

Spring 2010 Syllabus Stream Ecology and Management

“America is a great story and there is a river on every page of it”.

C. Kuralt

Course Prefix, number, Title and Credit Hours

WL719-SO1, Stream ecology and management, 3 credits

Class Meeting Times:

Lecture: Tu & Th 2 – 3pm, NPBL 179; Lab: 2-4pm Monday, NPBL 179

Instructor Contact Information

Charles R. Berry, Biostress Building 142C, all office hours open

Phone 605-688-6121; Email: charles_berry@sdstate.edu

Resume: Dr. Berry is the Leader of the South Dakota Cooperative Fish and Wildlife Research Unit. The Unit is jointly sponsored by the USGS, SDSU, GFP, FWS, and Wildlife Management Institute. Dr. Berry has been an Adjunct Professor in the Department of Wildlife and Fisheries Sciences for 25 years, and has studied stream fish and lotic conditions for 40 years.

In Virginia, he investigated pollution of rivers and pioneered toxicity bioassays for fish and benthic invertebrate communities and fish health indices to assess pollution impacts. In Utah he worked on the endangered fishes of the Colorado River, primarily on stress-related research, but somewhat on fish distribution (e.g. Southwest. Natl. 25:41; 26:389). In South Dakota, Berry and students have updated the 1950s era data on fishes of South Dakota rivers and provided new information on fish habitat associations, and temporal change in riverine fish communities.

Within the general area of rivers research, Berry and students have emphasized fish and habitat associations, rare species (e.g. sturgeon chub, Topeka shiner) and recreational species (e.g. catfish, walleye). Berry's current projects include inventory of riverine fish in the Red River basin of North Dakota, fish use of created floodplain wetlands, and status of the sturgeon chub in the White River and stoneroller (*Campostoma* sp.) in the Red River basin.

Course Description:

Land health and water health are not two issues, but one (A. Leopold)

The structure and function of rivers and streams will be studied through reading, videos, and field trips. Rivers and streams are a reflection of their watersheds, including geomorphic evolution and man-induced perturbations. Traditional and **watershed-based approaches** to river and stream management will be discussed. A watershed-based approach means problem identification and resolution led by interest groups in the watershed, and assisted by Federal or State agencies. Today, the idea of **adaptive management** is being espoused for river conservation. Adaptive management included monitoring and then adaptive management plans as necessary.

The rationale for the course is thus: **humans use rivers** and streams for recreation, municipal water, power production, and irrigation. To ensure continued availability of this life-giving resource for future generations, present users need to develop ways to protect and restore our fluvial resources, and minimize conflicts among competing concerns. In South Dakota, water resources are unique – sometimes scarce, sometimes abundant, so we need to reassess the term *stability*, and understand the **variability of the stream system** and the *flexibility* needed to study and manage streams.

“Our recent work shows that productivity of a stream is dependent upon the extent and condition of its backwaters, and the period of its overflow, a fact which makes drainage district operation on the river bottoms a menace to its productiveness” Forbs, 1912.

Course Requirements

- a. Textbook: Allen, J. David, and Maria Castillo. 2007. *Stream Ecology: Structure and Function of running waters*. Second edition.
- b. Supplemental materials to be assigned
 1. Berry et al. (eds.) *History of fisheries and fishing in South Dakota*
 2. Wissmar, R. and P. Bisson, (eds.) *Strategies for restoring river ecosystems*
 3. Classic and cornerstone science articles
- c. Laboratory attendance and participation
- d. Class attendance not required but students are responsible for all material
- e. Cheating and plagiarism policies of the Department and university are enforced
- f. Missed exams and other missed assignments must be excused beforehand

Other texts for the public

C. Cushing and J. D. Allan. 2001. *Streams, their ecology and life*. Academic Press.
Benke, R., and C. Cushing. 2005. *Rivers of North America*, and the 2009 *Field Guide to Rivers of North America*, Elsevier (I can get discounts)
Palmer, Tim. 1996. *America by rivers*. Island Press (also has a coffee table book)

Other books for the ecologist

Matthews, W. J. and D. Heins. 1987. *Community and evolutionary ecology of No. Amer. stream fishes*. Oklahoma St. Univ. Press.
Barnes, J. and G. Minshall. 1983. *Stream Ecology*, Plenum Press (an early JNABS pub.)
Petts, G and P. Calow. 1996. *River Biota*
Hynes, H.B.N. 1971. *The Ecology of Running Waters*
Hauer, F.R. and G.A. Lamberti. 1996. *Methods in Stream Ecology*. Academic Press, Inc.
National Research Council. 2002. *The Missouri River Ecosystem: Exploring the prospects for recovery*. National Academy press (www.nap.edu).

Books that are engineering primers for the ecologist

L. Leopold. 1974 *Water. A Primer*. 1994 *A View of the River*. 1997 *Water, Rivers, and Creeks*
Calow, P. and G. Petts. *The Rivers Handbook (2 VOL)*
Gordon, N.D., T.A. McMahon, and B.L. Finlayson. 1992. *Stream Hydrology*

Approach:

Stream Ecology has only been recognized as a major sub-discipline of ecology and limnology in the past few decades. Methods for teaching the core components are not widely agreed upon among stream ecologists. In this course, the **core component is the biota** including man; goals are broad and conceptual. Because of our location, I am biased in using local examples from prairie streams and rivers; however, we will discuss characteristics of streams from many ecoregions. Field trips will be to the Missouri River, the Big Sioux River, a small tributary of the Big Sioux, and to an upland site.

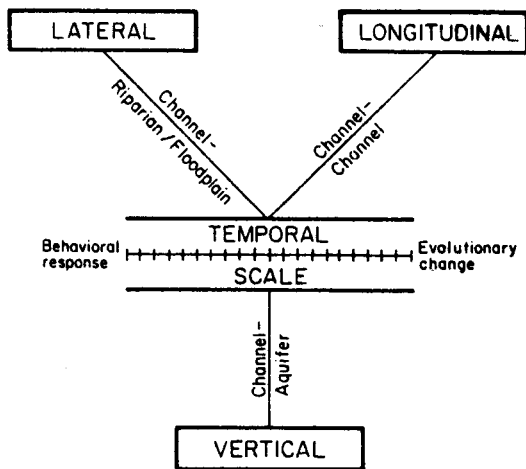


FIG 1. A conceptualization of the four-dimensional nature of lotic ecosystems.

The course will emphasize stream biota and how the communities change in temporal, longitudinal, vertical, and lateral dimensions. We'll also cover river functions and values to society and the people issues that relate to watershed management with an ecosystem approach.

An **ecosystem approach** means protecting or restoring the function, structure, and species composition of an ecosystem while providing for its sustainable socioeconomic use (USFWS definition of ecosystem approach).

"We suggest that efforts to rehabilitate stream system form and function over the long term should focus on increasing perennial vegetation in both riparian areas and uplands..."
(Vondracek et al. 2005 after studying 9 watersheds in Minnesota)

Course Goals:

The following 5 points could be the basis for a study guide for the Final Comprehensive Exam because at the end of the semester each student should be knowledgeable and competent in:

- classic literature and important scientists
- terminology and equipment of stream ecology
- ecological processes in streams and how they vary over distance and time
- basic stream hydrology and how to measure and calculate important metrics
- current issues relating to man's impact on rivers and on river conservation (e.g. Missouri River Master Manual, nonpoint source impacts and TMDLs, watershed management, biomonitoring) and fisheries conservation (endangered species, exotic and introduced species, advocacy groups)

Evaluation Procedures

This class requires your attention to speaking and writing well, and uses the internet as a resource for river information.

Class participation	50%	Help with class discussions, comment on contemporary river issues from news, Wissmar and Bisson presentations, connections to your research
Midterm Exam:	25%	Short answer questions and essays on hydroecology
Final Exam:	25%	Short answer questions and essays on biota and management, synopsis of “your” river (in form of <i>Rivers of North America</i>)

Manure runoff prompts complaint

Lincoln County looking into waste stream, feedlot

BY BEN SHOUSE
beshouse@argusleader.com

BERESFORD – Manure running through a road ditch and onto a neighbor's field has prompted formal complaints against a feedlot near Beresford.

Kirk Jensen said he mailed a complaint to the state Department of Environment and Natural Resources this month because manure was running in the ditch just across from his home, through a culvert and onto his property.

ADA Statement

Students are entitled to reasonable accommodations under the provisions of the Americans with Disabilities Act. Those in need of accommodation notify me and make appropriate arrangements with the SDSU Office of Disabilities Services.

Laboratory:

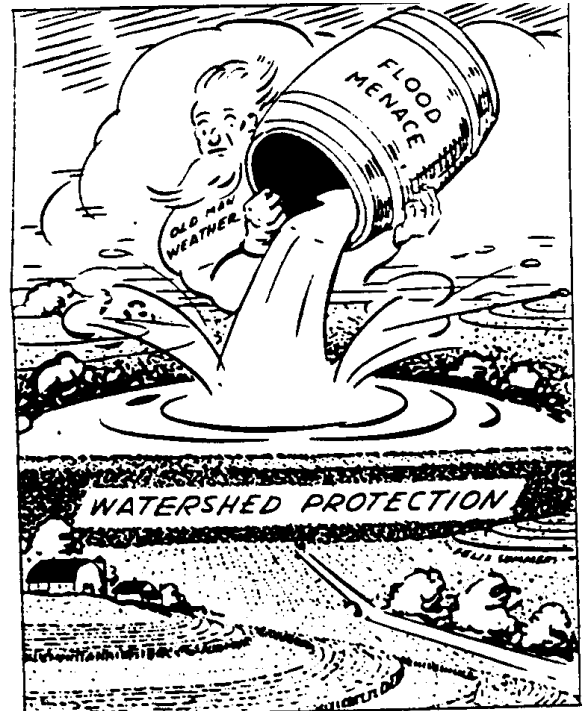
We will have one or two field trips where you will walk on the river, and if conditions allow in the spring, we will canoe a segment of the Big Sioux.

“In the end, we will conserve only what we love, we will love only what we understand, we will understand only what we are taught.”

“look at their fields and imagine what they might write”

H. D. Thoreau

“to protect your rivers, protect your mountains.”
Chinese saying “



Keep a stiff fin and stem all tides thou mayst meet.” Thoreau