

OCN 320: Aquatic Pollution
Fall 2009
MWF 8:30-9:20, MSB 315

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TEXT BOOK

Aquatic Pollution: An Introductory Text. 3rd Edition (2000), by E. A. Laws, John Wiley and Sons, Inc. NY **ISBN 0-471-34875-9**
Library card catalog number: TD420.L38 2000

SCHEDULE

| Date | Topic | Chapter |
|-------------|--------------|--|
| Aug | 24 | Introduction, Course objectives |
| | 26 | Food chain theory |
| | 28 | Food chain theory |
| Aug | 31 | Primary production |
| Sep | 2 | Primary production |
| | 4 | Physical factors affecting production |
| Sep | 7 | Holiday: Labor Day |
| | 9 | Physical factors affecting production |
| | 11 | Cultural eutrophication |
| Sep | 14 | Cultural eutrophication-Lake Washington |
| | | Draft of 1st paper due for in class review |
| | 16 | Cultural eutrophication-Kaneohe Bay |
| | 18 | Sewage treatment: primary |
| Sep | 21 | Sewage treatment: secondary |
| | | 1st paper due to instructor |
| | 23 | Sewage treatment: tertiary and alternatives |
| | 25 | Non-Point source pollution and urban runoff |
| Sep | 28 | NPS-Urban runoff |
| | 30 | NPS-Urban runoff |
| Oct | 2 | Video: Waters of Ayole |
| Oct | 5 | Pathogens |
| | 7 | Pathogens in water supplies |
| | 9 | Pathogens in water supplies |

Class Discussion: Water and health

| | | | |
|------------|-----------|---|----|
| Oct | 12 | Pesticides | 10 |
| | 14 | Pesticides: DDT | 10 |
| | 16 | Pesticides: Alternatives | 10 |
| Oct | 19 | First Exam | - |
| | 21 | Thermal Pollution | - |
| | 23 | Thermal Pollution | 11 |
| Oct | 26 | Draft of 2nd paper due for in class review | |
| | 38 | Student presentations (on second paper) | |
| | 30 | Student presentations (on second paper) | |
| Nov | 2 | Metals - General Concepts | 12 |
| | | 2nd paper due to instructor | |
| | 4 | Metals: Mercury | |
| Nov | 6 | Metals: Cadmium | |
| | 9 | Metals: Lead | 12 |
| | 11 | Holiday: Veteran's Day | 12 |
| | 13 | Class discussion: Metals in urban Honolulu and other cities | |
| Nov | 16 | Oil Pollution | 13 |
| | 18 | Oil Pollution | 13 |
| | 20 | Oil Pollution | 13 |
| Nov | 23 | Draft of 3rd paper due and handed out to students for (take home) peer review | 15 |
| | | Acid Deposition | |
| | 25 | Acid Deposition | 15 |
| | 27 | Holiday: Thanksgiving | |
| Nov | 30 | Acid Deposition | 15 |
| | | Reviewed drafts of 3rd paper returned to students for revisions | |
| Dec | 2 | Acid Deposition | 15 |
| | 4 | Groundwater pollution | 16 |
| | | 3rd paper due to instructor | |
| Dec | 7 | Groundwater pollution | 16 |
| | 9 | Groundwater Pollution | 16 |
| | 11 | Optional Review for Exam | |
| Dec | 14 | Final Examination, 07:30-09:30 | |

OCN 320: Aquatic Pollution Fall 2009

GENERAL COURSE COMMENTS

This course is not particularly difficult if you have some basic background in chemistry and biology (i.e., introductory courses) as well as the formal course prerequisite (OCN 201). Students with no chemistry or biology background will be at a potential disadvantage, because class presentations and discussions will often invoke basic concepts from these subjects. If you have no background in chemistry or biology, you will likely need to spend additional time outside of class to obtain a basic understanding in some fundamental principles **on your own. You are welcome to seek assistance from the course instructor (or tutors) as needed but it is unlikely much time will be spent covering such material in class so as not to inconvenience the students who already have this background.**

Students are responsible for knowing and adhering to due dates for textbook readings and writing assignments unless notified otherwise by the course instructor. **The schedule of lecture topics is tentative and current events and/or a keen interest by the class in material related to a given class topic may lead to changes in the lecture schedule.** Significant schedule changes will be announced during class time and, once announced, become the responsibility of the students. Extreme deviations from the lecture schedule will be provided in the form of an updated syllabus on the web site or handed out in class, or by email to the students.

This course syllabus and some other **limited** information, including some old exams from the professor who wrote our textbook, (but not my old exams) are available on the OCN 320 website: <http://www.soest.hawaii.edu/oceanography/courses.html>

GRADING

Your grade in the course will be based on **total points** achieved in the course. Final letter grades will be based on numerical scores. You are encouraged to find out how you are doing throughout the semester by requesting an “estimated” letter grade up to the time of your request. Keep in mind that letter grades on individual components are not averaged to yield a final letter grade. **Your total numerical score determines your final letter grade.**

The fraction of total points achievable in the various course categories is shown below:

- a) **Periodic quizzes (10%)**
- b) **Midterm exam (25%)**
- c) **Final exam (25%)**
- d) **Three written assignments (i.e., term papers worth 30%)**
- e) **One classroom presentation (10%).**

Quizzes will be unannounced and based partly on material previously covered in classroom lectures and partly on the assigned readings (i.e., material not yet covered in class). There will be **NO MAKEUP** on missed quizzes. Excused absences, however, will be factored into the total quiz score.

Exams will test student knowledge of the material covered in classroom lectures and the assigned textbook readings (some textbook materials and other assigned reading may not be repeated/discussed comprehensively in class). The first exam will cover the material covered in the time between the beginning of the course and the exam and the second exam will cover primarily material presented after the first exam. Although exams are not designed to be cumulative, knowledge is, by nature, cumulative and comprehension of concepts learned in the first half of the semester will be important in mastering the second half of the subject matter. Exams will include a combination of multiple-choice, true/false and fill in the blank questions, with short (quantitative) problems and short essay questions.

WRITING ASSIGNMENTS:

The University of Hawaii “writing intensive” designation for a course is defined as a minimum of 20 pages of original writing during the semester. In this class the writing intensive requirement is met through three research/term papers and a student classroom presentation that includes written handouts prepared by the students. The twenty page limit excludes any figures, and reference lists in the term papers.

The student group classroom presentations will be on the topic of your 2nd paper. More details on the format of the presentations are provided below.

Information presented in your research papers and the classroom presentation **must be based on material derived from a minimum of two peer-reviewed** publications from the scientific literature and any other material you wish to use. The course textbook, web sites, magazines, newspapers, etc. can be used as references **to supplement** the minimum required peer reviewed articles. When using non-peer reviewed resources, it will also be necessary to discuss how objective, credible, or biased the opinions presented in these resources are. A portion of your grade on the papers will depend on the appropriate use/citation of references.

Students are to turn in drafts of the full-length papers by dates specified in the syllabus for preliminary in class or take home peer-review (by fellow students). Final versions of the papers are due one week after return of the edited draft to the students, **NO EXCEPTIONS.** Grades for late submissions of the drafts and/or final versions of papers will be reduced by 5% per class day up to a maximum of 50% grade **reduction.** After in class (or take home) review, students will turn in revised papers to the course instructor, who will grade them and provide students with additional comments on style, grammar and content as necessary. Students are expected to pay careful attention to the nature and type of editorial comments (from both the in class peer review and the instructor reviews) so that they can be prepared to conduct a good “peer review” of another student’s draft of the third paper. **If desired students can re-submit any graded paper for a second instructor evaluation and re-grading. Please be aware that unless there are substantive revisions and improvement to the paper, no additional points will be given.**

The structure of your papers should include the following:

- 1) **The title of your paper** (on the top of the first page)

- 2) **An introduction.** This should be one to (at most) two paragraphs, depending on the overall length of the paper, which introduce the topic of the essay. This/these paragraph(s) should inform the reader about what you will be writing and provide a brief layout of the rest of the paper. A key part of your introductory paragraph is to explain why the subject matter is important and worth presenting/discussing.
- 3) **The body of your paper.** In the body of your paper you will need to organize individual paragraphs sequentially in a logical manner so that the material in each paragraph follows from the previous paragraph. Please be concise and avoid repetition.
- 4) **The final summary paragraph.** This paragraph provides the reader with a summary of the most important conclusions and can also point out what additional work should/needs to be done on this topic.
- 5) **The reference list.** All sources of materials used in your paper including peer reviewed publications, books, newspaper articles, magazine articles and web-sources must be cited.

An instructor I had in college told us that the basic components of an oral presentation or a paper are such that: 1) you tell them what you are going to tell them, 2) you then tell them about the subject matter in question, and 3) you finish by telling them what you just told them... This seems pretty simple, but you will be surprised how many presentations and papers do not follow this simple format.

The writing assignments in this course have two primary objectives. The first is to help reinforce the concepts that are taught/learning during the lectures as well as to allow you to obtain a more in-depth understanding of the material than is possible from simply listening to the instructor and/or reading the text book. The second is to help you improve your critical thinking and writing skills. It is well-known that one of the better ways to learn material is to write about it. Good communication skills are also very important in most professional occupations. I cannot overemphasize how many times I have been asked by employers who were recruiting that they needed a person with good communications skills.

Unfortunately, as is the case with many things, the only way to get better at writing is to do it frequently... Practice makes perfect... The more you write, the better your writing will become and the easier it will become. Many of us do not like to write, but developing effective writing skills is a very important part of your professional training.

How to construct your papers:

Try to make your papers follow a logical order. First present a problem or a known fact (or data). Present (various) hypotheses that have been advanced by those who have worked on the subject matter and try to present and evaluate, as much as possible, alternative hypotheses or arguments. In all cases ensure that material in the early sentences and paragraphs lead into the subsequent discussion. Does material in each paragraph relate to the introductory sentence of that paragraph? Does material in the next paragraph follow logically from the last sentence in the previous paragraph? Make sure that you let the reader know when you transition from one point to another or when you are explaining an opposing hypothesis/argument. Words such as “however”, “in contrast”, “nonetheless” help the reader realize that you are changing topics or presenting a differing opinion. The

use of outlines, while sometimes seemingly very simple and not too exciting, may prove to be very helpful to organize your thoughts. As you begin to fill in an outline with more detail, you will find that its utility increases and that it can serve as a roadmap to the structure of your paper. If you take it to the extreme, the outline can become your first draft...

Your writing assignments should be concise and articulate. This is easier said than done and in order to achieve this goal you will likely have to edit your paper carefully and repeatedly! The writing assignments of this course, however, should not represent an onerous time commitment on your part. Try to begin your writing assignments early (i.e., do not procrastinate) and do not worry too much about how well you write your first draft. Your first draft can be as simple as what I refer to as a “brain dump”. Once you have looked over your reference materials and jotted down relevant notes, you just begin to write thoughts that come to your head about the topic, without paying too much attention to grammar, structure or whether the ideas follow logically or not. I encourage you to prepare your first draft using word processor software on your computer. This will make it easier for you to edit and fill in missing material later, as well as re-arrange things that are not in a logical order. This first draft will likely not be much fun or interesting for anyone else to read, but that is fine, at least at this stage. Put this draft away for a while, then come back and re-read it and see if there are other things missing from your research. An important part of your first editing of the draft will be to eliminate material that just “hangs there” on its own and is consistent with the ideas you are trying to express. Unsupported thoughts also should be eliminated when editing your paper.

Once you have a second draft, have someone else read it (yes, you may have to bribe them...) and provide you with feedback. Room-mates, friends, other instructors, etc. can help you significantly improve your writing because they are looking at it with fresh (and unbiased) eyes.

Use of references in your writing assignments:

Your writing assignments must be supported by a list of bibliographic references that describe the sources of material that you consulted. The use of relevant published references, gives proper credit to the original authors of prior work whom you quote, and provides a historical timeline for the reader to examine at greater length if he or she desires. Keep in mind that peer-reviewed literature articles are much better references because they have already been given approval as relevant by others. These references are less likely to be subjective and/or biased and contain unsupported opinions than newspaper or magazine articles and web materials such as blogs, etc.

A good example of what not to use is an article that says: “Plaxo has been proven to be 60% more efficient in enhancing digestive function”... 60% more efficient than what? Who determined this and how? What is the source of this information and how do you know it is reliable?

For citations in your text, please use the name of the author (or authors) followed by the year of publication. For example: A study of school children showed that using Plaxo as a food additive helped digestion (Smith and Jones, 2007). Alternatively you could say: A

study conducted by Smith and Jones (2007) demonstrated that using Plaxo as a food additive helped digestion. If there are more than two authors the citation should be: Smith et al. (2007) or (Smith et al., 2007).

The references should be listed in alphabetical order with multiple entries by a given author listed in chronological order:

- Ahad, J.M.E., Barth, J.A.C., Ganeshram, R.S., Spencer, R.G.M. and Uher, G. 2008. Controls on carbon cycling in two contrasting temperate zone estuaries: The Tyne and Tweed, UK. *Estuarine, Coastal and Shelf Sci.* 78:685-693.
- Balls, P.W. 1994. Nutrient inputs to estuaries from nine Scottish East Coast rivers: Influence of estuarine processes on inputs to the North Sea. *Estuarine Coastal and Shelf Sci.* 39: 329-352.
- Berner, R.A. and Raon, J.-L. 1994. Phosphorus in sediments of the Amazon River and estuary: Implications for the global flux of phosphorus to the sea. *Geochim. Cosmochim. Acta* 58:2333-2339.
- Burford, M.A., Alongi, D.M., McKinnon, A.D., and Trott, L.A. 2008. Primary production and nutrients in a macrotidal estuary, Darwin Harbour, Australia. *Estuarine, Coastal and Shelf Sci.* 79:440-448.
- Caccia, V. G., and Boyer, J.N. 2007. A nutrient loading budget for Biscayne Bay, Florida. *Marine Poll. Bull.* 54:994-1008.
- Caraco, N. F. 1995. Influence of human populations on phosphorus transfers to aquatic systems: A regional scale study using large rivers. Phosphorus in the global environment. Chichester, John Wiley & Sons. 235-244.
- Carruthers, T.J.G., van Tussenbroek, B.I. and Dennison, W.C. 2005. Influence of submarine springs and wastewater on nutrient dynamics of Caribbean seagrass meadows. *Estuarine Coastal and Shelf Science* 64:191-199.
- Cook, P.L.M., Eyre, B.D., Leeming, R. and Butler, E.C.V. 2004. Benthic fluxes of nitrogen in the tidal reaches of a turbid, high-nitrate subtropical river. *Estuarine, Coastal and Shelf Science* 59:675-685.

In the case of two papers by the same author(s) in a given year, please cite them in the text as Kawahara (1998a) and Kawahara (1998b) so as to differentiate them.

For non peer reviewed citations, please select a format and then use it consistently. You should, however, still cite by last name first, first initial(s), YEAR, then the rest of the info such as title, followed by the source of the info.

The following are the topics of your writing assignment:.

1) The nitrification of coastal waters: Hypoxic and anoxic zones

The focus of this paper is to be on **cause and effect** relationships between land-derived (natural or anthropogenic) inputs of freshwater, suspended sediment and their associated nutrient loads on the coastal waters. It is strongly suggested that you use quantitative data to substantiate any arguments presented in your paper. **This paper is to be three and a half to four pages (double space, 12 point, one inch margins) in length, excluding references.**

Some starting points/reference papers are given below.

- Caraco, N. F. 1995. Influence of human populations on phosphorus transfers to aquatic systems: A regional scale study using large rivers. Phosphorus in the global environment. Chichester, John Wiley & Sons. 235-244.
- Carruthers, T.J.G., van Tussenbroek, B.I. and Dennison, W.C. 2005. Influence of submarine springs and wastewater on nutrient dynamics of Caribbean seagrass meadows. *Estuarine Coastal and Shelf Science* 64:191-199.
- Cheroske A.G., Williams, S.L., and Carpenter, R.C. 2000. Effects of physical and biological disturbances on algal turfs in Kane‘ohe Bay, Hawai‘i. Journal of Experimental Marine Biology and Ecology 248:1–34.
- De Carlo, E.H., Hoover, D.J., Young, C.W., Hoover, R.S. and Mackenzie, F.T. 2007. Impact of storm runoff from subtropical watersheds on coastal water quality and productivity. Applied Geochemistry, 22:1777-1797, <http://dx.doi.org/10.1016/j.apgeochem.2007.03.034>
- Garrison, G.H., Glenn, C.R. and McMurtry, G.M. 2003. Measurement of submarine groundwater discharge in Kahana Bay, Oahu, Hawaii. *Limnology and Oceanography* 48:920-928.
- Hoover, D.J. and Mackenzie, F.T. 2009. Fluvial fluxes of water, suspended particulate matter and nutrients and potential impacts on tropical coastal water biogeochemistry: Oahu, Hawaii. *Aquatic Geochemistry*. DOI 10.1007/s10498-009-9067-2
- Laws, E.A. and Allen, C.B. 1996. Water quality in a subtropical embayment more than a decade after diversion of sewage discharges. *Pacific Science*, 50(2):194-210.
- Laws, E.A., Ziemann, D. and Schulman, D. 1999. Coastal water quality in Hawaii: The importance of buffer zones and dilution. Marine Environmental Research 48:1-21.
- Rabalais, N. 2004. Eutrophication. Chapter 21, pp. 819-865 in A. R. Robinson, J. McCarthy and B. J. Rothschild (eds.), *The Global Coastal Ocean: Multiscale Interdisciplinary Processes, The Sea*, Vol. 13, Harvard University Press.
- Rabalais, N. N., N. Atilla, C. Normandeau and R. E. Turner. 2004. Ecosystem history of Mississippi River-influenced continental shelf revealed through preserved phytoplankton pigments. Marine Pollution Bulletin 49: 537-547.
- Rabouille, C., Conley, D.J., Dai, M.H., Cai, W.-J., Chen, C.T.A., Lansard, B., Green, R., Yin, K. Harrison, P.J., Dagg, M. and McKee, B. 2008. Comparison of hypoxia among four river dominated ocean margins: The Chianjiang (Yangtze), Mississippi, Pearl and Rhône. *Continental Shelf Research* 28:1527-1537.

- Ringuet, S. and Mackenzie, F.T. 2005. Controls on nutrient and phytoplankton dynamics by storm runoff events, southern Kaneohe Bay, Hawaii. *Estuaries*.28:327-337
- Scavia, D., N. N. Rabalais, R. E. Turner, D. Justic, and W. J. Wiseman, Jr. 2003. Predicting the response of Gulf of Mexico hypoxia to variations in Mississippi River nitrogen load. *Limnology & Oceanography* 48: 951-956.
- Smith, S.V., Kimmerer, W.J., Laws, E.A., Brock, R.E., and Walsh, T.W. 1981. Kaneohe Bay sewage experiment: Perspectives on ecosystem responses to nutritional perturbation. *Pacific Science*. 35:379-395.
- Turner, R. E. and N. N. Rabalais. 2004. Suspended sediment, C, N, P, and Si yields from the Mississippi River Basin. *Hydrobiologia* 511: 79-89.
- Turner, R. E. and N. N. Rabalais. 2003. Linking landscape and water quality in the Mississippi River basin for 200 years. *BioScience* 53: 563-572.

2) The importance of water resources for development and sustainability of societies.

Alternate topic: Ownership of water resources: Conflict over water rights.

This paper is to be five and a half to six pages in length. Because this is a topic of both political and scientific interest, you may make more extensive use of newspaper, magazine and web resources but must still utilize two peer reviewed citations

Solley, Pierce, and Perlman. 1998. Estimated Use of Water in the United States in 1995. U.S.G.S. Circular 1200.

The below are random citations I found by doing a “water resources AND sustainability” search in Science Direct (www.sciencedirect.com)

- Sustainability, water resources and regulation. *Geoforum*, Volume 29, Issue 1, February 1998, Pages 51-68 C. Cocklin, G. Blunden
- Modelling water policies with sustainability constraints: A dynamic accounting analysis. *Ecological Economics*, Volume 63, Issues 2-3, 1 August 2007, Pages 392-402 Fabio Fiorillo, Antonio Palestrini, Paolo Polidori, Claudio Socci
- The development and application of water management sustainability indicators in Brazil and Scotland. *Journal of Environmental Management*, Volume 88, Issue 4, September 2008, Pages 1190-1201 Antonio A.R. Ioris, Colin Hunter, Susan Walker
- Sustainability assessment of desalination plants for water production. *Desalination*, Volume 124, Issues 1-3, 1 November 1999, Pages 19-31 Naim H. Afgan, Mohammad Darwish, Maria G. Carvalho
- Incorporating resilience into sustainability indicators: An example for the urban water sector. *Global Environmental Change*, Volume 18, Issue 4, October 2008, Pages 758-767 Anita Milman, Anne Short
- Sustainability Criteria for Water Resource Systems: Daniel P. Loucks, John Gladwell (Eds); Cambridge University Press, 1999, 139 pp., ISBN 0-521-56044-6
- Resources Policy, Volume 27, Issue 2, June 2001, Pages 139-140 P. Wouters, Alistair Rieu-Clarke

Limiting hydrochemical factors for sustainability of water resources: The Cisjordanian experience. *Chemie der Erde - Geochemistry*, Volume 69, Issue 3, July 2009, Pages 191-222 Eliahu Rosenthal, Joseph Guttman, Robbie Sabel, Peter Möller
The sustainable residential water use: Sustainability, efficiency and social equity. The European experience. *Ecological Economics*, Volume 68, Issues 1-2, 1 December 2008, Pages 221-229 Kostas Bithas

The below are random citations I found by doing a “water resources AND water rights AND water conflicts” search in Science Direct (www.sciencedirect.com)

Local water rights and local water user entities: the unsung heroines of water resource management in Tanzania. *Physics and Chemistry of the Earth, Parts A/B/C*, Volume 29, Issues 15-18, 2004, Pages 1349-1356. Charles S. Sokile, Barbara van Koppen

Contested water rights. *European Journal of Political Economy*, Volume 25, Issue 2, June 2009, Pages 247-260. Erik Ansink, Hans-Peter Weikard

Defining national property rights to a common property resource: The case of the West Bank aquifers. *Resource and Energy Economics*, Volume 16, Issue 4, November 1994, Pages 373-390. James W. Moore

Linking poverty levels to water resource use and conflicts in rural Tanzania. *Physics and Chemistry of the Earth, Parts A/B/C*, Volume 28, Issues 20-27, 2003, Pages 911-917. Ndalaha F. Madulu

Whose scarcity? Whose property? The case of water in western India. *Land Use Policy*, Volume 24, Issue 4, October 2007, Pages 654-663. Lyla Mehta

Approaches to the Legal Aspects of the Conflict on Water Rights in Palestine/Israel. *Studies in Environmental Science*, Volume 58, 1994, Pages 239-249. Jonathan Kuttab, Jad Ishaq

3) Water quality in urban environments (a focus on the Ala Wai Canal watershed in Honolulu is suggested but not required)

This paper is to be five and a half to six pages in length.

Beltran, V.L. and De Carlo, E.H. 2005. Variability of particulate metal concentrations during storm events in streams of a subtropical watershed. Chapter 15 in “Environmental Chemistry”, E. Lichtfouse, S. Dudd, S. Robert, Eds. (Springer Verlag), pp153-176.

Dashiell, E. P. 1997. Ala Wai Watershed Water Quality Improvement Project Management and Implementation Plan. Vol. I. Honolulu City and County Steering Committee.

De Carlo, E. H. and Spencer, K.J. 1995. Sedimentary records of anthropogenic inputs of heavy metals to the Ala Wai a small man-made estuary in Honolulu, Hawaii. *Pacific Science*, 49(4), 471-491.

De Carlo, E.H. and Anthony, S.S. 2002. Spatial and temporal variability of trace element concentrations in an urban subtropical watershed, Honolulu, Hawaii. *Applied Geochemistry*, 17:475-492.

De Carlo, E.H., Beltran, V.L., and Tomlinson, M.S. 2004. Composition of water and suspended sediment in streams of urbanized subtropical watersheds in Hawaii. *Applied Geochemistry*, 19(7):1011-1037.

[doi:10.1016/j.apgeochem.2004.01.004](https://doi.org/10.1016/j.apgeochem.2004.01.004)

- De Carlo, E.H., Tomlinson, M.S., and Anthony, S.A.. 2005. Trace elements in streambed sediments of small subtropical streams on Oahu, Hawaii: Results from the USGS NAWQA Program. Applied Geochemistry, 20(12):2157-2188
[doi:10.1016/j.apgeochem.2005.08.005](https://doi.org/10.1016/j.apgeochem.2005.08.005)
- McMurtry, G. M., Wiltshire, J. C., and Kauahikaua, J. P. 1995. Heavy metal anomalies in coastal sediments of O`ahu, Hawai`i. Pacific Sci. 49(4), 452-470.
- Spencer, K. J., De Carlo, E. H., and McMurtry, G.M. 1995. Isotopic clues to the sources of natural and anthropogenic lead in sediments and soils from Oahu, Hawaii. Pacific Science, 49(4), 492-510.
- Sutherland, R. A. 2000. Bed sediment-associated trace metals in an urban stream, Oahu, Hawai`i. Environmental Geology, 39(6), 611-627.
- Sutherland, R.A. and Tolosa, C.A. 2000. Multi-element analysis of road-deposited sediment in an urban drainage basin, Honolulu, Hawaii. Environmental Pollution 10: 483-495.
- Sutherland, R.A., Graham Pearson, D. and Ottley, C.J. 2007. Platinum group elements in road deposited sediments in two urban watersheds, Hawaii. Applied Geochemistry 22:1485-1501.
- Tomlinson, M.S. and De Carlo, E.H. 2003. The need for high-resolution time series data to characterize Hawaiian streams. Journal of the American Water Resources Association (JAWRA), 39:1, 113-123.

GROUP CLASSROOM PRESENTATION

This assignment is designed to provide students with the opportunity to develop their organizational, collaborative, and (oral) communications skills. As part of this assignment students will team up in groups of three or four to develop a 10-12 minute power-point presentation on the topic of the second paper. **All students** in each group are expected to participate in **all aspects** of the assignment. Students will prepare a handout of the powerpoint slides **as well as an extended text outline (lesson plan) that includes more in-depth or supplementary information not covered thoroughly during the classroom presentation. The extended text outline should be on the order of three to four pages in length and include relevant (peer-reviewed) references for supplemental reading.** The final exam will include questions from all student classroom presentations.

The handout material you prepare for this presentation will count for up to three pages of your minimum twenty pages necessary to meet the "Writing Intensive" requirement for this course.

Students must adequately complete all writing assignments to pass this course, i.e., a grade of F will automatically be given to anyone who does not meet the writing and classroom presentation requirements, regardless of the number of points achieved on quizzes and exams.

STUDENT EXPECTATIONS

YOU (THE STUDENT) ARE RESPONSIBLE FOR YOUR GRADE

Because the syllabus is effectively the “contract” for this course, the successful student will read this document carefully and use it as a reference throughout the semester.

If you are like most of us who cannot remember everything we hear throughout our busy lives, it is important to write down information in a notebook dedicated to this class. This includes specific directions from the course instructor regarding assignments as well as the taking of notes during class. There is a positive correlation between note-taking and grades achieved in many courses and it has long been demonstrated that note-taking is a valuable memory and learning aid. Students who take detailed notes often achieve a greater final numerical score than those who do not.

In order to facilitate your note taking you will be provided with a summary printout of the class powerpoint presentation slides for each chapter/topic. **NOT ALL MATERIAL PRESENTED IN CLASS WILL BE ON THE HANDOUTS.** The powerpoint slides are NOT, by any means, all you need to know to score highly on the quizzes and exams. Additional note-taking is critical. To get the most benefit from your note-taking, you should also review your notes relatively soon after class (i.e., within the day) and expand or clarify them. This process will help you assimilate the subject material.

When you have questions in class, do not hesitate to ask and, as necessary, follow up after class! If you have questions outside of class, please do your own research on the topic first so as to be prepared to ask informed questions and have a fruitful discussion.

Please plan your time carefully and appropriately. We are all busy and most of you are taking multiple courses, each of which likely requires work outside of class. **For this course, each class lecture session should generate a minimum of 2-4 hours of outside work, depending on your preparation for the course and writing skills.** It is imperative that you keep up in this class. If you cannot devote the time outside of class that is indicated above, maybe you should not be in this course. It is highly unlikely that you will be able to cram successfully and catch up one or two nights before an exam and do well!

Each of us has a slightly different learning style (hence a different ability to succeed following a particular approach)... if you know what works for you, by all means follow it. If your current approach for learning does not work you should try a different approach. Remember not to hesitate to consult the course instructor for help and advice.

Remember: This course for YOU!!!

STUDENT LEARNING OUTCOMES

Upon completion of this course students will:

- 1) Be able to understand and explain to lay and technically skilled persons the underlying principles of primary productivity and eutrophication and how natural events and human induced changes impact these processes in fresh and coastal water bodies.
- 2) Be able to understand how different human activities affect the composition of natural waters (fresh and marine) and how to determine any consequent “cause and effect” impact on the welfare of the “biology”.
- 3) Be able to understand how to make informed decisions regarding stewardship of natural waters and how to minimize the adverse impacts of human activities on natural water bodies.
- 4) Through writing formal scientific papers and group oral presentations, students will have developed organizational, collaborative, and presentation skills that lead to improved oral and written communication skills.