

# SOILS (SOIL)

## SOIL 1010 Soil, Health, and Climate (1 credit)

This course examines the foundational role of soils in addressing critical global challenges such as climate change, human health, and regenerative agriculture. Topics include the intersection of soil health with carbon sequestration, the impact of soil management on human well-being, and the principles of regenerative agriculture. Designed as a first-year experience course. Typically Offered: Fall.

## SOIL 1200 Introduction to Water Science and Management (2 credits)

This course is an introduction to water science and management. The first part of the course will provide a basic scientific background for understanding water movement, occurrence, and behavior related to the nature of the water molecule that leads to its extraordinary but critical properties. The second part of the course will explore relationships between water, soils, plants, and the atmosphere. The third part of the course will introduce economic, legal, political, institutional, and engineering perspectives of water through a series of case-studies that simultaneously explore critical water issues and the wickedness of water management that is trying to address these needs. This course is designed to gradually transition from frontal lectures to discussions during the semester. Typically Offered: Fall.

## SOIL 2050 The Soil Ecosystem (3 credits)

General Education: Scientific Ways of Knowing  
Introduction to the physical, chemical, and biological nature of soils.  
Typically Offered: Fall and Spring.

**Prereqs:** CHEM 1101 or CHEM 1111 or Instructor Permission

## SOIL 2060 The Soil Ecosystem Lab (1 credit)

Lab study relevant to SOIL 2050. Experiments and demonstrations on basic and applied aspects of soil science. One 3-hour lab per week.

**Coreqs:** SOIL 2050

## SOIL 2100 Introduction to Food Systems (3 credits)

Introduction to food systems including the historical development of our current global food system. Linkages among the production, marketing and transportation of food and food policy on human health will be explored. Students will complete a semester-long assessment of the local food system and its impacts on individual, school and community health and strategies to improve the food system. Typically Offered: Fall (Odd Years).

## SOIL 2990 (s) Directed Study (1-16 credits, max 99)

Credit arranged

## SOIL 3980 (s) Internship (1-6 credits, max 6)

Credit arranged Graded Pass/Fail.

**Prereqs:** Department Permission

## SOIL 4000 (s) Seminar (1-16 credits, max 99)

Credit arranged

## SOIL 4040 (s) Special Topics (1-16 credits, max 99)

Credit arranged

## SOIL 4090 Principles of Environmental Toxicology (3 credits)

Joint-listed with ENVS 5090, FS 5090

, SOIL 5090. Fundamental toxicological concepts including dose-response relationships, absorption of toxicants, distribution and storage of toxicants, biotransformation and elimination of toxicants, target organ toxicity and teratogenesis, mutagenesis, and carcinogenesis; chemodynamics of environmental contaminants including transport, fate, and receptors; chemicals of environmental interest and how they are tested and regulated; risk assessment fundamentals. Graduate students are required to prepare an additional in-depth report. Recommended Preparation: BIOL 1020 or BIOL 1150, CHEM 1111, CHEM 1120, CHEM 2750, and STAT 2510. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

## SOIL 4150 Soil and Environmental Physics (3 credits)

Joint-listed with SOIL 5150

Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Two lectures and one 3-hour lab per week. Recommended Preparation: SOIL 2050, SOIL 2060, and PHYS 1111. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

## SOIL 4170 Market Garden Practicum (1-6 credits)

Experiential learning based course that covers all aspects of running a small acreage vegetable farm. Topics include farm planning, crop rotation, soil fertility and testing, weed management, and food systems. Students satisfy credit hours through participation in lecture/discussion, field work, and field trips. Class meets at the Plant Science Farm. Recommended preparation: SOIL 2050.

## SOIL 4200 Soil and Plant Water Relations (3 credits)

Joint-listed with SOIL 5200

The water use efficiency of plants is terrible. This course explores the journey of a water molecule from the atmosphere as it enters the soil, the root, travels through the vascular system and back into the atmosphere from a stomate. Fundamental principles of energy, flow and distribution are explored integrating soil physics and hydrology, plant physiology, and atmospheric sciences to understand the why and how plants utilize water. This course does not explore molecular biology but focuses on fundamentals as well as recent developments in rhizosphere sciences, precision and alternative agriculture, and the global climate. An additional project is required for graduate credit. Typically Offered: Spring.

## SOIL 4220 Environmental Soil Chemistry (3 credits)

Joint-listed with SOIL 5210

Chemical processes in soil environment. Additional work required for graduate credit. Recommended Preparation: SOIL 2050, SOIL 2060, and CHEM 1120. For 5210 enrollment, students should have completed one or more chemistry-related courses, including physical chemistry, inorganic chemistry, organic chemistry, mineralogy, biochemistry, analytical chemistry, second semester general chemistry, or geochemistry. Typically Offered: Spring (Even Years). Cooperative: open to WSU degree-seeking students.

## SOIL 4250 Microbial Ecology (3 credits)

Joint-listed with SOIL 5250

Biogeochemical activities and relationships of microorganisms in soil, water, plants, and animals. Extra oral and/or written assignments required for graduate credit. Recommended Preparation: MATH 1143. Typically Offered: Spring.

**Prereqs:** EPPN 1540 or BIOL 2500

**SOIL 4270 Sustainable Food Systems (3 credits)**

General Education: Capstone Experience

Joint-listed with SOIL 5270

The purpose of this course is to help students apply systems thinking and systems methodological problem solving skills to identify and describe current and future food system issues. Through lectures, case studies, and research, students will explore elements and behavior of food systems that impart sustainability. Additional readings, research, and presentations required for graduate credit.

**Prereqs:** FOR 2210, REM 2210, or SOIL 2100; or Instructor Permission

**SOIL 4340 Landscape Nutrient Management (3 credits)**

Joint-listed with SOIL 5340

Fundamentals of elemental cycles in managed and natural terrestrial systems. The basis underlying nutrient and soil fertility recommendations is explored. Impacts of climate, lithology, and plant-soil feedbacks are discussed. Management at field to watershed scale is addressed. Extra oral and/or written assignments required for graduate credit. Typically Offered: Varies.

**Prereqs:** SOIL 2050 and SOIL 2060

**SOIL 4360 Principles of Sustainability (3 credits)**

Cross-listed with FS 4360, ENVS 4360

Joint-listed with FS 5360, SOIL 5360

, ENVS 5360. Presented as online doculectures, covering topics such as origins of sustainability, standards of sustainability, culture of waste, built environment, industrial sustainability, energy sustainability, water resources, measuring sustainability, sustainable impact assessment, and our sustainable future. Readings and homework are assigned with each topic. Learning assessment will be from homework, exams and written papers. Additional work is required for graduate credit. Typically Offered: Fall and Spring.

**Prereqs:** Junior standing or higher Cooperative: open to WSU degree-seeking students.

**SOIL 4380 Pesticides in the Environment (3 credits)**

General Education: Capstone Experience

Cross-listed with ENT 4380, PLSC 4380

Principles of pesticide fate in soil, water, and air; pesticide metabolism in plants, pesticide toxicology, and pesticide mode-mechanism of action; pest resistance to pesticides; biotechnology in pest control; regulations and liability; equipment application technology; pesticide transport, storage, and disposal; and social and ethical considerations. Recommended Preparation: CHEM 2750.

**SOIL 4440 Water Quality in the Pacific Northwest (3 credits)**

Cross-listed with ENVS 4440

Joint-listed with ENVS 5440, SOIL 5440

, WR 5440. Qualitative aspects of water are covered in this class. Major topics are qualitative aspects of (1) surface water, (2) groundwater, (3) drinking water, (4) water in the oceans, and (5) the human waste stream. Concepts presented are relevant to world-wide water quality issues and concepts; however, an emphasis is placed on issues within the four Pacific Northwest states (ID, AK, OR, WA). Typically Offered: Fall.

**SOIL 4460 Soil Fertility (3 credits)**

Principles of soil fertility management; availability of plant nutrients and their relationship to plant growth and fertilization practices.

Recommended Preparation: SOIL 2050 and 2060. Typically Offered: Spring.

**SOIL 4480 Drinking Water and Human Health (3 credits)**

Cross-listed with ENVS 4480

Joint-listed with ENVS 5480, SOIL 5480

Understand the characterization, testing, and treatment of chemical, microbial and hazardous compounds and their impact on human health. Be familiar with drinking water standards, regulatory aspects and protection of municipal, community, and private well systems. Typically Offered: Spring.

**SOIL 4500 Environmental Hydrology (3 credits)**

Cross-listed with ENVS 4500

Comprehensive understanding of the hydrologic processes associated with the environmental processes. Includes components of the hydrologic cycle, analysis of precipitation and run off, evapotranspiration, routing, peak flow, infiltration, soil and water relationships, snowmelt, and frequency analysis. Typically Offered: Spring.

**Prereqs:** MATH 1143 or vertically related higher course

**SOIL 4520 Environmental Water Quality (3 credits)**

Joint-listed with SOIL 5520

Students are exposed to techniques, approaches and strategies to monitor and assess non-point pollution and its effects on beneficial uses in downstream water bodies. The class covers field lab and modeling approaches as applied to mixed forest, urban and agricultural watersheds. Students will learn approaches commonly used in TMDL assessment and the development of best management practices in implementation planning. Additional work required for graduate credit. Two lectures and one 3-hour lab a week. Recommended preparation: SOIL 2050 and BIOL 2500. Typically Offered: Varies.

**Prereqs:** CHEM 1111 and CHEM 1111L; SOIL 4500 or ENVS 4500 or FOR 4600 or CE 3250

**SOIL 4540 Pedology (3 credits)**

Morphology, genesis, and classification of soils; distribution of soils as related to environmental processes and factors. Two lectures and one 4-hour lab per week. Recommended Preparation: SOIL 2050 and SOIL 2060. Cooperative: open to WSU degree-seeking students.

**SOIL 4560 North Idaho Field Trip (1 credit)**

Joint-listed with SOIL 5560

Soils and land use in northern Idaho ecosystems; emphasis on soil parent materials, soil formation and morphology, and soil-plant community relationships. One 3-day field trip; additional class meetings and assignments before and after field trip. Graded Pass/Fail. Typically Offered: Fall.

**Prereqs:** SOIL 2050 or Permission Cooperative: open to WSU degree-seeking students.

**SOIL 4580 Soil and Site Evaluation (2 credits)**

Description and evaluation of soils; emphasis on morphological features and properties that influence land use. Two to four hours of lab per week (may include local field trips); one 3-day or one 6-day field trip. Recommended preparation: SOIL 2050. Graded Pass/Fail. Typically Offered: Spring. Cooperative: open to WSU degree-seeking students.

**SOIL 4640 Food Toxicology (3 credits)**

Cross-listed with FS 4640

Joint-listed with FS 5640, SOIL 5640

General principles of toxicologic evaluation of chemicals, which intentionally or unintentionally enter the food chain. Toxicology of food additives, colors, preservatives, drugs, pesticides and natural toxins in foods and risk characterization. Additional projects/assignments required for graduate credit. Typically Offered: Fall.

**Prereqs:** BIOL 3000 or BIOL 3800 Cooperative: open to WSU degree-seeking students.

**SOIL 4990 (s) Directed Study (1-16 credits, max 99)**

Credit arranged

**SOIL 5000 Master's Research and Thesis (1-16 credits, max 99)**

Credit arranged

**SOIL 5010 (s) Seminar (1-16 credits, max 99)**

Credit arranged

**SOIL 5020 (s) Directed Study (1-16 credits, max 99)**

Credit arranged

**SOIL 5040 (s) Special Topics (1-16 credits, max 99)**

Credit arranged

**SOIL 5090 Principles of Environmental Toxicology (3 credits)**

Cross-listed with ENVS 5090, FS 5090

Joint-listed with SOIL 4090

Fundamental toxicological concepts including dose-response relationships, absorption of toxicants, distribution and storage of toxicants, biotransformation and elimination of toxicants, target organ toxicity and teratogenesis, mutagenesis, and carcinogenesis; chemodynamics of environmental contaminants including transport, fate, and receptors; chemicals of environmental interest and how they are tested and regulated; risk assessment fundamentals. Graduate students are required to prepare an additional in-depth report. Recommended Preparation: BIOL 1020 or BIOL 1150, CHEM 1111, CHEM 1120, CHEM 2750, and STAT 2510. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

**SOIL 5150 Soil and Environmental Physics (3 credits)**

Joint-listed with SOIL 4150

Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Two lectures and one 3-hour lab per week. Recommended Preparation: SOIL 2050, SOIL 2060, and PHYS 1111. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

**SOIL 5200 Soil and Plant Water Relations (3 credits)**

Joint-listed with SOIL 4200

The water use efficiency of plants is terrible. This course explores the journey of a water molecule from the atmosphere as it enters the soil, the root, travels through the vascular system and back into the atmosphere from a stomate. Fundamental principles of energy, flow and distribution are explored integrating soil physics and hydrology, plant physiology, and atmospheric sciences to understand the why and how plants utilize water. This course does not explore molecular biology but focuses on fundamentals as well as recent developments in rhizosphere sciences, precision and alternative agriculture, and the global climate. An additional project is required for graduate credit. Typically Offered: Spring.

**SOIL 5210 Environmental Soil Chemistry (3 credits)**

Joint-listed with SOIL 4220

Chemical processes in soil environment. Additional work required for graduate credit. Recommended Preparation: SOIL 2050, SOIL 2060, and CHEM 1120. For 5210 enrollment, students should have completed one or more chemistry-related courses, including physical chemistry, inorganic chemistry, organic chemistry, mineralogy, biochemistry, analytical chemistry, second semester general chemistry, or geochemistry. Typically Offered: Spring (Even Years). Cooperative: open to WSU degree-seeking students.

**SOIL 5250 Microbial Ecology (3 credits)**

Joint-listed with SOIL 4250

Biogeochemical activities and relationships of microorganisms in soil, water, plants, and animals. Extra oral and/or written assignments required for graduate credit. Recommended Preparation: MATH 1143. Typically Offered: Spring.

**SOIL 5270 Sustainable Food Systems (3 credits)**

General Education: Capstone Experience

Joint-listed with SOIL 4270

The purpose of this course is to help students apply systems thinking and systems methodological problem solving skills to identify and describe current and future food system issues. Through lectures, case studies, and research, students will explore elements and behavior of food systems that impart sustainability. Additional readings, research, and presentations required for graduate credit.

**SOIL 5340 Landscape Nutrient Management (3 credits)**

Joint-listed with SOIL 4340

Fundamentals of elemental cycles in managed and natural terrestrial systems. The basis underlying nutrient and soil fertility recommendations is explored. Impacts of climate, lithology, and plant-soil feedbacks are discussed. Management at field to watershed scale is addressed. Extra oral and/or written assignments required for graduate credit. Typically Offered: Varies.

**SOIL 5360 Principles of Sustainability (3 credits)**

Cross-listed with ENVS 5360, FS 5360

Joint-listed with ENVS 4360, FS 4360

, SOIL 4360. Presented as online doculectures, covering topics such as origins of sustainability, standards of sustainability, culture of waste, built environment, industrial sustainability, energy sustainability, water resources, measuring sustainability, sustainable impact assessment, and our sustainable future. Readings and homework are assigned with each topic. Learning assessment will be from homework, exams and written papers. Additional work is required for graduate credit. Typically Offered: Fall and Spring. Cooperative: open to WSU degree-seeking students.

**SOIL 5440 Water Quality in the Pacific Northwest (3 credits)**

Cross-listed with ENVS 5440, WR 5440

Joint-listed with ENVS 4440, SOIL 4440

Qualitative aspects of water are covered in this class. Major topics are qualitative aspects of (1) surface water, (2) groundwater, (3) drinking water, (4) water in the oceans, and (5) the human waste stream. Concepts presented are relevant to world-wide water quality issues and concepts; however, an emphasis is placed on issues within the four Pacific Northwest states (ID, AK, OR, WA). Typically Offered: Fall.

**SOIL 5480 Drinking Water and Human Health (3 credits)**

Cross-listed with ENVS 5480

Joint-listed with ENVS 4480, SOIL 4480

Understand the characterization, testing, and treatment of chemical, microbial and hazardous compounds and their impact on human health. Be familiar with drinking water standards, regulatory aspects and protection of municipal, community, and private well systems. Typically Offered: Spring.

**SOIL 5520 Environmental Water Quality (3 credits)**

Joint-listed with SOIL 4520

Students are exposed to techniques, approaches and strategies to monitor and assess non-point pollution and its effects on beneficial uses in downstream water bodies. The class covers field lab and modeling approaches as applied to mixed forest, urban and agricultural watersheds. Students will learn approaches commonly used in TMDL assessment and the development of best management practices in implementation planning. Additional work required for graduate credit.

Two lectures and one 3-hour lab a week. Recommended preparation: SOIL 2050 and BIOL 2500. Typically Offered: Varies.

**SOIL 5560 North Idaho Field Trip (1 credit)**

Joint-listed with SOIL 4560

Soils and land use in northern Idaho ecosystems; emphasis on soil parent materials, soil formation and morphology, and soil-plant community relationships. One 3-day field trip; additional class meetings and assignments before and after field trip. Graded Pass/Fail. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

**SOIL 5640 Food Toxicology (3 credits)**

Cross-listed with FS 5640

Joint-listed with FS 4640, SOIL 4640

General principles of toxicologic evaluation of chemicals, which intentionally or unintentionally enter the food chain. Toxicology of food additives, colors, preservatives, drugs, pesticides and natural toxins in foods and risk characterization. Additional projects/assignments required for graduate credit. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

**SOIL 5970 (s) Practicum (1-16 credits, max 99)**

Credit arranged

**SOIL 5980 (s) Internship (1-16 credits, max 99)**

Credit arranged Graded Pass/Fail.

**Prereqs:** Permission

**SOIL 5990 (s) Research (1-16 credits, max 99)**

Research not directly related to a thesis or dissertation.

**Prereqs:** Permission

**SOIL 6000 Doctoral Research and Dissertation (1-45 credits, max 99)**

Credit arranged