

**NREM 407/507
WATERSHED MANAGEMENT
2006**

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Graduate Assistants – Francisco Meza-Aguero (PhD), Dong Gill Kim (PhD), Mustafa Tufekcioglu (MS), Keegan Kult (MS). These gentlemen will help during labs and will also handle class on several occasions when I have to be out of town.

Text: I have not found a textbook that covers the specific set of material that I want to cover. I have developed a spiral bound handout that covers a number of major topics. This handout is a work in progress so there may be additions and/or updates during the semester. You can also expect major packet of information associated with the laboratory exercises. You will be responsible for any and all information that is handed out to you during the semester.

Course fees: You will be assessed a fee of \$25.00 to cover mainly transportation and some copying costs. We will have 8 or 9 field labs this semester. It costs about \$2.25 per student for transportation per lab trip. The rest of the money will go to cover some of the copying costs. I have opted not to use a textbook to reduce your costs but will provide you with a lot of valuable handout material.

Web CT: Course materials will be posted on Web CT. After each day's class discussion, the power point material for that day will be posted. Reading material and grades will also be posted. Any feedback on the usefulness of the posted material would be appreciated.

COURSE DESCRIPTION

The major objectives of this course are: 1) to sensitize you to the local, national and global importance of water to the health and function of all who live on the planet; 2) to provide you with the background that will allow you to describe how water moves through natural and intensively managed watersheds/landscapes; 3) to allow you to be able to predict and describe the impacts of human activities on water quality and movement through watersheds/landscapes; 4) to introduce you to methods of restoration of streams, riparian areas and whole watersheds, and 5) to expose you to many different sources of practical information on hydrology and watershed management; 6) to provide you with significant field exposure to topics that are discussed in class.

I am especially interested in making you "field smart" so we will spend a lot of time reviewing field situations in class and spend the majority of our labs outdoors with the goal of making you comfortable in identifying landscape features important to water movement and describing the conditions of the hydrologic cycle in local watersheds.

Specific Outcomes: Upon completion of this course you will:

1. know what watersheds are and be able to delineate them on topographic maps and in the field.
2. be able to describe the major components of hydrologic processes within a watershed -
 - a) geomorphology - land form as it influences water movement
 - b) soil as it influences water movement (infiltration, percolation, water holding capacity, surface and subsurface flows)
 - c) erosion and sediment movement
 - d) movement of water in stream channels
 - e) movement of dissolved nutrients through a watershed
 - f) groundwater and surface water connections
 - g) the specific role of plant, soil and aquatic communities in water and nutrient movement
 - h) biological and physical processes that reduce non-point source pollutants as they move through a watershed
3. be able to identify differences in the major sinks and pathways of the hydrologic cycle in healthy & unhealthy watersheds.
4. be able to describe the specific roles of forests, prairies and wetlands on the hydrologic cycle of a landscape and identify the linkages between terrestrial and aquatic ecosystems.
5. be able to predict what the impact of natural disturbances and human land management activities are on the hydrologic cycle and assess those impacts in the field.
6. be able to describe, both in the classroom and in the field, the morphology and dynamics of streams and rivers and their role in watershed functions.
7. be able to describe, both in the classroom and in the field, the dynamics of the riparian zone and how land management activities modify these dynamics.
8. be able to assess the present condition, predict the future desired condition and design riparian zone systems that restore the original hydrologic functions to the system.
9. be able to identify the major water quality, quantity and timing problems facing Iowa, the region, the nation and the world and be able to discuss possible physical, social and political solutions.
10. be able to communicate the above in verbal and written formats while working individually and in groups.

COURSE OUTLINE

The following is a flexible outline of the topics we will cover during the semester. Because we will use an open discussion format in class with a lot of group activities, we may not stay on task with the following dates. ***For an open discussion format to work, I will expect that you will already have read the material before coming to class. We will have frequent announced and unannounced graded quizzes and activities at the beginning of the period to encourage class preparation.*** These will cover all reading and class laboratory discussion materials. We will not be able to discuss all of the material in the reading handouts but I will expect you to be able to read it all and be able to discuss it, so please ask questions

about information you do not understand.. I will make it clear when we are moving from one major topic to the next.

Our general approach will be to begin with a discussion of the hydrologic cycle and how it differs between landscapes and land-use practices around the country. We will then look at specific components of the the cycle starting with water in the atmosphere and how it influences climate and weather. We will then move to surficial processes of water movment, including an in-depth look at soils in watersheds and end by looking at streams and rivers as conveyors of surface water from one watershed to another. Throughout these discussions we will compare landscapes and management practices and identify tools for assessing and addressing hydrologic and ecological problems that exist and restoration activities that can mitigate those problems.

Jan 10, 12, 17, 19, 24 - Introduction to the hydrologic cycle and weather and climate

Jan 26, 31, Feb 2, 7 - The watershed - geomorphology and the production and movement of water.

Feb 9, 14, 16, 21, 23, 28 – Soils, erosion and hydraulic processes

Mar 2, 7, 9 – Stream channel processes

Mar 13-17 – Spring Break

Mar 21, 23 – Stream channel processes and stream biology

Mar 28, 30, Apr 4, 6, 11 – Riparian management systems and watershed functions

Apr 13, 18, 20 - Rural and urban stream corridor restoration

Apr 25, 27- Summary of management of watersheds - control of amount and timing of streamflow; control of water quality (topics to be discussed throughout the semester as parts of each of the above topics)

In addition to these general topics we will conduct group exercises that introduce you to the major rivers of North America and some International ones as well. We will also conduct exercises that introduce you to some of the major water issues being faced in both North America and around the world.

LABORATORY ACTIVITIES

Laboratory exercises, for the first part of the semester will be held indoors. They will include exercises to introduce you to the terminology and processes of the hydrologic cycle, presentations on river systems and discussions of current issues and development of land-use plans for restoration of landscape hydrologic functions.

During the latter part of the semester most of the labs will be held in the field, weather permitting. I want each of you to become adept at evaluating the health of watersheds and especially stream corridor systems and be able to identify methods to address specific problems that you see in the field. A major part of that activity will be to develop a riparian management plan for a specific portion of a stream. We are very fortunate this year in that we may be able to involve you in the actual planning and planting of a riparian buffer system.

Tentative laboratory activities

Jan 10 – What is a watershed and how does it generate runoff. What is a tsunami and why can it do so much damage.

Jan 17 – Weather map exercise

Jan 24 - Delineation of watersheds and streams from maps, aerial photos and soil surveys.

Jan 31 – Watershed in Winter (**FIELD TRIP**). Objective is to observe and discuss differences in winter and summer rates of hydrologic processes and identify landscape positions from topographic map positions. **BE PREPARED FOR THE FIELD (This lab may be switched with the Feb 10 lab depending on snow conditions – I would like there to be snow on the ground for the lab)**

Feb 7 – Delineation of watersheds and streams from maps, aerial photos and soil surveys.

Feb 14 – Development of a water management plan for a portion of a farm based on maps, soil surveys and other data.

Feb 21 – Finish development of a water management plan for a portion of a farm based on maps, soil surveys and other data.

Feb 28 – **FIELD TRIP** to interpret the role of landscape features on water movement. **BE PREPARED FOR THE FIELD**

Mar 7 - **FIELD TRIP** to estimate runoff, erosion and channel conditions. This exercise will be conducted in the same area as the major class field project on riparian management and data from this exercise will be used as part of the assessment of channel conditions on the class field project site. **BE PREPARED FOR THE FIELD**

Mar 13-17 – Spring Break

Mar 21 – Stream morphology (**FIELD TRIP**) - objective is to look at watershed drainage patterns and channel development using the project material you will prepare in class for the Class Field Project.

Mar 28 - Assessment of riparian zone conditions and development of management alternatives – (**FIELD TRIP**) to view them in real life and to assess the landscape of the class field project site.

Apr 4 – Riparian management system planning (Next three labs) (**FIELD TRIP**)

Apr 11 – Riparian management system planning - term project (**FIELD TRIP**)

Apr 18 – Riparian management system planning - term project (**FIELD TRIP/INDOORS**)

April 25 - Stream biology (**FIELD TRIP**).

We may have one or two optional weekend activities in April that might include planting of the buffer site and/or clean-up of a stream corridor in the Ames area.

NREM 507 ADDITIONAL ACTIVITIES

For those of you taking this course as NREM 507 I would like you to develop a watershed related project that ties in with the research you are presently conducting or plan to conduct for your advanced degree. I would like you to prepare a literature review and a course of action for how you might tie some issue of the broad field of watershed management to your project whether you actually use it in the field or not. I would like you to prepare a paper copy and present me and the other students taking the course as NREM 507 with a power point presentation covering your topic. I will work closely with each of you to help you accomplish this.

COURSE GRADING & TESTS

Laboratory exercises and any problem sets will be due at the next lab period unless otherwise stated. There will be a 10% drop in your exercise/lab grade for each day that it is handed in late unless I am told before hand of extenuating circumstances.

Two major tests will be given one February 23, 2006 and one on April 20, 2006. The tests may be in class or take-home depending on where we are in the syllabus and what I think might be best for the class. The final exam will taken during final week. The final exam may be held in the field and all students will be asked to complete it. The tentative final exam schedule for Spring Semester 2006 shows that our exam would be held Friday, May 5, 7:30-9:30 am

My grading philosophy is that all students are in this class because they want to be and with hard work will get a good grade. I will not be satisfied until all of you have mastered at least 80% of each concept. However, I will expect that you have done your part to read, study and understand the material. My grading scale begins with 90-100 = A; 80-90 = B; 70-80 = C, etc. I do give + and - grades and I will curve if it is warranted.

1. Two Exams (15% each)	30%
2. Final Exam/Activity	10%
3. Class exercises (Quizzes & individual and group activities)	25%
4. Laboratory Exercises	30%
5. Class Participation	5%
TOTAL	100%

CLASS PARTICIPATION AND GROUP ACTIVITIES

General Philosophy and Procedure

I believe that *my job as a teacher is to help you construct, discover, transform and extend the information* that we are going to discuss. In other words, I believe that you learn little by having me stand in front of you and lecture for 80 minutes. You must take an active role with me and with your fellow students so that we all learn cooperatively.

To help us learn cooperatively we will work in base groups to maximize each other's learning. We will work with these groups in both class and laboratory settings so you will be asked to sit with your groups throughout the semester.

I do not subscribe to the competitive style of teaching where you are pitted against each other to see who rises to the top. Our goal is to have all of us process the information together and learn it to the best of our ability. My goal is that all of you will master at least 80 percent of all the material we cover. My job is to facilitate your learning and to help when you get stuck. This approach puts pressure on you to work hard to help the rest of the class process the information.

To enhance our learning we will be using cooperative learning techniques such as TTYP (turn to your partner), paired readings (read and explain pairs), problem solving pairs, jigsaws, etc. in the base groups both during class and laboratory throughout the semester. These activities are based on the concept that we need to see, use, and repeat new concepts up to 15 times before we become comfortable enough with them to use them in our daily thinking.

To that end these activities will ask you to:

- **formulate** an answer individually
- **share** your answer with your partner
- **listen** carefully to your partner's answer
- **create** a new answer through discussion
- **account** for your discussion by being prepared to be called upon.

The general model for the daily class session will be:

- I will begin by listing the stated objectives and learning outcomes for the day and announce any important dates for assignments, labs, etc.
- We will then have a brief review exercise that will summarize what we discussed in the last class period.
- I will then present 10-15 minutes of new material that I expect you to have already read about before class.
- This will be followed by an individual or group activity.
- There will be 3-4 cycles like this each period.

Rules for Discussions

- We will use first names (after I have learned them from your name tags).
- We will respect the opinions of others.
- We will use active listening where we pay attention to whom ever has the floor.
- We will challenge ideas and not individuals.

- We will build consensus and strive to have everyone in the class understand the concepts being discussed.

We will also use classroom assessment techniques (CAT's) to allow me to assess how well we are grasping the information that we are discussing. Activities such as "one minute papers", "one sentence summaries", "muddiest points" and "directed paraphrasing" will be used.

Base Groups

Base groups are long-term cooperative learning groups whose primary responsibility is to provide each student the support, encouragement, and assistance for mastering the course content and skills, and provide feedback on how well the content and skills are being learned. It also allows you to think critically about the course content, explain precisely what you are learning, engage in intellectual controversy, get work done on time, and apply what you have learned to your own life.

As a member of a base group **you have three responsibilities:**

- 1) *Master and appropriately implement* the concepts, information and skills emphasized in the class.
- 2) *Ensure that all members of your base group* master and appropriately implement the concepts, information and skills emphasized in the class.
- 3) *Ensure that all members of the class* master and appropriately implement the concepts, information and skills emphasized in the class. In other words, if your group is successful, find another group to help until all members of the class are successful.

I will ask you to sit with your group each class and laboratory period. I have tried to mix groups to represent the diverse background of individuals in the class. At the beginning of each session you as a group should:

- 1) Congratulate each other for living through the time since the last class session and check to see that none of your group is under undue stress.
- 2) Check to see if all members of your group have completed their homework or need help and assistance in doing so.
- 3) Review what each of you has read and done since the last class session. You should be able to give brief, terse, succinct summaries of what you have read, thought about or done.

A portion of each major test in this class may have a group component and all of you should work to help the group master at least 90% of each test. You should also help each other in all lab exercises to make sure that all members successfully complete them. A number of lab exercises will require only one product to be handed from each group.

"Teamwork is the ability to work together toward a common goal. Coming together is a beginning, staying together is progress, and working together is success." (Successories, Inc.)

Name Tags and Class Pictures

I will ask you to wear name tags the first few weeks so I can learn your names. I will also use your Access Plus pictures to construct sheets with group pictures. I strongly believe that to recognize individuals by name will provide the following:

- a) it will show respect and value for the individual
- b) it will remove anonymity
- c) it will encourage participation and shows that opinions are valued
- d) it is an attention getter
- e) it allows me to give more directed compliments
- f) it can be used to loosen up all of us.

Therefore please pick up your name tag each time you walk into class - it will be in a box on the desk and please put it back in the box at the end of the session. Thanks.

I look forward to having a good time with this class. It is very interesting material, you are all from diverse and exciting disciplines and we keep things active.

Please visit our web site: <http://www.buffer.forestry.iastate.edu>

“The difference between a successful person and others is not a lack of strength, not a lack of knowledge, but rather in a lack of will.” (Successories, Inc.)