Environmental Geology Spring 2021 Midterm Exam Study Guide

The Midterm Exam will be available on Thursday May 6, from 8 AM – 11 PM. The exam format will be a combination of short-answer terminology, medium- to long-answer essay, and lab-style quantitative problems. Labs have largely focused on identifying features on maps and photos, and thinking about geologic hazards in relation to human populations. Be prepared to make sketches of diagrams and recall key equations to illustrate your answers. The exam will have a 3 hour maximum time limit, once you begin.

I would spend a minimum of studying 8-10 hours total for this exam, to assure maximum success. Use the keyword and concept list below as a check list for studying.

Class Notes to Review:

Introduction to Environmental Geology https://people.wou.edu/~taylors/g473/intro.pdf
Mass Wasting https://people.wou.edu/~taylors/g473/masswast.pdf
Flood Hazards https://people.wou.edu/~taylors/g473/floods.pdf
River Restoration https://people.wou.edu/~taylors/g473/ES473_River_Restoration.pdf

Class Powerpoint Slide Shows to Review:

Intro to Environmental Geology https://people.wou.edu/~taylors/g473/Week2_ES473_Introduction.pptx
Mass Wasting https://people.wou.edu/~taylors/g473/Week3_ES473_Mass_Wasting.pptx
Flood Hazards https://people.wou.edu/~taylors/g473/Week4_ES473_Rivers_Floods.pptx
River Restoration https://people.wou.edu/~taylors/g473/Week5_ES473_River_Restoration.pptx

Text Chapters / Journal Readings to Review:

Chapter 1 – Introduction https://people.wou.edu/~taylors/g473/1_Keller_Intro.pdf
DOGAMI – Hazards Mitigation in Oregon
https://people.wou.edu/~taylors/g473/Beaulieu_Olmstead_1999_DOGAMI_SpecialPaper31.pdf
Chapter 4 - Hazards Overview https://people.wou.edu/~taylors/g473/4_Keller_Hazards_Overview.pdf
Chapter 3 - Soils https://people.wou.edu/~taylors/g473/3_Keller_Soils.pdf
Chapter 6 - Mass Wasting overview https://people.wou.edu/~taylors/g473/6_Keller_Landslides.pdf
Chapter 5 - Rivers/Flood Overview https://people.wou.edu/~taylors/g473/5_Keller_Rivers.pdf
Roni et al., 2002, River Restoration in the Pacific Northwest
https://people.wou.edu/~taylors/g473/3_Roni_etal_2002_restoration_techniques_review_PNW.pdf

Supporting Video Study Content:

National Environmental Policy Overview https://www.youtube.com/watch?v=fwxy_9HO1MI
What are Landslides http://www.youtube.com/watch?v=JrV4uCVwmfk&feature=related
Intro to Rivers and Flooding http://www.youtube.com/watch?v=4PXj7bOD7IY
Calculating Flood Risk http://www.youtube.com/watch?v=a1gXKyIKnHk
Flood Management Strategies http://www.youtube.com/watch?v=9pFTI7GjBBE
Introduction to River Restoration https://www.youtube.com/watch?v=CsayzeejVzY

Key Words from Notes, Video Exercises and Readings

Introduction
Environmental Geology
- natural hazards
- environmental quality
  - water
  - soil
  - waste
- management
- natural resources
  - water
  - energy
  - mineral

Geologic Hazards
fluvial
mass wasting
coastal
seismic
volcanic
coastal
death / destruction
anthropogenic
urbanization
hazard vs. risk
contaminants
health effects
environmental fate
industrial waste
biological waste
pollution
nature vs. humans
humans vs. nature

Introductory Video Exercise
Hanford Site
Radiation
Groundwater
Nuclear reactor
Plutonium waste
Soil/water contamination
K-reactor
Reactor fuel rods
Site Remediation

Oregon Natural Hazards Overview
seismic / earthquake
subduction zone earthquake
intraplate earthquake
landslide
coastal erosion
volcanic activity
- ash zone
- lahar

tsunami
flood
stream bank erosion
quake-slide
quake-tsunami
flood-coastal erosion

Mass Wasting Hazards
Cohesion
Clay cohesion
Water cohesion
Weathering
Regolith
Colluvium
Landslide deposit
Bedrock
Controls:
- Vegetation
- Root strength
- Slope
- Gradient
- Angle of repose
- Cohesion
- Pore pressure
- Friction
- Human activity

Earth
Debris
Rock
Fall
Topple
Slide
Slump
Rotational slide
Translational slide
Flow
Creep
Debris flow
lahar
Earth flow
Rock fall
Rock slide
Rock block slide
Debris slide
Scarp
Toe slope
Hummocky topography
Deranged contour patterns
Slow-moving landslide
Rapidly moving landslide
Cut slope
Fill slope
Landslide hazard mapping
Source region
Run-out zone

Flood Hazards
Hydrologic cycle
Infiltration
Runoff
flood
discharge
bankfull discharge
magnitude-frequency
discharge-time
river stage
hydrograph
flood peak
flood peak lag
peak annual discharge
recurrence interval
runoff
infiltration
floodplain storage
drainage basin
watershed
drainage divide
drainage network
channel
floodplain
100-yr floodplain
floodplain management

flood hazard mitigation
flood hazard assessment
floodplain zoning
risk assessment
hazard vs. risk
urbanization
floodplain storage
dam - flood retention
climatic vs. geologic causes of flooding

River Restoration
Watershed
Channel network
Watershed Controls:
- Geology
- Topography
- Climate / Hydrology
- Vegetation
- Anthropogenic

Channel complexity
Channel habitat
Channel pattern (straight, meandering, braided)
Debris flow
Hillslope Delivery
Sediment / Erosion
Dissolved Oxygen
Turbidity
Drainage basin
Disturbance (fire-flood-slide)
Downcutting / incision
Estuary
Anadromous fish
Salmonid
Coho-Chinook-Steelhead
Fish life cycle (spawning-rearing-fry-redd)
Hydrograph
Hyporheic Zone
Peak flow
Floodplain
Large woody debris (LWD)
Low flow-high flow
Recruitment of LWD
Redd
Resident fish
River Restoration
Oregon Salmon Plan

Restoration Strategies:
- Habitat Reconnection
- Road Improvement
- Riparian Restoration
- Instream Channel Restoration
- Nutrient Enrichment

Riparian zone
Critical habitat
Degraded streams
Channel narrowing
Urbanization
Off Channel Habitat
Engineered Channel Structures
Ecosystem services
Nutrient cycling
Riparian vegetation
Road Building
Fish passage
Bridge structures
Culverts
Rip-rap
Road Improvement
Streamside Grazing mgt.
Carcass placement
Side channel
Floodplain
In-Channel Modification
Wood-boulder placement
Off-channel habitat
Nutrient loading
Stream canopy/shading

Possible essay questions and other concepts

- What is the difference between geologic hazard and risk?
- List and discuss anthropogenic vs. natural environmental geology problems. How does these relate to the introductory video examples given for the Hanford Nuclear Reservation?
- List and discuss the types of environmental hazards (natural and manmade) in Oregon / PNW.
- List and discuss the types of earthquakes associated with the Pacific Northwest
- Discuss the types of hazards associated with seismic events in the PNW.
- What are the volcanic hazards in Oregon? Why do we have volcanic and seismic hazards in Oregon?
- What are the ultimate energy sources for tectonic and climactic hazards?
- List and discuss anthropogenic vs. natural environmental geology problems.
- List and discuss the types of environmental hazards (natural and manmade) in Oregon / PNW.
- List, discuss, describe, sketch the mass wasting classification.
- What is the difference between a slump and slide?
- What is the difference between a debris flow and lahar? And mudflow? Bedrock and regolith?
- Discuss flood hazards in western Oregon vs. eastern Oregon
- What is a flood hydrograph and rating curve? How are they used to assess flood hazards.
- What types of meteorological events trigger landslides, floods, and debris flow hazards in Oregon?
- Rain-on-Snow flooding
- List and discuss the mass wasting classification system, with sketch examples of each type.
- How are magnitude-frequency concepts applied to geologic hazards? How do these concepts relate to floods, earthquakes, and volcanic eruptions?
- Discuss flood hazards in western Oregon vs. eastern Oregon; what types of conditions lead to floods?
- What is a debris flow? What types of conditions lead to debris flow?
- List and discuss the primary variables controlling slope stability and mass wasting.
- What are the significant climatic events in western Oregon that lead to flooding? What time of year?
- How is the 100-yr floodplain determined and mapped out?
- What is a rating curve? How do you calculate recurrence interval and probability of occurrence?
- What is a flood hydrograph and how does it look when comparing a forested area to an urbanized area?
- What types of meteorological events trigger landslides, floods, and debris flow hazards in Oregon?
- List and discuss the three primary methods for managing geologic hazards to prevent loss of life or property.
- What is river restoration and why is it important in the Pacific Northwest?
- List the key elements of river restoration strategies in the Pacific Northwest, provide examples and sketches.

Homework / Lab Exercise Skills

Map reading, photo observation, and process interpretation. ID landslides from Lidar images.
Can you conduct basic calculations of map scale, and unit conversions?
Can you draw a profile and make basic map observations? Can you read a topographic map?
Can you identify mass wasting and flood hazard zones on a topographic map?
Can you solve basic hydrology / watershed problems? Calculate slope and gradient.
How is a recurrence interval and probability for floods determined?

The exam will also include an open-book problem solving portion related to the lab exercises; review lab answer keys posted on class web site: http://www.wou.edu/las/physci/taylor/g473/ES473_home.html