Jensen Almquist

Mass Wasting Hazards in Western Oregon Outline

INTRODUCTION

TYPES OF MASS WASTING COMMON IN OREGON

- **Landslides**
- **Debris flows**
- **Rock topples and falls**

CONDITIONS IN OREGON COMMONLY TRIGGERING MASS WASTING EVENTS

- **Precipitation**
  - **Heavy rain and rapid snow melt**
- **Freeze/thaw**
- **Earthquakes**
- **Human**
  - **Changing slope**
  - **Diverting water/drainage**

SUMMARY AND CONCLUSION

REFERENCES CITED

Hofmeister, R.J., Miller, D.J., Mills, K.A., Hinkle, J.C., Beier, A.E., 2002, GIS Overview Map of Potential Rapidly Moving Landslide Hazards in Western Oregon: Oregon Department of Geology and Mineral Industries, p. 4-10.

Schmidt, K.M., Roering, J.J., Stock, J.D., Dietrich, W.E., Montgomery, D.R., Schaub, T., 2001, The variability of root cohesion as an influence on shallow landslide susceptibility in the Oregon Coast Range: NRC Research Press

Tanyas, H., Allstadt, K.E., van Westen, C.J., 2018, An updated method for estimating landslide-event magnitude: Earth Surface Processes and Landforms

Ryan Bibler

Coastal Erosion in Western Oregon

Intro

1. Modes of erosion
2. Erosion in the past
3. Potential erosion problems
4. Solutions

Modes of erosion

1. Wind
2. Water
3. Gravity
4. Man

Erosion in the past

1. Erosion is increasing
2. Rivers
3. Mountains
4. Volcanoes

Potential erosion problems

1. Landslide
2. Property loss
3. Tourism
4. industry

Solutions

1. OCMP
2. NOAA
3. CZMA

Conclusion

I. Introduction

II. Tectonic Setting and Climate

III. Erosion Processes

IV Hazards Management

V. Conclusion

VI. References Cited

4/4

See me for references

Citations

"Beachapedia." *Climate Change - Beachapedia*, www.beachapedia.org/State_of_the_Beach/State_Reports/OR/Beach_Erosion.

"About Coastal Zone Management." *Oregon Department of Education : 2018 Social Sciences Standards SBE First Reading Draft : Social Sciences : State of Oregon*, www.oregon.gov/LCD/OCMP/Pages/About.aspx.

Associated, The. "Oregon Beaches Eroding Faster than Past, New Study Shows." *OregonLive.com*, OregonLive.com, 10 Dec. 2013, www.oregonlive.com/pacific-northwest-news/2013/12/oregon_beaches_eroding_faster.html.

Brody Bohrer

Dr. Taylor

ES 202

2/28/19

4/4

Preliminary Outline

Topic: Coastal Tsunami Record of Cascadia Subduction Zone

I. Introduction

II. History of Tsunami Record

III. Tectonic Setting

Sedimentary Features/Stratigraphy — III A.

IV Concerns/Prep for the Future — "Hazards management Plan"

V Summary and Conclusion

VI. References Cited

Tonya Bradley

ES 202 Term Paper

Preliminary Outline

Volcanic Hazards in Oregon

I. Introduction

II. Tectonic setting/history

  A. Bedrock geology

    1. Volcanic

    2. Sedimentary

  B. Subduction zone

III. Geologic history

  A. Volcanism

IV. Conclusion

4/4

~~Focus~~

I. Introduction

II. Tectonic Setting

III. Overview of CASCADE Volcanoes

IV. Hazard
A. Lahar potential
B. Lava flow/Basaltic
C. Ash
D. Seismicity

V. Conclusion

VI. Bibliography

James Ceciliani

Earth Science

Term Paper

4/4

Global Climate Change & Predictions for Pacific Northwest

+Define Climate Change

+Climate change over time

+Effect climate change has on sediment

+Different views on climate change (politically)

+Give recent examples of climate change

+Predictions of climate change moving forward for the PNW

+Offer possible solutions?

+Evaluate why climate change is where it is today.

+How much is in fact our fault?

I. Introduction

II. Physiographic Setting

III. Climate Trends

IV. Future Predictions

V. Conclusions

VI. References Cited

Contact me for references + publications

3/1/19

Grace Comer

Term Paper Outline

Intro

1. history of Oregon Coast
2. intro to topic (Coastal Processes/Hazards of oregon)

Body

1. Coastal Processes
2. Tectonic setting
3. Coastal Hazards

Conclusion

1. Summary of Paper
2. Prevention of Major Damage

References Cited

Figures and Tables

4/4

TITLE ?

I. INTRODUCTION

II. GEOLOGIC SETTING

III. COAST PROCESSES & HAZARDS

IV HAZARDS MANAGEMENT

V. CONCLUSION

VI. REFERENCES CITED

DULCE G.

A salmon article that will get a better title later.

I. INTRODUCTION

BODY OF ARTICLE

II. Background on salmon & fluvial systems in Oregon "SALMON HABITAT"

The life cycle and migration pattern of a salmon

Which rivers to salmon frequent?

What systems are in place that interfere with salmon migration and life cycle

History of salmon and rivers in Oregon

Talk about dams?

III. WATERSHED RESTORATION
Issues arising and why they are issues

Watershed Restoration (maybe put in above sub category?)

Deconstructing dams

Too much sediment in rivers

Decreasing salmon population 4/4

Proposed solutions(?)

IV SUMMARY/CONCLUSION

V. REFERENCES CITED

Rebecca J.

Salmon & Fluvial Systems

- Introduction
- Body of article
  - > Background on salmon and fluvial systems in Oregon
    - The life cycle and migration pattern of a salmon
    - Which rivers do salmon frequent?
    - Which systems are in place that interfere with salmon migration and life cycle?
  - > History of salmon and rivers in Oregon
    - talk about formation of dams (?)
    - salmon ladders (?)
  - > Issues arising for salmon and why are they issues?
    - watershed restoration (maybe this will go in the above sub category)
    - deconstructing dams
    - too much sediment in rivers (?)
    - decreasing salmon population
  - > Proposed solutions (?)
- Summary / Conclusion

Works Cited:

Beechie, Timothy J., et al. "Process-based principals for restoring River Ecosystems." *BioScience* vol60, no.3, Mar. 2010, pp. 209-222

May, Christine L., and Thomas E. Lisle. "River Profile controls on channel morphology, debris flow disturbance, and the spatial extent of salmonias in

I emailed a printed version

Jamari Gilbert

Dr. Taylor

ES 202W

February 20, 2019

4/4

I wish to do my term research paper on Tsunami hazards and deposits associated with coastal Oregon.

I. Introduction

II. Economic Impacts

III. Tsunami Research

IV. Hazard Management

V. Conclusion

VI. References Cited

Overview

Hazards

Earthquakes

Landslides

Liquefications

Secondary Hazards

Fires

Destruction of Buildings and structures

How Sediment is transported due to tsunami

Summary

Conclusion

Sources I found thus far

http://scecinfo.usc.edu/eqcountry/roots/tsunami.html

https://www.fema.gov/media-library-data/20130726-1541-20490-2086/frm_p1tsun.pdf

See me in Office for References

2-SIDED

Good 8/4

Andy Hernandez

2-27-19

ES 202

Title: groundwater resources of the southern willamette valley

I. Introduction

A. Groundwater information

1. Age and area of notable groundwater (13-50 years)
2. Aquifers (willamette silt)

B. Contaminants in groundwater

see me for references AS Nevins

II. Geologic setting

. Willamette basin

1. bounded to the west by the Coast Range, to the east by the Cascade Range, to the south by the Coast and Cascade Ranges, and to the north by the Salem Hills

A. Tertiary strata beneath the valley

1. Developed during the eocene era

B. Uplift of the coastal range

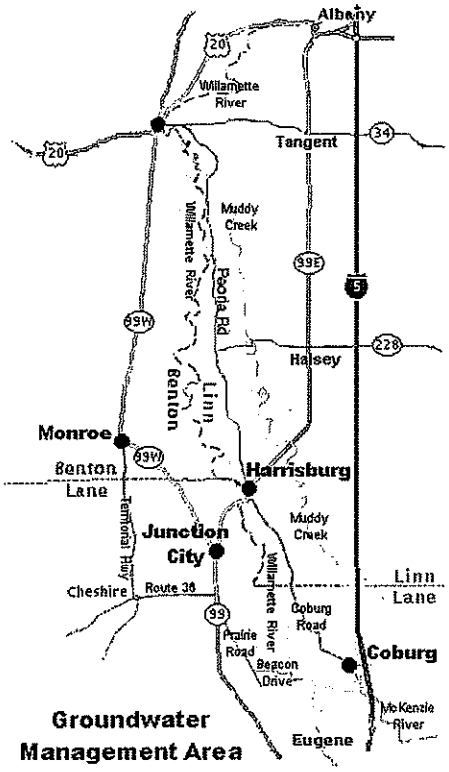
1. Provides gentle east dip beneath western edge of valley

III. Water resources

. Age of groundwater (13-50 years)

A. Area of groundwater (willamette valley)

1. Groundwater management area



2.

B. Chemicals in the groundwater (notably nitrate)

1. Can be very harmful for aquatic vegetation and humans

a. Cancer and birth defects due to excess nitrates

2. Areas of contaminated water (mainly coburg and junction city)

3. Willamette silt preventing leaching of nitrate

IV. Summary and Conclusion

V. Work cited/references

. https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/1544bs15f

A. http://wellwater.oregonstate.edu/swvgwma

B. Hydrogeologic Field Investigation and Groundwater Flow Model of the Southern Willamette Valley, Oregon.

Taylor Hoj PTLE 7

-1

3/4

Paper Outline

I Introduction
A definition of tsunami

II Chance of a cascadia earthquake today

III Evidence of past cascadia earthquakes & tsunami's

IV Repercussions of tsunami's on west coast

V Conclusion

VI References Cited

I Introduction

II Seismic Setting

III Tsunami Records

IV Hazards Management

V Conclusion

VI References Cited

Troy Howard

2/25/19

ES 202

Taylor

4/4

Topics

1) Tsunami hazards and deposits associated with coastal Oregon

- ***Introduction:***
  - ***Hook:*** (story about a family enjoying a day at the beach, the major earthquake hits - they need to know where to go).

I. Introduction

II. Tectonic Setting

III Tsunami Records

IV Hazards Management

V Conclusion

VI References

- Topic Points:
  - What/How tsunamis form
    - Usually follow earthquakes
    - Can travel across the ocean
    - Occurs in the ocean
    - Result in a change in the sea floor
    - Transfer of energy
  - Past tsunamis
    - 2011 - Japan
    - 2007 - Sumatra
    - 2006 - Java islands
    - 2004 - Indian ocean (Most devastating)
    - 1998 - New Guinea

TROY

- Tsunami warning system (TWS)
- Can calculate arrival times

- Conclusion - the hazards that come with tsunamis and why they are so dangerous.

Possible sources

1. Sources: https://www.oregon.gov/oem/hazardsprep/Pages/Tsunami.aspx (What to do)
2. http://library.state.or.us/repository/2010/201012201541261/ (Contour maps)
3. https://www.ci.florence.or.us/community/oregon-coast-now-fully-mapped-tsunami-dangers (Pre-pairing)
4. https://pnsn.org/blog/2013/01/24/the-last-cascadia-great-earthquake-and-tsunami-313-years-and-ticking (Past tsunamis)
5. https://www.foxnews.com/science/timeline-a-history-of-pacific-tsunamis-earthquakes (1700 tsunami)
6. Incorporating Tidal Uncertainty into the Methodology of Probabilistic **Tsunami Hazard** Analysis. - wou Library (Tsunami chart)
7. https://www.oregongeology.org/pubs/fs/tsunami-factsheet_onscreen.pdf (How they form)
8. https://earthweb.ess.washington.edu/tsunami/general/warning/warning.html (Tsunami warning)
9. https://www.redzone.co/2018/10/19/how-tsunami-early-warning-systems-work-and-why-indonesias-system-failed/ (How the tsunami warning system works)
10. https://news.nationalgeographic.com/news/2007/04/tsunami-facts-warning-signs-safety-tips/ (Thing to know/do)

Jordyn Krake

Missoula Flood Term Paper Outline 1

I **Introduction**

II **Mechanics of a Flood**
- A. Processes
- Warning signs

III. **Causes of the Missoula Flood**
- Environmental
- Human

IV **Effects of the Missoula Flood**
- Statistics
- Effects on humans
- Effects on the environment

V **Conclusion**

VI. **References Cited**

DeGrey, L., and Link, P.K., Lake Missoula Floods: The Pleistocene Ice Age and the Cordilleran Ice Sheet Ancient Lake Missoula and the Missoula Ice Age Floods Lasting Effects of the Missoula Ice Age Floods, Internet Web Source, URL: http://geology.isu.edu/Digital_Geology_Idaho/Module13/mod13.htm.

Montana Natural History Center, A Geologic Catastrophe: Internet Web Source, URL: http://www.glaciallakemissoula.org/story.html.

Topinka, L., 2018, Missoula Floods, Internet Web Source, URL: http://columbiariverimages.com/Regions/Places/missoula_floods.html.

See me for references

Christopher Mikkelson
2/26/2019

ES 202 Term Paper Outline

Influences of Natural Resource Harvest on Mass Wasting in the Oregon Coast Range

1) ABSTRACT: Overview of PNW Landslide impact, reason to care
2) Landslide definition and mechanics
   a) Different types of mass wasting
   b) contributing factors to mass wasting frequency in undisturbed areas
3) Major geologic formations of the Oregon coast
   a) Siletz River Volcanics
   b) Tyee formation
   c) Intrusive igneous bodies
   d) Soil Trends
4) Climate overview
   a) Distribution of precipitation
   b) Timing of precipitation
5) Direct influence of logging influence on landforms
   a) Deforestation
   b) Road-related soil movement
   c) Tilling & compaction
6) Synthesis
   a) Interactions between all previous influences
7) Conclusions

4/4

I. Introduction

II. Physiographic Setting
A. Climate
B. Geology
C. Soils
D. Land-use History

III. Effects of Timber Harvest

IV Conclusion

V. Ref Cited

Melina Mullin
ES 202
First outline for Term Paper

Good 5/4

I. **Introduction**
   A. Megathrust record of the Cascadia Subduction Zone (CSZ)
   B. Tsunami record of the Cascadia Subduction Zone
   C. General effects of Megathrust and tsunami's on PNW

II. **Geologic History/Overview**
   A. Tectonic placement
      1. Subduction zone definition and description
      2. Juan De Fuca and North American plate
         A. Description of how high magnitude earthquakes occur on CSZ
         B. Description of how offshore earthquakes form Tsunamis
   B. Geology of PNW coastlines
      1. Oregon and Washington coastline tectonic location
      2. California coastline tectonic location
      3. Human occupation in PNW
         A. City populations
         B. Residential areas
   C. Record of past Earthquakes on Cascadia subduction Zone
      1. Recent Megathrust earthquake 1700
         A. Effects on surrounding environment of area involved
         B. After effects of tsunamis on impacted areas
   D. Coastal Tsunami record due to Earthquakes on CSZ

III. **Emergency Preparedness of the PNW**
   A. Infrastructure of Cities
      1. Earthquake resistant buildings
   B. Tsunami evacuation routes along PNW coastline
      1. Seaside Oregon "Beat the Wave" Evacuation
      2. Evacuation route improvement across PNW
   C. Public knowledge of incoming Megathrust earthquake
      1. Limited knowledge
      2. How to get the public prepared

IV. **Summary and Conclusion**
   A. Importance of being aware of the CSZ
      1. Importance of preparation for megathrust and tsunamis
   B. Future of the Pacific Northwest in relation to the Cascadia Subduction Zone

Melina Mullin
ES 202
First outline for Term Paper

V. References Cited

Satake, K., Shimazaki K., Tsuji, Y. and Udea, K., 1996, Time and Size of a Giant Earthquake in Cascadia Inferred From Japanese Tsunami Records of January 1700: Letters To Nature, p. 246-249.

Priest, G. R., Stimely, L. L., Wood, N.J., Madin, I.P., Watzig, R.J., 2016, Beat-The-Wave Evacuation, Mapping For Tsunami Hazards in Seaside, Oregon, USA: Springer: Dordrecht, Netherlands, p. 1031-1056.

Faith Pardini

ES 202

Paper Outline

February 25, 2019

TITLE?

INTRODUCTION

- Talk about local geology
- Oregon forestry
- The impact of timber harvesting on soil and water resources and how that impact effects surrounding life and future development of forests

LOCAL GEOLOGY/ECOLOGY

- The rogue river basin
- Risk of mass wasting evens

TIMBER HARVESTING

- Replanting
- Gradient and its effect of regrowth and erosion
- Wildfire risk

IMPACT ON WATER RESOURCES

- Discharge
- Water quality
  - Sediment
  - Temperature
  - Oxygen

CONCLUSION

REFRENECES

Brown, George W. The Impact of Timber Harvest on Soil and Water Resources. p1-19.

Grant, Gordon E, Lewis SL, Safeeq M, Hayes SK.. 2008, Disentangling Effects of Forest Harvest on Long-term Hydrologic and Sediment Dynamics, Western Cascades, Oregon. Water Resources Research

Houtman, Nick, 2017, Forest harvesting rules effectively protect water quality in the Alsea watershed, OSU Newsroom.

I. INTRODUCTION

II. PHYSIOGRAPHIC SETTING

A. TOPOGRAPHY

B. CLIMATE

C. GEOLOGY

III. LAND USE/HISTORY

IV. EFFECTS OF TIMBER HARVESTING

V. CONCLUSION

VI. REFERENCES CITED

Alex Rodriguez

Geology 202

Outline for term paper

TITLE?

H/4

I. Introduction

A. Structure of Mount Rainier

B. Encroaching suburbs in the Seattle-Tacoma area

C. Geologic Area surrounding volcano

II. Geologic Overview

A. Tectonic Setting

1. located on the Juan de Fuca Plate and it is a divergent boundary.

2. It is a subduction of the Juan de Fuca Plate and North American Plate.

B. Geologic History

1. Stratovolcano made from sluggish, intermittent lava flows and explosive eruptions of ash and rock.

2. Formed by many years of great volcanic activity.

III. VOLCANIC Hazards Surrounding Mount Rainier

IV. Summary and Conclusion

V. References Cited

Amy Sherer

Surface Water/Water resource issues in Willamette Valley

Introduction

Geologic Overview:

The Water Tables of the mid-valley

The Water

Water Content
PH Balance
Mineral Content
Harmful or harmful composition

Flow of water
Origin of water
Final destination of water
Possible minerals or contaminants picked up.

Environmental Impact
Analysis at end of journey
***Can the* water be considered toxic?**
Is there evidence along the path of the water of harm?

Clean Water Comparison

Is our water better or worse than average?
Where in the rankings are we?

Future predictions about the mid-valley water.

Other geologic factors

Erosion
Human contamination
Cross water contamination

Summary and conclusion

References Cited

I. Introduction

II. Geologic setting

III Hydrology
A. Climate
B. Surface H2O
C. Ground H2O

IV. Water resource management

V Conclusion

VI. References

4/4

2-SIDED

Madison Smith

ES 202W

17 Feb. 2019

4/4

Glacial History of Puget Sound

I. INTRODUCTION

II. ~~OVERVIEW OF~~ CLIMATE HISTORY AND GLACIAL IG AGES

Introduction

Glacial Processes

-Glaciers are a thick mass of flowing ice

- occur in polar or high altitude mountainous regions

-formed by snow crystals accumulating on earth's surface

-snow crystals compacted (recrystallization)

III GLACIAL HISTORY OF PUGET SOUND

A. LATE PLEISTOCENE

B. ORIGIN OF ICE AGE

Types of glaciers

-Alpine: confined to mountain valleys

-Cirque: Confined to basins in head of valley

-Valley: extend down drainage/valley

-Piedmont: valley glaciers that extend to mouth of valley, ice spreads broadly over flat land

-Continental: massive ice extending over areas of earth's surface

Ice sheets: continental scale ice mass

IV CONCLUSION

V REFERENCES CITED

Highland: mountain areas, ice accumulates in unconfined sheet through coalescence of valley glaciers

Polar v. Temperate Glaciers

- Polar: ice below melting point through whole year
- Temperate: Seasonal freeze-thaw cycles

Ice Movement

- Plastically flow
- Glaciers erode surface beneath
- Plucking process
- Most glaciers in Pleistocene Epoch

Glacial History of Puget Sound

Conclusion

http://academic.emporia.edu/aberjame/student/brown4/PugetSound.htm

https://www.dnr.wa.gov/programs-and-services/geology/glaciers

https://pcc.uw.edu/education/classroom-resources/climate-teaching-modules/the-glacial-history-of-puget-sound/

http://faculty.washington.edu/dbooth/Booth%20GPQ%201991.pdf

See me for revisions

Ben Thompson

ES-202

Term Paper Outline

Geologic History of the Columbia River Gorge

I. Introduction

A. History of the area. Yakima Basalt, flowing lava

B. Give general description of Columbia River Basin

II. Timeline of events

A. Apprx. 40-60 million years, granite from within the Earth was lifted by lava

B. 10-15 million years, formation continues with lava flow from eruptions in Western Idaho, Eastern Washington and Eastern Oregon

C. 2 million years ago, Ice age

D. 2500 Years, possibly 100 floods through the area.

III. Water resources

A. Ice dam broke Lake Missoula

B. Ice Bergs

IV. Summary and Conclusion

V. References

4/4

4/4

Aaron Turner
February 27, 2019
ES 202 – Winter 2019
Dr. S. Taylor
Term Paper – Initial Outline

CLIMATE CHANGE AND INFLUENCE ON WATER RESOURCES IN WILLAMETTE VALLEY

PRELIMINARY OUTLINE

I. INTRODUCTION
- connections between the recent geology of the Willamette Valley, it's land use, climate change, flood hazards and water resources to explain the current layout, hazards, water use, and future possibilities of the land.

II. GEOLOGIC HISTORY & LANDUSE
RECENT GEOLOGY OF THE WILLAMETTE VALLEY
- Landscape changes (vegetation changes, disturbances, etc.)
- Change in climate - historical causes and current effects
- Public and private land ownership

LANDUSE OF THE WILLAMETTE VALLEY
- Water management systems developed by humans
- Erosion

III. CLIMATE MODELS
CLIMATE CHANGE IN THE WILLAMETTE VALLEY
- Water connections
- Hydrologic/ecologic/man made components regarding alternative future outcomes
  a) Temperature
  b) Hydrological mountain systems
  c) How the ecosystem responds
  d) Overall landscape changes
  e) Effect of population of humans
  f) Snow risks

IV. CLIMATE RISK & HAZARDS
FLOOD HAZARDS OF THE WILLAMETTE VALLEY
  a) Climate change and drought risk
  b) Willamette river basin
  c) Historical data of floods (hot spots)
  d) Snow risks, causing floods in drought locations

V. SUMMARY AND CONCLUSION

[REFERENCES CITED ON NEXT PAGE.]

VI. →

VI REFERENCES CITED

Hamlet, A.F. (2010). Assessing water resources adaptive capacity to climate change impacts in the Pacific Northwest region of North America. *Hydrology and Earth System Sciences 7(4)*: 4437-4471, doi:10.5194/hessd-7-4437-2010.

Jung, W., & Chang, H. (2011). Climate change impacts on spatial patterns in drought risk in the Willamette River Basin, Oregon, USA. *Theor Apple Climatol*.

Mote, P.W., J. Abatzoglou, K.D. Dello, K. Hegewisch, and D.E. Rupp, 2019. Fourth Oregon Climate Assessment Report. *Oregon Climate Change Research Institute.* occri.net/ocar4.

Nolin, A. (n.d.). Perspectives on climate change, mountain hydrology, and water resources in the Oregon cascades, USA. *BioOne*.

Sproles, E., & Roth, T. &. (2017). Future snow? A spatial-probabilistic assessment of the extraordinarily low snowpacks of 2014 and 2015 in the Oregon Cascades. *The Cryosphere*.

Turner, D., & Conklin, D. &. (2015). Projected climate change impacts on forest land cover and land use over the Willamette River Basin, Oregon, USA. *Springer*.

Austin Wegner
ES 202
Dr. Steve Taylor

4/4

Paper Outline for:
Effects of Forestry Practice on Watershed Processes in Western Oregon

I • Intro INTRODUCTION
  - Introduce the topic as a whole
    - Explain necessity for forestry practices
    - pros/cons of practices
    - List types of forestry practices
      - Which are more or less harmful than others
    - List several different SPECIFIC ways that forestry affects the watershed (these will be the main points discussed in the body of the paper)
      - Loss of habitat
      - Increase in chance of mass wasting events
      - Increases chances of flooding
      - Increases amount of overall storm runoff
      - Increase in stream channel erosion
      - Decrease in soil and water quality

II LAND USE, HISTORY

III. • Body TIMBER HARVEST AND EROSION PROCESSES
  - Discuss effects in detail (do all steps for each topic)
    - 3-5 major points should do
    - Leaning towards mass wasting, channel erosion, flooding, and water quality
    - Discuss implications for each
      - Environmental effects
      - Effects on humans
    - Suggest ways to decrease impact and strain on environment

IV • Conclusion
  - Short recap of topics discussed
  - Tie negative effects discussed with possibilities for increased efficiency, reduced environmental impact, and possible future techniques or technologies.

V REFERENCES CITED

Evander Willingham

Geology of the Portland Basin

I Introduction

II. Tectonic Setting

III * Geologic Overview
- ~~Tectonic Setting~~
- Mountain Range
  - ~~Cascades~~
- Igneous Rocks
  - Volcanic Rocks
- Sedimentary Rocks
  - Processes

-1

3/4

* ~~Geologic History~~
* Weather and Climate
  - ~~Erosion / Weathering~~

IV * Conclusion

V. References Cited

See Cited use for reference/ Resource

Houston Winslow Outline 1 TITLE?

I. Intro
II. Causes of Tsunamis — Tectonic Setting 4/4
    A. Earthquakes
    B. Volcanic eruptions
    C. Meteorological
    D. Submarine landslides
    E. Human activity
III. Effects of tsunamis
    A. Hazards
    B. Deposits
~~IV.~~ Tsunamis in the pacific northwest
    A. Which coastal areas are vulnerable
    B. Historical examples of tsunamis in the PNW
    C. Specific Geological Aspects of the PNW coastal regions that suggest past Tsunamis
~~V. Conclusion~~

IV. Hazards management
V. Conclusion
VI. References Cited

Michaela Yonkman

ES202

Term Paper first outline

4/4

Missoula Floods

I. Introduction

- Catastrophic flooding during at the end of last ice age
- Glacial dams
  - Cordilleran Ice Sheet blocking Columbia and Clark Fork Rivers
  - Multiple ice dammed lakes from multiple glacier lobes
- Western Montana to Pacific Ocean

II. ~~Geologic Overview~~ ICE AGE FLOOD HISTORY

- Quaternary time – 14-20 thousand years ago
- Flow characteristics
  - At least 25 flood events
  - Flow volumes of up to 10 million m^3/second
  - Convergence at Wallula Gap
- Evidence of flooding
  - Loess and alluvium deposits – Palouse Loess
  - Overflow and deltaic features
  - Ice-rafted erratics
- Influence on landscape
  - eroded bedrock basalt – channeled scablands
  - Paleoshores in MT
  - Waterfalls, loess islands, coulees

III. Effect on Willamette Valley

- Fertile farmland
  - Scoured sediment deposited
  - Lake Allison – temporary lake that filled the valley
- famous ice-rafted erratics

IV. CONCLUSION

Michaela

References Cited

Baker, V.R., Bjornstad, B.N, Busacca, A.J., Fecht, K.R., Kiver, E.P., Moody, U.L., Rigby, J.G., Stradling, D.F., and Tallman, A.M., 1991, Quaternary geology of the Columbia Plateau, *in* Morrison, R.B., ed., Quaternary nonglacial geology; Conterminous U.S.: Boulder, Colorado, Geological Society of America, The Geology of North America, v. K-2.

Bjornstad, Bruce, 2008, The ice age floods through the western channeled scablands: Northwest Geological Society, 24p.

Idaho State University, n.d., Lake Missoula Floods: Internet Web source, URL: http://geology.isu.edu/Digital_Geology_Idaho/Module13/mod13.htm.

Lee, Keenan, 2009, The Missoula flood, Department of Geology and Geological Engineering Colorado School of Mines: Golden, Colorado, 19p.