

ERTH 306 Work of Water

Scott Rowland, Earth Sciences Dept., POST 617-A, 956-3150, scott@hawaii.edu

Environmental Hydrology (any Edition; Ward & Trimble; W&T – order online)

Water Resources in Hawaii (Hawaii Water Authority 1959; HWA – on Laulima)

Work of Water Supplementary notes (Peterson – on Laulima)

E mālama i ka wai (*take care of the water*) are extremely important words to live by here on our small Hawaiian islands. Water is essential to our modern way of life, it was essential to the traditional Hawaiian way of life, and it is essential to the ecology of Hawai'i. At times (e.g. floods) water is also a threat to lives and infrastructure. A good understanding of water, where it can be found, how it can be utilized, and how it can (or should) be controlled is important for almost all geological disciplines. It is also important as a human living on an island.

Work of Water, devised and taught by Dr. Frank Peterson for many years, is designed to give you that understanding. You will learn how water cycles through mountains, streams, and the subsurface, how it can be captured for use, the problems that occur when it is over-used and polluted, and the problems that occur when there is too much water in a short time. The course will consist of lectures, homework, and hands-on activities in the lab and in the field. There will be at least one, and possibly two, all-day field trips. Mahalo to Jill Torikai and Scot Izuka of the USGS Water Resources Center for assistance.

There will be homework, a midterm, and a non-cumulative final.

Schedule (subject to change):

Date	topics	section(s) in book or other reading	SLO (see p. 3)
Week 1	Intro. to Hydrology, Hydrologic Cycle	W&T 1.1-1.4, HWA 1-7, Peterson 44-47	1, 3, 5
	Water in old Hawai'i, <i>Mānoa stream and Kānewai lo'i</i>	Handy <i>et al.</i> 54-67, Miike 40-73	
Week 2	Properties of Water, Water Units	Peterson 1-18, W&T 1.5, 2.1-2.3, HWA 7-17	1, 2, 3, 5
	<i>Capillary rise lab</i>		
Week 3	Precipitation I (causes, Hawai'i patterns)	W&T 2.4-2.9, HWA 21-22, Peterson 46-49, 106-109	1, 2, 3, 5
	Precipitation II (measurement), <i>Precipitation lab</i>		
Week 4	Infiltration to Soils, Groundwater, Water Tables, Aquifers, Springs	W&T 3.1-3.8, Peterson 52-56, W&T 11.1-11.3, HWA 38-41, Peterson 60-79	1, 2, 4, 5
	<i>Porosity, Permeability, Field Capacity lab</i>		
Week 5	Groundwater in Hawai'i	handout, Peterson 103-105, 113-121	1, 3, 5

	<i>Ghyben-Hertzberg lab</i>		
Week 6	Darcy's Law	Peterson 79-87	1, 2, 3, 5
	<i>Darcy's law lab</i>		
Week 7	Wells and Drawdown cones	W&T 11.4-11.5, Peterson 94-101	1, 3, 5
	<i>Drawdown curve lab</i>		
Week 8	Flownets	Peterson 87-94, W&T 11.4-11.5, Peterson 94-101	1, 3, 5
	<i>Waihe'e tunnel field trip</i>		
Week 9	Deep Fresh Water (Guest Speaker: Dr. Don Thomas),		1, 3, 5
	<i>No class (Scott gone)</i>		
Week 10	<i>SPRING BREAK !!</i>		
	<i>SPRING BREAK !!</i>		
Week 11	Stream Morphology and Order, Flow Measurement	W&T 6.1-6.10, Peterson 34-35	1, 2, 3, 5
	<i>Midterm review</i>		
Week 12	MIDTERM		
	<i>Mānoa streamflow lab</i>		
Week 13	Flow in Channels, Rivers and Streams, Hawai'i and elsewhere	W&T 7.1-7.5, Peterson 38-43 HWA 22-36, Peterson 111-113	1, 2, 3, 5
	<i>Water Pollution (lecture + lab)</i>		
Week 14	Floods (Measurement and controlling factors)	W&T 5.1-5.11, Fontaine & Hill	1, 3, 5
	<i>Manoa rating curve lab</i>		
Week 15	Recent Hawai'i Floods (2000, 2004, 2006)	US Army, Godbey, Dracup <i>et al.</i> , HWA 37-38	
11/29	<i>Flood control field trip</i>		
12/3	Water Law in Hawai'i (Guest Speaker: Mike Dahilig)	HWA 80-85, Peterson 121-128, Miike, HWA 57-78, Miike 74-136	1, 3, 5
12/6	<i>Field trip to Waipao</i>		1, 2, 3, 5

Final Exam, (Thursday of finals' week), 9:45-11:45 am

There are lots of Hawai'i Water-related publications available from the US Geological Survey's Water Resources Branch:
<http://hi.water.usgs.gov/publications/>

CLOs – Course Learning Objectives: The objectives of this course are to learn how water works, how it flows, where it flows, and why this is all so important. Students will learn how climatological and geological processes control water and its distribution, and how these processes can be used to calculate water budgets, runoff, flood potential, etc. They will also learn about how traditional Hawaiian societies managed water and what we should learn and practice today from these ways of old.

***SLOs – Student Learning Objectives:** Earth Sciences undergraduate courses have to consider how they address a number of SLOs, which the Earth Sciences Department has decided are key attributes and/or abilities of any Earth Sciences student. They are (in no particular order):

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and be able to discuss issues related to geology and its impact on society and planet Earth.
2. Students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.
3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.
4. Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.
5. Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

ILOs – Institutional Learning Objectives: Students will gain knowledge about the *physical and natural occurrence of water*, as well as its *cultural relevance in Hawai'i*, both in the past and today. They will learn to *think critically* while making calculations of flow rates, flooding potential, and contamination. They will *collect data in the lab and in the field* and *communicate their results* in short reports. They will learn the importance of *water stewardship* to conserve and protect water resources, with particular *emphasis on Hawai'i, its environment, and its people*.

CHEATING (ON EXAMS, FOR EXAMPLE), IS TOTALLY UN-COOL AND VIOLATES THE UHM STUDENT CODE OF CONDUCT (SEE <http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm#integrity> IN THE ON-LINE UH CATALOG). CHEATING WILL NOT BE TOLERATED, AND WILL RESULT IN A GRADE OF F FOR THE COURSE AND A LETTER SENT TO YOUR ACADEMIC DEAN EXPLAINING THE REASON FOR THE F.