University of Victoria

Faculty of Social Sciences
Department of Geography

GEOG 476 (A01): Geomorphological Landscape Reconstruction
Advanced Studies in Geomorphology - Fall 2014

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Lectures: TWF 1230 – 1320; COR B145

Department of Geography: http://geography.uvic.ca
GEOGPLAN degree planning: http://www.geog.uvic.ca/moodle [Log in as guest]
Undergraduate advisor: Phil Wakefield (philw@geog.uvic.ca)

Course Description:

I have designed this course to help you utilize skills developed in your Physical Geography and/or Earth Science programs to reconstruct the landscape history of a particular study area. We will look at the physical landscape from the micro-, meso-, and macro-scale, and incorporate methods on a range of spatial and temporal scales. Methods introduced will include time-tested (e.g. sedimentology, stratigraphy, radiocarbon age determination) and emerging (e.g. LiDAR, Optically Stimulated Luminescence dating, spatial statistics) methodologies used in the field. There will be a regional focus on coastal British Columbia to present many of the concepts in this course, however I will draw examples from other areas where applicable. The skills you will gain in this course will be important in a number of fields, from prospecting, geotechnical studies, environmental assessments, archaeological work, and others.

This course draws upon introductory geomorphological concepts presented in Geography 103 that were further developed in 276. Process skills developed in 376 will assist greatly in developing methods for your project, as well as understanding underlying mechanisms for landform development. We will also review and expand upon other key sedimentological and geological principles and approaches used to enhance geomorphic investigations in a wider range of geomorphic environments.

As your course instructor, I will present the underlying theories using case studies that incorporate multiple disciplines and industry applications where possible. I will rely on my extensive field experience in places like the central coast of British Columbia, west coast Vancouver Island, north and south Haida Gwaii, and elsewhere to provide interesting examples of the application of this type of research. In addition there will be many interesting guest lecturers with a wide range of expertise in the subject material.

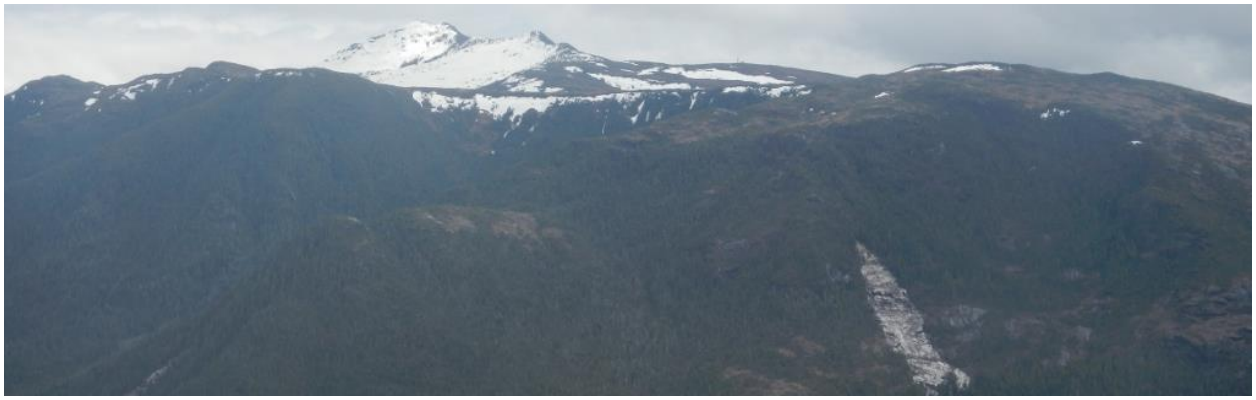
“The University of Victoria is committed to promoting, providing and protecting a positive and safe learning and working environment for all its members.”

Course objective:

My intent for this course is to provide the knowledge necessary to view a landscape for its formative processes, rather than what is immediately visible. To do this, I will expose you to some of the methods researchers use to test initial hypotheses about a landscape.

Course topics:

- Geomorphologic landforms: genesis, form and function
- Glacial, sea-level, climatological and general landscape history of the Pacific Northwest
- Remote sensing and GIS as tools for landscape reconstruction, e.g. LiDAR (airborne and terrestrial), spatial statistics, DEM-derived parameters
- Stratigraphic principles and sedimentology
- Geochronology, e.g. Radiocarbon age determination, luminescence dating
- Paleoecology as tools for environmental reconstruction, e.g. diatoms and fossil pollen
- Dendrochronology for age determination, climate reconstruction, and event-based research



Prerequisites and recommended readings:

GEOG 376 or permission of the department.

Please take some time to read some of the many, many papers by John Clague (http://www.sfu.ca/~jclague/#recent): but if you want just a sampling try http://www.sciencedirect.com/science/article/pii/S0277379101000701, http://www.nrcresearchpress.com/doi/abs/10.1139/e82-048#.U9aEDeNdWHg, and http://www.sciencedirect.com/science/article/pii/S0277379100000901.

For some in-house research:
-http://dx.doi.org/10.1016/j.quascirev.2014.05.022 (sea-level changes on the Pacific Coast of NA),
-http://tinyurl.com/HG-reconstruction (late Quaternary geomorphic reconstruction of NE Haida Gwaii)
- http://tinyurl.com/luylcnu – dendrochronology

The last link is part of a larger volume on Quaternary methods available here:
http://www.sciencedirect.com/science/referenceworks/9780444527479

Course Moodle

This course has a CourseSpace site (http://coursespaces.uvic.ca/), where I will provide outline notes for lectures, post guest lectures (if available), and provide information on course events and deadlines. As a student in the course you are expected to monitor the website as an important source of course information.

Course Experience Survey (CES)

Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous survey regarding your learning experience (CES). The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. The survey is accessed via MyPage and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time but please be thinking about this important activity during the course.

Course evaluation scheme:

Research review seminar	10 %
Research project proposal	20 % (15% paper, 5% presentation)
Test 1	15 % - Will cover lectures, guest lectures, and seminars
Research project	40 % (30% paper, 10% presentation)
Test 2	15 % - Cumulative, similar format to test 1

Note: Students are required to complete all sections of the course and obtain a passing grade on the project to obtain credit.

Component evaluations:

Research review seminar: Each group will prepare a seminar presentation (10%) that reviews fundamental concepts and scientific literature on a general topic in landscape reconstruction broadly related to eventual research projects. The objective here is for groups to delve into both fundamental sources (e.g., texts, course materials) AND research literature to provide an overview of key concepts, models, theories, etc. on a general topic of interest. This could include (but not limited to): remote sensing used in landscape reconstruction; type sections; GIS analyses; palynology; dunes; glacial landscapes; coastal development etc. Groups should aim to engage the audience about key processes and/or landforms of interest.

Each group will be given 15 minutes to present their using Powerpoint. Groups should indicate their topics and discuss the structure of their seminars with me in advance.

Keep in mind that a seminar is not a 'lecture', so be innovative and think of ways you can engage the class effectively (e.g., assigned readings, handouts, case studies, demonstrations, etc.). I will be available to consult on readings, focus, methods, etc.

Seminars will be graded on: i) presentation style & effectiveness of delivery, ii) content accuracy & clarity of materials, iii) level & effectiveness of class engagement, iv) handling of questions.

Group research project: Combined, the group project proposal (20%) and final paper and presentation (40%) are worth 60% of your final grade. The project is designed with the following learning objectives in mind:

i) to allow you to gain experience researching topic of interest in landscape reconstruction. This encourages creativity, group work, resourcefulness, experiential learning & building knowledge pertinent to the course objectives.

ii) to prepare a research proposal that surveys peer-reviewed literature to identify the current state of knowledge on a topic, methods (analytical, field, etc.) used to investigate this, and supporting knowledge on which you can build your study and interpretations. This engages you in the process of knowledge synthesis and application that is useful for advanced graduate studies or careers in consulting or government research.

iii) to present your results as both a written research paper and a formal conference-style presentation to the class. This builds key skills in research writing & presentation delivery also required for advanced study or other career pursuits.

iv) to work in a team. This aims to disperse the workload, share the responsibilities & develop 'real-world' group-work skills.

Project topics: while fieldwork is not required, it is *stongly recommended*. Even if it is just a site visit to gather some perspective on the data and literature already collected then that would be beneficial. The idea behind a research project in a landscape reconstruction course is not to "figure out" the history of the landscape, as you will not have the funds or time to determine an absolute chronology or collect all the data that I'm sure you'd like to! Rather, it gives you an opportunity to pick a study area, gather any freely available data (e.g. free LiDAR(!):http://ncalm.cive.uh.edu/; airphotos; Google Earth recon; Geomorphology maps, already published research), apply what preliminary tools you can (e.g. stratigraphic mapping, fabric measurements, sedimentology, basic surveying), and propose future work involving geochronology, LiDAR flights, drone photogrammetry, etc. Some study areas that would have interesting landscape histories include:

- Cowichan Head stratigraphic sequence and surrounding landforms
- Sidney Island
- Coburg Peninsula
- Dallas Road stratigraphic sequence (Clover point park)
- Cape Lazo, Comox
- Wickaninnish Dune Fields, Ucluelet
- Sea-to-sky, highway 99
- Savary Island
- Cape Scott
- Rebecca Spit, Quadra Island
- Mount Garibaldi (Ring Creek lava flow or glacial activity)

Where possible, I will make time to visit study areas with each group to assist in interpretation. This can coincide with lecture slots assigned to project work or otherwise.

Groups:

Please work in groups of 2-3. Groups should discuss topics/objectives with me early in the semester. Group topic titles, contact info & discussion forums will be hosted on moodle.uvic.ca. All group members will receive the same grade.

Requirements:

Project proposal (20%). Groups will prepare a written proposal (15%, 2-3p. + annotated bibliography) & give a ~10 min. presentation (5%) on the context (lit review), objectives & proposed methods of their project. The presentation will be a variant of a PechaKucha talk, to be discussed further in class.

Your research proposal should include ALL of the following components. Be sure to cite research works as needed in proper journal citation formatting style (see ESPL or Geomorphology Journals for examples… Tao et al. 1991, etc.). If it makes sense and is succinct, then it's probably a good citation style.

1. Title: Should be descriptive but succinct, and also make it interesting! For example, "Relict dune fields at Cape Lazo"…. Yawn. "Terrain parameters and implications of increased past aeolian activity at Cape Lazo relict dunefields, Comox, BC" would get me interested!
2. Research context: In a few paragraphs (~1 page) explain the context, objectives & proposed methods involved with your project. In doing so, be sure to review and refer to research literature on the topic that helps indicate the opportunity or potential contribution that such a study could provide. Be sure to provide:

   i. A concise explanation the general context/focus of your research project and (avoiding first person) its rationale (i.e., why your group chose this project/study area, what about it is interesting/relevant/novel?).

   ii. An elaborated statement on the methodology you will use for the project, which should include more elaboration on specific 'methods'. For instance, will you choose a field-based project, geomatics study, etc. and by what means/methods/analyses will you address your research objectives (stated in the next section). In other words, the how & why of your research.

   iii. A statement on the importance or broader relevance of studying this topic from a geomorphic perspective. Perhaps provide some global or regional context for this or identify a distinct research gap or applied relevance as stated in the literature.

3. Purpose & objectives**:** simply and clearly indicate the broader purpose or focus of your project and how you will attempt to address or present this via specific research objectives or hypotheses. See examples in research papers. Often, it is a concise purpose statement followed by a numbered list of objectives. For example, from the Shugar et al. paper from above:

   In this paper, we provide a comprehensive survey of the extensive literature and related datasets on RSL change along the northwestern coast of North America. From this, we assess the main geophysical contributions to RSL dynamics throughout the region since the LGM and provide comprehensive sub-regional interpretations of how these contributions may have combined and varied from Alaska through British Columbia and Cascadia. One of our central arguments is that RSL changes in western North America during the late Quaternary period were highly localized due to substantial differences in geophysical forcing mechanisms.

4. Annotated bibliography: a summary (400 words max) of peer-reviewed journal articles relevant to your topic. Two from each group member is required.

   -provide bibliographic reference for each article in proper journal referencing format.
   -summarize in your own words. Do NOT paraphrase or copy abstract or conclusions! Review key points/results of the paper AND demonstrate how it is relevant to your research topic/project. Stick to the 400 word limit.
   -NO WEBPAGES please (thousands of articles await you!), see me for assistance
   -Suitable journals: Earth Surface Processes & Landforms, Geomorphology, Canadian Journal of Earth Sciences, J. Geophysical Research, J. Coastal Research, etc.
   -Examples from my PhD:

*Clague JJ & James TS. 2002. History and isostatic effects of the last ice sheet in southern British Columbia. Quaternary Science Reviews **21**: 71-87.*

This paper will provide a thorough base of information on the size and nature of the Cordilleran ice sheet during OIS 2. It also provides useful discussion of the coupling of sea-levels and ice loading, as well as interactions with mantle viscosity. Furthermore, it highlights the gaps in knowledge of ice sheet extent and sea-level data that exist on the central coast of BC.

*Clark PU & Mix, AC. 2002. Ice sheets and sea level of the Last Glacial Maximum. Quaternary Science Reviews **21(1-3):** 1-7.*

This study looks at the LGM in a global context. It approaches LGM ice sheet reconstruction from a number of methods, including:

1. *Geological records of ice sheet extent, which are mapped out extensively, are fairly well understood, and agree well with numerical ice sheet models,*
2. *Eustatic sea-level, which is best approximated by drilled cores of coral reefs, which have been dated using high precision U-Th dating methods.*

3. *Ice sheet models, which improves as more variables such as iceberg calving, climate sensitivity, deformation and basal boundary conditions are accounted for.*
4. *Glacial isostatic adjustment, based on far-field measurements that better account for the glacial meltwater signal (and thus total land ice volume) and near-field measurements that can give a better approximation of local thickness.*
5. *Geochemical records of oxygen isotopes, which gave rise to the OIS chronology used today.*

The study provides a minimum and maximum ice extent based on an earlier model, issues with which the issue of QSR was formed to discuss. Total ice volume is found to be less than postulated by the minimum previous model, and uncertainties much better constrained, so that the range of equivalent sea-level lowering is 118 – 130/135 m.

*Cohen, KM & Lobo FJ. 2013. Continental shelf drowned landscapes: Submerged geomorphological and sedimentary record of the youngest cycles. Geomorphology **203:** 1-5.*

This editorial provides a useful summary of a special issue of Geomorphology on drowned coastlines. This is useful for any exploration into the nearshore that will be performed as a part of my PhD research, as it outlines the geomorphological processes acting on continental shelves, the effects of sea-level changes on drowned environments, and the hydrological, nutrient, and mineral cycle component that contental shelves provide.

5. Timeline & Responsibilities: Briefly outline your timeline for accomplishing tasks for your research & project preparations. Indicate who will be responsible for each (e.g., everything from library research and photocopying to presentation production). Show me that you, as a group, have thought on how to get the jobs done *equally, thoroughly & not at the last minute*. Plan ahead especially if ordering articles, writing and preparing your presentations, getting airphotos/data, etc.

Consider also that fieldwork will occur on your own time or during a practical lecture.

Evaluation**:** This proposal & related presentation are worth 20% of your grade and will be evaluated based on the following criteria.

- clarity & effectiveness of the title
- research context (i.e., how is the study situated in the broader knowledge/research literature)
- conciseness & focus of the purpose, objectives
- clarity, rationale & feasibility of methods
- linkage to & effective use of peer-reviewed literature (journal articles) via annotated bibliography
- quality & presence of required components including journal article title pages, annotated biblio, etc.

- indication of planning, preparation & equitable delegation of tasks

Research project (40%) Each group will prepare a research paper (30%, 15 page max, 12 point font, plus references) and give a 15 min. conference-style presentation (10%), both due at the end of the semester.

Final papers & conference-style presentations will be due at the end of the semester.

a) Research paper**:** will contain most of the following components, structured similar to a research journal article. From this, each group will prepare a presentation that draws upon the components they see as necessary. Please prepare your paper with the format and referencing style of the journal Quaternary Science Reviews (http://www.journals.elsevier.com/quaternary-science-reviews/). Components:

I. Title: effectively describes the specific focus of your project

II. List of Contributors: list all members of your group under the title

III. Abstract: a concise (250 word) summary of your report[1] stating purpose, objectives and main details/results of what is presented including conclusions & contributions made.

IV. Introduction: describes general focus, purpose & objectives of your report and presents a brief review of related research literature. As outlined in your proposal, provide some paragraphs that review the research context from the literature surrounding your topic. To do so, be sure to referring to at least 8 research articles (perhaps those from your annotated bibliography). This frames your project in terms of what has been done. Be sure to properly cite ideas expressed in these works. See me for clarification or any journal article for examples of citation.

V. Study site: using a proper map to show the broader study region, describe your specific study site. See any field research article for examples. Show pictures or diagrams of your methods, as appropriate.

VI. Methods and data: state rationale and approach(es) clearly &/or any sources of data used (e.g., airphotos, NCALM LiDAR, detailed section work, etc.). Do not interpret anything (data, results) but consider that the reader/audience has no idea of what/how

[1] See examples of abstracts in any journal article. Avoid bullets or citations. Be clear and very concise.

you did your work, so explain so the reader can follow exactly what you did and understand the rationale, limitations, decisions made, etc.

VII. Results or summary of key findings from reviewed literature/case studies. At this point, you do not interpret them, just present and explain them. Interpretation occurs in the discussion section. Use maps, tables, statistics, graphs, photos, etc. to convey your results concisely and effectively.

VIII. Discussion: In the body of your project, interpret what each of your results components 'means' in the context of other research findings/literature. Consider also how your results may converge on 3-5 points of discussion or 'integrated' ideas/issues/findings that emerge. Feel free to use sub-headings to structure these.

IX. Conclusion: a brief (2-3 paragraph) summary of main findings/points of your project. This can be done using bullet points & a leading paragraph. The leading paragraph should explain how you have addressed the purpose & objectives stated in the intro. Include a statement on the relevance & application of geomorphic research on features/processes like those you have studied. Finally, incorporating several methodologies and theories presented in this course, propose several new methods that future researchers could apply at your study site, and what hypotheses these would test.

X. References: a bibliography of all cited articles/sources including maps, government documents, etc. See *Geomorphology* for proper citation & bibliography formatting. Again, if it makes sense (i.e. all the information is there) and is concise, then it works.

b) Conference-style presentation: Each group will give a 15 min. oral presentation to present your study, research context, results & discussion from your paper. Similar to a conference, talks will be moderated for time & a few minutes will be allowed for questions.

Key suggestions: i) try to use no more than 1 slide per minute of your talk, ii) you may not have time to cover everything in detail, so focus on key findings, iii) practice, practice, practice & time yourselves. Remember: minimal text is good. A picture is worth a thousand powerpoint slides full of words.

Course policies and important notes:

1. **Lateness policy:** A deduction of 25% of the total mark per day will be applied to late submissions. Concessions will be made only for extenuating circumstances with proper medical or counselling documentation provided.

2. **Academic Integrity:** Students should review the UVic Policy on Academic Integrity (http://web.uvic.ca/calendar2014/FACS/UnIn/UARe/PoAcI.html), which defines key violations such as plagiarism, multiple submissions, falsifying materials, etc. *Note that all written products will be submitted for originality assessments on Turnitin.com as a means to discourage plagiarism.*

3. **Grading scale:** according to the Dept. of Geography guidelines**:**

A+	> 90%	B	70 - 74%	D	50 - 55%
A	85 - 89%	B-	65 - 69%	E	45 - 49%
A-	80 - 84%	C+	60 - 64%	F	< 45%
B+	75 - 79%	C	55 - 59%		

Passing Grades	*Description (as listed in the Undergraduate Calendar)*
A+ A A-	**Exceptional, outstanding and excellent** performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
B+ B B-	**Very good, good and solid** performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
C+ C	**Satisfactory, or minimally satisfactory**. These grades indicate a satisfactory performance and knowledge of the subject matter.
D	**Marginal** Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
Failing Grades	*Description (as listed in the Undergraduate Calendar)*
E F	Conditional supplemental. **Unsatisfactory** performance. Wrote final examination and completed course requirements; no supplemental.
N	Did not write examination or complete course requirements by the end of term or session; no supplemental.
Temporary Grades	*Description (as listed in the Undergraduate Calendar)*
DEF	**Deferred status** granted. Used only when deferred status has been granted because of illness, an accident or family affliction. Requires approved Request for Academic Concession.