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ENSC 540.01: Watershed Conservation Ecology

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ENSC 540 Watershed CPR (Conservation, Preservation, Restoration) Fall 2016 **subject to change**
Vicki Watson, 101 NS, 243-5153, Vicki.watson@umontana.edu office hrs: **10am--noon**, Wed usually or by appointment

GOALS: To increase student understanding of watershed science, policy, actions & organizing with a view to increasing citizen participation in the stewardship of watersheds & training watershed professionals.

Sept. Introduction – 7 C's of Watershed CPR, Watershed CPR plans; grading/projects
see (www.umt.edu/clarkforkslideshow ?)& <http://communitybuilders.net/the-united-watershed-states-of-america/>

Watershed Science – Connections, Condition, Changes, Capacity

Reading: *Postel & Richter 2003. Rivers for Life. Island Press. Ch 1 & 2.*

References: From most basic: Murdoch, T. **Streamkeepers Guide** Ch 1 & 2 (assessments ch 3-7)

To increasingly advanced – Entering the Watershed 93 (esp. exec sum & ch 3)

Naiman, R. 92 Watershed Management (esp chs. 1, 3, 6); Williams, J. 97 Watershed Restoration (esp: chs 1, 5-8, 25)

Rosgen, D. 96 Applied Stream Morphology (esp. ch 3 & 4) & Field Guide

Naiman, R. 99 River Ecology & Mgt (esp: chs **1**, 2-4, **5**, (11,12,16), **18**, 24, 26)

Likens, G. 2010. River Ecosystem Ecology

Online: Google: [Federal Stream Corridor Restoration Handbook](#) (1998, 2001, 2010), read chs 1-3

EPA's online watershed courses at www.epa.gov/watertrain

Clark Fork papers: www.umt.edu/clarkforksymposium UM Watershed Clinic: www.umt.edu/watershedclinic

MT's Clean Water Act Info Center <http://deq.mt.gov/Water/WQPB/CWAIC>

National River Restoration Science Synthesis (NRRSS) (part of NBII taken down in 2012) [now here](#)

[Synthesizing U.S. River Restoration Efforts](#), Bernhardt, et al, 2005, Science, 308(5722):636-7. [supporting data](#)

[River restoration in the 21st century](#) By M Palmer et al. 2007. Restoration Ecology 15(3):472-481

Lolo Watershed Climate Change Vulnerability Assessment <http://www.fs.usda.gov/main/lolo/workingtogether>

[Gravel Bed River Floodplains](#), Hauer et al 2016 [short summary here](#)

Oct – Watershed CPR – Planning & Actions – (Field trips also serve to illustrate this – see field trip list)

References – (more sites may be emailed)

[Federal Stream Corridor Restoration Handbook](#) (planning & design 4-8, implement 9, actions A)

Will email: Aikens article (Blackfoot case study) from [Watershed Restoration](#)

Chris Frissell's articles in [Watershed Restoration](#) & Naiman 99 (also ch 26)

2015 Montana State Water Plan <http://dnrc.mt.gov/divisions/water/management/state-water-plan>

[Clark Fork/Kootenai basin water plan](#)

In Watson lab: many pamphlets & booklets on BMP's, restoration & management

Nov 1st half – Watershed Law/Policy--US & MT water laws/regs, water rights, nondegradation, TMDL law, definition of impairment & sufficient credible evidence of use support

References: US law: *Postel & Richter, Ch 3. Ch 22 of Naiman 99 (River Law)*

River Network's Understanding the Clean Water Act – www.rivernet.org/introduction-cwa-course

EPA's National Rivers and Stream Assessment <https://www.epa.gov/national-aquatic-resource-surveys/nrsa>

ELI, 2008. State Wetland Protection: www.eli.org/freshwater-ocean/state-wetland-programs

EPA on NPS <http://water.epa.gov/polwaste/nps/> & healthy watersheds <http://water.epa.gov/polwaste/nps/watershed/index.cfm>

Brown, et al. 1993. Laws controlling nonpoint sources. Water Res Bull. 29(1):1-13.

MT Law: Mt DEQ web site: <http://deq.mt.gov/Water> see Water Quality Info; see Laws & Rules

Guide to Stream Permits <http://dnrc.mt.gov/licenses-and-permits/stream-permitting>

More guides -- Guide to MT WQ Regulations (2015), MT Water Rights (2014), Index of Env Permits (2016),

SEE <http://leg.mt.gov/css/Publications/Environmental/default.asp> Guide to MEPA (2015)

TMDLs: <http://deq.mt.gov/Water/WQPB/TMDL> [Water Quality Standards](#)

Nov, 2nd half – Watershed Organizing/Funding – Communities, Choices, Commitment

References: Chs. 21 & 25 of **Naiman 99**; Conflict resolution <http://www.cnrep.org/resources.html>

Guide to Effective Outreach in your Watershed <http://cfpub.epa.gov/watertrain/pdf/modules/NEWgettinginstep.pdf>

[EPA 2012 Economic Benefits of Protecting Healthy Watersheds. EPA 841-N-12-004](#)

Education: MT Watershed Coordination Council www.mtwatersheds.org

watercenter.montana.edu co-sponsors AWRA/MT meetings

Clark Fork Coalition publications <http://clarkfork.org/learn/annual-report-publications/>

FUNDING [Catalog of Federal Funding Sources for Watershed Protection](#) [MT funding](#)

Dec – Student Presentations **Final meeting – Dec 19 (Mon) 10 - noon** or earlier if we can find a time

Guest Speakers/field trip leaders include: watershed coordinators, land trust managers, planners, fish biologists, mining reclamation engineers, restoration scientists, floodplain managers

Field trips: sign up lists in class or later at M2 Rankin; some listed on www.umt.edu/conservationcalendar

References – Above references **in bold** are at library, online &/or available from me. See also Citations on ref list (emailed)
Many educational pamphlets/booklets are free or cheap (see examples in 102 Natural Science).

1-2 papers & presentation worth 200 pts--10 for proposal(s), 40 for progress report(s), 100 for paper(s); 50 for presentation on one paper; **participation in class/field trips (100pts); report on relevant public meeting (50pts) = 350 pts total.**

1) An academic paper (sort of a mini-thesis) that attempts to be an original creative work. It may involve carrying out an original study designed by you that collects data to answer a question or test a hypothesis. It may instead involve analyzing data collected by others, once again to answer a question or test a hypothesis. These data may come from government data files or appear in the open literature. Often you will be pulling together data from several sources and using it to answer a new question. The paper could also be a review paper on some topic, but it is often a challenge to be really creative and original with this approach.

Your goal is to advance our understanding of a subject (try to teach me & other academics something).

The paper should be publishable. You should identify a target publication and write the paper in its style.

It is wise to identify a model paper that accomplishes a similar goal to yours and ask if a paper with a similar goal/format/sophistication, etc is appropriate. Make use of refereed literature as well as other sources.

2) A more applied paper aimed at an off campus target audience (sort of a mini **professional paper**). You will act as a consultant to some off campus target audience. Identify a need and fill it. You might: investigate a subject and develop a position paper or action plan for them (based on scientific info and group's values); critique an EIS or other government decision; conduct a survey or other study that gathers/analyzes data; develop a curriculum or exercise for a teacher. Often this paper will address an issue that may be of local interest only; or address very site-specific questions (ie analyzing local data to address how a site should be managed, restored, etc). The level of sophistication depends on the target audience (but the science must be scientifically defensible).

The two papers can be on the same or different subjects. Either can be produced first. Often the timing needs of the applied paper may dictate this (there may be a deadline for comments, for example).

THE TWO PAPERS MAY BE COMBINED INTO A SINGLE PAPER IF IT CAN SATISFY THE GOALS OF BOTH.

Length of paper(s): About 20 single spaced pages total (+/- 5) of original, well written, tightly crafted, no-wasted-words prose. These pages may be allocated between the two papers as you see fit. (Two 10 pp papers or one 15 pp and one 5 pp). Don't worry about the exact number of pages. It should be as long as it needs to be to address the question, explore the relevant literature, & treat the subject at the agreed upon level of sophistication. Don't put in unnecessary words or explanation to fill up space and don't cut it shorter than you feel necessary to fit into some length. The page guidance given above is to help you establish the scope of the paper. And also to remind you that not much that is longer than 10-20 pages ever gets read or published. If you wish to emphasize one paper over the other, you may negotiate for reappportioning points.

Suggested Milestones (negotiable). Can email me all assignments but the paper—that I need in hard copy & e-copy. Note: I will need at least a week to provide feedback after receiving something in writing.

Week of course: if writing 2 papers, observe these milestones:

Wk 3 (9/15)—Proposal for first paper; wk 6 (10/6)— Progress Report; wk 8 (10/20)—First paper due

Wk 10 (11/3)—Proposal for 2nd paper; wk 12 (11/17)— Progress Report; wk 14 (12/1)—2nd paper due

1 paper: Wk 3 (9/15)—Proposal; wk 8 (10/20)—progress report; wk 12 (11/17) draft paper; wk 14 (12/1) final paper
14-15 th week —Presentation on one of the two papers (you can negotiate for an earlier time)

Proposal: GIVE TITLE. Explain need for the project/paper: explain questions/hypotheses to be addressed.

Who is the target audience or target publication?

How will you address this question/hypothesis? What study design & methods?

What do you plan to produce and how can it be used?

What relevant resources have you located so far? What problems do you anticipate?

What is your timeline for milestones? (be specific to your project—dont give me my timelines)

Optional – but good practice: Discuss your qualifications for doing this work. Give a budget.

Progress Report: Explain any changes from original proposal;**** **provide detailed outline of paper****;**

And a bibliography of the sources collected to date (use the CBE citation style; guide emailed on request).

Paper: Single space (double space between paragraphs). Double-sided preferred. Provide 2 copies: one to mark up & return; one for me to keep. Also an e-copy. **DO NOT EMBED** tables, figures, in text. Put them all at the end. If they are large, put them in a separate file. Keep formatting simple and easy to edit. NUMBER PAGES. If you write a single paper, a double spaced draft is due at least 2 weeks before final is submitted. Revise based on my comments.

540 students must attend at least one water-related public meeting & report back to class. Some meeting possibilities are:

Montana Watershed Coordination Council meetings (www.mtwatersheds.org),

Subscribe to their newsletter www.mtwatersheds.org/updates/subscribe-to-watershed-news/

Any watershed group's meeting -- check out their web sites (<http://www.mtwatersheds.org/watershed-groups/>) & subscribe to newsletters; you might find some meetings listed at www.mtwatersheds.org/updates/calendar/

Msl Conservation district meets – 2nd Mon; 7-9pm; USDA Service Center, 3550 Mullan Road (near Mullan Rd & Reserve)Agenda, call 829-3395.

Msl Water Quality Advisory Council – 2nd Tuesdays , 7-9pm; City-County Health Dept. (301 W. Alder, Missoula; 2nd floor).Agenda, 523-4890

For trips with UM vans (*), Students in ENSC 105, 360 & 540 may register for a space in a UM van on a sign up list at Rankin Hall room M-2. Other UM students can ride in the UM van if there is space. Non-students must provide their own transportation.

8/31 (Wed, walk/bike) & 9/2 (Fri, *van)--**Clark Fork River sampling in Msl**—meet at 102 Natural Science at 2:10pm

Sept 3-5 (Sat-Mon), – **sampling on upper & lower river.** arrange to ride with VW on any of these days (as space permits).

* Sept 17, Sat – **Clark Fork Superfund tour.** meet at 8am at north end of Van Buren br. (East Gate parking lot). return 6pm.

Sept 16-17– Missoula Hazardous Waste Collection Days (volunteers needed, great experience & counts for field trip hours)

Sept 24 Sat – Public Land Day (volunteer project on Clark Fork)

* Oct 1 or 8, Sat, **Blackfoot Restoration Tour** – meet at 8am at north end of Van Buren Br. (East Gate parking lot). return 6pm.

* Date TBD --**Tour Msla Wastewater Treatment & Ekocompost** (composts our sewage sludge; started by EVST alum!)

.....and land application site with poplar plantation – also started by EVST alums!

Others field trips that may be organized – Greenough Park groundwater lab; Nine Mile Creek restoration site

Note: Some field trips of ngos, government agencies or other departments may be of interest. You'll need to arrange your own transportation. For more info (time, location, contacts) on field trips, see -- www.umt.edu/conservationcalendar
See field trips offered by Clark Fork Coalition, Audubon, Sierra, MPG Ranch, etc . **Also trainings by WEN.**
Ecological Restoration field trips (courtesy of Cara Nelson) are also recommended. Info on these will be emailed.

Sept 7 (Wed)– Clark Fork Coalition Volunteer Orientation; Sept 12 -- storm water utility hearing (7pm, 140 W. Pine)

Sept 12 (Mon)—Drought Forum – 2-3:30 in NAC 103 organized by EVST alum Ada Montague, now with DNRC

Oct 5 (Wed)– Clark Fork Task Force Meeting 10am-1pm out on Running West Road (near Wye)

Oct 12-14 -- AWRA-MT meeting, Fairmont. Oct 19 Wetland Council, Helena. Oct 20-21 Restoration workshop, Big Sky.

Oct 24-26 – Montana Watershed Conference, Billings

Project ideas --

(past projects involved state & basin water plans, TMDLs, nutrient trapping by poplar land application site)

Evaluate one of the many recent TMDLs produced by DEQ. <http://deq.mt.gov/Water/WQPB/TMDL/TPAmap> (CF basin done)

Evaluate watershed part of a Forest Plan. Assist with long term Clark Fork studies.

Relate Clark Fork algae levels to flows. Relate DO levels to temp, algae, flows. (FWP DO & temp, USGS flows, VWalgae)

Evaluate potential to land apply Deer Lodge wastewater to a tree plantation – they are considering building a costly nutrient removal plant that would greatly increase individual sewer rates.

Evaluate remediation needs at abandoned Frenchtown mill in light of EPA superfund assessment there.

Work on Water Footprint Analysis with Mike Sweet of Montana Climate Office

Quantify natural storage restoration achieved through various riparian or wetland restoration projects (public & private)

Design a natural storage and/or green infrastructure project for a watershed (Bruce Sims, resource person)

[Evaluate DEQ's Load Reduction Estimation Guide](#) (released July 21, 2014)—(an overview of many models used)

Evaluate EPA's [Final Clean Water Rule](#) clarifying definition of “waters of the US” for regulatory purposes and views of the farm lobby. Clarify what the new rule does and doesn't do, and why it generated such opposition. Comments were due last October.

Evaluate watershed simulator. <http://wikiwatershed.org/model/>

Serve as a facilitator for Clark Fork Task Force (or for the emerging Clark Fork Basin Council) -- good project for someone pursuing the conflict resolution certificate . Organizing meetings, recording minutes, resurrecting web site

Maybe of interest to Clark Fork Task Force

--Review Macgruder studies done for CFTF (enhanced conservation; water availability/mitigation options; enhancing instream flows)

- Review studies on materials used for conserving irrigation water, specifically the useful life and water-savings related to different kinds of pipe and ditch-liners.

-diversion inventory and flow study of the mainstem Clark Fork River during late August. Collect flows and temperature at various points from the headwaters to Missoula. Also, inventory and photograph all irrigation diversions and pumps. Take flow measurements above and below each diversion. (more of a thesis project)