ERS 300 Socioecological Systems Analysis
Fall Term 2019 Syllabus
(Everything You Wanted to Know, Ever, but Were Afraid to Ask)

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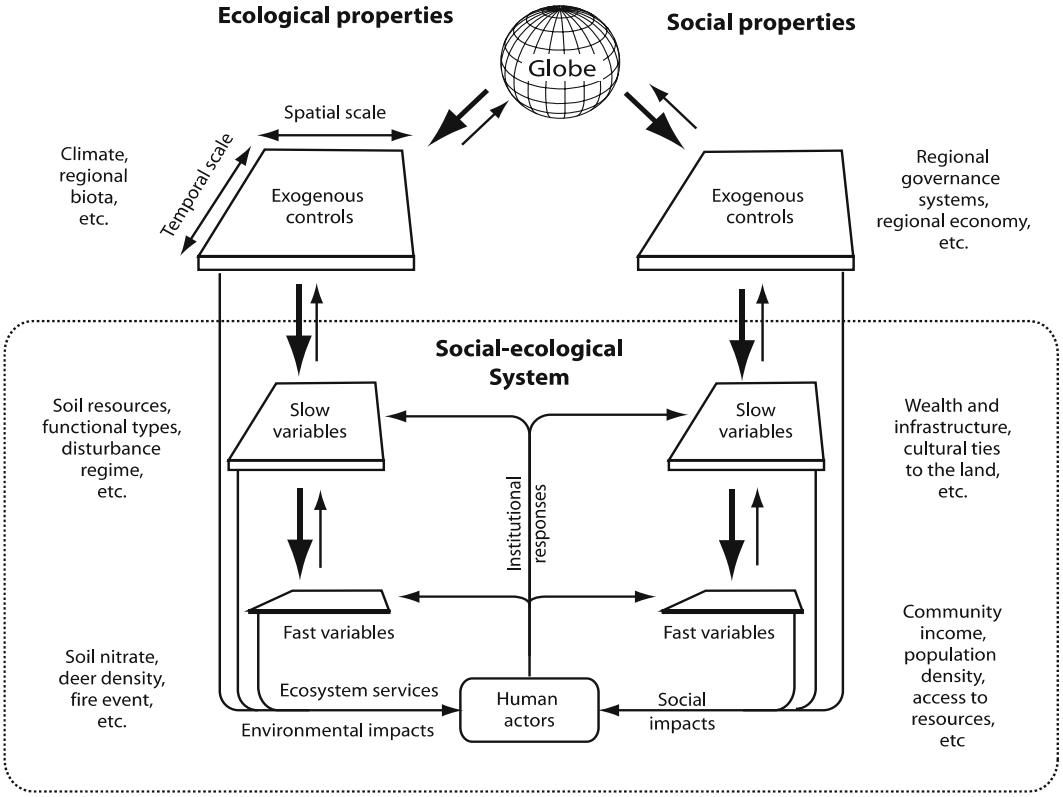
(I recommend appointments for urgent matters - but you can drop by as you like)

Scope and Rationale of ERS 300

As human beings in an interconnected world, we face a number of complex and seemingly intractable problems including such things as climate change, food security, global poverty and pandemic diseases. Understanding how to address such problems is the first step to solving them. Ultimately, we need to foster social and ecological resilience. Resilience is the ability of a linked social and ecological system to respond to stress and build the adaptive capacity of individuals and groups to respond to stress. The dynamics of social change and innovation are key to building such resilience.

This course provides an opportunity to learn and begin to apply systems-based tools in the context of a case-based study defined by the student in cooperation with the teaching-team. Students are provided with an introduction to the conceptual tools of systems thinking and resilience that help understand the dynamics of social change and social innovation. These conceptual tools will then be applied by students to develop a richer understanding of a case study of fostering social change and building adaptive capacity.

The next page outlines one of the ways we can characterize socioecological systems (courtesy of Terry Chapin; https://www.pnas.org/content/103/45/16637) and a 4-picture collage as an example of how complex these systems are on the ground in places like Niger. There, everything is considered: from 3-D printed drones controlled by cell phones, to traditional harvesting of crops (restricted and assigned by gender) to breaking those traditions with maker-based right-to-repair low tech to the problems of armed conflict. People sometimes think systems approaches and analyses are abstractions; they are very real, very messy, sometimes very nasty but there is a great deal of hope and opportunity if we can grapple with reality and change it for the better.


Ecological properties
Social properties
Globe
Spatial scale
Temporal scale
Climate, regional biota, etc.
Exogenous controls
Exogenous controls
Regional governance systems, regional economy, etc.
Social-ecological System
Soil resources, functional types, disturbance regime, etc.
Slow variables
Slow variables
Wealth and infrastructure, cultural ties to the land, etc.
Institutional responses
Fast variables
Fast variables
Soil nitrate, deer density, fire event, etc.
Ecosystem services
Human actors
Social impacts
Environmental impacts
Community income, population density, access to resources, etc

ERS 300 Schedule at a Glance (see the LEARN site for materials)	
DATE/CLASS TASKS/REQUIRED READINGS (LOTS OF READINGS) ERS 300 CLASSES ARE WED 0830-0950 IN EV2 2002	THIS WEEK'S TUTORIAL TASKS SEE QUEST FOR TUTORIAL SCHEDULE
September 4 Class Conceptual Frameworks of Socioecological Systems Practicum in Class: The Victor Diamond Mine Assessment Meadows C1 & C2 Arnold & Wade (2017) Victor Diamond Mine Briefings – Two Perspectives	No tutorials this week. If it is sunny, go out and have fun. If it is not, same advice.
September 11 Class Theoretical Frameworks of Socioecological Systems Ostrom & Cox (2010) Cumming (2014) Kluvánková & Gežik (2016) Linstädter et al (2016) Monechi et al (2017) Herrero-Jáuregui et al (2018) Partleow (2018)	Week 2 Discussion: Discuss the pros and cons of a more holistic approach (SES) vs. other approaches. If you are ambitious, nose around the internet & bring some ideas. Action: Choosing your system, system perspective, & presentation date
September 18 Class Methodological Frameworks in Socioecological Systems Meadows C3-C5 Bosch et al (2007) Zhichang (2010)	Week 3 Action: Analyze THIS! Setting up an analysis of a problem using a methodological framework
September 25 Class (Guest – ENV/ERS Prof. James Nugent) Applying the frameworks: Cities as a Socio-Ecological System (Urban Metabolism) Kennedy et al. (2011)	Week 4 Action: Analyze THIS! Analyze any city you choose as a socioecological system
October 2 Class Methods (Lots!) in Socioecological Systems Analysis Elsawah et al (2015) Lake et al (2015) Vilar et al (2016) Briassoulis (2017) Rocchini et al (2017) Holzer et al (2018) Sponsler et al (2019) Wheeler et al (2018) Willcock et al (2018)	Week 5 Action: Analyze THIS! Choose a socioecological systems analysis method to address a problem.
October 9 Class Complexity in Socioecological Systems Meadows C3 & C4 Palla et al (2005) Cundill et al (2005) Gaudreau et al (2009) Drake & Griffin (2010)	Week 6 Action: Analyze THIS! Use complexity thinking to address a sociological systems problem. **Assignment 1 due on October 11 2000 h via LEARN dropbox**

October 16 No Class **Fall Term Reading Week**	**Week 7 is Reading Week** **No tutorials**
October 23 Class Social Innovation & Socioecological Systems Mulgan (2006) Amable (2000) Moore & Westley (2012)	Week 8 Action: Analyze THIS! Use social innovation to analyze a problem that you choose, define and care about the most.
October 30 Class Critical Systems Thinking Jackson (2001) Jackson (2010) Reiss & Mischo (2010)	**Week 9 Student Presentations (This is Assignment 2)** Discussions
November 6 Class Resilience in Socioecological Systems Folke et al (2010) Rasch et al (2017) Abdi-Habib & Lawrence (2018)	**Week 10 Student Presentations (This is Assignment 2)** Discussions
November 13 Class Systems Thinking Practicum in Class Meadows C7	**Week 11 Student Presentations (This is Assignment 2)** Discussions
November 20 Class I Can Offer Ennui & Sadness: Bad Systems… Fischer et al (2016) Fetzel et al (2018) Sguotti et al (2018) Lattera et al (2019) (and there are some links on LEARN to recent stories that we will examine during class)	**Week 12 Student Presentations (This is Assignment 2)** Discussions
November 27 Final Class (!) **… But I'd Rather Offer Hope & Happiness: Good Systems** Berkes (2010) Egerer et al (2018) García-Ayllón (2019) Hess & Satcher (2019) Honrado et al (2019) Kupika et al (2019) Le Noë et al (2018)	**Week 13: No tutorials this week since that's enough work for now, eh?** **Assignment 3 is due on November 29 at 2000 h. via LEARN Dropbox;**

Course Objectives:

1. Through readings and weekly discussions, this course introduces undergraduate students to:

- systems and complexity-based capacities for effectively understanding and engaging in systems change;
- different approaches that have been taken to describe, analyze and intervene in complex systems, and;
- how these can be applied to issues of resilience and sustainability of linked social and ecological systems, including development of social innovations for adaptive management responses to these issues.

2. Apply these tools to understand better socioecological problems; you soon will use this experience for more ambitious project, thesis, and/or employment experiences.

Course Structure:

- **Classes:** Some classes will be a bit more of the traditional 'received wisdom'[1] approach but some of them will be less heavy on the PowerPoint and you – as scholars – will be guided through interactive discussions.
- **Tutorials:** The 50-minute tutorials will be used to supplement and support the lectures and prepare you for assignments and the final exam via some in-tutorial exercises & discussions. The Teaching Assistant will provide advice on assignment topic choice and on-going support for systems description in the tutorial sessions. Students will leadoff brief discussions on their systems descriptions and proposals to receive input from their peers.

Resources:

Course Text and Readings:

- Meadows, Donella, H., 2008. *Thinking in Systems: A Primer*. Vermont, U.S.A.: Chelsea Green.
- This text is supplemented by readings posted to LEARN. Many readings. Quite a lot. Damn, there's a lot. The point is to read these strategically (not every damn detail), examining the main themes and evidence. We will address every reading in classes or use them for tutorials.

U Waterloo Learning Management System – LEARN (aka Desire 2 Learn or D2L):

- **All** course communications and course materials (lecture notes, weekly readings) will be provided through LEARN. Please sign in to LEARN as soon as possible and ensure you are on the course roster and that your e-mail address is correct.
- **Course schedule** and **weekly readings** are provided through **LEARN**. You can find resources for your assignments and general learning in many places. However, the best search venue for peer reviewed primary literature (academic/scholarly journals – the gold standard) is via Web of Science via the UW Library Portal.
- Please allow at least **24 hours** for responses to e-mail queries from the teaching team and do not expect e-mail responses from the teaching team over the weekend. I get ambitious occasionally, but I teach two other courses and run a 20-person research group so things can get busy. Still, I prioritize teaching during fall and winter terms so I will get back to you as soon as possible, especially if you are in true crisis mode.

[1] Cue the wiseass comments….

Summary of Grade Allocation (due dates are specified in later detailed descriptions of each).

1. Continuous participation in tutorials (attendance will be taken). Students can participate in various ways, often matching their personality. This means some will participate in short bursts of ideas in most weeks; others may prefer to reflect and contribute longer, thoughtful pieces on a less frequent basis. Essentially, you are graded on your willingness and ability to engage in the tutorials. There several guided exercises in some tutorials that afford you an opportunity to earn most of this part of the grade. Your willingness to provide constructive feedback on others' presentations and in the overall discussion in some weeks also count. 5% of final grade for your actual performance. *Be advised that I intend to use at least one of the tutorial exercises ('analyze THIS!') on the final exam*; this means that it would be a good idea to have done the tasks since you will see at least one again on the final and therefore will be well practiced in how to do it.

2. Assignment 1. Write an annotated bibliography on a socioecological systems research problem. This anticipates Assignments 2 and 3 (see below and later details). 15% of final grade.

3. Assignment 2. Each student will do a presentation and lead a tutorial discussion that focuses on their socioecological systems research (see Assignment 3). Students presenting earlier in this 4-week timeframe likely will show more of an in-progress draft; students presenting near the end will likely be finished or nearly so – the TA makes allowances and adjusts expectations for different ends of this timeframe. 10% of final grade.

4. Assignment 3. Write a paper that summarizes your research on a socioecological systems problem with a focus on describing the system embedded in this problem and its analysis. 30% of final grade.

5. Final exam that addresses the entire course, including tutorial discussions. Exam focuses mainly on problem solving and synthesis questions using essay or analytical styles. 40% of final grade. The final exam will be scheduled by the Registrar's Office during the December exam period. Caution: As inconvenient as it may be, do not schedule your travel to begin until after the entire exam period even if ERS 300's exam is nearer the beginning or middle of the exam period. This is because if we have postponements because of weather, the exam happens to be scheduled for the 'snow day' at the very end of the exam period (we have had these types of postponements). If there is a firm need to schedule otherwise, negotiate with Steve early in the term.

Grading Policies (see also later section on how to write assignments):

Assignments 1 and 3 can be late with a penalty; they will be accepted up to **one week after the due date** with a penalty of a flat 20% off your erstwhile grade - except for unusual mitigating circumstances that should be communicated as soon as possible. Any requests for extension without penalty or for more than one week must be made in writing in advance of the assignment due date. If you have to miss a tutorial (especially your own presentation – Assignment 2), contact the TA, who likely will consult with Steve about alternatives. Do not wait to tell us if you need help – be advised that for privacy reasons, you can have Accommodations do the work; we will comply. We can also adjust deadlines if personal or medical crises erupt; again, we can help but you have to reach out.

The details of the three Assignments will now follow on the next few pages.

Assignment 1. Write an Annotated Bibliography
15% of Final Grade; TA grades this assignment.
Due October 11 @ 2000 h[2] via LEARN dropbox

Broad scope of the assignment. Write an annotated bibliography for research in a social, ecological, or socioecological systems problem that will explored further in Assignments 2 and 3. You will devise a research problem that involves using a socioecological systems approach.

The early lessons and tutorials will help give you some ideas, but you should also explore the later course readings for some good ideas on how to approach this.

Most problems can be analyzed using one of the many forms of systems analysis. Usually, the only problems not amenable to this are ones that involve a narrow set of goals, variables, and likely outcomes (nothing wrong with those sorts of problems or approaches but for ERS 300 we are focusing on a more holistic – systems – analysis; the name of the course is not a random choice).

Structure/grade allocation of the annotated bibliography.

- (20 marks) You begin with **a brief summary** of how you define your research problem but the major focus (per this course's name and scope) is to begin to consider what your socioecological (or social or ecological) system looks like. The summary focuses further on how your systems analysis is likely to be informed by literature. This means you have **at least 15 topic-relevant articles / book chapters** (*most of these must be from peer-reviewed sources; if they are used as supporting evidence, they all must be demonstrably credible* – there are cases you can identify and use crackpot articles as straw dogs to demonstrate how bizarre some ideas are). You must engage – where relevant – supporting AND counterpoint literature.

- (70 marks; yes, this is the part you spend the most effort upon). Consistent with your choices above, you next provide a **much more detailed and clearly coherent evaluation – this is what 'annotated' means - of the articles** – once again, focus briefly on how these will help inform the research problem of interest and even more so on the articles' utility in describing your system of interest and its analysis. Now this is early in the process and is linked to your later tutorial presentations and systems description assignment so we appreciate that this first assignment is rather akin to a draft version of what you will produce later. As such, we tend to be a bit generous in grading though we do not recommend attempting to bamboozle, befuddle, baffle or bullshit your way through this.

- (10 marks) You produce a well-structured (logical, clear - yet nuanced) paper that meets the format requirements and writing style concomitant with expectations of a 3rd year student. Your paper will be about 8-10 single-spaced pages (including citation of references); no title page needed (paper title and your name at top right); use 12-point Calibri font; left justify.

[2] Every year this happens: People misread the 24-hour format. Once again, 2000 h means 8 PM. Okay? I choose 2000 h because it has three zeroes and means the deadline is early enough so you can do other things with your evening. Sleep. Eat. Read. Many other things that are none of my business and I never did anything like that anyway. No, really. Stop laughing.

Assignment 2. Tutorial Leadoff 5 Minute Presentation & Guided Discussion.
Presentations occur during the final 4 weeks of tutorials.
You choose your presentation date during the 1st tutorial.
10% of Final Grade Total; TA grades this assignment

Broad scope and structure of the assignment. This is rather straightforward and compact. Each student will lead a tutorial discussion that synthesizes their research to date into a socioecological systems problem with a focus on describing the system embedded in this problem and its analysis (see Assignment 3). Students presenting earlier in this 4-week timeframe likely will show more of an in-progress draft; students presenting near the end will likely be finished or nearly so – the TA makes allowances and adjusts expectations for different ends of this timeframe. Here, each student provides an elevator pitch'; this is a well-prepared and concise 5-minute leadoff presentation for discussion in a tutorial session. These discussions are intended to allow you to get feedback from colleagues on your Systems Description at whatever the stage of completion. As I prepare this syllabus in early spring ahead of the fall term, I will have to wait and update whether we will have e-classrooms (so you can use computer presentations) or if we do this the old-fashioned way using whiteboards or flipcharts. When the TA grades your presentation, here is the rubric (wherein you are graded on your expected progress for each component; it is graded out of 50 marks). Notice it is consistent with many of the elements of Assignment 3, though it is less demanding since this is mainly a verbal exercise requiring summation rather than deeper details.

The intent here is that you can use your emerging Systems Descriptions and Scale Diagrams as the sole slides (if we have an e-classroom for tutorials); if we don't, we'll ask each student to post their 1-2 slides in a special open dropbox on LEARN and students can follow along that way. As noted, we may have a flipchart handy; if so, one can use the old fashioned way of drawing while talking if you have the confidence to do so (think "Bob Ross"; you've seen the meme, have a look at his TV shows on YouTube for an idea of what this means).

- Describe the basic research problem and socioecological system generally (5 marks).
- Describe System Components (5 marks). Describe relevant components of the system (based on your purpose and perspective).
- Describe System Structure (5 marks). Describe how all the relevant components in the system are interconnected or causally linked (based on your purpose and perspective).
- Describe System Boundary (5 marks). Describe the system boundary that you have chosen and why.
- Describe System Scale (5 marks). Identify the scale at which the system is being defined and why AND briefly describe the system a scale above and a scale below your system (i.e. how do these affect your system?).
- Describe System Perspectives or Types (5 marks). Briefly describe at least two (ideally three) different, relevant perspectives or system types that help you understand your system (e.g. biological, geological, sociological, psychological)
- Describe Systems Analysis (10 marks). Describe what methodological framework(s) and method(s) will be useful to operationalize your systems description – how to analyze it.
- Deliver a well organized, appropriately timed (5-minute maximum) presentation that shows clear engagement with the research fosters discussion. To facilitate this, each presenter should prepare 1-2 discussion questions in advance and guide their colleagues through them. It is expected each discussion period will last a maximum of 5 minutes for each presenter. (10 marks).

Assignment 3.
Research a socioecological systems problem
30% of Final Grade; Steve marks this assignment
Due: November 29 at 2000 h via LEARN dropbox

Broad scope of the assignment. Being able to describe and illustrate a socioecological system is critical to understanding and communication – and helps to do the detailed research (analysis and recommendations for action). Examples of this sort of exercise are already available in many of the readings we have done. Not all of these examples have all the elements demanded in this assignment and not all are formatted like this assignment so use those to guide you rather than constrain your creativity or reflection.

Your focus will be on developing a narrative with a logical progression that leads to a Systems Description and Scale Diagram of a research problem to both refine your understanding of the case study and to describe how you propose to analysis it and then change the system to make it more resilient (or, given the name of SERS, 'sustainable'). For your benefit, I provide an example of a System Design and then a Scale Diagram that comprises the final element of this assignment.

Structure and Grade Allocation within This Assignment.

Abstract (5 marks). Summarize your conceptual and theoretical framework that led to you isolating a tractable socioecological systems problem. You next describe (a) the basic problem and (b) why it needs to be researched. The rest of this is about how you can research it. Focus first – and extensively - on how you can describe this as a system (the breakdown below helps guide your approach here). Next, you then describe the methodological framework and likely methods (techniques) suited to analyzing this problem and its system. Finally, reflect upon your expected outcomes and perhaps on any research gaps you expect will remain.

Conceptual and Theoretical Framework (10 marks). While some call this a literature review, that is too mundane. It does address the major (mainly peer reviewed) literature but you need to construct a narrative that guides readers from the largest context of the problem of interest and how one narrows it down to a tractable problem of interest – not only to you, but to others (why should anyone care?) You should be focusing on how this is a 'systems' problem (ideally it is socioecological, but it may be more social or ecological if necessary – prepare to justify why it should be more disciplinary than this course normally expects). End with a clear statement of what problem is to be solved and how you think systems analysis (be specific what kind) might help solve it.

Describing the Socioecological System (80 marks total). Since this is a research paper – almost a research proposal, really – it cannot be structured like a research report that deals with data. Thus, this big section is subdivided to help you succeed and be explicit to help readers understand your approach. This is a bit of an organic and recursive process because you need to consider the first 5 elements before constructing a Systems Diagram, but you need to refer to and consider the Systems Diagram in those same elements. Start with the first 5 elements, draft a Systems Diagram, and then reflect on how each influence each other or identify gaps – then fix those gaps in the next draft. This is kind of a Catch-22 (look up that term; better yet, read Joseph Heller's novel of the same name) but all writing is like this – you can't write the conclusion without the body of the text but the body of text has to be influenced by the conclusion. Without further ado, here are the components and their mark values:

1. System Components (10 marks). Describe all the relevant components of the system (based on your purpose and perspective). In the final version after several drafts, show how these influenced your systems diagram.

2. System Structure (10 marks). Describe how all the relevant components in the system are interconnected or causally linked (based on your purpose and perspective). In the final version after several drafts, show how these influenced your systems diagram.

3. System Boundary (10 marks). Describe the system boundary that you have chosen and why. In the final version after several drafts, show how these influenced your systems diagram.

4. System Scale (10 marks). Identify the scale at which the system is being defined and why AND briefly describe the system a scale above and a scale below your system, i.e. how do these impact your system? Include a separate Scale Diagram – see the last element.

5. System Perspectives or Types (5 marks). Briefly describe three different, relevant perspectives or system types that help you understand your system (e.g. biological, geological, sociological, and psychological)

6. Systems Analysis (20 marks). Describe what methodological framework(s) and method(s) will be useful to operationalize your systems description – how to analyze it. This often will be related to element 5 and the type of problem you chose. This part will rely rather more heavily on citations and explanations of relevant peer reviewed literature.

7. System Diagram and Scale Diagram (15 marks). For the Systems Diagram, provide a detailed diagram of the system of interest clearly illustrating your system's components, structure (different types of interconnections or flows), and boundary. Next, this is embedded with a Scale Diagram that shows/illustrates it as nested in a hierarchy / holarchy of sub-systems and super-systems; where does your system fit within the larger world and how do sub-systems fit within it?

Style/Format (5 marks). Did you use and properly reference relevant literature and write a paper with proper spelling, grammar and style expected of a 3rd year student? For your guidance, this assignment should produce a paper that is 12-15 single-spaced pages (including citations of references); same format otherwise as for the 1st assignment.

What follows are 4 examples of Socioecological Systems Descriptions and Scale Diagrams – naturally, these are in diagrammatic (figure) form. These should help guide you as you try to devise your own for this Assignment.

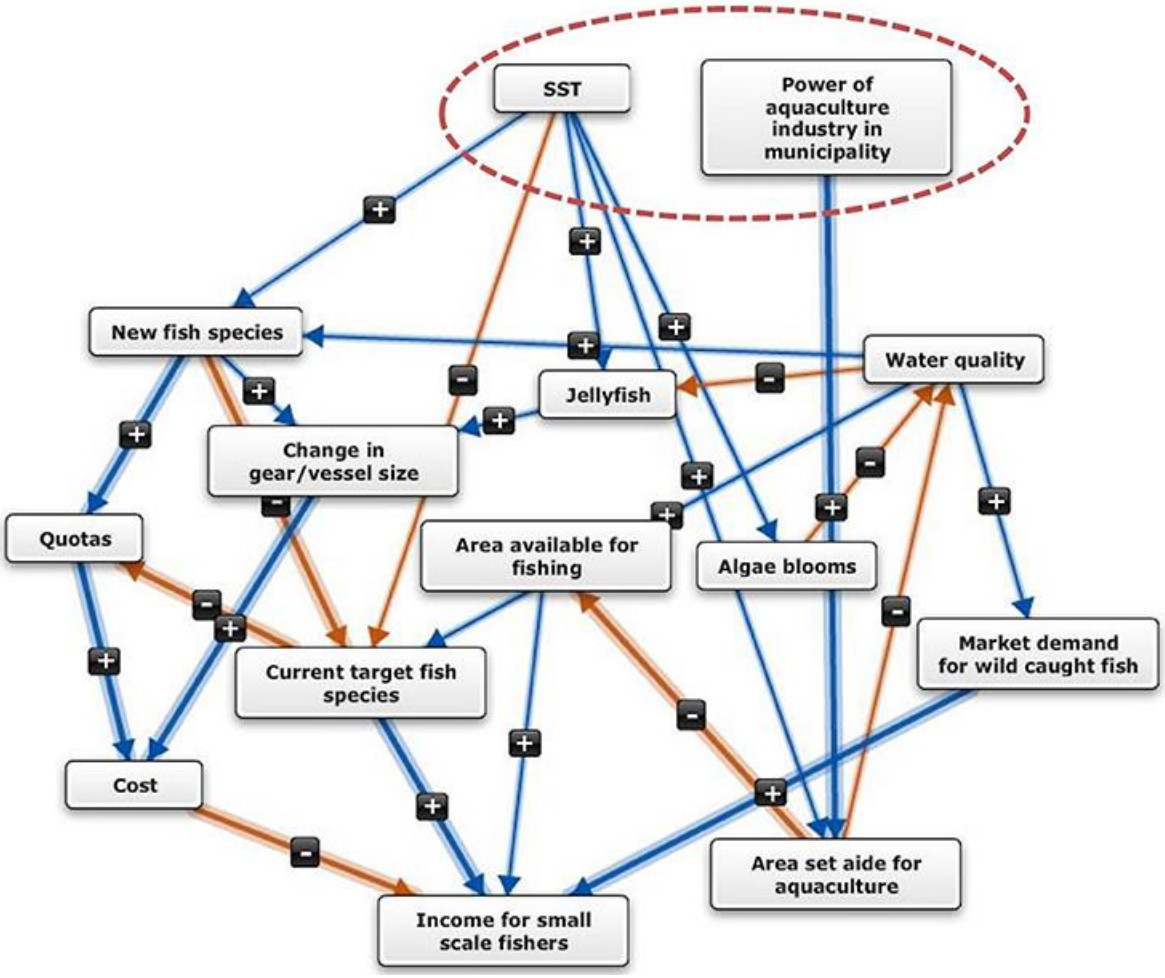


Figure 1. This is a good example of a Systems Description of a fisheries socioecological case. I will caution that we would want more detail in ERS 300 (per the requirements detailed for Assignment 3) but it gives you an idea of what the Descriptions looks like as a diagram (figure). This is not criticism; it is a fine description. It is simply that the Assignment 3 in ERS 300 asks for some more details – that is all.

This is from https://www.frontiersin.org/articles/10.3389/fmars.2016.00267/full.

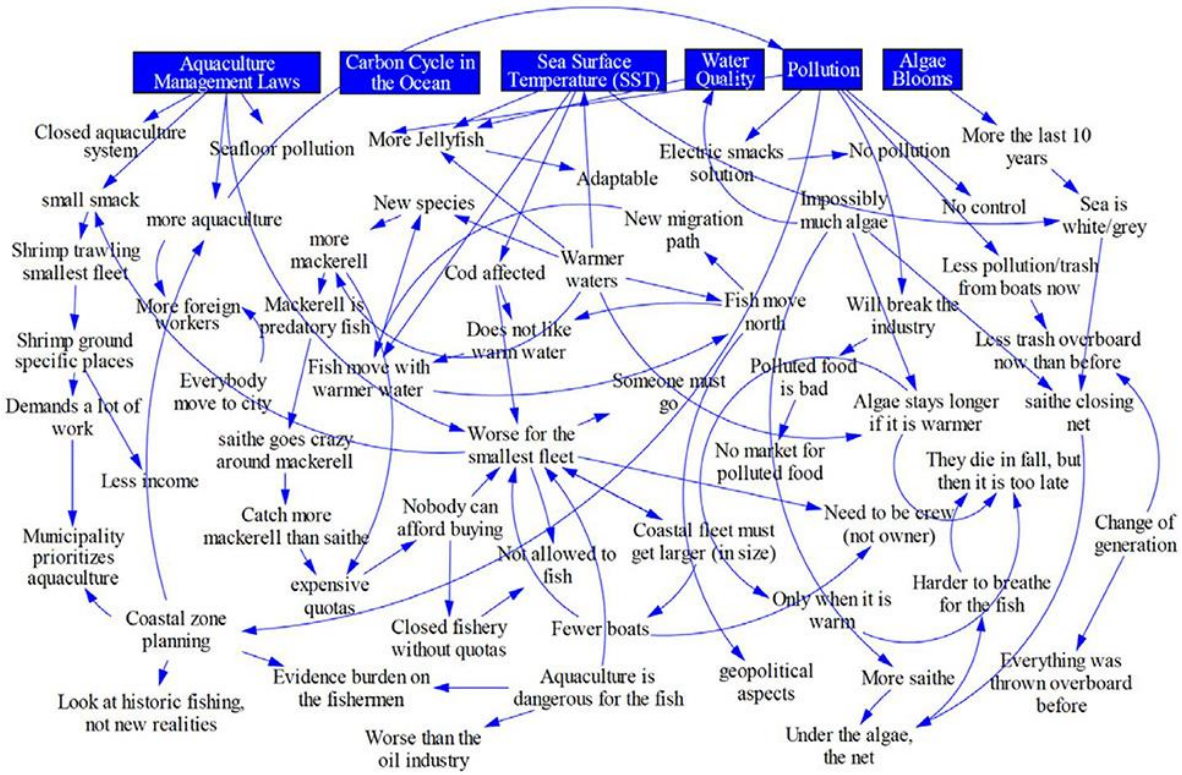


Figure 2. Now this is a more detailed and sophisticated Systems Description of how stakeholders perceive fisheries socioecological systems. It would get a better grade than Figure 1 would but sometimes you can do just fine with simpler Descriptions if you manage readers' expectations by demonstrating that the current state of knowledge of a System is so low that this sort of detailed Description in Figure 2 is not possible. Remember that: Provide evidence to manage the expectations of a reader (the person grading your paper).

This is from https://www.frontiersin.org/articles/10.3389/fmars.2016.00267/full.

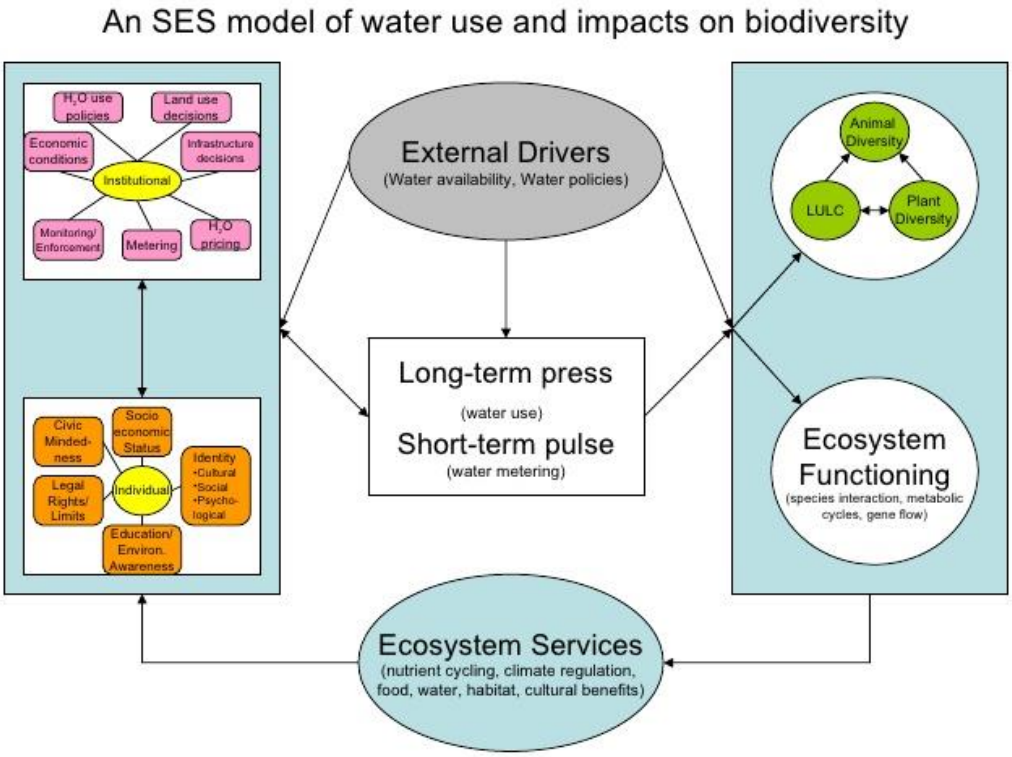


Figure 3. A Scale Diagram. This is a decent example showing how different systems are embedded in other systems using breakouts within the diagram. It shows a holarchical socioecological (SES) system. Notice it simplifies the sub-systems because otherwise the Scale Diagram would become compressed and unreadable. Sometimes, people use the power of Word to allow the reader to click on subsystems and enlarge each of them. This allows readers to see the System Descriptions' details and yet retain the Scale Diagram.

This is via Dr. Andrew Jones (https://www.slideshare.net/leafwarbler/socio-ecological-systems).

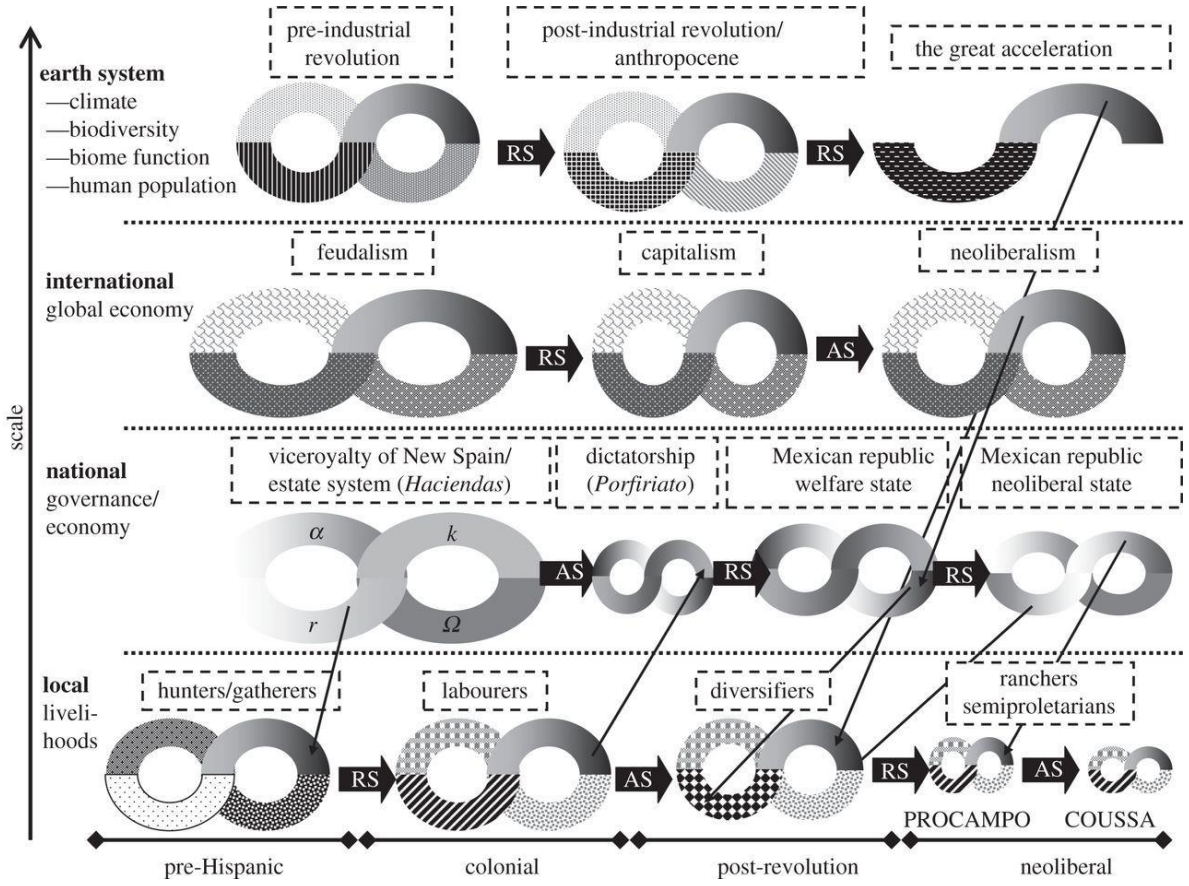


Figure 4. Perhaps the gold standard of Scale Diagrams (or maybe not – this is busy and might be confusing; you can chew on that). Still, this is one of the few good examples that really tries to show a holarchical series of adaptive cycles – a panarchy (meaning: several hierarchies represented as 'figure 8' or 'Mobius' diagrams that interlinked and nested or embedded within other scales and cycles).

It shows how the socioecological subsystems in Mexico's dryland agroecosystems have changed and driven outcomes through post-colonial history. Notice it focuses details more on social systems, but the larger Earth systems are given a nod in the upper left. What gets lost is a clearer explanation of the integrated ecological and social interactions and perhaps the solution is to 'explode' out each of these adaptive sub-systems/sub-cycles to show details and to explicate the ecological sub-systems much more.

This should give you an idea of how difficult this exercise (and Assignment) can be – though I do not expect this to be the norm or represent meeting my expectations for a very good (75/78) or even excellent (80-90) grade in a 3rd year course. This sort of Scale Diagram – for its flaws – is probably what earns you an outstanding grade and that is hard to attain (it would be in the 95% range, as long as the author explained how it could be improved further, per my comments).

Oh, and this is from https://royalsocietypublishing.org/doi/full/10.1098/rstb.2011.0349.

This Next Bit is a Refresher That I Provide in All My Courses
This is to Assist You to a Successful Path in ERS 300 and Beyond:
Surviving & Thriving in University/Expectations and
the Meaning of Grades in University

In high school (remember those days?), mastery of foundations and expected efforts often yield grades above 90%. In University, they do NOT; meeting expectations at a level commensurate with your program level (e.g. 1A, 3B, 4B) typically earns you a grade around 75%. That means the remaining 25% is for extraordinary effort. It also means that if you never progress and submit the same level of work, what earns you a 75% in 1A will probably earn you a 65% in 2A, 55% in 3A and less than 50% in 4A. This rarely happens because people begin to learn the system and get better as they progress during University.

This is what students rarely consider when they first enter university; the assumption is that a good and basic effort will yield a high grade. Nope. That means you get a good and basic grade – around 75%, though one could choose any baseline (in the UK, they choose around 50-60% for this but that really hurts students going for scholarships internationally where all others use the 75% basis for 'meets standards'). Our job is to make you better and show you how to be the best if you are willing to put in a lot of effort and/or work efficiently.

This is why I – or any professor – will say you need to start assignments immediately, finish early, write many drafts or you need to review class lessons immediately after they happen. You need to do the mandatory readings before and after (taking notes on these – synthesizing main points). You need to reflect and synthesize the big ideas or principles in each class/reading/tutorial and consider how case examples – including ones in current events you can read about in the news – are examples of how the principles/idea are applied. You want an A+? You can earn it – with a lot of work.

University is full time; think of it as a job – one that can be fun and rewarding if one has a good attitude and dedication. If you must work more than 10 hours a week because of finances, I'd recommend taking no more than 4 courses a term; it means perhaps an extra term in total over 4-5 years or taking some higher credit weight courses (e.g. ERS has 2 triple weight and 4 double weight courses in spring terms) but it is worth it. You need to devote about 10-15 hours per course each week to achieve above 80% in each course; this means 40-75 hours per week if you are taking 5 courses so that leaves 93 hours a week for all else. Not too bad but since you'll want to sleep, eat, have some non-academic fun, and allow for days when you are exhausted or ill, it is less time than you think. Work-life balance is something that we all must learn; it is a skill and an art.

Personally, I recommend taking even an old-fashioned paper calendar of some type and working BACKWARDS from the end of each term. You will not know exact dates of your final exams until the end of the 2nd month of each term but you will know you have X number of exams during the final month of term based on course syllabi. Add in your test, quiz, or assignment due dates for all courses and add in times when you anticipate big social events or other happenings. Then add in a schedule where you set hours/times to start assignments and review course materials, synthesizing them in anticipation of your tests and exams. Stick to this schedule. If you maintain a great routine, you will succeed.

Grades can be interpreted a bit differently depending on the professor and type of course (and in

some places in the world – like the UK – they use a different basis for grading, i.e. they rarely assign a grade higher than 80% so the mean and median grades and interpretation of student success is different than in Canada). Below, you will find a decent description of what grades mean in my courses and in many SERS courses. Personally, I tend to grade by range-blocks (e.g. 100, 95, 90, 85, 80…) because I examine the quality of an answer – based on the criteria below – and then transform them into a numerical grade reflective of the effort and achievement of a student. Higher grades = better completeness, nuance, creativity, and technical abilities.

- A+ (90% and above): Your work gives an in-depth, reflective or analytical answer that addresses the question beyond a fundamental outline of the main issues; essentially, the answer makes use of class discussions, class resources and other credible sources or ideas and translates these into an answer that produces a workable strategic assessment and operational solutions. Grades in this range or the next one below usually reflect the fact that a student has made a serious and successful effort to review material daily or weekly, anticipate assignments by starting them early and drafting several versions before handing them in, considered the synthesis and specific issues for the course material, made notes on key points of the readings assigned or read extensively beyond mandatory readings or expectations for an assignment, and explored the current events/news relevant to the course or assignment material to mine comparative examples. In sum, the highest grades reflect extraordinary effort

- A/A- (between 80% & 90%): Your work addresses the fundamental issues related to the question and provides a useful and concise summary of them. The upper end of this range means that you have taken reasonably intense efforts at going beyond the materials provided, insights covered in class or the literature assigned. On the lower end of this grade range, your answer does not take the time or provide enough depth to convince the reader that you have great insight into the issues or the technical knowledge to produce an operational solution

- B-/B/B+ (between 70% & 80%): Your work shows that you have most of the basic elements and knowledge related to answering the question but the text and answer itself is a bit muddled or disorganized. Answers receiving the lower end of this grade range normally are ones that reflect a superficial understanding of the issues related to the answer or are not well written.

- C-/C/C+ (between 60% & 70%): You generally addressed the main requirements of the question or an assignment, but your answer shows less than rudimentary mastery of the basic materials and no real cohesion in your answer. If it is a written report, it usually reflects some rather poor sentence structure, grammar, spelling, and/or organization.

- D-/D/D+ (between 50% & 60%): You had enough elements in your work to convince me you have some vague notion of the requirements and key concepts but that's about all; there is usually no cohesion at all on an exam question and if it is a written assignment, your answer is barely readable but does contain enough to pass.

- F (less than 50%): The work gives me a strong suspicion you didn't care, didn't bother, or didn't attempt to comprehend the question and made little to no effort – either that or you truly missed the point of the question or assignment. This usually reflects a very rushed job on an exam or written assignment (no drafts and no real editing); for assignments, it means you probably failed to meet even the most basic requirements (e.g. did not pay attention to

instructions or missed key objectives). If it is around the 40% range, it usually means you made some effort but did not address the major issues or wrote poorly; less than that usually means you had no clue or did not care to get a clue. The answer may be incoherent, contradictory, or plain wrong. It may not even address the question asked. In some cases, however, it can reflect a life crisis or a hidden learning challenge that we can use to diagnose, get help and solutions, and in those cases, we then eliminate this grade and work out a plan to fix things. I do that if the same situation arises and you passed with, say, a D-level grade too.

The above is a good summation of the principles and guidelines when one is marking on a basis of the quality of the answer. In some cases, the assignment or exam lends itself to a very strict and point-by-point grading rubric. Annotated bibliographies, multiple choice or true-false questions on exams and perhaps brief lab reports are examples where there is less reliance on a qualitative framework for grading and more on a tallying rubric where element X gets you Y points. I tend not to use it much because life is not multiple choice; it is all reflection, essay and synthesis.

How does a student write a good paper or exam answer?

No matter what the approach, I think students sometimes miss the two most important points when they answer exam questions or write an assignment:

1. Is this answer or assignment any good – is it great (beyond expectations; A+), perhaps?
2. Did it address the question/follow the instructions/focus on the main goals of the assignment or exam question?

Point 1 is rather obvious and yet so many people miss it; people are caught up in life and in scrambling to juggle (usually) 5 courses with multiple assignments and deadlines and class attendance (one hopes). The mind's focus then goes to the simple stuff: how many words do I need to use (what is the word limit – minimum, maximum or both?). That simple stuff is the wrong question and the wrong attitude – you are not graded on how many words you use; yes, some professors levy heavy penalties for exceeding the word limit and you need to watch that. Word limits are usually no more than attempts at telling you when to stop and that is all. Simply ask yourself upon reading your draft versions: Is this any good? Be honest with yourself.

Point 2 is also trite and yet also missed by many; follow the instructions and focus on what is demanded and emphasized as being important. Do you have an assignment where it is a scientific or consultant style report and 80% of the grade weight is on the discussion? Well, then, 80% of your attention and effort should be on the discussion, right? You would be surprised. I've seen people who clearly spent days formatting a cover for their report (said cover is worth ZERO marks) and then handed in a 1-page discussion when there were another 8-10 pages allocated to discussion and the concomitant weight of the grade. A little sober reflection on the sheer imbalance and mismatch between efforts on each part would have saved some tears, I think.

In terms of content, the effort needed varies depending on circumstances and questions asked. For exam answers, the total weight (number of marks) can sometimes reflect the number of 'points' tallied or expected. That happens with short answer or multiple-choice type exams. However, whether it is more of an essay style or even a 'point-form exam' (which is not the same as 'tallying points' – it just means you do not have to use proper essay style), the weight simply gives you an idea of the depth and breadth expected in an answer.

- My rule of thumb was that a 20-25-mark weight indicated a very deep and sophisticated answer was expected. I never bothered to worry if I had 20 or 25 points or items because the professor could easily give the same great mark to someone who took 10 items and explained them more in depth as to someone who took 15 items and explained them well but perhaps with a less depth for each but more integration of the ideas and items. I simply tried to do my best where 'best' meant weeks of work/prep.
- Sometimes the depth vs. breadth approach depended on the question being asked but in most cases, it is a challenge question to the student: Show me you understood the concepts, explain them, show me how these address the question, raise any issues about missing information and how we should research it/find it, and impress me with your sophistication and well-read nature (did you read beyond the mandatory material and did you reflect and practice answering questions all term?). These big questions are usually synthesis and reflection – the big picture of the course and about strategic ideas.
- A 10-15-mark weight is often one that is a problem-solving one; a greater mark value usually means more detail is expected or it is cross-linked between several topics and lessons and perhaps multi or transdisciplinary in nature.
- Questions around 5 marks are usually more reductionist and focused on one idea.
- Thus, I worried less about how many actual marks were allocated and more about what the relative number of marks/weights against the whole exam can tell me about the type of answer expected – meaning the marks reflect the quality of answer, translated to a numerical assessment.

The writing style often bedevils students because as one begins to learn terminology and reads peer literature, there is a temptation to emulate the complex language and sentence structure in some of these sources to sound smart. In some cases, students emulate the worst excesses of peer literature. My advice: KISS – keep it simple, stupid. Write simple (not compound) sentences that focus on one subject, one verb, one object. Structure the paper so that the paragraphs each focus on one main point and the series of paragraphs lead to an emergent and important theme, that is often reinforced by active voice subtitles to help readers focus. For example, here are two possible subheadings from my own specialization in restoration ecology:

- Importance of diversity to ecological restoration.
- Increased genetic diversity increased the successful outcome of ecological restoration.

The second subheading tells us what the series of paragraphs that follow lead us too; this is not a murder mystery novel so do not worry about giving away the plot. Don't bury the lede.

As far as first vs. third person is concerned, unless the instructions demand one of the other, it does not matter. I tend to use first person, active voice because it is less awkward to write and produces clearer and better writing.

Do not waste time and space on rhetorical flourishes, pedantic comments, (again) burying the lede, irrelevance, half-a-story, or chattiness.

For example, this is bad writing: "A study that was done in Australia in 1987 by DS Smith, FP Jones, AB Uriah, and Dr. Robert Q. Important-Person showed that restoration was good."

The citation style is wrong; most of the sentence is not needed, why call the last author by a full name, and this never tells us why we should care.

This is better: “Smith et al (1987) determined that connectivity analysis improved landscape scale restoration of sand-dune ecological communities’ outcomes by 80% vs. use of Landsat satellite mapping because connectivity focused on animal and plant migrations, fecundity and survival in real-time.” This tells us a lot; there may be more we could add but it gives us a clear idea of what was done and what the relevance is.

The bottom line: Ensure your submission addresses the question, ensure that it is good (that means a lot of hard work with multiple drafts written well in advance), and ensure that it has evidence and proper citations to back your interpretation and claims.

That is a reasonably detailed guideline to grading in university, or at least the way that I (and many colleagues) do it. One thing is to read the syllabus - if you do, you will be rewarded. Like now. If you are reading this, send me an email telling me you read this (by 15 October), and you get an extra 1% on your final grade. There are inevitably going to be many more permutations but professors who know their field and use qualitative grading frameworks know how to spot gems vs. bullshit; good answers vs. great ones; all possible combinations of answers. Therefore, professors should (and usually do) mark final exams in courses that are 120 students or less.

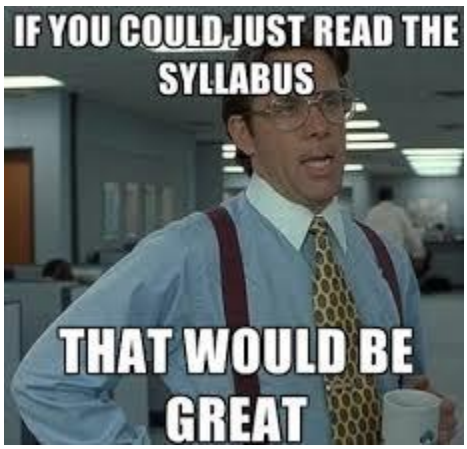
An Obvious but often Neglected Piece of Advice: Attend Classes.

There is often a temptation to become indolent and skip classes, assuming that the slides provided, or the readings will provide all that is needed. In my experience as a student and as a professor, I have found this is rarely the case. The classes provide real-time engagement and the slides are merely a useful foundation. The professors elaborate and explicate the nuances and emphasizes on the topics and ideas – and that is where learning happens. I have long studied impacts of class attendance in my courses and while I generally have very good attendance, I still have enough data from those who tend to miss my class (and, from talking with colleagues, all their other classes) to draw some conclusions. Examining the relative influence of attendance to classes (and tutorials in courses where that is relevant), the latest data indicate that attending > 90% of the classes (etc.) is rather important to success in courses I teach. The difference in grades on the exam indicate that there is a 36.5% difference (mean exam grade for those MIA is 51.8%; mean exam grade for those attending and [I add] participating or involved otherwise in classes is 88.3%). The overall course grade shows similar trends but a bit lower since one can do assignments solo; it is a 31.7% difference. **If illness/mental health are issues, let us talk; we can make alternative arrangements for those sorts of deeper needs.**

Resources for You – University Policies, Your Rights, Mental Health Help, AccessAbility

We used to have a mandatory ‘advisory’ from the Dean of Environment. Beginning in winter 2019, that is replaced with a webpage with many resources (e.g. policies, mental health help): https://uwaterloo.ca/environment/undergraduate-teaching-resources

As noted earlier, make all efforts to communicate with me if there are acute or chronic struggles that affect your class attendance or course performance – I know it is tough to admit you need help or to trust anyone. The earlier we address issues and find a success path, the better; I am willing to assist and alter the standard path.



(I am not sure I like being the one representing the Bill Lumbergh character above but whatever)