Environmental Geology Spring 2013 Midterm Exam Study Guide

The Midterm Exam will be in 2 parts, the lab skills portion will be open book. You will be able to use your notes, conversion charts, etc. to work on lab-style problems. Labs have largely focused on identifying features on maps and photos, and thinking about geologic hazards in relation to human populations.

The second part of the exam will be closed book, and consist of long-answer essay questions and short-answer terminology. Be prepared to make sketches of diagrams to illustrate your answers.

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.

Key Words

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

LIDAR Introduction
LIDAR
Laser
Laser pulse
Reflection
Absorption
Two-wave travel time
Laser source
Pulse detector
first-returns
second-returns
last returns
bare-earth model
digital elevation model
DEM
Aerial surveys
Laser swath mapping
Land classification
Vegetative structure
Ground cover
Flight lines
GPS – positioning systems
Urban modeling
Watershed modeling
Topographic analysis
Point cloud
Laser altimetry
First-return model

OSU Paired Watershed Conference
Paired watershed study
Hinkle Creek
OWEB
Industrial logging
Clear cut
Treatment vs. control
First-order watershed
Second-order watershed
Selective cut
Sediment yield
Stream temperature
Stream discharge
Stream flow
Gage station
Weir
Sediment flume
Sediment trap
Fish-bearing streams
Non-fish-bearing
Type N vs. Type F
Headwaters
Stream buffers
Forest management
Harvest units
Aquatic habitat
Road building
Forest practices Act
Fertilization
Nutrient load
Mobile cations
Salmonid biomass
PIT tagging
Salmonid Growth rates
>clear cut > Q
Peak Q (discharge)
Instantaneous peak flow
Stream stage
Turbidity
Sediment yield
Suspended sediment
Nitrogen uptake
Pool habitat
Pool depth
Fine vs. coarse substrate
Channel substrate

River Restoration Principles
Anadromous vs. resident fish
Salmonids
Oregon Salmon Plan
Coho, Chinook, Steelhead, cutthroat
Juvenile, spawning
Riparian zone
Riparian buffer
Tree planting
Erosion prevention
Large woody debris
Big wood
Wetlands
Habitat structure
Fish passage
Flow / discharge
Log jams
Floodplain connection
Stream restoration
Watershed scale
Reach scale
Culverts-dams
Passage barriers
Sediment regime
Spawning gravel
Flow regime
Gravel budgets
Incised channels
Debris flow
Landslide
Alluvial
Bedrock channel
Channel scour
Pool-riffle
Cascade-step pool
Channel aggradation
Groundwater connection
Hyporheic zone
Tributary / back water
Habitat assessment
Channel cross section
Large wood / log jams
Best management practice
Rearing habitat
Refugia
Redd
Geomorphic mapping

Intro to 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

Earthquake Overview
earthquake
focus
epicenter
faults
volcanic
fault trace
fault zone
fault segment
fault-line scarp
fault offset
rock deformation
    ductile
    elastic
    brittle
stress
strength
faulting
stick-slip
aftershock
P-wave
S-wave
Surface-wave
Rayleigh wave
Love wave
Seismic velocity
Seismograph
Seismogram
First-break
Arrival time
Magnitude
Richter scale
Isoseismal map
Intensity
Seismic acceleration
fault creep
intraplate quakes
plate bound quakes
earthquake intensity vs. earthquake magnitude
fault slip rate
fault scarp
surface deformation
fault displacement
earthquake recurrence
paleoseismology
seismicity
fault offset
Hazard Variables
    intensity
    duration
    building design
    foundation materials
    written record
    geologic records
Earthquake Hazards Mapping
liquefaction potential
amplification potential
landslide potential
earthquake prediction
magnitude-frequency
recurrence interval
seismic record
seismic upgrade

Oregon Seismic Hazards
Plate convergence
Juan de Fuca plate
Oblique subduction
Plate locking
Accretionary tectonics
Aseismic slip
Seismic slip
intraplate quakes
interpolate quakes
crustal quakes
Cascadia subduction zone
megathrust
Deep intraplate
shallow crustal
paleoseismic record
tsunami
groundshaking
hazard mapping

Volcanic Hazards
magma
lava
subduction zone volcanism
craters
hillslopes
Cascade volcanic arc
dormant/active/extinct
shield volcano
fissure eruptions
cinder cones
composite volcano
stratovolcano
volcanic dome
explosive vs. quiescent
lateral blasts
phreatic eruptions
eruptive products
    lavas
    pyroclastics
        ash
        lapilli
        blocks
        bombs
    gases
Cascade Hazards
    tephra
    ballistics
    pyroclastic flow
    lahar
    lava flow
    volc. gases
    lateral blasts
    glacial outburst floods
volcanic landslides
debris flows/lahars
pyroclastic flow
dome collapse
co-seismic eruption
hazard zone
volcanic risk map
lahar warning system
noxious gas monitoring
eruptive recurrence
magnitude-frequency

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 concept of paleoseismology, it's application to hazards mitigation, and the types of records that contribute to the paleoseismic data set for Oregon.
- 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?
- 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?
- What is LIDAR? How is it acquired? What is it used for?
- 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 are the effects of / responses to clear-cut logging on headwater basins in the Western Cascades? In terms of streamflow(?), sediment yield(?), nutrient load(?), fish population and biomass(?)… what were the key take-home messages from the OSU Paired Watershed Conference?
- What is the Oregon Salmon Plan? What is OWEB? What are the key elements associated with River Restoration initiatives in the Pacific Northwest? What is the goal of river restoration? What are the essential habitat characteristics associated with healthy salmonid habitat in Oregon rivers?

Homework / Lab Exercise Skills

Map reading, photo observation, and process interpretation.
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 volcanic hazard zones on a topographic map?
Can you solve basic hydrology / watershed problems?
How is a recurrence interval and probability for earthquakes or floods determined?