PROFESSIONAL SCIENCE MASTER'S DEGREE IN WATER RESOURCE MANAGEMENT

Program Need

The Professional Science Masters (PSM) degree in Water Resource Management was developed to meet the growing demand for advanced knowledge in water resources and their use in the urban, industrial, and agricultural environment. The degree includes political and policy aspects of water use as well as an understanding of the economics involved. The program of study will rely upon the use of Geographic Information Systems (GIS) to assemble and analyze databases describing water availability, use, and reclamation. The student will also gain a proficiency in water management that relies on spatial visualizations and basic modeling skills used to track the natural variability of water supplies and water-use forecasting. Each student will acquire a deep understanding of the physical processes of water delivery and storage along with the management of these water resources. The program syllabi are contained in Appendix A.

We expect the program to build a base of graduates that are increasingly knowledgeable about water resource management, and that these graduates will have an impact on water management and water policy in the Central Valley, California and beyond. PSMs are relatively new degrees, blending highly technical expertise with job related skills at a professional level. We are in an ideal location for a PSM in water resource management, and expect our graduates to have a substantial impact. In the agriculturally centered Central Valley of California water resources are overextended, highly dependent on natural climate variability, and increasingly affected by anthropogenic climate change and adaptation to these changes. These challenges in the Central Valley are a microcosm of growing national and international concerns as similar processes are occurring worldwide. Fresno State is a leader in water technology with three water research centers on campus. This program will strengthen the water research focus of the university by providing returning students with an advanced degree that will address water management at an advanced level. A successful program in water resource management is of vital importance to the community, state, nation and world.

Broader Impacts: Fresno State is a minority-serving institution (34% Hispanic, 1% Native American, 6% African American) and the University is in an economically challenged region where only 24.4% of young adults across the area enrolled in higher education (average for the state is 35.4%). Unemployment in Fresno County is approximately 16%, above the national average of approximately 7.5-8.0%. Successful participation in this program will lead graduates to good paying jobs that are in high demand.

Professional Science Master Degrees (PSM's) are often developed to meet regional needs and are designed as a bridge between employers and the application of the latest scientific findings (http://www.npsma.org/). Surveys were performed (Appendix C) to determine if regional and statewide employers, industry/businesses/agencies, saw a need for employees trained in Water Resource Management. Additionally, the survey also asked about the training desired in new

employees, internship opportunities that they could provide, and job prospects for graduates. We surveyed 154 stakeholders representing industry, business, or agency enterprises about the feasibility of a PSM degree in Water Resource Management and 91 responded. They strongly supported the implementation of the Water Resource Management degree. When asked if they would need to hire someone with the Water Resource Management degree in the next 10 years, 69% replied that they would. We divided the respondents into twelve categories, though the largest group (27 respondents) identified themselves as "other". Many viewed their industry as changing in the near future, indicating the dynamic nature of the industry and the need for graduate level expertise to meet future challenges. As a measure of the need in the community; 55% of respondents offer internships and 78% were interested in offering internships in the near future. We used the results of this survey of industry/business/agency stakeholders in the water industry to develop the program of study outlined below.

General Overview

The units responsible for offering this program are:

The division of Continuing & Global Education in collaboration with the College of Science and Mathematics and the Division of Graduate Studies are responsible for offering this program.

Program Coordinator; Dr. Peter K. Van de Water

Core Faculty Members:
Dr. R. Sean Alley
Dr. Sharon Beness
Dr. Tom Holyoke
Dr. Donald Hunsaker
Dr. Peter K. Van de Water
Dr. Zhi (Luke) Wang
Dr. William Wright
Dr. Xioaming Yang

The vitae of the core faculty are found in the appendix B of this document labeled Faculty.

Mission

The mission of the Professional Science Master's degree in Water Resource Management is to provide an advanced educational study program that explores the principles of water management using Geographic Information Systems (GIS) and geospatial technologies as tools to investigate real-world situations. Students explore the principles of GIS and Water Resource Management by completing coursework. In addition students will serve within an intership during the study program, and in conjunction of their sponsor using "real" life situations and data for analysis. The students apply their skills to these real-world problems in water resources to develop solutions that must be judged and defended on their scientific merit. In addition the students must formulate their solutions within a framework

that includes the economics, politics and regulatory policy environment surrounding water resources. Students will graduate with these skills to capitalize on a marketplace hungry for employees with advanced knowledge and analytical skills when managing water resources.

The courses within the Professional Science Master's degree will demand that students:

- Know basic GIS theory and software (EES 211 or base course on GIS)
- Design, construct and manage spatial databases (EES 212)
- Incorporate knowledge about building and using spatial data models, especially for decision-making processes. (EES 212)
- Understand the principles of climatology and evaluate conditions that lead to different outcomes in water supply and how changes in the water environment alter water resource management decisions. (EES 264)
- Integrate the processes involved in the hydrologic cycle and create scenarios where hydrological parameters change then track their effects and the outcomes with regard to water use management.(EES 265)
- Evaluate and interpret complex interactions between the hydrosphere, lithosphere, atmosphere, and biosphere in terms of climate and its effect on water availability and use (EES 264 and EES 265).
- Understand different natural water resources and be able to compare and contrast different methods of water acquisition whether from surface or subsurface resources (EES 265).
- Compare and contrast spatial changes in water availability along with resource quality and quantity (EES 264 and EES 265).
- Differentiate systems of assigning economic costs to natural resources (EES 270)
- Compare and contrast the economics of water use in urban versus agricultural uses (EES 270)
- Design and assemble complex outcomes for the interactions of water with natural, agricultural, industrial and urban water resource uses.(EES 266 and EES 267)
- Differentiate between different water uses, outcomes, and evaluate different effluent treatment options. (EES 267)
- Compare and contrast different applications of economics to water and water use in terms of outright and hidden economic structures (EES 270).
- Understand the construction of, and argue for or against the policy underlying administrative management of natural resources (EES 268 and EES 269).
- Compare current NEPA and CEQA rules and regulations with the outcomes of a variable natural resource. (EES 269)
- Interpret management of a variable water supply through evaluation and the critique of water issue politics and policy (EES 268 and EES 269)
- Evaluate a series of potential natural outcomes that range from water abundance to water shortages in terms of the politics and policy implementation (EES 263).

Program Structure

The aim and goal of the PSM degree in Water Resource Management is to introduce the student to a systematic understanding of how water is delivered to the terrestrial environment from our climate system, then follow it through its storage and use. Water moves through the natural and manmade environment where it is monitored, pumped, and applied to urban and agricultural systems. Once used it then must be treated as effluent and returned to the natural environment. The student is expected to integrate the effects of changes in water availability in terms of supply and also the effect on its economics and the politics surrounding these changes.

The Professional Science Master's (PSM) degree in Water Resource Management consists of eight courses, an internship consisting of 150 hours working in a professional environment and a culminating project course (PSM degree in Water Resource Management Project) for a total of 30 units of graduate level academic credit. Each of the classes will be taught wholly on-line with instructors using a variety of delivery styles and methods to interact with the students. The desired design is to complete the program as a cohort (i.e., lock-step program). Courses are based on the concepts learned in previous courses and students must enroll in courses in the chronological order listed below. Successful completion of all courses is required to earn the PSM degree in Water Resource Management.

Required Coursework: **(Syllabi contained in Appendix A)**

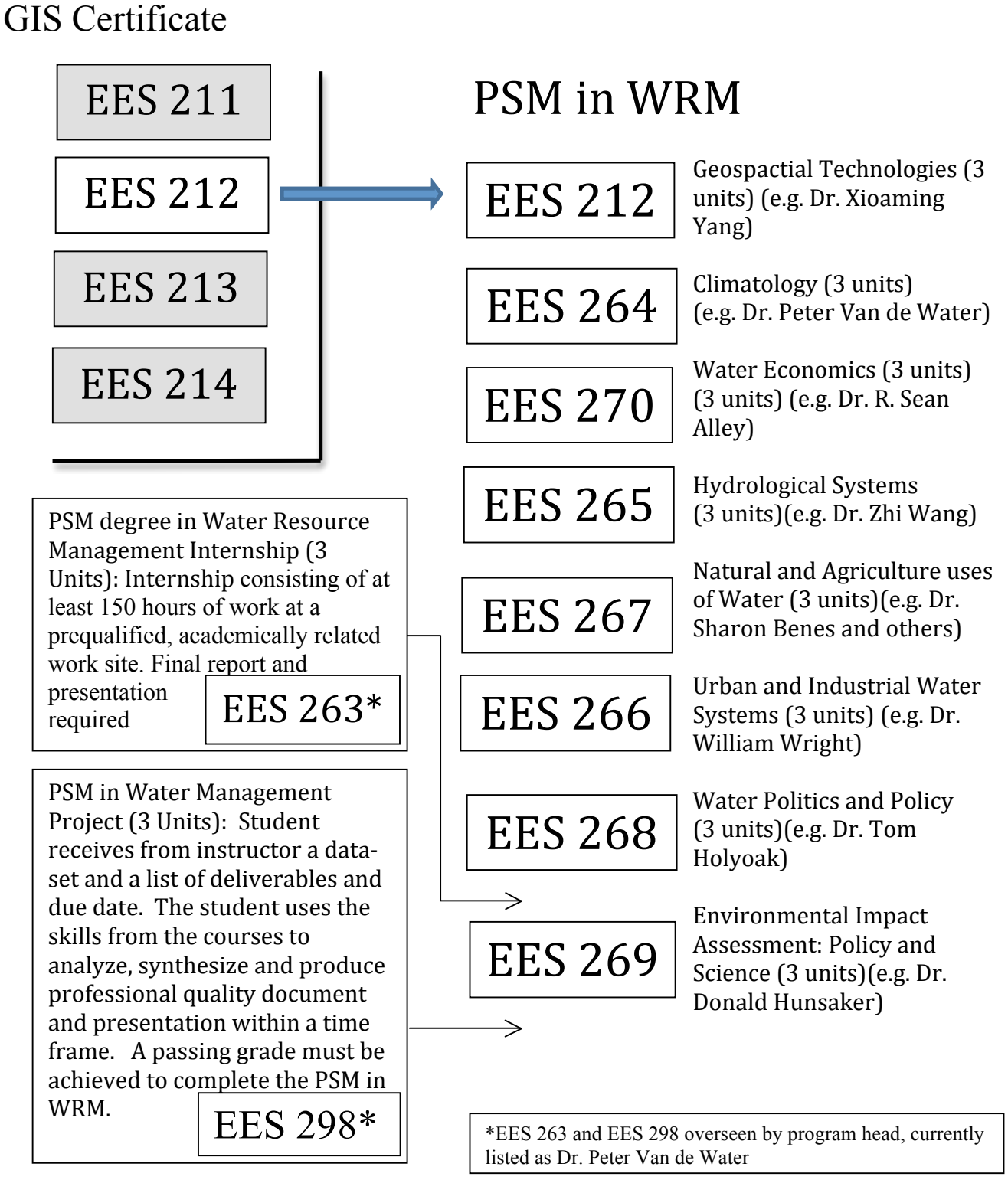
EES 212: Geospatial Technologies	3 units
EES 264: Climatology	3 units
EES 265: Hydrological Systems	3 units
EES 266: Natural and Agricultural Uses of Water	3 units
EES 267: Urban and Industrial Water Systems	3 units
EES 268: Water Politics and Policy	3 units
EES 269: Environmental Impact Assessment Policy and Science	3 units
EES 270: Water Economics	3 units
EES 263: PSM degree in Water Resource Management Internship	3 units
EES 298: Final Project	3 units
Total Units	30 units

The students are required to complete a "Fundamentals of Geographic Information Systems (GIS)" class that will instruct them on the basics of ArcGIS software prior to the programs initiation. This prerequisite can be satisfied by taking EES 211 (offered through Continueing and Global Education), baccalaureate GIS classes, or technical classes offered through ESRI or other GIS software companies. GIS will be used in many of the assignments throughout the program. The first semester of the program requires all students to take "Geospatial Technologies (ES 211)" and "Climatology (EES264)." At the end of the first semester the student should understand how to use GIS software for analysis, be able to describe and differentiate between suites of commonly used Geospatial instrumentation, and be able to explain and discuss processes connected to the delivery of water to the natural environment from the climate system. The second semester consists of the techniques of discovering,

mining and delivering natural water resources for human use by studying the science of hydrology (EES 265). In addition, once water resources are identified and delivered, price structure and the effects of price changes will be assigned through water economics (EES 270). At this point the student will understand where water comes from, how it is harnessed for use and how the price for water is determined. Natural, agricultural and urban uses of water will be the focus of the third semester (EES 266 and EES 267). Mechanisms of delivery, use, recovery and post-use treatment in agriculture, urban, or industrial environments will be studied. The last semester of classes will cover the politics of water, especially within the framework of western water policy (EES 268) and specifically within the long history of water use in California. The other class (EES 269) will focus on the application of both the "National Environmental Protection Act (NEPA)" and the "California Environmental Quality Act (CEQA) to the policy side of water recovery, use and disposal. For the culminating experience, students will integrate all of the materials from their classwork along with data and analysis gathered during any internship into a final culminating document that focusing on an advanced understanding of the complexity of water resource use and management. This document will be expected to achieve the same standards as if the student was matriculating through a traditional master's degree program.

The online delivery mode is being utilized to accommodate working professionals as participants. Students will add project material to an e-portfolio throughout the program by adding material at the completion of each course. The final project requires students to use a data-set that will be provided by the program to analyze along with a list of deliverables and a time table for those deliveries. The penultimate deliverable will be a written compilation of the analysis of the project class material along with a professional presentation. During the preparation of these required elements, the student will be encourages to use the e-portfolio of class material for examples as well as background material. Communication between students in each of the classes will give a diverse set of potential outcomes from the spatially diverse data sets that will be worked on concurrently within each class, including the final project class. The final project and presentation is intended to be carried into the student's professional life as an example of their work capability, as well as provide current and future employers with a defined skill set that the employee brings to the work environment. In many cases analysis of current problems provided by the employer will be used thus the student will be contributing to ongoing problem solving during the internship as they proceed through their academic program.

Figure 1. Flow chart of class progression during the PSM in Water Resource Management program.



Audience

The target audience for the PSM in Water Resource Management includes both traditional and non-traditional students. Traditional students will acquire a strong foundation in water resource management to meet current or future career opportunities, including those dependent on GIS applications. Non-traditional students, or those professionals already working in the public and private sector, including educators, municipal government employees and elected officials with other undergraduate or graduate degrees, will use the PSM as a valuable resource to gain additional technical expertise in water resource management.

Because the proposed PSM degree will be delivered online, students from outside the university service area may enroll in the program. The PSM in Water Resource Management is designed for students with little or no experience in GIS and/or its application to natural resource management. In addition, there is no requirement for students to have experience with any aspect of natural resource management including water.

Admission Criteria

Formal admission to Fresno State through CSU mentor is required for participation in this Professional Science Master's degree in Water Resource Management with the exception of graduate students who are currently admitted to the university. All candidates interested shall meet the university admission requirements including the following criteria. Applicants will qualify if they already hold a bachelor's degree from an accredited institution of higher education and hold a 3.0 or higher grade point average (GPA calculated from the last 60 unites from an accredited institution)

Admission Process

Students shall submit a program application to the PSM water management degree coordinator. The application can be found in the Program website http://www.csufresno.edu/cge/PSMWR. Candidate's admission to the program will be notified via their email address.

California State University, Fresno participates in all standard State and Federal programs. Students matriculated into this graduate degree program will have access to financial aid. Students will be required to conform to all laws, policies and rules for award. Students will be required to maintain minimum enrollments and other criteria to be eligible. Students will apply for aid online through the same procedures as matriculated stateside students.

Computer Requirements and Support

Participants must have access to a computer with a DVD drive and capable of running MS Windows-based software. The minimum system requirements are:

- PC with minimum of 2 G RAM running current OS
    - CPU Speed: 1.6 GHz or higher
    - Memory (RAM): 2 GB
    - Free Disk Space: 5 GB **or**

- MAC with minimum of 2 G RAM running Windows 2000 Professional or higher under emulation software
    - VMware Fusion 2.0, or
    - Parallels Desktop 4.4 for Mac, or
    - Boot Camp.

Students must activate a CSU Fresno email account https://googleapps.fresnostate.edu/signup/. In addition students can visit the TILT (Technology Innovations for Learning and Teaching) website http://www.csufresno.edu/tilt/ to learn more about the online environment with regards to online learning. Students also have access to an online orientation and can self-enroll at http://blackboard.csufresno.edu/documents/BbStudentOrientationSelf-Enroll.pdf

Advancement to Candidacy

The advancement to candidacy gives the student permission to proceed toward qualifying for the degree. In the case of the PSM in Water Management the student will take classes in a prescribed order, therefore all students must take each class to fulfill the degree requirements. A listing of the classes will be provided to the student upon entering the program and each session will be taught as a progressive cohort continuing through to graduation. Advancement to candidacy must be attained after the third semester but no later than the semester preceeding the semester in which the student applies for the degree. Completion of the third semester of the program is seen as an indication of the commitment of the student to the PSM in "Water Resource Management" degree. All students in the PSM in Water Management must demonstrate a satisfactory level of scholastic achievement as revealed by grades and performance on examination, as well as professional and personal standards and ethical competence as determined by the faculty. This standard must by maintained in order for a student to be eligible to continue in the Professional Science Master's program and qualify for candidacy.

All graduate degree students at CSU Fresno must demonstrate their competence in written English prior to advancement to candidacy. A failure to adequetly demonstrate this skill will be evaluated by the faculty and students may be asked to delay programmatic completion while they seek further English writing experience and skills outside of the PSM program. Graduate students are required to submit an academic graduate writing sample prior to advancement to candidacy. Specific dates for submitting the writing sample are established by the Graduate Coordinator. Writing samples are evaluated by two graduate faculty based on correct and effective style, mechanics, content, and organization. If needed the Graduate Coordinator will evaluate the writing sample in order to break a tie. The evaluations are conducted using a blind review process.

Failure to successfully complete this writing requirement will postpone or prevent the student's advancement to candidacy. If the student fails the writing requirement on the first attempt, a revised or second writing sample must be submitted within the same semester. If the revised or second writing sample fails to meet department expectations, the student will be required to work with the University Writing Center and a faculty mentor. The student will be given the opportunity to resubmit writing samples during the regularly scheduled dates each subsequent semester until the writing sample meets department expectations. The appeals process: In the event that a student contests the writing requirement results, the contested writing sample will be further reviewed by two graduate faculty members in a blind review process. If needed, the Graduate Coordinator will evaluate the writing sample in order to break a tie. All students are governed by official rules published in the University Catalog. The Catalog shows the formal (official) degree requirements.

Exit From Program

An application for the graduate degree to be granted must be filed within the first two weeks of the semester in which the work is to be completed. In addition, applicants must be enrolled. Prior to filing a request for the graduate degree to be granted, the student should check with the graduate adviser of the graduate program concerned in order to ensure that all program requirements have been, or will soon be completed. The PSM in Water Resource Management shall be issued upon completion of all coursework with a GPA of 3.0 or higher within a 4-year period of the student's initial enrollment (earliest course listed on the advancement petition).

Curriculum and Assessment of Learning Outcomes

Educational Objectives and Expected Student Learning Outcomes

The primary goal of the program is to provide students with a systematic understanding of water resources through weather and climate that brings water to the region, through the study of the interface of water and the ground where the resources lie, its extraction and delivery to users, the use of water in urban and industrial as well as agricultural applications, the economic drivers of the resource, along with the political and regulatory policy environment that has grown with our ever increasing demand on this resource. Specific learning outcomes are listed in the matrix below:

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Course	*Objectives and Learning Outcomes: The students will:*
Prerequisite requirement	**Fundamentals of GIS**
	Resolve issues involved in choosing a suitable GIS analysis procedure and toolset for any project; organize data and modify various map projections for different project purposes
	Expertly apply ArcCatalog and Toolboxes in ArcGIS; properly choose, convert and align various coordinate systems in any GIS project.
	Compile, categorize and combine GIS tools, concepts, data and models to solve in-situ

	problems. This includes identifying scientific and application needs, data acquisition and analysis, and report writing at the professional level.
	Create, devise, restructure and relate various GIS components such as maps, tables, digital documents, air photos, drawings, geological and geographic data etc. to produce mapping results of combined GIS analyses. Be able to critique the values of proposed ideas, materials and the GIS assessment results for decision making.
	Create and integrate GIS spatial data and demographic data from various sources to explore social, demographic, scientific, engineering, political and economic conditions of a given system. Delineate temporal and spatial distributions of human resources, economic status, natural resources and hazards etc. in a given geographic region.
	Create and conduct hypothesis or scenario testing; compare, evaluate and critique input data; interpret the results; summarize, conclude and produce recommendations on results. Be able to disseminate results through reports, publications, presentations and/or other outlets.
EES 212	**Geospatial Technologies**
	Demonstrate understanding of common Remote sensing (RS) and global positioning system (GPS) terminologies.
	Critically evaluate and analyze data quality for their GIS project.
	Design a geo-database and defend the data type selection.
	Appraise the degree to which remote sensing data can be used efficiently and effectively.
	Critique the role of the Space Segment, the user Segment and the Control Segment to the operation of the GPS system. This will be demonstrated as evidenced by the annotated bibliographies and participating discussions on a class discussion board.
	Interpret the significance of Dilution of Precision and its effect on position accuracies and evaluate correction techniques as evidenced by the annotated bibliography and a report after taking the web seminar.
	Interpret the GPS signal and the factors that affect signal quality.
	Decide and defend the use of raster versus terrain when performing analysis with LIDAR data.
	Combine LIDAR data with multiple data sources to create more complex three-dimensional surfaces.
EES 264	**Climatology**
	Develop an integrated understanding of the climate system to a level at which one can intuitively integrate, assess and critique technical aspects of fundamental climate issues.
	Use advanced computer skills to quantify how weather and climate vary throughout the environment and over time. This will include the ability to integrate the effects of seasonality, landforms, three-dimensional aspects of the atmosphere, and a variety of natural and anthropogenic forcing terms
	Compile, categorize and combine climate tools, concepts, data and models to analyze regional climate trends. This includes identifying and analyzing the scientific basis for climate data acquisition, the integration of calculated outcomes, and report writing at the professional level. .

	Quantitatively determine and relate various climatological components such as temperature, pressure, precipitation, winds and humidity to produce accurate maps and reports to relate to water resource management. This is applied in the required term project to generate the climatology of an assigned area.
	Critique the values of current and modeled future climate outcomes, and their impact on water resources for decision makers. This is learned through the execution of the class term project.
	Resolve issues involved in choosing suitable equations for calculation, analysis procedure, and appropriate tools for the project; organize data and integrate calculations, analysis procedures, and appropriate tools for the final class project; organize data and integrate calculations and simulation results; apply GIS to produce spatial and temporal maps of climate parameter distribution; properly choose, convert and align various units and coordinate systems in the hydrology project.
	Delineate temporal and spatial climate patterns in a given geographic region and conduct trend analysis.
	Create and conduct hypothesis or scenario testing; compare, evaluate and critique the modeled future data and output results of a a comate model; summarize, and produce recommendations based on the results.
	Produce professional quality results in your reports, publications, presentations and/or other outlets
EES 265	**Hydrology**
	Develop an integral understanding of hydrologic systems to a level at which one can intuitively assess and critique the technical aspects of fundamental issues, as this course will emphasize the tools of hydrology and how one uses them to better understand the role of water in the ecosphere and human affairs.
	Use advanced computer skills to quantify how water moves through the environment and how water affects and is affected by landforms, climate, wildfires and a variety of other natural and anthropogenic forcing terms.
	Compile, categorize and combine hydrologic and hydraulics tools, concepts, data and models to solve in-situ environmental or engineering hydrology problems. This includes identifying the scientific and application needs, data acquisition and analysis, and report writing at the professional level.
	Quantitatively determine and relate various hydrologic components such as atmospheric vapor flow, precipitation, infiltration, evapotranspiration, surface storage and flow, soil water and ground water etc. to produce accurate maps and reports for water resources management. This is applied in the required term project to study a watershed or groundwater aquifer.
	Critique the values of proposed ideas, materials and the water resources assessment results for decision making. This is learned through the term project proposal and its execution, in which students will create and integrate GIS spatial data and water resources data from various sources to explore social, demographic, scientific, engineering, political and economic conditions of a given system based on water availability.
	Resolve issues involved in choosing suitable equations for calculation, analysis procedure or toolset for the project; organize data and integrate various calculation and simulation results; expertly apply the GIS and remote sensing techniques to produce spatial and temporal maps of water distribution; properly choose, convert and align various unit and coordinate systems in the hydrology project.
	Delineate temporal and spatial distribution of natural resources and hazards in a given

	geographic region and conduct risk analyses. Create and conduct hypothesis or scenario testing; compare, evaluate and critique the input data and output results of a hydrologic model; summarize, conclude and produce recommendations based on the results.
	Disseminate results through reports, publications, presentations and/or other outlets.
EES 266	**Natural and Agricultural Uses of Water**
	Describe major federal and state water legislation and California's Water Plan
	List and describe the major uses of water in California and the related water quality issues
	Demonstrate the concept of water use efficiency at the plant, field, and landscape scale.
	Integrate the processes of formation and ultimate characteristics of soil factors influencing water conservation and water quality protection.
	Identify the major constituents influencing water quality in specific agricultural or natural settings.
	Formulate management practices aimed at minimizing negative impacts to water quality in these natural and agricultural settings.
	Analyze the feasibility of implementing these good management practices (GMP's).
EES 267	**Urban and Industrial Water Systems**
	Be able to identify and intelligently describe major challenges, from a historical perspective (pre-1970) and in contemporary times (1970 – present), for providing water of suitable quality and amounts, and at spatially distributed locations, for a variety of urban and industrial uses
	Be able to identify and intelligently describe major challenges, from a historical perspective (pre-1970) and in contemporary times (1970 – present), for managing municipal wastewater flows.
	Be able to identify, integrate and describe major challenges, from a historical perspective (pre-1970) and in contemporary times (1970 – present), in: managing municipal stormwater flows.
	Be able to identify and intelligently describe conventional and alternative sources of water for major municipal and industrial uses, amounts used in these applications, and the fate of the water after use (reuse or disposal).
	Be able to identify and intelligently describe components of water transmission and distribution systems, wastewater collection systems a, and stormwater collection and transport systems
	Be able to identify and intelligently describe parameters used in the characterization of water, and the classification scheme presented in this course for organizing those parameters.
	Identify and intelligently describe impurities of concern commonly found in ground waters, surface waters, urban storm-water, drinking water, and in raw and treated wastewater.
	Be able to identify and intelligently describe water quality goals and regulatory requirements associated with drinking water, urban storm-water and treated wastewater.
	Be able to identify and intelligently describe unit operations and processes used in the treatment of water, wastewater, and storm-water, and how each operation and process fits into an overall treatment system.
	Describe and be able to integrate phases of a water infrastructure project including steps in the material balance techniques as well as the engineering approach to problem solving.
	Describe and be able to integrate hydraulic principles as they apply to pressurized flow, free surface flow, and pumping systems.
	Describe and be able to integrate contemporary issues encountered in the planning, design, operation, and maintenance of urban and industrial water systems.
	Develop sensitivity to the interaction of global and societal issues within the fields of water resources and environmental engineering.

	Quantitatively determine and apply hydraulic principles in the analysis and design of water distribution, wastewater collection, and pump station systems. In doing so, expand abilities to apply basic science knowledge to the design of water resource infrastructure.
	Be able to analyze and determine a wide variety of water chemistry problems including the determination of molarity, normality, pH, alkalinity, hardness, and accuracy of water quality data.
	Develop the ability to work in groups in a fully on-line collaboration environment (Blackboard) via active participation in a small group research assignment.
	Participate as a functioning participant in ethnically diverse, multicultural environments (on-line)
EES 268	**Water Politics and Policy**
	Research trends in water availability from rivers, reservoirs, and the Sierra snowpack using government websites
	Analyze different political arguments regarding the prioritization of water usage and annual allotments for municipal use, agriculture and environmental protection.
	Discuss and debate the various justifications behind the creation of U.S. and California water policy.
	Understand and analyze changes in social expectations regarding water use, namely the social shift from resource extraction to resource preservation.
	Explore and debate the future consequences of increased water usage in the context of environmental degradation and climate change.
EES 269	**Environmental Impact Assessment: Policy and Science**
	The students will integrate and understand the history of, along with the intent of NEPA (National Environmental Protection Act) and CEQA (California Environmental Quality Act).
	The students will list and describe the types of environmental review documents needed to be prepared under both NEPA and CEQA requirements
	The students will compare and contrast document requirements under NEPA and CEQA
	Formulate a project management plan, including the integration of the schedule for different types of NEPA and CEQA documents.
	Outline and define the major steps in the NEPA and CEQA processes
	Understand and integrate the environmental laws most applicable to the NEPA and CEQA processes
	Analyze and determine good and bad writing in NEPA and CEQA documents
EES 270	**Water Economics**
	Understand, integrate and use correct terminology, concepts and basic economic models used to study the economics of water issues.
	Understand and be able to evaluate trends in water availability from rivers, aquifers and mountain snowpack supplies as it relates to the economics involved.
	Evaluate the political arguments related to water use prioritization among agriculture, municipal, residential and environmental uses and the role that economics plays.
	Assess the consequences of increased water usage in the context of resource extraction versus preservation, environmental degradation and climate change.
EES 263	**PSM in Water Management Internship**
	Students will present themselves in a professional manner that includes the work environment as well as a professional level of communication during the internship experience.

	The student will become acquainted with the professional work environment and the expectations of a professional employee.
	Apply academic concepts and skills in a directed work setting including the integration of appropriate quality assurance and quality control practices.
	Students will present themselves in a professional manner that includes the work environment as well as a professional level of communication during the internship experience.
	Become a working member of the professional staff of the internship organization by themselves or within working groups with others as dictated by the supervisor
	Demonstrate an ability to function effectively as a working group member in an industrial setting.
	Create a written document that summarizes the internship experience including the results of the internship project.
	Apply professional standards to the final written product in terms of organization and presentation, then, ensure that all external sources are cited correctly and that the citation format is used correctly throughout.
	Summarize important differences between academic and industrial work environments.
	Give a 10 to 15 minute presentation on your final product to other students within your cohort.
EES 298	**PSM in Water Management Project**
	The final project will commence with individual data sets being passed out to each of the students. In addition to the data, a list of deliverables and their due dates will be assigned. The students will analyze and interpret the data then compile it into a culminating documents and presentations. This document may include, but is not restricted to the following skills and outcomes,
	Describe the climate system to a degree that the student can assess and critique temporal and seasonal changes in the delivery of water onto the landscape and longterm changes in climate that are ongoing, all at different spatial scales.
	Use advanced computer skills to quantify how water moves in the environment and how it is captured, recovered and moved for human use. Be able to integrate and discuss, the many effects of the natural and anthropogenic environments.
	Be able to describe the mechanisms employed to track, monitor and retrieve natural water resources from the natural environment. Apply mechanisms of management for natural, agricultural, urban and industrial uses.
	Describe the use of water in natural, agricultural, and industrial processes and applications. Be able to describe water systems in terms of the source, distribution, use and reclamation of water in Urban and Industrial settings. Be able to calculate basic equations that apply to hydraulic principles including flow, pressure, head and pumping mechanisms.
	Describe the integration of water resources at regional and larger scales in terms of the immediate availability and natural cycles that may disrupt delivery
	Analyze the mechanisms for the assignment of value to water resources. Compare the effects of natural and artificial demands on the price structure model and how this affects the use within the natural, agricultural, urban, and industrial environments.
	The ability to discuss at a professional level the legislative and legal environment surrounding water in California and across the western United States. Analyze and assimilate the major legal initiatives over time and be able to couple them with legislative actions to bring a historical context to water use and water management.
	Apply the outcomes of legal and legislative initiatives with past, present, and predictable future actions taken because of NEPA (National Environmental Protection Act), CEQA (California

	Environmental Quality Act), and the ESA (Endangered Species Act). Address, specifically the public policy environment in terms of water management and how legislative actions affect water management.

Assessment Strategies

The matrix below lists the various assessment strategies that will be utilized to evaluate student-learning outcomes to be used in the curriculum.

Course	*Assessment Strategies to be utilized*
EES 211	Course "eportfolio" additions
	Results of lab exercises
	Individual inputs on the discussion board
	Data quality for term project
	Analysis tools used
	Map quality
	Term project proposals and reports
EES 264	Course "eportfolio" additions
	Report on web seminar
	Report on web seminar
	Completion of virtual class
	Virtual class exercises
	Graded class discussions
EES 265	Report on web seminars
	Course "eportfolio" additions
	Successful completion of virtual classes
	Virtual class exercises
	Graded class discussions
EES 266	Examinations on course material
	Discussion Board Postings
	Graded discussion board summaries
	Discussion article summaries or quantitative calculation exercises
	Small group investigation
	Powerpoint presentation
	Final Paper
	Course "eportfolio" additions
EES 267	Examinations on course material
	Blackboard quizzes
	Homework problem set assignments
	Discussion Board Postings
	Course "eportfolio" additions
EES 268	Examinations on course material
	Written paper
	Class discussions on-line
	Blackboard quizzes
	Course "eportfolio" additions

EES 269	Examinations on course material
	Blackboard quizzes
	Written homework assignments
	Discussion Board Assignments
	Course "eportfolio" additions
EES 270	Examinations on course material
	Course "eportfolio" additions
	Homework problem set assignments
	Attendance and participation during on-line sessions
EES 263	Individual inputs on the discussion board
	Creation of a document that details the skills learned during the internship experiance
	Creation and presentation of skills learned and used in the internship ecperiance
	Interviews with the instructor during the internship
EES 298	Individual inputs on the discussion board
	Course "eportfolio" additions
	Data assignment and quality assurance and quality control for term project
	Analysis and integration of learned skills from Water Management courses
	Map, diagram and table construction in final report
	Proper and appropriate use of citation's within the final report
	Creation of a document that applies water management understanding, analyzes multiple effects, evaluate outcomes in a culminating project.

Grading Methodology

Grading for the courses will be based on reading/writing, problem sets, lab assignments, discussion board postings, map preparation and presentations and term projects.

Grading for Reading/Written and Lab Assignments

Grading will be 4 (high) to 0 (low) for each topic

4 = The student shows a superior understanding of the topic and is able to analyze and synthesize concepts in depth relating theory to findings. The student uses appropriate tools in GIS. The student is able to derive the correct answers in problem sets and lab assignments.

3 = The student demonstrates an accurate grasp of the topic and is able to relate theory to findings in adequate depth, but shows less detailed knowledge and synthesis. Problem sets and assignments may have 1 or 2 errors.

2 = The student demonstrates an acceptable but commonplace understanding of the topic. Is able to present important factors but explains them with the most obvious specifics and implications. The student may have 3 to 4 errors.

1 = Assignment is late and/or quality of writing and data interpretation is poor. A significant portion of the derived answers for quantitative analysis is neither double checked or is wrong.

0 = Incomplete or missing assignment.

Discussion Board Grading

Each required topic thread and each required response or reply will be graded from 4 (high) to 0 (low).

4 = The student shows a superior understanding of the topic and is able to analyze and synthesize concepts in depth relating theory to findings. Responses are on time and use appropriate GIS and water resource management vocabulary.
3 = The student demonstrates an accurate grasp of the topic and is able to relate theory to findings in adequate depth. Shows less detailed knowledge and synthesis. Responses are on time. The student may have 1-2 grammatical and/or spelling errors as well as errors in quantitative analysis.
2 = The student demonstrates an acceptable but commonplace understanding of the topic. Is able to present important facts, but explains them with the most obvious specifics and implications. Responses are on time. May have 3-4 errors.
1 = Content could be any of the above, but the responses are late and/or grammatical and spelling errors are so numerous that the quality of writing does not reflect that of a professional educator.
0 = Incomplete or missing assignment.

Grading rubrics for other types of assignments will be included in the specific class syllabus.

STUDENTS ARE REQUIRED TO EARN A PASSING GRADE IN ORDER TO GET CREDIT. A PASSING GRADE ALSO REQUIRES TIMELY INTERACTION ON THE DISCUSSION BOARD.

Courses in Summary

EES 211 Fundamentals of GIS (3 units)
This course will provide basic and advanced GIS concepts and techniques with special skills on spatial information management, analysis, interpretation, map generation and display using advanced GIS software packages.

EES 212 Geospatial Technologies (3 Units)
This course focuses on remote sensing and global positioning systems. These two technologies provide key data inputs to Geographic Information Systems. Remote sensing obtains object information without physical contact, GPS collect the location of objects or navigates to and/or from locations.

EES 264 Climatology (3 units)
This course provides an understanding of weather phenomenon as the foundation of climate. Climate data from the National Climate Data Center will be manipulated to integrate spatial and temporal changes along with future forecast changes to understand natural water systems.

EES 265 Hydrological Systems (3 units)
Mechanisms of water and sediment transport in the hydrologic cycle. Advanced tools such as GIS will be used to quantify the storage and movement of water in the atmosphere, land surface, soil and underground aquifers.

EES 270 Water Economics (3 units)
This course will analyze water availability in light of water resource economics. Analytical tools will be used for policy and project assessment. Access points will be established for key material, providing for problem comprehension and the initiation of contemporary solutions.

EES 266 Natural and Agricultural Uses of Water (3 units)
This course reviews natural and agricultural water use. The course identifies stakeholders and addresses natural water quality protection. Agricultural issues include soil properties, irrigation, water quality, and water reuse. Students will focus on water supply and quality management issues.

EES 267 Urban and Industrial Water Systems (3 Units)
This course introduces water management systems in urban and industrial settings. The basics of water occurrence, use, transport, treatment, and disposal are included.

EES 268 Water and Politics (3 Units)
This course explores the role of politics and public policy in developing water resources for California and the Central Valley. It provides background for understanding today's battles over the control and use of water and the future of water policy.

EES 269 Environmental Impact Assessment: Policy and Science (3 Units)
This course provides an overview of environmental law and policy including environmental impact assessment. Students prepare decision-making documents under the auspices of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) for water specific projects.

EES 263 PSM in Water Resources Management Internship (3 Units)
Course is taken with permission from the internship coordinator and program director. The internship requires at least 150 hours of work at prequalified, academically related site. Final report and presentation required. Report and presentation judged and graded by the faculty

EES 298 PSM in Water Resource Management Project (3 Units)
Students receive data-sets and lists of deliverables and due dates . Student use course skills to analyze, synthesize, and produce professional quality documents and presentations within the time frame. A passing grade must be achieved for PSM in WRM completion

Program Budget with Narrative

1. Projected changes in enrollment (FTES)

Recent enrollment history of the program and what effects will the proposed changes have on enrollment.

N/A

If FTES is expected to increase, what proportion represents new FTES and what proportion represents shifts from existing programs?

The program is offered through Continuing and Global Education, and therefore, will not impact FTES.

How did you estimate your expected changes in enrollment?

Expected enrollment will be 15-30 students per cohort. Normally students finish the program within a five semester period.

2. Projected changes in existing curriculum

Will there be changes in the cost of delivering the curriculum? What will those costs be and what is their basis?

As a self-supported program the fee structure is set within the approved range that will maintain the program. The program will be offered as a 'self-support' program via the Division of Global and Continuing Education (DCGE). Faculty will be paid separately through the DCGE contracts, which will reflect the salary level of each individual faculty based on rank and enrollment.

For new courses, what are the estimated class size, frequency and level/classification of course delivery?

There are total of nine new courses. The projected class size is between 15-30 students. Courses will be offered in a sequence for each cohort. The coursework includes EES 211, EES 264, EES 265, EES 266, EES 267, EES 268, EES 269, and EES 270 with a practicum experience EES 271.

For courses currently being offered, will there be changes in class size, frequency, level or classification of course delivery?

Not applicable

Will courses be dropped from the existing curriculum?

This PSM in Water Resource Management is designed for post- baccalaureate students. The curriculum is new and therefore no courses will be dropped from the existing curriculum.

3. Projected changes in faculty

Will there be a shift in faculty assignments? If so, what will be the difference between current and proposed assignments?

There are no anticipated shifts in faculty assignments. As a special session self-support program faculty are all adjunct and teaching outside their assignments at Fresno State. Over time there may be other faculty that will be offered the opportunity to teach in this program under the same circumstances.

Will there be shifts in faculty numbers or distribution? If so, what will they be?

It is not projected that there would be any shift in faculty numbers or distribution and no new faculty positions would be added that would be supported through state FTE funding.

Will new positions be added/required and what resources will be used to acquire them?

Teaching positions would be paid for through Salary Code 2322 utilized by the Division of Continuing and Global Education.

4. Projected changes in budget

What is your current operating budget?

This being a brand new program this is currently no operating budget, however an estimated budget for the first three years is listed below

What are your current positions?

The program will have a combined total of 9 classes with faculty instructors for each. Of those nine classes two of them are currently slated to be taught by the same instructor (climatology EES 264 and EES 271). Therefore there will be a total of eight instructors. In additon, there will be a program director

Do you anticipate outside revenue to support your program?

The program uses a self-support student fee structure through the Department of Continuing and Global Education.

Will budget requirements change and what will those changes be?

An anticipated increase in fees within the next year (2012-13) will be considered as added features to the online service may be added (e.g. student support services).

Will there be any increase in administrative roles/responsibilities that require buy-back or release time?

The program director will have 20K per cohort at their discretion to provide for adminstative tasks that may or may not be used as buy-back or release time.

How will the expected changes in budget requirements be met?

It will be met through the self-support fee structure

Has the budgetary impact of the proposal been reviewed by the Dean of the Division of Graduate Studies, *Budget Committee and the Division of Continuing and Global Education AVP?*

This review is proceeding for other groups

5. Effect on Support Services and programs in other Colleges/Schools

Are support services required for program implementation and function?

This will be an online facilitated program offered through the Department of Continuing and Global Education.

Are programs in other Colleges/Schools directly affected by the proposal and in what way?

This program will be fully online as a Professional Science Master's degree within the College of Science and Mathematics. This program is specific to post-baccalaureate level students, is delivered on-line and has a focus in science and technology. As such this program has no anticipated impact on other programs, departments or colleges.

Who are the representatives in the affected service area and /or Schools/Colleges that have been contacted?

Dr. Lyn**n**ette Zelezney, Associate Vice President, Division of Continuing & Global Education
Dr. Sharon Brown-Welty, Dean for the Division of Graduate Studies
Dr. Andrew Hoff, Interim Dean, College of Science & Mathematics
Dr. Rick Z**e**ckman, Associate Dean, College of Science & Mathematics
Dr. Luz Gonzalez, Dean, College of Social Sciences
Dr. Ram Nunna, Lyle College of Engineering
Dr. Charles Boyer, Jordon College of Agriculture

Appendix A: Syllabi

Submitted separately

Copies of the Syllabi and Instructor CV's Available upon request

CALIFORNIA STATE UNIVERSITY, FRESNO
Geospatial Technologies
Academic Department Office Location:
Science II, Room 121
Department of Earth and Environmental Sciences
Fax: (559) 278-5980

Catalog Description:
EES 212: Geospatial Technologies
Prerequisites: None. The course introduces global positioning systems, remote sensing, and light detection and ranging technology and their integration with Geographic Information Systems. Asynchronous online.

Course Information Instructor Information

Course No: EES212	Instructor: Xiaoming Yang, PhD
Units: 3 Email:	xmyang@csufresno.edu
Prerequisite:	None
Online Office Hours	Mon. & Wed. 9-11:3mam

Basic Course Information:
This is a 3-unit online course to be learned at any time during the offering period. The course materials are available through Blackboard (login using your CSUF e-mail passwords)

Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, students may email the instructor directly. When writing an E-mail to the instructor, be sure to write "EES212-LastName-Initial and question, otherwise the email will be deleted as junk mail.

Response Times: The instructor will check and respond to email and the discussion board at least 2 days a week. Assignments will be graded, posted in the grade book and returned within the week of the due date.

Online office hours may be accessed from course menu in Blackboard.

Course Goals:
The goals of this course are to:
- Provide knowledge about the fundamentals of remote sensing, sensor systems and image characteristics
- Provide knowledge about the GPS system and its components, the GPS signal structure, the types of GPS measurements and their errors and biases
- Provide an introduction to LIDAR data and discusses how to integrate and manage LIDAR data in GIS
- Enhance student understanding of characteristics of spatial data that come from

different sources
- Enhance student understanding of data quality issues when integrating different data sources in GIS.

Student Learning Outcomes:
Upon successful completion of the class, students should be able to:
- Critically evaluate and analyze data quality for their GIS project.
- Design a geo-database and defend the data type selection.
- Appraise the degree to which remote sensing data can be used efficiently and effectively.
- Interpret the GPS signal and the factors that affect signal quality.
- Interpret the significance of Dilution of Precision and its effect on position accuracies and evaluate correction techniques.
- Decide and defend the use of raster versus terrain when performing analysis with LIDAR data.
- Combine LIDAR data with multiple data sources to create more complex threedimensional surfaces.

Textbooks:
Ahmed El-Rabbany; Introduction to GPS: The Global Positioning System, Second Edition; published by Artech House; ISBN 978-1-59693-017-9

David L Verbyla; Satellite Remote Sensing of Natural Resources; Published by CRC Press; ISBN 1-55670-107-4

Assignments:
There are three (3) ESRI web courses to be completed and two (2) ESRI training seminars to be attended. The web courses must be completed by the due date. A report on what have you learned from the seminar must be submitted after finishing the training seminar and submitted by the due date. Late completion of assignments will result in reduction of the grade by 10% per day for the first five days and will result no credit after the fifth day.

The report on the GPS seminar should focus on
- Why GPS is critical to GIS
- Differential correction and GPS data accuracy
- Considerations in selecting GPS device for GIS applications

The report on the imagery seminar should focus on

- Elements of image interpretation

Required Materials - Hardware and Software Requirements, Cost
Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software. The student bears the cost of hardware and Internet access. The minimum system requirements are:
- Operating system: current windos OS

- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 2 GB
- Free Disk Space: 5 GB
- Broadband Internet access
- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions, will be provided at no cost to students. The software was supplied to students at the beginning of EES 211.

Evaluation Procedures:

- Grading:
  - Four quizzes: 60%
  - GPS training seminar report 10%
  - Visualizing and Analyzing Imagery seminar report 10%
  - Working with Raster exercise 10%
  - Using LIDAR Data exercise 10%
- Grading scales:
  - 90-100% = A
  - 80-89% = B
  - 70-79% = C
  - 60-69% = D
  - Under 60% = F

Grading Rubric for Training Seminar Reports:

- Each report is graded based on the following criteria:

Criteria	3	2	1
Introduction	Presents a concise lead-in to the report	Gives very little information or too much information--more like a summary	Does not give any information about what to expect in the report
Research	Focus on the topics and includes many other interesting facts	Focus on some topics and includes a few other interesting facts	Does not focus on the topics
Conclusion	Presents a logical explanation for findings and addresses most of the topics	Presents a logical explanation for findings and addresses some of the topics.	Presents an illogical explanation for findings and does not address any of the topics
Grammar & Spelling	All grammar and spelling are correct	Only one or two errors	Frequent grammar and/or spelling errors

Timelines	Report handed in on time	10% reduction per day	10% reduction per day

• Total points are summary of each criterion.

Grading Rubric for web courses:

- Each web course is graded out of 5 points.
- 5-Completed web course and greater than 95% correct on the course evaluation
- 4- Completed web course and 90% to 94% correct on the course evaluation
- 3- Completed web course and 85% to 89% correct on the course evaluation
- 2- Completed web course and 80% to 84% correct on the course evaluation
- 1-Completed web course and <80% correct on the course evaluation
- 0-Incomplete web course

Expectations:

Communications: The course is an online class; therefore, most of our interactions will be asynchronous. Three ESRI training courses and two seminars will be assigned in the class. ESRI classes are graded by the above criteria; a report (2 to 4 pages; double spaced; 12 pt font; 1" margins) is required for the two of the ESRI Training Seminars. The report must be submitted to the instructor via the Blackboard Assignment link.

Workload: Students should expect to spend 10-12 hours per week completing the work in this course.

Resources:

This course will be presented through Blackboard where all course materials and online discussions will be hosted. The primary resource for the course is the textbook. The following link is provided for extra readings:

Aerial Photography and Remote Sensing webpage (http://www.colorado.edu/geography/gcraft/notes/remote/remote_f.html) - RS

Remote Sensing Tutorial webpage (http://www.fas.org/irp/imint/docs/rst/Front/tofc.html) - RS

U.S. Government Global Positioning System webpage (http://www.gps.gov/) - GPS

GPS Errors & Estimating Your Receiver's Accuracy webpage (http://eduobservatory.org/gps/gps_accuracy.html) - GPS

UNIVERSITY POLICIES:
Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the University Center Room 5 (278-2811).

Honor Code:
"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

a. understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)

b. neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.

c. take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers:

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Syllabus: EES212 – Geospatial Technologies
Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page:
http://www.csufresno.edu/library/libraryinformation/campus/copyright/copyrtpolicyfull.pdf
For copyright Questions & Answers:
http://www.csufresno.edu/library/libraryinformation/campus/copyright/faqcopyright.pdf

Tentative Course Schedule:

Week	Topic	Reading Assignment	Assignment/Quiz/Test
1	Introduction	Chapter 1	
2	GPS Details	Chapter 2	
3	GPS Satellite Orbit/ GPS errors and Biases	Chapter 3 and 4	Quiz #1
4	GPS Positioning Modes	Chapter 5	
5	GPS Data and Correction Services/ GPS Stand Format	Chapter 7 and 8	
6	GPS Integration with GIS	Chapter 9.1	GPS training seminar – report due on Wednesday of week seven
7	Satellite Image and Image Processing systems	Chapter 1 and Chapter 2	Quiz 2
8	Spectral Regions	Chapter 3	Visualizing and Analyzing Imagery seminar – report due on Friday of week nine

9	Radiometric Corrections and Geometric Corrections	Chapter 4 and 5	Quiz 3
10	Unsupervised Classification and supervised Classification	Chapter 6 and 7	Working with Raster exercise
11	Classification accuracy Assessment	Chapter 8	Quiz 4
12	Using LIDAR Data	Getting Started with LIDAR	Using LIDAR data exercise

This syllabus and schedule are subject to change. Adequate notice will be given to students. It **is your responsibility to check Blackboard announcements to obtain this information**

EES 264 – Climatology (3 units)

Online Course for
Professional Master of Science in Water Management

Department of Earth and Environmental Sciences
College of Science and Mathematics, California State University, Fresno
(offered through Division of Continuing and Global Education)

Catalogue Description:

EES 264 Climatology (3 units)
This course provides an understanding of weather phenomenon as the foundation of climate. Climate data from the National Climate Data Center will be manipulated to integrate spatial and temporal changes along with future forecast changes to understand natural water systems.

Semester: Spring 2013 **Units:** 3 (Asynchronous Online, equivalent to 5 hours per week) **Website:** To access the course, login to Blackboard (http://blackboard.csufresno.edu) using your Fresno State "username" and "password". For Blackboard help; Contact Technology Innovations for Learning and Teaching (TILT) at 278-7373 or send an email to tiltsupport@csufresno.edu.	**Instructor:** Dr. Peter K. Van de Water **Office phone:** (559)278-2912; **Department Office**: 1(559)278-3086 **E-Mail:** pvandewater@csufresno.edu **Online Office Hours**: MW 3-5 pm **Office Location**: Fresno State University, Science II, Room 124 **E-Mail Rules:** E-mail is the best way to contact the instructor. When writing an E-mail to the instructor, be sure to write "***EES264-YourLastName-Initial***"

Basic Information

This is a 3-unit online course to be learned at any time during the offering period. The course materials are available through Blackboard (login using your CSUF e-mail passwords) Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, email or telephone the instructor.

Response Times: The instructor will check and respond to email and the discussion board at least 4 days a week. Assignments will be graded, posted in the grade book and returned within the week of the due date.

Course Description

The Climatology class is a process oriented approach to climate where the class tries to characterize and understand the atmosphere and its interaction with the oceans and continents. The understanding of climate will occur through readings, problem sets and other assignments. Advanced tools such as GIS will be used to quantify the climate of a region, the processes that

result in that climate, along with spatial, elevation and temporal variations. The course is Asynchronous online.

The program will use and the students are expected to contribute to their ePortfolio. Eportfolios are electronic web pages where students store evidence of their work, reflect on the impact of the material that they have learned within a course, integrate the work across courses and prepare to present the "eportfolio" as a professional showcase of their progress during the program. Each course in the program will add information to their "ePortfolios" providing a compilation of their best work to be summarized and integrated during their capstone experience and then take forward into their professional careers.

Prerequisites

EES 211 (Fundamentals of GIS) to be taken at the same time. Highly recommend practical skills in Excel and Access as they are essential for GIS and climate data management.

Course Goal and Contents

The basic **goal** of the course is to provide advanced methods for understanding and quantifying climatology and climatological processes.

Contents include principles and governing mathematical models of the earth's radiation budget, energy and temperature of the earth, moisture in the atmosphere, precipitation, winds and pressure, general circulation and global climate, Tropical weather and climate, extra-tropical weather and climate, local climates, climates of the past, modeling climate, and climate change into the future.

Note: This course will emphasize the **Climate of California and western North America** and the role of climate in delivering freshwater across our earth. All students will use ***GIS*** and are expected to be well versed in using the standard Microsoft office set of programs (word, excel, powerpoint) in this course.

Student Learning Outcomes

Upon completion of this course the students will be able to:

1. Evaluate climatic conditions that lead to different outcomes in water supply and how climatology relates to resource management.
2. Incorporate knowledge about building and using spatial data models, especially for decision-making processes. Then produce professional quality results for reports, publications and/or presentations.
3. Develop an integrated understanding of the climate system to a level at which one can intuitively integrate, assess and critique technical aspects of fundamental climate issues.
4. Use advanced computer skills to quantify how weather and climate vary throughout the environment and over time. This will include the ability to integrate the effects of seasonality, landforms, three-dimensional aspects of the atmosphere, and a variety of natural and anthropogenic forcing.

5. Compile, categorize and combine climate tools, concepts, data and models to analyze regional climate trends. This includes identifying and analyzing the scientific basis for climate data acquisition, the integration of the calculated outcomes, and its reporting.
6. Quantitatively determine and relate various climatological components such as temperature, pressure, precipitation, winds and humidity to produce accurate maps and reports to relate to water resources management. This is applied in the required term project to generate the climatology of an assigned area.
7. Critique the values of current and modeled future climate outcomes, and their impact on water resources for decision making. This is learned through the execution of the term project.
8. Resolve issues involved in choosing suitable equations for the calculation, analysis procedure, and appropriate tools for the project; organize data and integrate calculations and simulation results; apply GIS to produce spatial and temporal maps of climate parameter distribution; properly choose, convert and align various units and coordinate systems in the hydrology project.
9. Delineate temporal and spatial climate patterns in a given geographic region and then conduct trend analyses.
10. Create and conduct hypothesis or scenario testing; compare, evaluate and critique the modeled future data and output results from a climate model; summarize, and produce recommendations based on the results.
11. Produce professional quality results in your reports, publications, presentations and/or other outlets.

Textbooks

***Required*:** Peter J. Robinson and Ann Henderson-Sellers, *Contemporary Climatology*, Pearson Prentice Hall, 1999 (ISBN 978-0-582-27631-4 (softcover).

Recommended Reference Books

John Marshall and R. Alan Plumb, (2008), *Atmosphere, Ocean, and Climate Dynamics*, Elsevier Academic Press, 2008 (ISBN 978-0-12-558691-7 (hardcover).

Russell D. Thompson and Allen Perry (Editors), (1997), *Applied Climatology; principles and practice*. Routledge. ISBN 0-415-14101-X (paperback).

- Ruddiman, William F., (2008), *Earth's Climate; Past and Future*, W.H. Freeman and Company, ISBN-13: 978-0-7167-8490-6.
- Fritts, H. C., (2001), *Tree Rings and Climate*, The Blackburn Press, ISBN-13: 978-1930665392.

Bases for Course Grade

Assignment	Weight
Online Attendance	15%
Problem sets	40%
Midterm project	20%
Term project	25%
Total	**100%**

Letter grade	Percentage
A	90% or higher
B	80% or higher
C	70% or higher
D	60% or higher
F	Lower than 60%

Online Discussion Attendance:

The instructor will post questions on the **"**Discussion Board" of Blackboard. Student input on the "discussion board" is required (beneficial to oneself and others) and will be tracked by the Course Statistics function and utilized in determining the points for on-line attendance.

Online Lab Exercises:

There are problem sets designed to demonstrate methods/techniques used in climatology, especially employing software packages. You must complete the problem sets to pass the course. These assignments will be due by 12 pm on the Sunday following the assignment week. Each problem set count for 5.0 points. Labs submitted after the deadline will lose 0.5 point (10%) per day of delay. Correction and grading of the labs will occur in a timely fashion.

Midterm Project:

A midterm project using climate statistics and other climatological data will be assigned during the fourth week of class. A variety of analysis and the integration of GIS products will be used to explore, analyze, and synthesize the data. A professional quality summary report is expected to be submitted on the due date. Climate determines the amount of fresh water that will be available on a yearly basis. Throughout California citizens depend upon a timely delivery of water for many uses. The midterm project will use real data sources to characterize the climate of an assigned region. The dataset is provided by the NWS and NCDC in text and Excel formats. Students will choose certain characteristics of the climate data and conduct statistical and spatial analysis. The results will include a written report. All map and document files, will be submitted through Blackboard.

Term Project:

The term project will be a continuation of the mid-term with the addition of future forecast scenarios added into the previous work. The instructor will help define problems, you will then obtain and create various datasets for the **project area** and be given a set of question to answer with the data**.** You will apply and integrate all the concepts and techniques learned in the course for your term project. At the end of the course, each student will submit his or her best work, along with the term project to their ePortfolio. In addition to the work products submitted to the ePortfolio, the student must add a written, oral, or video-recorded reflection about the value of that work. The reflection should emphasis how the selected work demonstrates what the student learned in the particular class and how the selected work is related to the student's profession. A detailed "**Problem set and mid-Term/Term Project Guideline"** is attached to the end of this syllabus**.**

Required Materials - Hardware and Software Requirements, Cost

Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software including ArcGIS9.x. The student bears the cost of hardware and Internet access. The minimum system requirements are:

- Operating system: Windows 2000 professional or higher
- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 1 GB
- Free Disk Space: 5 GB

- Broadband Internet access
- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions.
- MicroSoft Office: Excel, Access, Word and Powerpoint.
- Adobe Acrobat PDF professional or similar software for generating PDF files.

Resources

- **Students must have Fresno State email account** Campus Email **(**http://email.csufresno.edu/**). Your username and password will be used to login for courses and various services on campus. To access this course, you need to login to** Blackboard (http://blackboard.csufresno.edu/).
- **Student resources can be found at** Blackboard 9.1 Student Guide! **(**http://blackboard.csufresno.edu/students/index.shtml**).**
- **If you find you are unable to access the Blackboard, first contact the** Technology Innovation for Learning and Teaching (TILT) **(**http://www.csufresno.edu/tlt/**) or call the** TILT Blackboard resource center at 559-278-7373 Monday through Friday from 8:00am to 5:00pm. After hours, email TILT at tiltsupport@csufresno.edu or call 559-278-7000 seven days a week between 7:00am to 10:00pm. If there is still a problem, contact the instructor.
- When in Blackboard view the initial announcement. A link to Blackboard 9.1 Student Guide can be found at Blackboard 9.1 Student Guide! (blackboard.csufresno.edu/students/index.shtml)**. Read it through before you access the course materials below.**

A. How to Learn in This Web-Based Course

1. With your work or home computer connected to the internet, login to Blackboard (http://blackboard.csufresno.edu/) using the login name and password of your CSUF e-mail account. Click on the name of this course.
2. Click on **First Day: Orientation and Software Installation** to go through the brief orientation, read the syllabus, and install required computer programs (provided).
3. Click on the "Required Basic Computer Skills" to go through the Excel tutorials.
4. To begin the formal course work, first go to the "Weekly Modules" which include lecture notes and problem sets. Review the lecture notes, read the book chapters and then complete the required problem sets. Afterward, you must answer the questions posted on the "Discussion Board" to earn the attendance score.
5. Please provide your CREATIVE inputs on the "Discussion Board" (do not copy from others), so that other students may have the benefit of your queries. I will check the "Discussion Board" regularly. Personal questions (such as grade concerns) should be sent to the instructor by e-mail.
6. For e-mail communications and all submissions, you must follow the e-mail rules in this course, otherwise, your e-mail may get lost. **E-mail Rules:** In the SUBJECT line of your e-mail, type **"EES264-YourLastName-FirstName-unit #" (e.g., EES264-Smith-John-unit 1, EES264-Smith-John-question).** ***If you do it EXACTLY, your e-mail will go directly to the designated mail box for EES265, otherwise it can be lost.*** **Thanks for your corporation!! Send your e-mail to** pvandewater@csufresno.edu**.**

EES 264: Climatology, Tentative schedule

Week	Textbook and Online Reading	Assignments (problem sets, blog postings, and projects) Assignments are due by midnight Sunday
1	Course introduction, Blackboard: **Ch. 1** scope and controls of the climate system	Problem sets for Excel and word skills
2	**Ch. 2**: The earth's radiation budget	**Problem set 1**:
3	**Ch. 3**: Energy and temperature	**Problem set 2**:
4	**Ch. 4**: Moisture in the atmosphere	**Problem set 3**:
5	**Ch. 5**: Precipitation	**Problem set 4**:
6	**Ch 6**: Winds and Pressure	**Problem set 5**:
7	**Ch. 7 :** General circulation and global climate	**Problem set 6**:
8	**Ch. 8 :** Tropical weather and climate ; readings on El niño and La niña.	**Problem set 7**:
9	**Ch. 9:** Extra-tropical weather and climate; readings on cycles such as PDO and NAO	**Problem set 8**:
10	**Ch. 10 :** Local (western U.S.) climate	**Submit mid-term project by Midnight Sunday before week 11**
11	**Ch. 11:** Human interactions with climate; readings on climate impact on humans past and present	**Blog discussion and answer board**
12	**Ch. 12:** Climates of the past; readings on past climates of the west	**Blog discussion and answer board**
13	**Ch. 13:** Modeling of climates; readings on climate models for California	**Blog discussion and answer board**
14	**Ch. 14:** Climate, climate change and the future; Readings on climate effects in California	**Blog discussion and answer board**
15	**Term project:**	**Term project; Submit prior to Friday 5 pm Week 15**

TextBook Chapters

Chapter 1: Scope and controls of climate
Chapter 2: The Earth's radiation budget
Chapter 3: Energy and temperature
Chapter 4: Moisture in the atmosphere
Chapter 5: Precipitation
Chapter 6: Winds and Pressure
Chapter 7: The general circulation and global climate
Chapter 8: Tropical weather and climate
Chapter 9: Extra-tropical weather and climate
Chapter 10: Local climates

Chapter 11: Human interaction with climate
Chapter 12: climates of the past
Chapter 13: Modeling the climate
Chapter 14: Climate, climate change and the future

Evaluation Rubric for Online Discussions, and Project elements

Category/Content	Poor 2pts	Fair 3 pts	Good 4pts	Excellent 5 pts
Discussion Have the analysis answers been written in detail with accuracy and insight?	Answers to the questions show limited detail, accuracy and insight.	Answers to the questions show some detail, accuracy and insight.	Answers to the questions show considerable detail, accuracy and insight.	Answers to the questions show a high degree of detail, accuracy and insight.
Problem Sets Has the problems been analyzed and solved, with the resolution of the problem incorporated?	Answers to the problems show little to no work, with or without the solution being evident. No attempt to incorporate the solution is evident.	Answers to the questions show some detail, accuracy and insight.	Answers to the questions show considerable detail, and accuracy. The answer is integrated the overall topic	Answers to the questions show a high degree of detail, accuracy and insight. The answer is integrated to show overall effects on the subject.
Maps; Organization Has the map been designed in an organized manner?	The organization of the map is displayed with limited effectiveness.	The organization of the map shows some effectiveness.	Map is displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization.
Maps; Technology Has the student exhibited an ability to use the software to achieve the desired results?	Exhibits no command of the software and is able to use it with limited effectiveness.	Exhibits satisfactory command of the software and is able to use it with some effectiveness.	Exhibits good command of the software and is able to use it effectively.	Exhibits a high degree of ability in the use of the software.
Maps; Application Does the layout contain all the necessary cartographic	The layout is missing several elements. These may include a legend, compass, title etc.	The layout is missing one or two of the following: a legend, compass, title	The layout is designed with effectiveness and includes necessary cartographic	The layout contains all necessary elements and is designed with a high degree of

Category/Content	Poor 2pts	Fair 3 pts	Good 4pts	Excellent 5 pts
elements?		etc.	elements.	effectiveness.

Evaluation Rubrics for Term Project Reports

Qualities & Criteria	Poor (0-59.9)	Moderate (60-79.9)	Good (80-100)
Format/Layout *(Weight 15%)*	Follows poorly the requirements related to format and layout.	Follows, for the most part, all the requirements related to format and layout. Some requirements are not followed or poorly done.	Closely follows all the requirements related to format and layout.
Content/Calculation/Graphics *(Weight 50%)*	The essay is not objective and poorly addresses poorly issues referred to in the proposed topic. Calculations are not necessary or inaccurate. The maps, diagrams and charts are poorly organized and displayed. They lack basic information required on all documents (scale, north arrow, etc…)	The essay is objective and for the most part addresses the topic with some depth analysis. Calculations are used properly and are accurate. The maps, diagrams and charts are well organized and displayed.	The essay is objective and addresses the issues with in-depth analysis. Any calculation are accurate and well described including defining terms. The maps, diagrams and charts are well organized and displayed.
Quality of Writing *(Weight 20%)*	The essay is not well written, and contains spelling or grammatical errors and/or poor use of English. The essay is badly organized, lacks clarity and/or does not present ideas in a coherent way.	The essay is well written without spelling errors and grammar mistakes are minimal. The essay is organized, clear and presents ideas in a coherent fashion.	The essay is well written from start to finish, without spelling, grammar errors. The essay is well organized, clear and presents ideas in a coherent fashion.
References and use of references *(Weight 15%)*	Most of the references used are not important, and/or are not of good/scholarly quality. There is not a minimum of 5 scholarly resources, and/or they are not used effectively in the text. References are not effectively used, and/or correctly cited and/or correctly listed in the reference list according to APA style.	Most of the references used are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources used effectively in the essay. References are correctly cited and correctly listed in the reference list according to APA style.	All references are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources that are used effectively in the essay. All references are effectively used, correctly cited and correctly listed in the reference list according to APA style.

Overriding criterion: Originality and authenticity. If the essay is identified as not being original, and/or not done by the student, the instructor has the right to grade the paper as an F.

Course Policies

Minimum requirement: Student must satisfactorily complete the 8 problem sets. You will receive an "Incomplete" or "F" grade automatically if you miss more than 2 problem set due dates, regardless of the work you have completed. These assignments be due at 12 midnight the Sunday following the assignment week. Late penalty for exercises and assignments is 10% deduction per day of delay (i.e. Don't be late unless you have a legitimate reason, such as illness or real emergencies.) The project report must be presented with acceptable professional standards, i.e. clear logical layouts, neat and legible.

Course Assignments and Files: Students must keep a copy of their submitted materials (e.g. emails, discussion postings, assignments, etc.) as part of their coursework. Students are fully responsible for the timely re-submission of their work upon the instructor's request.

Study Expectations: Students are expected to study ***at least five hours per week*** depending on prior training and experience in climatology, hydrology, computer programming and GIS literacy. This is especially true when conducting the midterm and final projects. This is a highly technical and very time-consuming course. Thus, if you have a heavy schedule or time conflict, please adjust it to leave time to complete the assignments.

University Policies

Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code:

"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by

fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For further information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations)

Computers:

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its Copyright Web Page (http://csufresno.edu/library/information/copyright/).

Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor

assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Subject-to-Change Notice

This syllabus and schedule are subject to change depending on the course progress. The above schedule and procedures are subject to changes in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent. Any substantive changes to this syllabus will be accompanied by the distribution of a revised syllabus.

Problem set and mid-Term/Term Project Guideline

How to prepare the term project report?

A written report detailing each step should be submitted on or before the stated deadline. Data sets for term projects will be given and hopefully will correspond to your professional interests. Students are encouraged to explore their data through work, GIS web sites, GIS magazines or research journals, etc. The written report should be double-spaced typed and limited to 10 pages or less, including figures and tables. This report should have all components as outlined below. In the body of the report you are to present a thorough discussion of the data, the analysis, problems encountered and the solutions and new findings. The report should include the following sections:

- Title page (project title, abstract, student name, and email address)
- Introduction and Problem statements (up to 1 page)
- Data collection and assembly (up to 1 page)
- Analytical methodology and procedures (up to 2 pages)
- Results and discussion (up to 5 pages)
- Concluding remarks (up to 1 page)
- Cited references (list and cite at least 5peer-reviewed references)

Reports will be graded based on

- A thorough understanding of the problem including the application of GIS.
- Use of appropriate data sources
- Proper use of data analysis techniques.
- Analytical methodology
- Grammar, spelling
- Report structure (abstract, table of content, bibliography, etc.)

EES 265 – Hydrological Systems (3 units)

Online Course for Professional Master of Science in Water Management
Department of Earth and Environmental Sciences
College of Science and Mathematics, California State University, Fresno
(offered through Division of Continuing and Global Education)

Fall 2013 (August 22 – Dec 16, 2013)

Instructor: Dr. Zhi (Luke) Wang
Phone: (559)278-4427 M - F 9:00 am – 6:00 pm Leave a message if there is no response. The call will be returned within 24 hours unless the instructor is out of town.
Office Location: Science II, room 121
Department of Earth and Environmental Sciences, California State University, Fresno
Fax: (559)278-5980
E-mail:zwang@csufresno.edu

Catalog Description;

EES 265 Hydrological Systems (3 Units)
Mechanisms of water and sediment transport in the hydrologic cycle. Advanced tools such as GIS will be used to quantify the storage and movement of water in the atmosphere, land surface, soil and underground aquifers.

Basic Information

This is a 3-unit online course (equivalent to 5 hours per week) to be learned at any time during the offering period. The course materials are available through Blackboard (login using your CSUF e-mail passwords)
Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, email or telephone the instructor. When writing an E-mail to the instructor, be sure to write "***EES265-LastName-Initial-lab# or question***" (no space anywhere) in the subject line, otherwise the email will be deleted as junk mail.
Response Times: The instructor will check and respond to email and the discussion board at least 4 days a week. Assignments will be graded, posted in the grade book and returned within the week of the due date.

Course Description

Mechanisms of water and sediment transport in the hydrologic cycle. Advanced tools such as GIS will be used to quantify the storage and movement of water in the atmosphere, land surface, soil and underground aquifers. Asynchronous online.

Prerequisites

EES 211 (Fundamentals of GIS) and EES 214 (Advanced Spatial Analysis) or equivalent.

Course Goal and Contents

The basic **goal** of the course is to provide advanced methods for quantifying hydrologic parameters and processes.

Contents include principles and governing mathematical models of atmospheric vapor flow, precipitation, infiltration, evapotranspiration, overland flow, groundwater dynamics, and the interactions between surface and subsurface waters. Application examples are used to quantify the processes such as flood generation, soil erosion, droughts, desertification, watershed processes, water supply, water contaminant, and water resources protection, harvesting and remediation, etc.

Note: This course will emphasize the ***tools of hydrology*** and how one uses them to better understand the role of water in the ecosphere and human affairs. All students will use ***GIS*** and other special tools (such as Excel, etc.) in this course.

Student Learning Outcomes

Upon completion of this course the students will be able to:

1. Develop an integral understanding of hydrologic systems to a level at which one can intuitively assess and critique the technical aspects of fundamental issues.
2. Use advanced computer skills to quantify how water moves through the environment and how water affects and is affected by landforms, climate, wildfires and a variety of other natural and anthropogenic forcing terms.
3. Compile, categorize and combine hydrologic and hydraulics tools, concepts, data and models to solve in-situ environmental or engineering hydrology problems. This includes identifying the scientific and application needs, data acquisition and analysis, and report writing at the professional level.
4. Quantitatively determine and relate various hydrologic components such as atmospheric vapor flow, precipitation, infiltration, evapotranspiration, surface storage and flow, soil water and ground water etc. to produce accurate maps and reports for water resources management. This is applied in the required term project to study a watershed or groundwater aquifer.
5. Critique the values of proposed ideas, materials and the water resources assessment results for decision making. This is learned through the term project proposal and its execution.
6. Resolve issues involved in choosing suitable equations for calculation, analysis procedure or toolset for the project; organize data and integrate various calculation and simulation results; expertly apply the GIS and remote sensing techniques to produce spatial and temporal maps of water distribution; properly choose, convert and align various unit and coordinate systems in the hydrology project.
7. Create and integrate GIS spatial data and water resources data from various sources to explore social, demographic, scientific, engineering, political and economic conditions of a given system based on water availability.
8. Delineate temporal and spatial distribution of natural resources and hazards in a given geographic region and conduct risk analyses.

9. Create and conduct hypothesis or scenario testing; compare, evaluate and critique the input data and output results of a hydrologic model; summarize, conclude and produce recommendations based on the results.
10. Disseminate results through reports, publications, presentations and/or other outlets.

Textbooks

Required*: Andy D. Ward and Stanley W. Trimble,* Environmental Hydrology*, 2nd edition. Lewis Publishers, 2003 (ISBN 1-56670-616-5).*

Recommended Reference Books

- V.T. Chow, D.R. Maidment and L.W. Mays (1988) "Applied Hydrology". McGraw-Hill Book Company, 572 pp. [Civil engineering]
- D.R. Maidment (Edit) 1993 "Handbook of Hydrology". McGraw-Hill Book Company. [Civil engineering]
- Hornberger, G.M., et al. (1998) "Element of Physical Hydrology", Johns Hopkins University Press, 302 pp. [An excellent book with current coverage.]
- Watson, Ian and Burnett, Alister D. (1993) "Hydrology - An Environmental Approach", Lewis Publishers. 702 pp. [A practical applications handbook. Weak on theory.]
- Domenico, P.A. and Schwartz, F.W. (1990) "Physical and Chemical Hydrogeology", John Wiley & Sons, New York. 824 pp.
- Roscoe Moss Company (1990) "Handbook of Ground Water Development", John Wiley & Sons, New York. 493 pp. [A practical reference].
- Heath, Ralph C. (1983) "Basic Ground-Water Hydrology", U.S. Geological Survey, Water-Supply Paper 2220. [Basic minimum. Quickest way to learn groundwater hydrology.]
- Gorr, W.L, and K. S. Kurland, *GIS Tutorial Workbook for ArcView 9*, ESRI Press, 2005. (ISBN 1-58948-127-5)
- Clarke, K.C., 2003. Getting Started with Geographic Information Systems, 4th edition, Prentice Hall, New Jersey.

Bases for Course Grade

Assignment	Weight
Online Attendance	10%
Lab exercises	60%
Midterm project	10%
Term project	20%
Total	**100%**

Letter grade	Percentage
A	90% or higher
B	80% or higher
C	70% or higher
D	60% or higher
F	Lower than 60%

Online Discussion Attendance:

The instructor will post questions on the **"**Discussion Board" of Blackboard. Student input on the "discussion board" is required (beneficial to oneself and others) and will be tracked by the Course Statistics function and utilized in determining the points for on-line attendance.

Online Lab Exercises:

There are up to 14 hands-on lab exercises designed to help learn the methods/techniques of hydrology with GIS- and other software-aided packages. You must complete at least 10 labs in order to pass the course. These lab exercises will generally be due by 5 pm Friday of the assignment week. Each lab counts for 5.0 points. Labs submitted after the deadline will lose 0.5 point (10%) per day of delay.

Midterm Project:

The instructor assigns a midterm project on **water resources usage by your county or state/province.** There are various water resources such as fresh, salty, surface and subsurface water etc. that can be used for various beneficial purposes such as irrigation, aquaculture, domestic use, industrial, recreation and power generation, etc. The dataset is provided by USGS in text and Excel formats. Students will choose certain uses of the water resources and conduct GIS mapping analysis. The results, including a written report and all map and document files, will be submitted through Blackboard.

Term Project:

A student proposed, but instructor approved, term project on **water resources management or hydraulic calculation** will be conducted. The instructor will help you define a geographic region and the problem of interest during the last four weeks. You will then obtain and create various datasets for the ***project area*.** You will apply and integrate almost all the concepts and techniques learned in the course for your research in the project. You are required to submit a comprehensive project report. A detailed "**Lab and Term Project Guideline"** is attached to the end of this syllabus**.**

Required Materials - Hardware and Software Requirements, Cost

Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software including ArcGIS9.x. The student bears the cost of hardware and Internet access. The minimum system requirements are:

- Operating system: Windows 2000 professional or higher
- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 1 GB
- Free Disk Space: 5 GB
- Broadband Internet access
- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions.

Resources

- **Students must have Fresno State email account** Campus Email**(**http://email.csufresno.edu/**). Your username and password will be used to login for courses and various services on campus. To access this course, you need to login to**Blackboard (http://blackboard.csufresno.edu/)
- **Student resources can be found at** Blackboard 9.1 Student Guide! **(**http://blackboard.csufresno.edu/students/index.shtml**)**

- **If you find you are unable to access the Blackboard, first contact the** Technology Innovation for Learning and Teaching (TILT) **(**http://www.csufresno.edu/tlt/**) or call the** TILT Blackboard resource center at 559-278-7373 Monday through Friday from 8:00am to 5:00pm. After hours, email TILT at dcfeedback@csufresno.edu or call 559-278-7000 seven days a week between 7:00am to 10:00pm. If there is still a problem contact the instructor.
- When in Blackboard view the initial announcement. A link to Blackboard 9.1 Student Guide can be found at Blackboard 9.1 Student Guide!(http://blackboard.csufresno.edu/students/index.shtml)**. Read it through before you access the course materials below.**

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- With your work or home computer connected to the internet, login to Blackboard (http://blackboard.csufresno.edu/) using the login name and password of your CSUF e-mail account. Click on the name of this course.
- Click on **First Day: Orientation and Software Installation** to go through the brief orientation, read the syllabus, and install required computer programs (provided).
- Click on the "Required Basic Computer Skills" to go through the Excel tutorials for your lab 0.
- To begin the formal course work, first go to the "Weekly Modules" which include lecture notes and labs. Review the lecture notes, read the book chapters and then complete the required labs. Afterward, you must answer the questions posted on the "Discussion Board" to earn the attendance score.
- Please provide your CREATIVE inputs on the "Discussion Board" (do not copy from others), so that other students may have the benefit of your queries. I will check the "Discussion Board" regularly. Personal questions (such as grade concerns) should be sent to the instructor by e-mail.
- For e-mail communications and all submissions, you must follow the e-mail rules in this course, otherwise, your e-mail may get lost. **E-mail Rules:** In the SUBJECT line of your e-mail, type**"EES265-YourLastName-FirstName-HomeWork#" (e.g., EES265-Smith-John-Lab1, EES265-Smith-John-question).** ***If you do it EXACTLY, your e-mail will go directly to the designated mail box for EES265 and will not get lost.*** **Thanks for your corporation!! Send your e-mail to** zwang@csufresno.edu**.**
- Finally, I am reminding you that this is a highly technical and very time-consuming course (depending on your computer programming and GIS literacy). Thus, if you have a heavy schedule or time conflict, please adjust it to leave more time for this course.

E-mail Rules

- Login to your e-mail account. The e-mail should be sent to zwang@csufresno.edu.
- In the "SUBJECT" line of your e-mail, type **"EES265-YourLastName-Initial-HomeWork#" (e.g., EES265-Smith-John-Lab1, EES265-Smith-John-ProjectReport).**
- In the "Attachment" line, attach your PDF file (one lab per e-mail). Click on "send" button and wait until the e-mail is sent out.

EES 265: Hydrologic Process, Tentative schedule

Week	Textbook and Online Reading	Labs **Labs are due by 5 pm Friday**
1	Course introduction, Blackboard	**Lab0**: Excel skill
2	**Module 1 Chap1**: Hydrologic cycle	**Lab1**: Chpt 1, Questions 1 and 2
3	**Module 2 Chap2**: Precipitation	**Lab2**: Chpt 2, Questions 1-4
4	**Module 3 Chap3**: Infiltration	**Lab3**: Chpt 3, Questions 1-6
5	**Module 4 Chap4**: Evapotranspiration	**Lab4**: Chpt 4, Questions 1-3
6	**Module 5 Chap5**: Runoff and Drianage	**Lab5**: Chpt 5, Questions 1-3
7	**Module 6 Chap6** : Stream flow	**Lab6**: Chpt 6, Questions 1-3
8	**Module 7 Chaps7-8**: Open Channel Flow & Hydraulic Control Structures	**Lab7**: Chpt 7, Questions 1-5 **Lab8**: Chpt 8, Questions 1-6
9	**Work on Mid-Term project**	**Submit Mid-Term project report by 5 pm Monday**
10	**Module 8 Chap9**: Soil Erosion and Sediment Budget	**Lab9**: Chpt 9, Questions 1-3
11	**Module 9 Chap10**: Hydrology of Forests, Wetlands and Cold Climate	**Lab10**: Chpt 10, Questions 1-3
12	**Module 10 Chap11**: Hydrogeology	**Lab11**: Chpt 11, Questions 1-3
13	**Module 11 Chaps12-13**: Human Impacts, Remote Sensing and GIS	**Lab12**: Chpt 12, Questions 1-5 **Lab13**: Chpt 13, Questions 1-3
14	**Module 12 Chaps14**: How to Conduct and Report Hydrologic Studies	**Submit Term Project Proposal by 5 pm Friday week 14** (Thanksgiving Recess)
15	**Term project**	**Term project**
16	**Term project**	**Term project**
17	**Examination week on campus**	**Submit project report by 5 pm Tuesday week 17**

TextBook Chapters

Chapter 1: Hydrologic Cycle, Water Resources, and Society
Chapter 2: Precipitation
Chapter 3: Infiltration and Soil Water Processes
Chapter 4: Evapotranspiration
Chapter 5: Surface Runoff and Subsurface Drainage
Chapter 6: Stream Processes

Chapter 7: Uniform Open Channel Flow
Chapter 8: Hydraulic Control Structures
Chapter 9: Soil Conservation and Sediment Budget
Chapter 10: Hydrology of Forests, Wetlands and Cold Climate
Chapter 11: Hydrogeology
Chapter 12: Human Impacts on the Hydrologic Cycle: Prevention and Treatment Strategies
Chapter 13: Remote Sensing and GIS for Hydrologic Applications
Chapter 14: Practical Exercises on Conducting and Reporting Hydrologic Studies

Evaluation Rubrics for GIS Online Discussion and Labs

Contents\Grade	**Poor 2pts**	**Fair 3 pts**	**Good 4pts**	**Excellent 5 pts**
Discussion Have the analysis answers been written in detail with accuracy and insight?	Answers to the online questions show limited detail, accuracy and insight.	Answers to the online questions show some detail, accuracy and insight.	Answers to the online questions show considerable detail, accuracy and insight.	Answers to the online questions show a high degree of detail, accuracy and insight.
Map Organization Has the map been designed in an organized manner?	The organization of the map is displayed with limited effectiveness.	The organization of the map shows some effectiveness.	Map is displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization.
Map Technology Has the student exhibited an ability to use the software to achieve the desired results?	Exhibits no command of the software and is able to use it with limited effectiveness.	Exhibits satisfactory command of the software and is able to use it with some effectiveness.	Exhibits good command of the software and is able to use it effectively.	Exhibits a high degree of ability in the use of the software.
Map Application Does the layout contain all the necessary cartographic elements?	The layout is missing several elements. These may include a legend, compass, title etc.	The layout is missing one or two of the following: a legend, compass, title etc.	The layout is designed with effectiveness and includes necessary cartographic elements.	The layout contains all necessary elements and is designed with a high degree of effectiveness.

Evaluation Rubrics for Term Project Reports

Qualities & Criteria	Poor (0-59.9)	Moderate (60-79.9)	Good (80-100)
Format/Layout *(Weight 15%)*	Follows poorly the requirements related to format and layout.	Follows, for the most part, all the requirements related to format and layout. Some requirements are not followed.	Closely follows all the requirements related to format and layout.
Content/Calculation/Graphics *(Weight 50%)*	The essay is not objective and addresses poorly the issues referred in the proposed topic. The calculation is not necessary or not accurate. The maps, diagrams and charts are poorly organized and displayed.	The essay is objective and for the most part addresses with an in depth analysis most of the issues referred in the proposed topic. The calculation is, for the most part, necessary and accurate. The maps, diagrams and charts are well organized and displayed.	The essay is objective and addresses with an in depth analysis all the issues referred in the proposed topic. The calculation is necessary and accurate. The maps, diagrams and charts are very well organized and displayed.
Quality of Writing *(Weight 20%)*	The essay is not well written, and contains many spelling errors, and/or grammar errors and/or use of English errors. The essay is badly organized, lacks clarity and/or does not present ideas in a coherent way.	The essay is well written for the most part, without spelling, grammar or use of English errors. The essay is for the most part well organized, clear and presents ideas in a coherent way.	The essay is well written from start to finish, without spelling, grammar or use of English errors. The essay is well organized, clear and presents ideas in a coherent way.
References and use of references *(Weight 15%)*	Most of the references used are not important, and/or are not of good/scholarly quality. There is not a minimum of 5 scholarly resources, and/or they are not used effectively in the essay. References are not effectively used, and/or correctly cited and/or correctly listed in the reference list according to APA style.	Most of the references used are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources that are for the most part used effectively in the essay. Most of the references are effectively used, correctly cited and correctly listed in the reference list according	All the references used are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources that are used effectively in the essay. All the references are effectively used, correctly cited and correctly listed in the

Qualities & Criteria	Poor (0-59.9)	Moderate (60-79.9)	Good (80-100)
		to APA style.	reference list according to APA style.

Overriding criterion: Originality and authenticity. If the essay is identified as not being original, and/or not done by the student, the instructor has the right to grade the paper as an F.

Course Policies

You must satisfactorily complete at least 10 out of the 15 lab sessions. You will receive an "Incomplete" or "F" grade automatically if you miss more than 10 lab exercises, regardless of the work you have completed. These lab exercises will generally be due at 5 pm Friday of the assignment week. Late penalty for exercises and assignments is 10% per day (i.e. Don't be late unless you have a legitimate reason, such as illness or real emergencies.) The project report must be presented with acceptable professional standards, i.e. clear logical layouts, neat and legible, no scribbling, no untidy work.

University Policies

Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code:

"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by

fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers:

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its Copyright Web Page (http://csufresno.edu/library/information/copyright/).

Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor

assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Subject-to-Change Notice

This syllabus and schedule are subject to change depending on the course progress. The above schedule and procedures are subject to changes in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent. Any substantive changes to this syllabus will be accompanied by the distribution of a revised syllabus.

Lab and Term Project Guideline

1. How to produce PDF files for your labs and combine them into one PDF file for submission:

- In the MS Word or Excel, select your print area then print the selected text into a PDF file.
- In ArcView 9.x (ArcGIS): Access "layout view" by clicking the button at the lower left corner of normal view. Go to "file/export map", then "save as" PDF file. Name the file as "EES265-YourLastName-Firstname-Lab#"
- In a PDF software package such as Adobe Acrobat or Nitro PDF Professional etc., open the first PDF file, then insert new pages of PDF file, or follow the specific procedures in your version of PDF software. Save the combined PDF file as "EES265-YourLastName-Firstname-Lab#.pdf"
- Please E-mail your PDF file as an attachment file (one PDF per lab) and **use the correct SUBJECT name of the e-mail**. Otherwise, your homework could be lost in the system.

2. How to prepare a project proposal?

In this term project proposal you will:

- Specify your project's objectives
- Briefly describe the information sources you expect to use
- List the expected results in terms of knowledge gained or analysis accomplished

It is understandable that in preparing a project proposal many things are not completely understood in the beginning and it is possible that major changes in the project may occur as you execute it. The main purpose of this outline is to give me an understanding of what you intend to do so that I can help you define a project that is feasible within the time frame and the information resources that are available. It is better to focus your ideas rather narrowly first and then broaden them out later. Many students start out attempting to do more than the time available during the semester will permit.

3. How to prepare the term project report?

A written report detailing each step should be submitted on or before the stated deadline. Ideas for term projects may come from past students, your professional work, GIS web sites, GIS magazines or research journals, etc. The written report should be double-spaced typed and limited to 10 pages or less, including necessary figures and tables. This report should

have all components as outlined below. In the body of the report you are to present a thorough discussion of the data, the analysis, problems encountered and the solutions and new findings. As the reports will be graded somewhat subjectively and loosely based on their levels of usefulness, students are advised to seek for in priori approval from the instructor and must include the following sections:

- Title page (project title, abstract, student name, and email address)
- Introduction and Problem statements (up to 1 page)
- Data collection and assembly (up to 1 page)
- Analytical methodology and procedures (up to 2 pages)
- Results and discussion (up to 5 pages)
- Concluding remarks (up to 1 page)
- Cited references (list and cite at least 5peer-reviewed references)

Reports will be graded based on

- Whether or not the problems can be solved without using GIS.
- Use of appropriate data sources
- Proper use of data analysis techniques (including 3-D analysis)
- Analytical methodology
- Grammar, spelling
- Report structure (abstract, table of content, bibliography, etc.)

EES 266

Natural and Agricultural Uses of Water

Catalog Description;

EES 266 Natural and Agricultural Uses of Water (3 Units)
This course reviews natural and agricultural water use. The course identifies stakeholders and addresses natural water quality protection. Agricultural issues include soil properties, irrigation, water quality, and water reuse. Students will focus on water supply and quality management issues.

Introduction and Course Description

EES 266, Natural and Agricultural Uses of Water is a three-unit course that meets entirely online. This course provides an overview of agricultural and natural uses of water with greater emphasis on agricultural uses. For natural uses of water, the course will identify stakeholders and address impacts on natural water bodies and management strategies to protect water quality. For agricultural uses, the course will examine soil properties and irrigation, management practices influencing water use, irrigation water quality, and water reuse. Students will also be introduced to contemporary water supply and quality issues in California using the Sacramento-San Joaquin Delta (aquatic life), San Joaquin River Restoration (flows and pesticide loading), western San Joaquin Valley (salinity and drainage) and Monterey County (reuse of municipal wastewater) as case studies. As such, this course complements the other courses in the Professional Science for Master's (PSM) Water Resources degree program offered at the California State University Fresno.

Water conservation and sustainable management of water resources in California will require a science-based knowledge of soil and irrigation management and the ability to determine appropriate uses of marginal waters taking into account the particular cropping and irrigation system. For natural uses of water and restoration of natural water bodies, a comprehensive approach is needed to minimize impacts to agricultural and other stakeholders. With population growth in the Central Valley of California and climate change, increased pressure on the water supply will place a greater imperative on the proper use and management of agricultural and natural waters.

The course is organized to first acquaint students with important water legislation at the federal and state levels and then identify the major uses of water in California and its natural and agricultural water systems. Given the importance and scale of agriculture in this region, students will be exposed to soil and water management practices primarily in irrigated systems. Once familiar with the water resources and factors affecting their quality, students working in teams will investigate one of the contemporary water issues listed above and prepare a comprehensive analysis of the problem and recommendations for improved management and actions. Students will thus be challenged to consider all stakeholders and balance agronomic, environmental, and economic concerns.

The instructional philosophy behind the course is to use as many different types of learning as is practical with an all-online course, to facilitate student understanding and retention of course content. Students will be using tools such as discussion boards, journal entries and group exercises and role playing to explore the subject matter content. Assessment will be done through a mixture of exams, quizzes, graded discussion boards, and graded writing assignments. Because this course is conducted entirely online, it is essential that students master Blackboard 9.1 and related tools (e.g., *Elluminate*) before beginning the course, and that they thoroughly understand the course syllabus. Students are required to take the Fresno State Blackboard 9.1 orientation and receive a certificate of completion before they can continue with course content for the semester.

Course and instructor information

Course Information

EES 266*: Natural and Agricultural Uses of Water*, California State University, Fresno, Fall 2013
Units: 3
Time and location: this course will be taught entirely online
Website: To access the course on Blackboard login to http://blackboard.csufresno.edu using your Fresno State username and password. For help with Blackboard contact Technology Innovations for Learning and Teaching (TILT) at 278-7373 or send an email to tiltsupport@csufresno.edu.

Catalog Description

Sources, distribution and utilization of water in natural and agricultural systems, including assessment of California water supply and quality. Discussion of water legislation and conservation issues. Soil properties and plant water relations as they relate to water use efficiency, agricultural productivity and the quality of natural waters. Irrigation systems and scheduling and water reuse. Management practices to reduce the impacts of salinity, nutrients and trace elements on water quality. Contemporary water supply and quality issues in California will be used as case studies for students to assess the challenges and opportunities for water management.

Instructor Information

The following individuals may be teaching this course, either as a team or individually

Dr. Sharon E. Benes, Department of Plant Science, 559-278-2255, sbenes@csufresno.edu
Office: Ag Mechanics 100
Dr. Dave Goorahoo, Department of Plant Science, 559-278-8448, dgooraho@csufresno.edu
Office: Ag Sciences 229
Dr. Florence Cassel-Sharma, Center for Irrigation Technology, 559-278-7955, fcasselss@csufresno.edu. Office: Postharvest lab (near CATI building)

Contact with Instructors: we respond to emails within 24-48 hours.
Office Hours: there may be opportunities for the students to communicate with the instructors using *Elluminate* or *Skype* during pre-established times. Online students may also telephone the instructor during these times or visit the instructor's office in person

Prerequisites

No specific prerequisites exist for this course, but the taking of this course is dependent upon the student taking other courses in the PSM Water Management program in the sequence described the program.

Required Textbooks and Materials

Course readings will be taken from a variety of water and soil science textbooks, academic journal articles, government reports, and other sources which will be posted to Blackboard. Students will be asked to purchase Hanson, B.R., Grattan, S.R. and A. Fulton (2006 rev.) Agricultural Salinity & Drainage, Division of Agriculture and Natural Resources (ANR), University of California, Publication #3375, available for purchase at http://anrcatalog.ucdavis.edu/. Students will also need current versions of MS Word, MS PowerPoint, Adobe Acrobat, and an internet browser.

Course Organization

This course is organized into modules and students will proceed through the modules sequentially. In general, each module takes one week to complete. Modules are posted under Course Documents on Blackboard. Each module contains reading assignments, a reminder to submit comments to the Discussion Board, and research and/or writing tasks. Students should proceed through the course sequentially because later chapters build on material presented in earlier chapters. PowerPoint lectures and any homework assignments are also posted in their respective folders under Course Documents on Blackboard.

Homework assignments will be submitted in the "Assignments" folder under "Course Documents." If used, journal entries will be used primarily for recording student thoughts after reviewing the PowerPoint lecture or other materials in each module. Some modules will use class discussion, which is done in the Discussion Board under Course documents. Entries in the Discussion Board are viewable by all, so this is where the "netiquette" practices described in your orientation as well as below are important.
For any given assignment, students will name the file uploaded to the assignment folder as follows: *Module X, Assignment Title, Last Name, date* where *X* is the module number, *Assignment Title* gives the title of the assignment (e.g., Discussion article #X commentary) and *Last Name* is the student's last name. Files should be in Adobe (.pdf) format, but MS Word format (.docx or .doc) is also acceptable. Current versions of MS Word allow saving of files in .pdf format (using the "save as" command).

Examinations and Major Assignments

There will be two **exams** which will cover the first and second half of the course material. They will have a combination of true/false, multiple choice, and short essay questions. These exams will be administered on-line through Blackboard (http://blackboard.csufresno.edu). There will be a three day window of time during which the exam can be taken and once started, the exam will have to be completed during the specified time period. Answers to the exam must be from the student, with no outside assistance. Academic honesty is of prime importance to the university and the student is referred to the campus policy on cheating found at the end of this syllabus. Unless prior arrangements are made, failure to complete the exam during the window of availability will result in forfeiture of all points allocated to that exam.

Discussion Board postings will be required to encourage synthesis and critical analysis of the assigned readings and video materials. For each module, students will be expected to post a 2-3 paragraph commentary which identifies critical points and any knowledge gaps or inconsistencies in published information on the topic. Students are also expected to contribute a short (2-4 sentence) response to one other posting. Responses must be worded properly and respect different interpretations/ opinions on the subject matter.
Students will need to complete **four homework assignments** (discussion article summaries or numeric exercises). They will be submitted through Blackboard and are worth 25 points each.
Students will also be assigned into small groups and tasked with **investigating and reporting on a contemporary water supply or quality issue** in California or some other part of the world. Near the end of the semester, this information will be compiled into a Powerpoint presentation and final paper. The latter must include adequate literature review and citation.
It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3-unit class, you should expect to study an average of 6 hours outside of class each week. Some students may need more outside study time and some less.
For free tutoring on campus, contact the Learning Center in the Collection Level (basement level) of the Henry Madden Library. You can reach them by phone at 278-3052 or visit www.csufresno.edu/learningcenter .

Participation Standards

Students must complete weekly assignments as given on Blackboard and deliver the work products to the instructor by the due date shown in each of the course modules (see Course Organization and Assignments as described above). Each module requires posting information to the Discussion Board as described above.
PowerPoint lectures are available from the time of original posting until the end of the semester. Students not participating in a given module are responsible for finding out what transpired for that module. The student has the responsibility to check announcements posted on Blackboard. If students miss a week of class they also should check with classmates to be up to date with course requirements.

Grading

The point value of each of the grading elements, and the grading scale, are as follows:

Exams (2) =	200 points
Homework Assignments = (4 @ 25 points each)	100 points
Discussion Board postings	100 points
Group Assignment	
Powerpoint presentation	70 points
Final paper	80 points
Total =	**550 points**

Final Grading Scale
A = 495 to 550 points
B = 440 to 494 points
C = 385 to 439 points

Final Grading Scale
D = 330 to 384 points
F < 384

Course Goals and Primary Learning Outcomes

Course Goals: The overall course goals are to give the successful student the ability to understand the full breadth of water usage in California and its role in agriculture and natural resource management. Students will be familiar with management practices related to water conservation and water quality protection, and understand the concerns of the various stakeholders involved. This will be achieved through the following learning outcomes:

Primary Learning Outcomes:

1. Describe major federal and state water legislation and California's Water Plan
2. List and describe the major uses of water in California and the related water quality issues
3. Describe the concept of water use efficiency at the plant, field, and landscape scale
4. Describe soil factors influencing water conservation and water quality protection.
5. Identify the major constituents influencing water quality in specific agricultural or natural settings
6. Formulate management practices aimed at minimizing negative impacts to water quality in these natural and agricultural settings.
7. Analyze the feasibility of implementing these good management practices (GMP's)

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

Course Policies & Safety Issues

All online communications for this course will reflect netiquette, especially those that are viewable by all course participants (e.g., Discussion Boards). In addition, the university policy on disruptive behavior also applies, even though this class does not meet in person in a physical classroom.

Plagiarism Detection. The campus utilizes the SafeAssign plagiarism prevention service through Blackboard. In this course, students will be required to submit major written assignments to SafeAssign. Submitted work will be used by SafeAssign for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the SafeAssign process, in which case the instructor can use other electronic means to verify the originality of their work. SafeAssign Similarity Reports (that give a numeric rating of the percent of a student's paper that is similar to other published work) will be available for student viewing. The instructor will set up draft SafeAssign assignments so that students can obtain feedback on the originality of their writing prior to formally submitting assignments for grading.

University Policies

Students must be familiar with university policies on students with disabilities, honor code, cheating and plagiarism, use of computers, disruptive classroom behavior, and copyright.

Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

d) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)

e) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.

f) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Cheating and Plagiarism: "Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations). As described above, this course will use SafeAssign for analysis of the original content of all major writing assignments.

Computers: "At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior: "The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page:
http://www.csufresno.edu/library/about/policies/docs/copyrtpolicyfull.pdf
TILT course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.
Students can also refer to the Required Syllabus Policy Statement at
http://www.csufresno.edu/academics/policies_forms/instruction/syllabus.shtml

Tentative Course Schedule—EES 266*

***subject to change in the event of extenuating circumstances**

Weekly Online Modules, Fall 2013

	Start/End Date	Topic	Assignments, Activities, Readings, Quizzes, Optional Resources
Module 1	Mon. Aug. 20	First Day of Instruction—Bb Orientation	Complete Blackboard Orientation and upload certificate; View Introductory Video on Contemporary Water Issues
Module 2	Mon., Aug. 27	Introduction—Water Legislation and CA Water Plan	Module 2 assigned reading and discussion board posting
Module 3	Mon., Sep. 3	**Natural Uses of Water-- systems**	Module 3 assigned reading and discussion board posting
Module 4	Mon., Sep. 10	Natural Uses of Water—factors affecting water quality	Module 4 assigned reading, discussion board posting and **Homework assignment**
Module 5	Mon., Sep. 17	**Agricultural Uses of Water**	Module 5 assigned reading and discussion board

	Start/End Date	Topic	Assignments, Activities, Readings, Quizzes, Optional Resources
		Irrigation—principles, concepts, soil factors	posting.
Module 6	Mon., Sep. 24	Irrigation systems and distribution uniformity.	Module 6 assigned reading and discussion board posting
Module 7	Mon., Oct. 1	Crop Water Use (ET) and Water Use Efficiency (WUE)	Module 7 assigned reading, discussion board posting and **Homework assignment**
Module 8	Mon., Oct. 8	Salinity and Drainage	Module 8 assigned reading and discussion board posting and **Homework assignment**
Module 9	Mon., Oct. 15	Agricultural Water Quality—assessment and protection	**Midterm Exam** Module 9 assigned reading, discussion board posting and **Homework assignment**
Module 10	Mon., Oct. 22	Water Reuse	Module 10 assigned reading and discussion board posting **Identify topic for group project**
Module 11	Mon., Oct. 29	Water Issues in California— Natural settings	Module 11 assigned reading and discussion board posting
Module 12	Mon., Nov. 5	Water Issues in California—Agricultural settings	Module 12 assigned reading and discussion board posting
Module 13	Mon., Nov. 12	Challenges and Opportunities for Water Management in California	Module 13 assigned reading and discussion board posting.
	Mon. Nov. 19	THANKSGIVING HOLIDAY	Work on group project
Module 14	Mon. Nov. 26	Case Studies—Natural settings	**Student on-line presentations**
Module 15	Mon., Dec. 3	Case Studies—Agricultural settings	**Student on-line presentations**
	Mon., Dec. 10	Case Studies cont'd	

Final Exam Preparation & Faculty Consultation Days	Thursday and Friday	Dec 13 - 14
Final Semester Examinations	Monday-Thursday	Dec 17 - 20
Second Half Exam		

EES267 Urban & Industrial Water Systems

Catalogue Description;

EES 267 Urban and Industrialized Water Use (3 Units)
This course introduces water management systems in urban and industrial settings. The basics of water occurrence, use, transport, treatment, and disposal are included.

Introduction and Course Description

CE 242, Urban & Industrial Water Systems, is a three-credit course that meets entirely online. This course provides an introduction to water use, water systems, and water management in urban and industrial (U&I) settings. Course material is organized into six broad subject categories as follows: U&I (1) Water sources (conventional & emerging alternatives); (2) Water use (quality, quantity & location); (3) Water reuse & disposal; (4) Water transport systems (water distribution & collection systems; hydraulic design approach); (5) Water quality basics (characterization & chemistry); and (6) Modification of water quality (water & wastewater treatment, process analysis, & process train selection).

This course complements other courses in two graduate programs offered at the California State University Fresno -- the Master of Science in Civil Engineering (MSCE) and the Professional Science Master's (PSM) in Water Resources.

The availability of water of suitable quality often determines the quality of life possible for people and communities throughout the world, and creation and maintenance of infrastructure for the sustainable provision of water in urban and industrial settings is one of the more difficult challenges faced in modern times. The challenge is manifold due to complexities associated with the acquisition of sufficient water supplies to meet societal needs; the modification and maintenance of its quality after its acquisition; hydraulic systems used for its transport and distribution; the manner in which it is used; and its collection, treatment and reuse or disposal after use. In addition to the challenges noted above, concern over the adequacy of current stormwater management practices is increasing, particularly with respect to contaminants that it acquires and negative impacts that they have on receiving waters and potential beneficial uses.

Water agencies are confronting dwindling water supplies, degrading source water quality, rising energy costs, growing populations, complex security concerns, and the need for sustainable environmental stewardship. In areas with an arid climate, such as in the California Central San Joaquin Valley, solutions to this challenge will include the development of new technologies for producing waters of different quality for use in different applications (e.g., drinking vs irrigation), from underutilized sources, and reducing energy requirements for both water production and delivery. Although water recycling/ reuse could be developed to provide a significant percentage of the water needed, at present this type of water represents a small fraction of the total water needs of society. Another part of the solution will be a movement towards distributed water treatment, which is expected to decrease conveyance (and, thus, energy) costs, and increase levels of water reclamation, recycling, and reuse.

Assessment of student learning will be done through a mixture of assignments, quizzes and exams. Because this course is conducted entirely online, it is essential that students master Blackboard 9.1 and related tools (e.g., Elluminate) before beginning the course, and that they thoroughly understand the course syllabus. Students are required to take the Fresno State Blackboard 9.1 orientation and receive a certificate of completion before they can continue with course content for the semester.

SYLLABUS FOR URBAN AND INDUSTRIAL WATER SYSTEMS (EES267)

Fall 2013

California State University, Fresno

Course Information: This course provides an introduction to water management in urban and industrial settings. Subjects include Water sources; water use, reuse & disposal; water transport systems; water quality basics; and modification of water quality.

Units: 3

Time: With the exception of quizzes and exams (see below), participation in this course is asynchronous and at times that are at the discretion of the student.

Location: This course is taught entirely online, however, students will be required to take between 5 and 10 quizzes online during pre-specified time periods, and two proctored exams at CSU Fresno, or other site that has been pre-authorized by the instructor at least one month prior to the exam.

Midterm Exam: **Day/ time TBD**

Final Exam: **Day/ time TBD**

Website: To access the course login to Blackboard (http://blackboard.csufresno.edu) using your Fresno State username and password.

For help with Blackboard contact Technology Innovations for Learning and Teaching at 278-7373 or send an email to dcfeedback@csufresno.edu.

Instructor: William Wright

Office Number: Engineering East 170

E-Mail: wfwright@csufresno.edu

Students should expect to receive a reply within 2 regular instruction days.

Telephone: (559) 278-5591

Office Hours: Online office hours will be held using Elluminate each Thursday from 12:00 Noon to 1:00 pm. Students may also telephone or visit the instructor during additional office hours from **11:00 – 12:00 Noon M, T, W, and F**; or by previous arrangement.

Prerequisites

Enrollment in this course by students in the Civil Engineering and PSM Water Resources programs is dependent upon the student taking other courses in their respective program in the sequence described in the program. See your graduate faculty advisor for more details.

Textbooks and Materials

Required: W. Viessman Jr., M. J. Hammer, E. M. Perez, P. A. Chadik (2009) *Water Supply and Pollution Control,* 8th Ed. Pearsons Education, Inc., New York. ISBN: 0-13-233717-7

Current versions of MS Word, Excel, & PowerPoint; Adobe Acrobat, and an internet browser.

Recommended: R. L. Droste (1997) *Theory and Practice of Water and Wastewater Treatment*, Wiley & Sons. ISBN: 0-471-12444-3.

Other Suggested References

- Sawyer, C.N., P.L. McCarty, and G.F. Perkin (2003) *Chemistry for Environmental Engineering*, 5th ed., McGraw Hill, New York.
- Davis, M.L. and S.J. Masten. (2009) *Principles of Environmental Engineering and Science*. McGraw Hill, 2nd edition**,** ISBN: 978-0-07-312235-9.
- Haestad Methods (2007) *Computer Applications in Hydraulic Engineering*, 7th Edition; software (CD is included with the textbook). ISBN-13 Number: 9780971414165.
- Finnemore, J. and Franzini, J. (2002) *Fluid Mechanics with Engineering Applications* 10th ed. McGraw Hill. ISBN: 0-07-243202.
- MWH - Montgomery Watson Harza (2005) *Water Treatment: Principles & Design*, 2nd ed. John Wiley & Sons.
- American Water Works Association (2010) *Water Quality and Treatment, 6th ed.* McGraw-Hill Book Company, New York. ISBN 0071630112 / 9780071630115
- Reynolds, T.D. and P.A. Richards (1996) *Unit Operations and Processes in Environmental Engineering*, 2nd ed., PWS Publishing Company, Boston, MA.
- Metcalf & Eddy, Inc. (2003), *Wastewater Engineering: Treatment and Reuse* 4th ed., McGraw Hill Book Company, New York.
- Asano, T., F. Burton, H. Leverenz, R. Tsuchihashi, G. Tchobanoglous (2007) Water Reuse: Issues, Technologies, and Applications, Metcalf & Eddy/ AECOM, McGraw-Hill book Company, New York.

Course Organization

This course is organized into modules and students will proceed through the modules sequentially. In general, each module takes one week to complete. Modules are posted under Course Documents on Blackboard. Each module contains reading assignments, a reminder to take the Blackboard Quiz if appropriate, and research and writing tasks. Students should proceed through the course sequentially because later chapters build on material presented in earlier chapters. Quizzes and PowerPoint lectures are also posted in their respective folders under Course Documents on Blackboard.

Homework and other assignments will be submitted in the "Assignments" folder under "Course Documents." Journal entries will be used primarily for recording student thoughts after reviewing the PowerPoint lecture or other materials in each module. Some modules may use class discussion, which is done in the Discussion Board under Course documents. Entries in the Discussion Board are viewable by all, so this is where the "netiquette" practices described in your orientation as well as below are important.

For any given assignment, students will name the file uploaded to the assignment folder as follows: MODULEX_AssignmentTitle_LastName, where *X* is the module number, *AssignmentTitle* gives the title of the assignment (e.g., Homework 1, Homework 2, etc.), and *LastName* is the student's last name. Files should be in Adobe (.pdf) format, but MS Word format (.docx or .doc) is also acceptable. Current versions of MS Word allow saving of files in .pdf format (using the "save as" command).

Examinations and Major Assignments

Exams: The course exams consist of one midterm exam (approximately 90-minutes long) and a final exam (approximately 110-minutes long). Material for exams will be drawn from lectures, readings, and assignments. The midterm and final exams will be cumulative. Exams are closed to books and lecture notes and typically will be administered in two parts with different formats as follows:

Part 1: Calculators and electronic devices are not allowed. Questions will include true/false, multiple choice, fill-in-the-blank, essay, and simple calculation.

Part 2: Calculators are needed, and the model must be among those that have been approved for use*. Questions are typically those for which the solution consists of multiple calculations, short explanations of approach, and essay discussion of the results. Students can bring two crib-sheets to Part 2 of the midterm exam and four crib-sheets to Part 2 of the final exam. Crib sheets will be 8.5"x11", one sided. You will not be allowed to keep your graded final exam but it will be made available to view in the instructor's office.

* To protect the integrity of its exams, the only calculator models acceptable for use during the exam are as listed at the National Council of Examiners for Engineering and Surveying (NCEES) calculator policy web page (http://www.ncees.org/Exams/Exam-day_policies/Calculator_policy.php).

Exams will be given at the Fresno State Academic Testing Center (ATC) (http://www.csufresno.edu/testing/testcenter) at the time indicated in the course schedule.

Students living outside the California State University, Fresno area who are unable to come to the ATC for tests may use a testing service at a convenient location, such as the following:

- Official testing center/office at a community college, university, or other academic institution
- The Education Office at a military installation
- Public libraries
- Corporate training centers
- Other proctor approved by the instructor at least one month prior to the exam

When you have identified a test proctor, complete and submit the Proctored Exam Approval Form (http://www.csufresno.edu/tilt/resources/proctored_exam_approval_enabled.pdf) (at least one month prior to the scheduled proctored exam). The student will be responsible for any fees the testing center may charge.

Make-up tests are generally not given and therefore it is essential that students take the exam at the specified time. Exceptions will be considered at the discretion of the instructor on a case-by-case basis, and only with prior arrangement or in the event of a documented, excused absence (e.g., hospitalization, death in the immediate family, etc.).

Quizzes: The Blackboard quizzes are designed to enhance student familiarity with the materials in the textbook. The instructor will give seven (7) quizzes on Blackboard at pre-specified time periods. Each quiz will be worth 10 points. Students will be allowed two attempts to take each quiz, with 30 minutes per attempt, separated by a period of 48 hours.

- After taking a quiz the first time, students will be able to view their scores and will be able to see which questions were answered incorrectly **24-hours later**.
- After consulting the textbook, lectures, and other non-course resources to find the correct answers for the questions marked incorrect, students will be able to retake the quiz one time 48 hours after the first attempt, to improve their overall scores by 50% for each question that was answered incorrectly the first time, but answered correctly the second time.

The instructor will make each quiz available from **8:00 pm** through **8:30 pm** on the **Monday** (and second chance on **Monday)** of the week it is shown in the schedule. Failure to complete a given quiz in the allotted time frame will result in a score of zero for that quiz. No make-up quizzes will be given. The lowest two scores will be thrown out in computing the final grade.

Homework: Homework assignments and due dates will be assigned approximately on a weekly basis, excluding the week in which the midterm exam is administered and the last week of the semester. Students will need to complete approximately twelve (12) homework assignments on assigned topics, worth 10 points each. The lowest two scores will be thrown out in computing the final grade.

No late homework will be accepted except under extreme circumstances and at the instructor's discretion. Homework must conform strictly to the attached format guidelines and failure to do so will result in the homework being returned ungraded.

Students are encouraged to work in groups on homework as a forum to exchange ideas after independently attempting all of the problems first. The final product must be an individual effort (i.e., the original work of the student submitting the assignment). Homework submittals that appear to be similar to each other will, at the instructor's discretion, be marked zero. The policy includes parts of submittals such as graphs produced using a computer.

Student Preparation

Students are expected to dedicate two hours of preparation for every hour of class time (typically reviewing recently covered material and reading ahead on the next topic to be discussed in class). Since this is a 3-unit class, you should expect to study an average of 6 hours outside of class each week. In addition, homework assignments on the average take 5 hours of time weekly. Some students may need more time for outside study and/or homework, and some less.

Don't get behind. Learning a complex subject results from numerous sequential efforts, rather than from just a few long study session efforts. Trying to "cram" this week to make up for what you didn't do last week is not an effective way of learning and will make your future progress difficult. The instructor is here to help you learn about urban and industrial water systems and help you to achieve your academic goals. Take advantage of on-line office hours. If you have concerns about the class or your progress talk to me as soon as possible. Be proactive and seek help before you feel overwhelmed. If you need additional help sign up consider forming a study group and doing additional reading from the list of suggested reference books (check to see if they are in the library and, if not, use interlibrary loans to obtain one from another library).

For free tutoring on campus for basic subjects (and some advanced material), contact the Learning Center in the Collection Level (basement level) of the Henry Madden Library. You can reach them by phone at 278-3052 or visit The Learning Center website (www.csufresno.edu/learningcenter).

Participation Standards

Each module is open from midnight of the Sunday for the week it is listed through 11:59 pm of the Saturday of the week for which it is listed. Students must complete weekly assignments as given on Blackboard and deliver the work products to the instructor by the due date shown in each of the course modules (see Course Organization and Assignments as described above). Participation points will be assigned based on Blackboard access statistics, student peer review of student participation in groups, and completion of journal exercises and homework and writing assignments on time. Most Discussion Board assignments will require posting at least one original thread and responding to at least two others. Each module requires posting a summary of the PowerPoint course content for that module in the student's journal.

Grading

PowerPoint lectures are available from the time of original posting until the end of the semester. Students not participating in a given module are responsible for finding out what transpired for that module. The student has the responsibility to check announcements posted on Blackboard. If students miss a week of class they also should check with classmates to be up to date with course requirements.

The point value of each of the grading elements, and the grading scale, are as follows:

Grading Element	**Value**	***Final Grading Scale***
Midterm Exam	20 pts	**A** = 90 to 100
Blackboard Quizzes	20 pts	**B** = 80 to 89
Final Exam	30 pts	**C** = 70 to 79
Homework Assignments	20 pts	**D** = 60 to 69
Participation/discussion	10 pts	**F** = 59 and below
Total	**100 points**	

Course Goals and Primary Learning Outcomes

Course Goals: The overall course goals are to give the successful student the ability to understand water systems in urban and industrial settings. This will be achieved through the following learning outcomes:

Primary Learning Outcomes:

1. Ability to identify and intelligently describe major:
   a. Challenges, from a historical perspective (pre-1970) and in contemporary times (1970 – present), in:
      1) providing water of suitable quality and amounts, and at spatially distributed locations, for a variety of urban and industrial uses (e.g., drinking, irrigation, process cooling and boiler make-up water)
      2) managing municipal wastewater flows.
      3) managing municipal stormwater flows.
   b. Conventional and alternative sources of water for major municipal and industrial uses, amounts used in these applications, and the fate of the water after use (reuse or disposal).
   c. Components of water transmission and distribution systems, wastewater collection systems, and stormwater collection and transport systems.
   d. Parameters used in the characterization of water, and the classification scheme presented in this course for organizing those parameters.
   e. Impurities of concern commonly found in ground waters, surface waters, urban stormwater, drinking water, and in raw and treated wastewater.
   f. Water quality goals and regulatory requirements associated with drinking water, urban stormwater, and treated wastewater.
   g. Unit operations and processes used in the treatment of water, wastewater, and stormwater, and how each operation and process fits into an overall treatment system.
   h. Phases of a water infrastructure project.
   i. Steps in the material balance technique
   j. Steps in the engineering approach to problem solving.

k. Hydraulic principles as they apply to pressurized flow, free surface flow, and pumping systems.

l. Contemporary issues encountered in the planning, design, operation, and maintenance of urban and industrial water systems.

2. Develop sensitivity to the interaction of global and societal issues within the fields of water resources and environmental engineering.
3. Ability to apply hydraulic principles in the analysis and design of water distribution, wastewater collection, and pump station systems. In doing so, expand abilities to apply basic science knowledge to the design of water resource infrastructure.
4. Be able to solve a wide variety of water chemistry problems including the determination of molarity, normality, pH, alkalinity, hardness, and accuracy of water quality data.
5. Improve ability to work in groups in a fully on-line collaboration environment (Blackboard) via active participation a small group research assignment.
6. Be able to function in an ethnically diverse multicultural environment (on-line).

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

Course Policies & Safety Issues

All online communications for this course will reflect netiquette, especially those that are viewable by all course participants (e.g., Discussion Boards). In addition, the university policy on disruptive behavior also applies, even though this class does not meet in person in a physical classroom.

Plagiarism Detection. The campus utilizes the SafeAssign plagiarism prevention service through Blackboard. In this course, students will be required to submit major written assignments to SafeAssign. Submitted work will be used by SafeAssign for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the SafeAssign process, in which case the instructor can use other electronic means to verify the originality of their work. SafeAssign Similarity Reports (that give a numeric rating of the percent of a student's paper that is similar to other published work) will be available for student viewing. The instructor will set up draft SafeAssign assignments so that students can obtain feedback on the originality of their writing prior to formally submitting assignments for grading.

University Policies

Students must be familiar with university policies on students with disabilities, honor code, cheating and plagiarism, use of computers, disruptive classroom behavior, and copyright.
Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For

more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

g) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration).
h) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
i) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Cheating and Plagiarism: "Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations). As described above, this course will use SafeAssign for analysis of the original content of all major writing assignments.

Computers: "At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior: "The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page
(http://www.csufresno.edu/library/about/policies/docs/copyrtpolicyfull.pdf)
TILT course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.
Students can also refer to the Required Syllabus Policy Statement
(http://www.csufresno.edu/academics/policies_forms/instruction/syllabus.shtml)

Tentative Course Schedule

The schedule and procedures for this course are subject to change in the event of extenuating circumstances.

Tentative Course Schedule—EES267
Fall 2013
Weekly Online Modules

	Start Date/ End Date	Topic	Assignments, Activities, Readings, Quizzes, Optional Resources
Module 1	Mon. Aug. 20	First Day of Instruction—Bb Orientation; Introduction / course overview.	Complete Blackboard Orientation and upload certificate; Bb Quiz 1; Reading and Homework Assignments.
Module 2	Mon., Aug. 27	Importance of water (quantity, quality, availability/location); Water resources planning & management; Water sources, flow, quality, & variability.	Bb Quiz 1; Reading and Homework Assignments.
Module 3	Mon., Sep. 3	LABOR DAY Sep. 3 Urban & industrial water use & role of conservation.	Reading and Homework Assignments.
Module 4	Mon., Sep. 10	Constituents in water, their classification, and variability.	Bb Quiz 2; Reading and Homework Assignments.
Module 5	Mon., Sep. 17	Statistical characterization of flowrate, constituent concentrations, & constituent loading; Transport systems for urban & industrial water & wastewater.	Reading and Homework Assignments.
Module 6	Mon., Sep. 24	Basic Hydraulic Principles I (conservation of mass and energy; headloss in pressurized flow and free-surface flow systems under steady flow	Bb Quiz 3; Reading and Homework Assignments.

	Start Date/ End Date	Topic	Assignments, Activities, Readings, Quizzes, Optional Resources
		conditions).	
Module 7	Mon., Oct. 1	Basic Hydraulic Principles II (design of pressurized water distribution systems).	Reading and Homework Assignments.
Module 8	Mon., Oct. 8	Basic Hydraulic Principles III (design of wastewater and stormwater collection systems).	Bb Quiz 4; Review for midterm exam
Module 9	Mon., Oct. 15	Basic Hydraulic Principles IV (Pumps and pump systems).	Midterm Exam; Reading Assignment.
Module 10	Mon., Oct. 22	Basic water chemistry; Water quality assessment (characterization & measurement of water quality; water quality standards)	Bb Quiz 5; Reading and Homework Assignments.
Module 11	Mon., Oct. 29	Process Analysis I (Material balance; Modeling ideal flow in tanks; Reaction)	Reading and Homework Assignments.
Module 12	Mon., Nov. 5	Process Analysis II (Reactors; Mass transfer)	Bb Quiz 6; Reading and Homework Assignments.
Module 13	Mon., Nov. 12	VETERAN'S Day Nov. 13 Water & Wastewater Treatment I – (water treatment unit operations and processes; common water and wastewater treatment trains)	Reading and Homework Assignments.
Module 14	Mon. Nov. 19	THANKSGIVING HOLIDAY Nov 22-23 Water & Wastewater Treatment II – (Phases of a water infrastructure project; Steps in the material balance technique)	Reading and Homework Assignments.
Module 15	Mon. Nov. 26	Water & Wastewater Treatment III – (Steps in the engineering approach to problem solving; Process train selection; Treatment plant design)	Bb Quiz 7; Reading and Homework Assignments.
Module 16	Mon., Dec. 3	Contemporary issues encountered in the planning, design, operation, and maintenance of urban and industrial water systems.	Reading and Homework Assignments.
Module 17	Mon., Dec. 10	LAST DAY OF INSTRUCTION – Dec 12 Course evaluation; Review for Final Exam	Review course material

Final Exam Preparation & Faculty Consultation Days:	Thursday and Friday	Dec 13 - 14
Final Semester Examination	**Thursday**	**Dec 20**
Final Exam in this course – Students will be taking the final exam in the Testing Center.		

Excel Homework Solution Requirements

When submitting Excel Spreadsheet solutions, provide the formula and a sample calculation (including units) for each type of calculation done in the Excel program.

General Requirements:

- Use engineering paper. Exception: Computer-generated sheets
- Use one side (the front) of the paper only
- Use a staple or binder clip if more than one page

- Solutions must be well organized and logical with sequential steps from top to bottom
- Use sketches when necessary (which is most of the time)
- Graphs in landscape format are to have the top side bound (Graphs are to be read from the right/long side of your sheet)
- Show all formulas in variable form before plugging in values
- Use Equation Editor or equivalent for formulas
- Use superscript and subscript
- Define all terms
- State all assumptions
- Show (carry) units for every calculation
- Use the appropriate number of significant figures
- Underline intermediate quantities
- Box or double underline final answer
- Separate problems with a horizontal line

Always do the following:

1. Provide a problem statement (Given, required) or attach the assignment sheet or a photocopy of the problem from the textbook (up to 20% off or returned ungraded)
2. Provide a sketch (if not already given) (up to 10% off)
3. Explain each step of the solution; state the method used; if not common, provide a complete reference (authors, title, edition, publisher) (up to 20% off or returned ungraded)
4. Provide equations in variable form; if not common, provide a complete reference (up to 10% off)
5. Define all variables (up to 10% off)
6. State assumptions. (up to 10% off)
7. Show at least one sample calculation for each type of calculation (up to 10% off)

Example Hand-Written Assignment Format

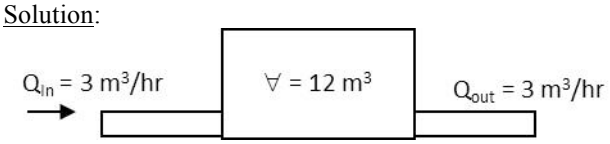
HW # 1, Prob. 1.1, 1.2, 1.3	CE 242 9-4-12	Last name, First name 1/3

Problem 1.1

Given: Water flowing through a 12 m^3 tank at a rate of 3 m^3/hr.

Find/required: Average residence time in the tank.

Solution:



Assumptions: Ideal flow through tank (no dead volume or short-circuiting)

Retention time, $\theta = \forall/Q$

Where:

∀ = tank volume

Q = volumetric flowrate

$$\theta = \frac{12\ m^3}{3\ m^3/hr} = 4\ hours$$

Problem 1.2

WATER POLITICS AND POLICY EES 268

Instructor	Dr. Thomas Holyoke Department of Political Science
Office:	McKee Fisk 216
Telephone:	559-278-7580
E-mail:	tholyoke@csufresno.edu
Office Hours:	Physical office hours: TBA Virtual office hours: On Thursday of every week at 4:00pm for one hour I will be available for an on-line chat with all students having questions through the Eluminate program on Blackboard. I will respond to each e-mail message within twenty-four hours.
Course Time:	See course calendar
Course Location:	This is a fully online course. This course is to be accessed on Blackboard, login in with your Fresno State user name and password to http://blackboard.csufresno.edu (for help with Blackboard, contact Technology Innovations for Learning and Teaching at 559-278-7373 or tiltsupport@csufresno.edu).

Catalog Description;

EES 268 Water and Politics (3 Units)

This course explores the role of politics and public policy in developing water resources for California and the Central Valley. It provides background for understanding today's battles over the control and use of water and the future of water policy.

Course Introduction and Description: Please read this syllabus carefully, it is essentially a contract that I make with you and you are responsible for knowing all of the information in it. This is a 3 unit course.

This is a course about what has been, is today, and almost certainly will in the future be, the most important and contentious problem for public policy makers: the ownership and use of fresh water. Although the availability of water and its central importance in human civilization and survival is a problem around the world, this course focuses largely on contentious political issues surrounding water in the western United States, in the state of California, and most specifically on the Central Valley. The development of water resources and water policy *is* the history of the development of the western United States and

agriculture here in the valley. Understanding its origins, the choices made in the past by policy makers, and the consequences of those choices, are essential for understanding the very serious problems surrounding water that exist today right here in (literally) our own back yards.

We will start this course by tracing the history of the development of water use infrastructure in the western United States and in California along with the simultaneous development of water law. We will then spend the second half of the course learning more about the major contentious issues in water policy that are playing enormous roles today in San Joaquin Valley and that could determine the future of our agricultural economy and the viability of our environment. As part of this we will most likely have the opportunity to hear directly from some of the people involved in water policy on a day to day basis. We will also read through some of the law and court decisions that are having such a tremendous impact on water policy now and will almost certainly do so for many years to come.

Course Operations, Policies, and Expectations: This course is entirely on-line. All on-line course material will be made available at the beginning of the appropriate week as indicated on the course calendar later in this syllabus. At the end of the week it will all be removed so make sure you read it during the week. Students are responsible for watching the on-line class and reading the posted material for that week during that week, just as they would do if they were in a physical classroom.

Specifically, every week there will be a pre-recorded on-line lecture from me, broken up into a series of three or four modules, as well as assigned readings (see the course calendar for specific readings).

All questions and comments will be done in a public forum where all students can see them as well as my responses. On Friday of every week there will be a short quiz conducted through Blackboard regarding that week's readings. The quiz will be available the entire day, but once you start the quiz you will only have ten minutes to complete it. All students are required to take it without exception.

Course Prerequisites: The PSM in Water Resource Management is a lock-step program therefore students must have completed the previous PSM in Water Resource Management classes to this point. In terms of other courses there are none, although it would be helpful to have had courses on American government, the history of the United States as well as California history. A writing course would also be very helpful.

Course Readings: There is one book for this course that you must purchase:

The Great Thirst: Californians and Water – A History by Norris Hundley Jr., University of California Press, 2001.

The other assigned readings will be provided by me. Students will need to have basic software such as Acrobat Reader, Java, Power Point Viewer, and functioning audio software. They must also have regular access to the internet.

Study Expectations: It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3-unit graduate level course, you should expect to study an average of 6 hours outside of class each week. Some students may need more outside study time and some less.

Course Learning Outcomes: Students in this course will:

- Research trends in water availability from rivers, reservoirs, and the Sierra snowpack using government websites;
- Analyze different political arguments regarding the prioritization of water usage and annual allotments for municipal use, agriculture, and environmental protection;
- Discuss and debate the various justifications behind the creation of U.S. and California water policy;
- Understand and analyze changes in social expectations regarding water use, namely the social shift from resource extraction to resource preservation;
- Explore and debate the future consequences of increased water usage in the context of environmental degradation and climate change.

Course Grading: There are a total of 100 points for this course, and your grade will come from two exams, a mid-term and a final, as well as a short paper. Both exams will be a combination of multiple-choice and essay and each is worth 35 points, or 35% of your grade. The paper will be worth the remaining 30 points, or 30% of your grade, and will be explained in a separate document.

Exam #1 (Mid-term)	35%
Exam #2 (Final)	35%
Paper	30%
	100%

It is YOUR responsibility to take each exam at its scheduled time. There is no excuse for not taking an exam at the scheduled time without an exceptionally good reason and make-up exams will only be approved at my discretion. Do not schedule vacations that conflict with the exam days and times unless you are prepared to take a "0" for the exam, which would also mean failing the course. No exemption will be given if you do not notify me TWO HOURS in advance of the exam time.

The grading scale is traditional. If your final course grade is between 90 and 100 points, then you will receive an A. If it is between 80 and 89 you will receive a B, and so forth. I do not curve grades.

Student Behavior: Classes, even on-line classes, are for learning, not for discussing personal issues. When you speak, including placing comments on a discussion board, it should be to myself and the entire class and be related to the discussion at hand. Students must do all of their own work. Repeated violations will result in your expulsion from the course. For more information please refer to the university policy on disruptive classroom behavior.

Academic Honesty, Cheating, and Plagiarism: Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page: www.csufresno.edu/library/about/policies/docs/copyrtpolicyfull.pdf
TILT course websites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Any student caught cheating or engaging in plagiarism will fail the entire course.

Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Computers: At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources.

Course Calendar:

(This syllabus and schedule are subject to change in the event of extenuating circumstances. If you miss class, it is YOUR responsibility to know all announcements made and all material covered while you were absent).On-line Lectures are to be viewed AFTER reading the assigned materials and everything should be completed by Thursday of that week

Week	Lecture Topic	Readings
One	Terminology and the Structure of the Western Waterscape	1. Glossary and basic information on the problems of American water policy
Two	Reclamation Law of 1902 and the Development of the American West	1. *Cadillac Desert* by Marc Reisner, pages 1 – 14 2. *Command of the Waters* by Daniel McCool Ch. 2, pages 14 – 33 3. *Great Thirst*, pages 113 – 120
Three	Western Water Law: Prior Appropriation and Riparian Rights	1. *Great Thirst*: pages 65 – 75 & 85 – 99 2. *Layperson's Guide to Water Rights Law*, pages 4 – 8
Four	Early Water Issues in California: Los Angeles and the Owens River; San Francisco and Hetch Hetchy Valley	1. *Cadillac Desert*, pages 57 – 84 2. *Great Thirst*, pages, 171 – 186
Five	The Colorado River Compact and water / irrigation districts	1. *Great Thirst*, pages 203 – 226 & 304 – 308 2. *Dead Pool* by James Powell, Chapter 18 *3.* "Irrigation Districts in a Changing

		West" by John D. Leshy, *Arizona State* 4. *Law Journal* 1982, pages 345 – 364
Six	Development of Water in California and the Central Valley Project	1. *Great Thirst,* pages 99 – 103 & 234 – 276 2. *Layperson's Guide to the Central Valley Project*
Seven	The State Water Project	1. *Great Thirst*, pages 276 – 302 2. *Layperson's Guide to the State Water Project*
Eight	Mid-Term Exam and Catch-up	None
Nine	Westside Water Irrigation and the Reclamation Act of 1982	1. Skim information at www.westlandswater.org 2. *B.F. Sisk: A Congressional Record* by U.S. Representative Bernie Sisk, pages 65 – 102 3. "Reaping Riches in a Wretched Region: Subsidized Industrial Farming And its Links to Perpetual Poverty" by Lloyd Carter *Golden State* *4. University Environmental Law Journal Great Thirst,* pages 461-466
Ten	The Clean Water Act and the Endangered Species Act 1. *Great Thirst*, pages 308 – 334	1. *Great Thirst*, pages 308-334
Eleven	Eastside Irrigation Issues (development, current contracting issues, and the restoration of the San Joaquin River)	1. *Great Thirst*, pages 501 – 511 & 515 – 527 2. CRS Report to Congress on the River Restoration, pgs CRS-1 to CRS-17 3. Please also skim through www.fwua.org
Twelve	Mono Lake and the Public Trust Doctrine	1. *Great Thirst,* pages 336 – 346 2. Excerpts from *National Audubon Society v. Superior Court* (1983), pages 1 – 11 (from my copy)
Thirteen	Sacramento – San Joaquin Delta Controversies and Peripheral Canal Proposals	1. *Natural Resources Defense Council v. Kempthorne et al.* 2007, pgs 1-15 2. *Comparing Futures for the Sacramento* – San Joaquin Delta, Chapters Two and

		Four and pgs. 94 to 96 of Chapter 6
Fourteen	Groundwater and the Problems of Government Regulation in California	1. *Great Thirst,* pages 534-538 2. *Water Follies* by Robert Glennon, Chapters 2 and 3 3. Rousey, Gail. 2006. "Groundwater: Uniform Control of a Critical and Limited Resource" *San Joaquin Agricultural Law Review*, 169 – 179
Fifteen	The Winters Doctrine and the Politics of Indian Water	1. *Command of the Waters*, pages 36 – 56 *2.* Jenkins, Matt. 2008. "Seeking the Water Jackpot." *High Country News*
	Final Exam: TBA	

EES 269

Environmental Impact Assessment: Politics and Science

Catalogue Description:

EES 269 Environmental Policy for Water Management (3 units)
This course provides an overview of environmental law and policy including environmental impact assessment. Students prepare decision-making documents under the auspices of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) for water specific projects.

Introduction and Course Description

EES 269, Environmental Policy for Water Management, is a three-credit course that meets entirely online. This course provides an overview of environmental law and policy, and then introduces students to the practice of environmental impact assessment. Students will learn the details of preparing decision-making documents under the auspices of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Water projects are emphasized, and the application of Geographic Information Systems (GIS) tools for environmental impact assessment is highlighted wherever appropriate. As such, this course complements the other courses in the Professional Science for Master's (PSM) Water Resources degree program offered at the California State University Fresno.

The development and sustainable management of water resources for the San Joaquin Valley will require extensive public funding at the federal and state levels. As such, development of water resource management projects will thus come under the purview of NEPA and CEQA. Failure to address NEPA and/or CEQA properly can lead to substantial delays in project delivery, and can also increase project costs. Managers and supervisors responsible for delivery of water resource projects will thus benefit from a detailed knowledge of the NEPA and CEQA processes, whether they hire consultants to prepare NEPA/CEQA documents or if they have staff in their own agency prepare the documents. Other environmental laws important to the NEPA and CEQA processes will be highlighted where appropriate.

The course is organized to first engage students in some exercises designed to acquaint them with impact assessment and water, then to help them learn about the basics of environmental law, the history and legislative intent of NEPA and CEQA, and other relevant topics such as information literacy, field visits and data gathering, etc. This is an intensive writing course; students will write and review sections of NEPA and CEQA documents. Students will also peer review each other's work in writing sections of NEPA and CEQA documents. Students will thus be challenged more as their understanding of the course content develops and matures throughout the semester.
The instructional philosophy behind the course is to use many different types of learning, as is practicable with an all-online course, to facilitate student understanding and retention of course

content. Students will be using discussion boards, journal entries, group exercises, and role playing to explore the subject matter content. Assessment will be done through a mixture of exams, quizzes, graded discussion boards, and graded writing assignments.

Because this course is conducted entirely online, it is essential that students master Blackboard 9.1 and related tools (e.g., Elluminate) before beginning the course, and that they thoroughly understand the course syllabus. Students are required to take the Fresno State Blackboard 9.1 orientation and receive a certificate of completion before they can continue with course content for the semester.

ENVIRONMENTAL IMPACT ASSESSMENT: POLICY AND SCIENCE (EES269)

Fall 2012 California State University, Fresno

Course Information: EES 269 Environmental Policy for Water Management
Units: 3
Time: This course will be taught entirely online.
Location: This course is taught entirely online.
Website: To access the course on Blackboard login to http://blackboard.csufresno.edu using your Fresno State username and password. For help with Blackboard contact Technology Innovations for Learning and Teaching at 278-7373 or send an email to dcfeedback@csufresno.edu.

Instructor Name: Donald B. Hunsaker, Jr., D.Env.

E-Mail: dhunsaker@csufresno.edu
I respond to emails usually within 24 hrs
Telephone: (559) 278-1078

Office Hours: Online office hours will be held using Elluminate during established times when the instructor is available. The office hours will be established at the beginning of each semester. Online students may also telephone the instructor during these times and/or at other times pre-arranged with the instructor.

Prerequisites:

No specific prerequisites exist for this course, but the taking of this course is dependent upon the student taking other courses in the PSM Water Resources program in the sequence described the program.

Required Textbooks and Materials:

NEPA and Environmental Planning, Charles H. Eccleston, CRC Press, 2009. Students will also need current versions of MS Word, MS PowerPoint, Adobe Acrobat, and an internet browser.

Course Organization:

This course is organized into modules and students will proceed through the modules sequentially. In general, each module takes one week to complete. Modules are posted under

Course Documents on Blackboard. Each module contains reading assignments, a reminder to take the Blackboard Quiz if appropriate, and research and writing tasks. Students should proceed through the course sequentially because later chapters build on material presented in earlier chapters. Quizzes and PowerPoint lectures are also posted in their respective folders under Course Documents on Blackboard.

Homework assignments will be submitted in the "Assignments" folder under "Course Documents." Journal entries will be used primarily for recording student thoughts after reviewing the PowerPoint lecture or other materials in each module. Some modules will use class discussion, which is done in the Discussion Board under Course documents. Entries in the Discussion Board are viewable by all, so this is where the "netiquette" practices described in your orientation as well as below are important.
For any given assignment, students will name the file uploaded to the assignment folder as follows: MODULEX_AssignmentTitle_LastName, where *X* is the module number, *AssignmentTitle* gives the title of the assignment (e.g., Homework 1, Worldview, GREENR1, etc.), and *LastName* is the student's last name. Files should be in Adobe (.pdf) format, but MS Word format (.docx or .doc) is also acceptable. Current versions of MS Word allow saving of files in .pdf format (using the "save as" command).

Examinations and Major Assignments:

The midterm and final exams will be a combination of true/false, multiple choice, and short essay questions. The instructor will post study guides for the midterm and final exams. The midterm exam will cover a defined portion of the course material, and the final will be comprehensive. The midterm and final exams will be given at the Fresno State Testing Center (http://www.csufresno.edu/testing/testcenter) . Students should bring a Scantron 886-E for taking the midterm and the final exams. Make-up tests will be granted at the discretion of the instructor and only with prior arrangement or in the event of a documented, excused absence (e.g., hospitalization, death in the immediate family, etc.).

The Blackboard quizzes are designed to enhance student familiarity with the materials in the textbook. The instructor will give fifteen quizzes on Blackboard and will use the top twelve quiz scores in computing the final grade. Each quiz will be worth 10 points. After taking a quiz, students will be able to view their scores and will be able to see which questions were answered incorrectly. After consulting the textbook to find the correct answers for the questions marked incorrect, students will be able to retake the quiz once during the week to improve their scores. Students will be allowed two attempts to take each quiz, with 30 minutes per attempt. The instructor will make each quiz available from 12:30 am on the Monday of the week it is shown through 11:30 pm on the Friday of the same week. Failure to complete a given quiz in the allotted time frame will result in a score of zero for that quiz. No make-up quizzes will be given. It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3-unit class, you should expect to study an average of 6 hours outside of class each week. Some students may need more outside study time and some less.

For free tutoring on campus, contact the Learning Center in the Collection Level (basement level) of the Henry Madden Library. You can reach them by phone at 278-3052 or visit www.csufresno.edu/learningcenter .

Students will need to complete four homework assignments worth 25 points each on assigned topics. These will entail writing about 300 words for each of the topics.
Students will be assigned into one of three standing groups for the first major group project of the course: Purpose and Need Group (PANG), Affected Environment Group (AEG), and Environmental Impact Group (EIG). In each of these groups, students will write the section(s) of a NEPA document for a water related project that was built before NEPA and CEQA were passed. Students may use current scientific information on the impacts of the project, but the project description is as built. They can only use information in a predictive capacity and can't use descriptions of impacts that were not reasonably foreseeable but that actually did occur. They will revisit the decision to build the project. The three groups will work together to ensure integration of their respective sections.

The second major group project is to prepare a NEPA document on a major water-related project that has been discussed but not yet built. Students will rotate into another of the above three groups to gain experience in preparing different sections of the documents. At the conclusion of the process students will reach a consensus decision on building and operating the project and will give the basis for that decision.

Participation Standards:

Each module is open from midnight of the Sunday for the week it is listed through 11:59 pm of the Saturday of the week for which it is listed. Students must complete weekly assignments as given on Blackboard and deliver the work products to the instructor by the due date shown in each of the course modules (see Course Organization and Assignments as described above). Participation is worth 100 points, and points will be assigned based on Blackboard access statistics, student peer review of student participation in groups, and completion of journal exercises and homework and writing assignments on time. Most Discussion Board assignments will require posting at least one original thread and responding to at least two others. Each module requires posting a summary of the PowerPoint course content for that module in the student's journal.

Grading:

PowerPoint lectures are available from the time of original posting until the end of the semester. Students not participating in a given module are responsible for finding out what transpired for that module.

The student has the responsibility to check announcements posted on Blackboard. If students miss a week of class they also should check with classmates to be up to date with course requirements.

The point value of each of the grading elements, and the grading scale, are as follows:

Midterm Exam =	100 points	*Final Grading Scale*
Blackboard Quizzes =	120 points	**A** = 910 to 1000 points
Final Exam=	100 points	**B** = 810 to 909 points

Final EIS Section=	300 points	**C** = 710 to 809 points
Group Assignment	180 points	**D** = 610 to 709 points
Homework Assignments		**F** = 609 and below
4 @ 25 points each	100 points	
Participation/discussion	100 points	
Total =	**1000 points**	

Course Goals and Primary Learning Outcomes

Course Goals: The overall course goals are to give the successful student the ability to efficiently move a water resource project through the environmental review process as described by NEPA and CEQA and related laws. Students will be familiar enough with the NEPA and CEQA processes to be able to locate, summarize, and understand applicable implementing regulations and policies for various agencies involved in water resource management. This will be achieved through the following learning outcomes:

Primary Learning Outcomes:

1. Describe the history and legislative intent of NEPA and CEQA
2. List and describe the types of environmental review documents prepared under each of NEPA and CEQA
3. Compare levels of environmental review under NEPA and CEQA
4. Formulate a project management plan, including schedule, for different types of NEPA and CEQA documents
5. Describe the major steps in the NEPA and CEQA processes
6. Describe other environmental laws most applicable to the NEPA and CEQA processes
7. Distinguish between good and bad writing for NEPA and CEQA documents

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

Course Policies & Safety Issues

All online communications for this course will reflect netiquette, especially those that are viewable by all course participants (e.g., Discussion Boards). In addition, the university policy on disruptive behavior also applies, even though this class does not meet in person in a physical classroom.

Plagiarism Detection. The campus utilizes the SafeAssign plagiarism prevention service through Blackboard. In this course, students will be required to submit major written

assignments to SafeAssign. Submitted work will be used by SafeAssign for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the SafeAssign process, in which case the instructor can use other electronic means to verify the originality of their work. SafeAssign Similarity Reports (that give a numeric rating of the percent of a student's paper that is similar to other published work) will be available for student viewing. The instructor will set up draft SafeAssign assignments so that students can obtain feedback on the originality of their writing prior to formally submitting assignments for grading.

University Policies

Students must be familiar with university policies on students with disabilities, honor code, cheating and plagiarism, use of computers, disruptive classroom behavior, and copyright.

Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)

b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.

c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Cheating and Plagiarism: "Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations). As described above, this course will use SafeAssign for analysis of the original content of all major writing assignments.

Computers: "At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience.

Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior: "The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page:
http://www.csufresno.edu/library/about/policies/docs/copyrtpolicyfull.pdf
TILT course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.
Students can also refer to the Required Syllabus Policy Statement at
http://www.csufresno.edu/academics/policies_forms/instruction/syllabus.shtml

Tentative Course Schedule

The schedule and procedures for this course are subject to change in the event of extenuating circumstances."

Tentative Course Schedule—EES 269
Fall 2012
Weekly Online Modules

	Start Date/End Date	Topic	Assignments, Activities, Readings, Quizzes, Optional Resources
Module 1	Mon. Aug. 20	First Day of Instruction—Bb Orientation	Complete Blackboard Orientation and upload certificate; Bb Quiz 1; Water Footprint Homework Assignment
Module 2	Mon., Aug. 27	Introduction to Impact assessment	Bb Quiz 2. Short Shower Impact Assessment Homework Assignment
Module 3	Mon., Sep. 3	LABOR DAY Sep. 3 Introduction to environmental law	Bb Quiz 3
Module 4	Mon., Sep. 10	Principles of NEPA	Bb Quiz 4.
Module 5	Mon., Sep. 17	Principles of CEQA	Bb Quiz 5. Comparison of NEPA/CEQA Homework Assignment
Module 6	Mon., Sep. 24	Levels of NEPA and CEQA review and documentation	Bb Quiz 6. Comparison of Levels of Review Homework Assignment
Module 7	Mon., Oct. 1	Scope of analyses and types of impacts	Bb Quiz 7.
Module 8	Mon., Oct. 8	Data sources and information literacy	Bb Quiz 8 Midterm Exam
Module 9	Mon., Oct. 15	Field work, site visits, sampling, chain of custody	Bb Quiz 9 Group Project 1: NEPA Document on Past Project
Module 10	Mon., Oct. 22	Public involvement	Bb Quiz 10
Module 11	Mon., Oct. 29	Integrating other laws	Bb Quiz 11
Module 12	Mon., Nov. 5	Managing the environmental process	Bb Quiz 12
Module 13	Mon., Nov. 12	VETERAN'S Day Nov. 13 Scheduling and budgeting	Bb Quiz 13
Module 14	Mon. Nov. 19	THANKSGIVING HOLIDAY Nov 22-23; International NEPA	
Module 15	Mon. Nov. 26	Emerging trends and challenges	Bb Quiz 14
Module 16	Mon., Dec. 3	Summary and critique of class project	Bb Quiz 15 Group Project 2: NEPA Document on Future Project
Module 17	Mon., Dec. 10	LAST DAY OF INSTRUCTION – Dec 12 Review for Final Exam	

Final Exam Preparation & Faculty Consultation Days:	Thursday and Friday	Dec 13 - 14
Final Semester Examinations	Monday-Thursday	Dec 17 - 20
Final Exam in this course – Students will be taking the final Exam in the Testing Center.		

SYLLABUS FOR EES 270: WATER ECONOMICS

Fall 2013	**California State University, Fresno**
Course Information	**Instructor Name:** Dr. Sean Alley
Units: 3	Office Number: **Peters Business Building Room 319**
Time This is a fully online course.	**E-Mail** ralley@csufresno.edu I will respond to each e-mail message within 24 hours. Students are expected to regularly access their Fresno State email account as this is the account used for official university correspondence and Blackboard communications.
Location This is a fully online course.	**Telephone** (559) 278-4931
Website To access the course login to Blackboard (http://blackboard.csufresno.edu) using your Fresno State username and password. For help with Blackboard contact Technology Innovations for Learning and Teaching at 278-7373 or send an email to tiltsupport@csufresno.edu**.**	Virtual Office Hours: **On Tuesday of every week at 4:00pm for one hour I will be available for an on-line chat with all students having questions through the Eluminate program on Blackboard. I will respond to each e-mail message within twenty-four hours.**

Catalog Description;

EES 270 Water Economics (3 units)
This course will analyze water availability in light of water resource economics. Analytical tools will be used for policy and project assessment. Access points will be established for key material, providing for problem comprehension and the initiation of contemporary solutions.

Course Description

Scarcity of fresh water is a common situation in California and much of the rest of the world. With population growth, its importance is steadily rising. This course will provide a working knowledge of water resource economics for future water managers and planners as well as for students wishing to improve their comprehension of these problems. Analytical tools for performing policy and project assessment will be examined and policy

options critically assessed. The course is designed to are to establish points of access to key material, so that students have a basis for comprehending problems, initiating contemporary solutions, and interacting with other professionals in water management positions.

Prerequisites

The PSM in Water Resource Management is a lock-step program therefore students must have completed the previous PSM in Water Resource Management classes to this point. In terms of other courses there are none, although it would be helpful to have had some exposure to microeconomics, at least at the principles level.

Required Textbooks and Materials

TEXTBOOK: W. Douglass Shaw, Water Resource Economics & Policy, Edward Elgar Publishing, 2006, ISBN (paperback) 9781847202253.

RECOMMENDED TEXTBOOK: Cowen & Tabarrok's Modern Principles: Microeconomics (or some other microeconomics text). In class, I will refer to the e-text, which is the same as their printed book, but is available only online at http://bcs.worthpublishers.com/cowentabarrokmicro/default.asp#t_542060. If you prefer to buy a printed copy, it is printed by Worth Publishers and can be ordered online. You may not need this book, but it is a good reference regarding basic principles of economics that you will need a working knowledge of, such as supply and demand diagrams.

This course will feature readings from Shaw and also from other sources. The other readings will be distributed electronically via Blackboard. The list of readings may be updated throughout the semester depending on current events, so students must check the website regularly and keep up with the readings.Textbook, handouts, additional materials, course fees (if any), etc.

We will communicate via e-mail. You need to have access to e-mail and Blackboard. Also, you will need access to word processing software (such as MS Word) and be proficient enough with it to draw diagrams or insert diagrams you have draw in another program.

Course Organization

This course is entirely on-line but is designed to simulate the classroom experience. All on-line course material will be made available at the beginning of the appropriate week as indicated on the course calendar later in this syllabus. At the end of the week it will all be removed so make sure you read/watch it during the week. Students are responsible for watching the on-line lecture and reading the posted material for that week during that week, just as they would do if they were in a physical classroom.

Each week there will be a pre-recorded on-line lecture from me, as well as assigned readings (see the course calendar for specific readings).

All questions and comments will be done in a public forum where all students can see them as well as my responses.

Examinations, Major Assignments & Grading

A) EXAMS: Two exams will be given, a midterm and a final. Each will count 25% of your grade. Unless a truly extraordinary situation occurs, there will be no make-ups given, for any excuse. Do not schedule vacations that conflict with the exam days and times unless you are prepared to take a "0" for the exam, which would also mean failing the course.

The format of the exams will be essay and problem based. Approximately a week prior to each exam, an extensive study question guide will be available from which questions and problems will be extracted to use on the mid-term and final exams.

The final exam is not cumulative.

B) PROBLEM SETS: Four problem sets will be assigned during the class. Students will have one week to complete each one and submit answers electronically. Each will count 10% of the final grade. The problem sets will be difficult, but are intended to be good preparation for the exams

Unless a truly extraordinary situation occurs, there will be no make-ups given, for any excuse.

C) ATTENDANCE: The remaining 10% will be for attendance and participation. Each lecture must be watched and each reading assignment must be read during the week it is available. Viewings of course material will be tracked a portion of a letter grade will be deducted from attendance for each set of readings/lecture missed.

Grade distributions:

A	90%-100%
B	80%-89%
C	70%-79%
D	60%-69%
F	< 60%

Study Expectations. Consider using the following statement:

It is usually expected that students will spend approximately 2 hours of study time outside of class for every one hour in class. Since this is a 3-unit graduate level course, you should expect to study an average of 6 hours outside of class each week. Some students may need more outside study time and some less.

Course Goals and Primary Learning Outcomes

Course Goals:

By the end of the course, students should be able to understand:

1. The terminology, concepts and basic economic models used to study the economics of water issues
2. Trends in water availability from rivers, aquifers and snowpack
3. Assessments of political arguments related to water use prioritization among agriculture, municipal, residential and environmental uses

4. The debate about the consequences of increased water usage in the context of resource extraction versus preservation, environmental degradation and climate change

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

Assignment and Examination Schedule

Week	Topic	Reading Assignment
1	Intro to Water, Economics and Law	Shaw, ch. 1
2	Review of Basic Microeconomics Applied to Water Resources	Shaw, ch. 2
3	Review of Basic Microeconomics Applied to Water Resources	Shaw, ch. 2
4	Water Quality Issues	Shaw, ch. 3
5	Residential Water Pricing	Shaw, ch. 4
6	Agriculture and Water	Shaw, ch. 5
7	Agriculture and Water	Shaw, ch. 5
8	**Midterm Exam and Review**	**None**
9	Uncertainty and Risk	Shaw, ch. 6
10	Uncertainty and Risk	Shaw, ch. 6
11	Groundwater	Shaw, ch. 7
12	In Situ Uses (Environment and Recreation)	Shaw, ch. 8
13	In Situ Uses (Environment and Recreation)	Shaw, ch. 8
14	Floods, Droughts and Dams	Shaw, ch. 9
15	Floods, Droughts and Dams	Shaw, ch. 9
16	International Water Issues	Shaw, ch. 10
	Final Exam	

Course Policies & Safety Issues

Course Assignments and Files. Students must keep a copy of their submitted materials (e.g. emails, discussion postings, assignments, etc.) as part of their coursework. Students are fully responsible for the timely re-submission of their work upon the instructor's request.

Classroom Rules:

1. No cheating
2. Be respectful of the instructor, your fellow students and the material.

Plagiarism Detection:

The campus subscribes to the SafeAssign.com plagiarism prevention service through Blackboard, and you will need to submit written assignments to SafeAssign.com. Your work will be used by SafeAssign.com for plagiarism detection and for no other purpose. The student may

indicate in writing to the instructor that he/she refuses to participate in the SafeAssign.com process, in which case the instructor can use other electronic means to verify the originality of their work. SafeAssign.com Originality Reports **WILL be available for your viewing.**

University Policies

Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code:

"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

j) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)

k) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.

l) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers:

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and

recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright Policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its Copyright Web Page (http://csufresno.edu/library/information/copyright/).

Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

EES 263 – PSM Degree in Water Resource Management Internship (3 units)

Online Course for
Professional Master of Science in Water Resource Management

Department of Earth and Environmental Sciences
College of Science and Mathematics, California State University, Fresno
(offered through Division of Continuing and Global Education)

Semester: Spring 2013 **Units:** 6 (Asynchronous Online, equivalent to 5 hours per week) **Website:** To access the course, login to Blackboard (http://blackboard.csufresno.edu) using your Fresno State "username" and "password". For Blackboard help; Contact Technology Innovations for Learning and Teaching (TILT) at 278-7373 or send an email to tiltsupport@csufresno.edu.	**Instructor:** Dr. Peter K. Van de Water **Office phone:** (559)278-2912; **Department Office**: 1(559)278-3086 **E-Mail:** pvandewater@csufresno.edu **Online Office Hours**: MW 3-5 pm **Office Location**: Fresno State University, Science II, Room 124 **E-Mail Rules:** E-mail is the best way to contact the instructor. When writing an E-mail to the instructor, be sure to write "***EES298-YourLastName-Initial***"

Catalogue Description;

Course is taken with permission from the internship coordinator and program director. The internship requires at least 150 hours of work at prequalified, academically related site. Final report and presentation required. Report and presentation judged and graded by the faculty.

Basic Information

This is a 3-unit course to be taken with the permission of the internship coordinator and the graduate program director. The course requires at least 150 hours of work at a prequalified, academically related work site. Final report and presentations of findings are required. Only a single internship may count toward the PSM in Water Resource Management requirements. The course materials are available through Blackboard (login using your CSUF e-mail passwords). Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, email or telephone the instructor.

Response Times: The instructor will check and respond to email and the discussion board at least 4 days a week. The culminating document and materials will be graded and posted as a requirement for the awarding of the PSM in Water Resource Management..

Course Description

The Water Resource Management Internship occurs during the progression of the PSM in Water Resource Management program. Students will take this class to get "real world" experience working on Water Management Projects within a work environment. An internship is a form of instruction and learning at off-campus sites that are often sponsored by business/organizational entities. The students will be required to attend discussion sessions on blackboard at regular intervals during the internship. The final report and presentation are expected to reflect the breadth, knowledge and skills obtained during the program. In addition the final product is expected to be of such quality that the student can use it as a showcase of their acquired skill set. The course is Asynchronous online.

Catalogue Description

Course is taken with permission from the internship coordinator and program director. The internship requires at least 150 hours of work at prequalified, academically related site. Final report and presentation required. Report and presentation judged and graded by the faculty.

Course Goals and Contents

The goal of the course is to apply the knowledge and skills from the "PSM in Water Resource Management" classes to the "work" environment. Through the experience a final paper and presentation will be created that reflects a fundamental understanding of the application of elements presented in the course work along with additional skills from the work environment.

Student Learning Outcomes

Upon completion of this course the students will provide a written report. The report will detail the internship experience. In addition, the student is expected to construct a professional presentation about the experience as well as present the work that was done during their internship. A summary report will be produced along with the presentation (see *Internship* description below for details). Each of the internship students will;

- Work within a professional work environment including both understanding and complying with professional expectations for dress, conduct, and communication.
- Apply academic concepts and skills in a directed work setting including the integration of appropriate quality assurance and quality control practices.
- Students will present themselves in a professional manner that includes the work environment as well as a professional level of communication during the internship experience.
- The student will become acquainted with the professional work environment and the expectations of a professional employee.
- Learn to communicate with their direct supervisor, take instructions, complete tasks and be involved with "Quality Assurance" and "Quality Control" procedures defined by each project.
- Demonstrate an ability to function effectively as a working group member in an industrial setting.
- Create a written document that summarizes the internship experience including the results of the internship project.

- Summarize important differences between academic and industrial work environments.
- Apply professional standards to the final written product in terms of organization and presentation, then, ensure that all external sources are cited correctly and that the citation format is used correctly throughout.
- Give a 10 to 15 minute presentation on your final product to other students within your cohort.

Prerequisites

EES 263 is one of the culminating classes in the Professional Science Master's degree in Water Resources Management. The class requires at least 150 hours of work at a prequalified, academically related work site. As one of the culminating experience, all classes within the curriculum, except EES 298, should be completed by the time the student finishes EES 263. The student must enroll in EES 263 to receive credit for the internship. It is expected that the student bring with them to the internship a body of knowledge gained from the classwork. They include the following; EES 211 (Fundamentals of GIS), EES 264 (Climatology), EES 265 (Hydrology), EES 270 (Water Economics), EES 266 (Agricultural and Natural Water Use), EES 267 (Urban and Industrial Water Use), EES 268 (Water and Politics), and EES 269 (Environmental Impact Assessment: Policy and Science).

Students should submit a resume to the Associate Program Coordinator and schedule an appointment with them to discuss the internship upon entering the class. Most internship opportunities will require site specific applications and interviews. Early in the process of finding an internship, students must obtain approval for a specific internship site with a Program Director. Send the industry name, contact person for the internship, address, phone number and information about the site to the Program Director by email. Letters of Agreement and Internship Code of Conduct Forms must be completed. Checklists for Graduate Students and Industry Sponsors regarding Internships must be completed. The Coordinator of the PSM program will assist students with these forms and the evaluation processes. Familiarize yourself with university policies regarding off site employment and learning experiences. CSU Fresno is committed to providing a learning environment free of harassment, discrimination, and sexual harassment extending to all remote learning sites.

Internship

During the internship Students maintain a log of hours worked that is signed by your work station supervisor at the completion of the internship. A log form will be provided to students upon registration in EES 263. Mid semester, representatives from the program will contact the student and the supervisor to check on work progress. It is imperative that each student contacts the program coordinator to let us know how you are doing once you have completed half of the internship. Do not wait until you have completed the course before discussing any concerns or problems. Ask your site supervisor to fill out the employer evaluation prior to your exit interview. The evaluation form will be provided to you upon registration and must be turned in at the Exit Interview. At the end of the internship, a student's site supervisor needs to complete an evaluation form for the program. This evaluation form is to evaluate the students work performance during the internship. It is also used to help determine a grade for EES 263.
An Oral presentation by each student is required near the end of the internship. The presentations will be organized around cohorts of students who are finishing the classes at about

the same time. Details about the requirements for the presentation are provided below. For other questions, please contact the PSM in WRM coordinator. Students are required to complete a written report about their internship to complete the course. This report is turned into the Program Director within 30 days after the internship finishes. Students are also responsible for ensuring that the presentations and the report do not violate any confidentiality agreements.

Students enrolled in the PSM in Water Resource Management that have participated in their work internship will present a formal presentation online to the other participating students during the current semester. The presentation is required to satisfy the requirements for EES 263. Students will have a maximum 20 minutes for their presentation. We recommend students prepare to present for 15 minutes and leave at least 5 minutes for questions or interaction with the audience. Presentations may be structured in any form that the student feels is most interesting and informative. In addition each student will provide the program director with paper copies of the slides prior to the presentation.

The presentation will be judged on the following criteria;

- Clarity and articulation: the graduate presenter is clear, concise and articulate while delivering the information.
- Exhibiting comfort and relaxation: The graduate presenter exhibits a great deal of comfort and is relaxed in providing the information.
- Enthusiasm and passion toward the work completed: The graduate presenter exhibits enthusiasm and passion during the presentation toward the work completed.
- Inclusion of relevant introductory and background content: The graduate presentation provides a thorough introduction to the topic with sufficient background information so all attendees can clearly follow the subject matter.
- Connection of topic to Internship Work Experience: The graduate presentation provides a strong and direct connection from the internship work experience, to the exploration and findings relevant to the subject matter.

The culminating document will follow standard scientific writing protocols (i.e. fully cited with current up to date citation resources). In addition within the document, the student will prepare and present within the document maps, charts, diagrams, and/or photos that fulfill the "Good" category or higher on the rubric for "Evaluation of Final Project Elements". The overall document must achieve a rating of "Good" or "Excellent" on the rubric for the "Evaluation of the Final Project". This two tier system ensures that not only will the overall finished product will be good or excellent, but that all of the elements will also meet a high standard.

Textbooks

None Required:

Bases for Course Grade

The grading for the internship will be pass/fail with the successful candidate moving forward in the program. The final decision of the candidate's pass/fail grade will be made by the listed instructor with input from the other instructors within the PSM program. In addition, comments from the internship sponsor will be taken into account.

Online Discussion Attendance:

The instructor will post questions and seek progress reports from each of the candidates on the **"**Discussion Board" of Blackboard during the student's participation in the PSM in Water Resource Management. In addition, the "Discussion Board" will be used to ensure that students have an ongoing capacity to interact with each other during the program and especially during the culminating experience. Student input on the "discussion board" is required (beneficial to oneself and others) and will be tracked by the Course Statistics function.

Course Policies

Minimum requirement: The project report must be presented with acceptable professional standards, i.e. clear logical layouts, neat and legible (see specific rubrics for the document and document elements). Remember that this is your culminating project from the degree. The final project should be a document that you proudly show as a reflection of your hard work and capability.

Course Assignments and Files: Students must keep a copy of their submitted materials (e.g. emails, discussion postings, assignments, etc.) as part of their coursework. Students are fully responsible for the timely re-submission of their work upon the instructor's request.

University Policies

Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code:

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1. understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
2. neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
3. take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by

fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For further information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations)

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its Copyright Web Page (http://csufresno.edu/library/information/copyright/).
Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Rubric for "Evaluation of Final Internship Document"

Qualities & Criteria	Unacceptable (<69.9)	Good (70-89.9)	Excellent (90-100)
Format/Layout *(Weight 15%)*	Follows poorly the requirements related to length, format and layout.	Follows, for the most part, all the requirements related to length, format	Closely follows all the requirements related to length format and

Qualities & Criteria	Unacceptable (<69.9)	Good (70-89.9)	Excellent (90-100)
		and layout. Some requirements are not followed or poorly done.	layout.
Content/Calculation/Graphics *(Weight 50%)*	The document is not objective and poorly addresses issues referred to in the proposed topic. Calculations are not necessary or inaccurate. The maps, diagrams and charts are poorly organized and displayed. They lack basic information required on all documents (scale, north arrow, etc…)	The document is objective and for the most part addresses the topic with some depth analysis. Calculations are used properly and are accurate. The maps, diagrams and charts are well organized and displayed.	The document is objective and addresses the issues with in-depth analysis. Any calculations are accurate and well described including defining terms. The maps, diagrams and charts are well organized and displayed.
Quality of Writing *(Weight 20%)*	The document is not well written, and contains spelling or grammatical errors and/or poor use of English. The document is badly organized, lacks clarity and/or does not present ideas in a coherent way.	The document is well written without spelling errors and grammar mistakes are minimal. The essay is organized, clear and presents ideas in a coherent fashion.	The document is well written from start to finish, without spelling, grammar errors. The essay is well organized, clear and presents ideas in a coherent fashion.
References and use of references *(Weight 15%)*	Most of the references used are not important, and/or are not of good/scholarly quality. Scholarly resources are not used effectively in the text. References are not effectively used, and/or correctly cited and/or correctly listed in the reference list according to APA style.	Most of the references used are important, and are of good/scholarly quality. References are correctly cited and correctly listed in the reference list according to APA style.	All references are important, and are of good/scholarly quality. All references are effectively used, correctly cited and correctly listed in the reference list according to APA style.

Overriding criterion: Originality and authenticity. If the final project contains elements that are identified as not being original, and/or not done by the student, the instructor has the right to fail the student's final project.

Subject-to-Change Notice

This syllabus and schedule are subject to change depending on the course progress. The above schedule and procedures are subject to changes in the event of extenuating circumstances. If you are absent from

class, it is your responsibility to check on announcements made while you were absent. Any substantive changes to this syllabus will be accompanied by the distribution of a revised syllabus.

EES 298 – Water Resource Management Project (3 units)

Online Course for
Professional Master of Science in Water Management

Department of Earth and Environmental Sciences
College of Science and Mathematics, California State University, Fresno
(offered through Division of Continuing and Global Education)

Semester: Spring 2013 **Units:** 6 (Asynchronous Online, equivalent to 5 hours per week) **Website:** To access the course, login to Blackboard (http://blackboard.csufresno.edu) using your Fresno State "username" and "password". For Blackboard help; Contact Technology Innovations for Learning and Teaching (TILT) at 278-7373 or send an email to tiltsupport@csufresno.edu.	**Instructor:** Dr. Peter K. Van de Water **Office phone:** (559)278-2912; **Department Office**: 1(559)278-3086 **E-Mail:** pvandewater@csufresno.edu **Online Office Hours**: MW 3-5 pm **Office Location**: Fresno State University, Science II, Room 124 **E-Mail Rules:** E-mail is the best way to contact the instructor. When writing an E-mail to the instructor, be sure to write "***EES298-YourLastName-Initial***"

Catalogue Description;

EES 298 Water Resource Management Project 3 Units
Students receive data-sets and lists of deliverables and due dates . Student use course skills to analyze, synthesize, and produce professional quality documents and presentations within the time frame. A passing grade must be achieved for PSM in WRM completion.

Basic Information

This is a 3-unit online course to be taken as a culminating experience after having finished the class program in the Professional Science Master's Degree in Water Resource Management (PSM in WRM). The course materials are available through Blackboard (login using your CSUF e-mail passwords). Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, email or telephone the instructor.

Response Times: The instructor will check and respond to email and the discussion board at least 4 days a week. The culminating document and materials will be graded and posted as a requirement for the awarding of the PSM in Water Resource Management.

Course Description

The Water Resource Management Project is the culminating experience in the "Professional Science Master's in Water Resource Management" (PSM in WRM) degree program. Students will take the project class to produce a final project reflecting the breadth of knowledge and skills obtained during the program. For the final project, each student will be given a set of water data from a defined area, a list of deliverables and a due date. The student is expected to produce a professional report and presentation using the data and analysis from the techniques and skills acquired during the program. In addition the final product is expected to be of such quality that the student can use it as a showcase of their acquired skill set in a professional manner. The course is Asynchronous online.

Catalogue Description

Students receive data-sets and lists of deliverables and due dates . Student use course skills to analyze, synthesize, and produce professional quality documents and presentations within the time frame. A passing grade must be achieved for PSM in WRM completion.

Prerequisites

EES 298 is the culminating project for the Professional Science Master's degree in Water Resources Management. As the culminating experience, all classes within the curriculum should be completed by the time the student enters into EES 298. This includes the following sequence of classes; EES 211 (Fundamentals of GIS), EES 264 (Climatology), EES 265 (Hydrology), EES 270 (Water Economics), EES 266 (Agricultural and Natural Water Use), EES 267 (Urban and Industrial Water Use), EES 268 (Water and Politics), EES 269 (Environmental Impact Assessment: Policy and Science) and EES 263 (Water Resource Management Internship).

Course Goal and Contents

The goal of the course is to create a final product that reflects a fundamental understanding of elements from all of the course work completed during the Professional Science Master's degree in Water Resource Management. Each student will be given a set of water data from a defined area and be expected to produce a professional report and presentation from the data and any additional materials from class or from their own discovery. The students will participate in a discussion group during the class to have a forum to discuss difficulties as well as share different methods of analysis and interpretation. The summary product will include analysis of the data and the application of skill sets taken from the PSM water resource classes. It is expected that the student will be able to describe the source for all waters on land that includes its geospatial variability. In addition, the student will analyze and evaluate resource variability, especially temporal trends in the supply and use of water, along with fluctuations in the assessment of economic value that comes with this variability. The student is also expected to be able to integrate both a firm knowledge of the political history of water resources in their region along with pertinent regulatory issues at the state and federal levels.

Student Learning Outcomes

Upon completion of this course the students will provide a written report. The analysis and final report will the reflect the breadth of the PSM in Water Resource Management program. The student is expected to work through a set of assignments that will be provided by the faculty.

The assignments will reflect a set of problems in water resource management along with due dates for each part of the assignment. The student is expected to construct professional presentations and meet the deadlines. Each of the students will;

- Create a written document that summarizes the PSM in "Water Resource Management" experience including the results of the final project.
- Present work as if they are in a professional work environment demonstrating both an understanding and complying with professional expectations for data manipulation, analysis, and documentation.
- Show within the final project work, the integration of appropriate quality assurance and quality control practices.
- Present work that reflects the complexity of the issues on multiple levels.
- Communicate with their advisor directly to take instructions, complete tasks and be involved with "Quality Assurance" and "Quality Control" procedures.
- Apply professional standards to the final written product in terms of organization and presentation, then, ensure that all external sources are cited correctly and that the citation format is used correctly throughout.
- Be able to give a 10 to 15 minute presentation on the final product to other students within the PSM in "Water Resrource Management" cohort.

Textbooks

None Required:

Bases for Course Grade

The grading for the project will be pass/fail with the successful candidate awarded their Professional Science Master's degree in Water Resource Management upon successful completion. The final decision of the candidate's pass/fail will be made by the listed instructor with input from the other instructors within the PSM program.

Online Discussion Attendance:

The instructor will post questions and seek progress reports from each of the candidates on the **"**Discussion Board" in Blackboard. In addition, the "Discussion Board" will be used to ensure that students have an ongoing capacity to interact with each other during this culminating experience. Student input on the "discussion board" is required (beneficial to oneself and others) and will be tracked by the Course Statistics function.

Final Project:

The term project will be the culmination of the Professional Science Master's degree in Water Resource Management. The student carries forward from skill sets from each class represented by a portfolio of work that will be an integrated resource to create the final document. Each student will be given a set of water data from a defined area or region and be expected to produce a professional report and presentation from the data and any additional materials from class or from their own discovery. The students will participate in a discussion group during the class to have a forum to discuss difficulties as well as share methods of analysis and interpretation. The summary product will include analysis of the data and the application of skill sets taken from the PSM water resource classes. It is expected that the student will be able to

describe the source for waters that includes geospatial variability. In addition, the student will analyze and evaluate resource variability across the area and especially over time. Temporal trends in the supply and use of water, along with fluctuations in the assessment of economic value that comes with this variability will be addressed. The students are also expected to be able to integrate both a firm knowledge of the political history of water resources in their region along with pertinent regulatory issues at the state and federal levels.

It is expected that this document will contain a written summary that integrates the combined topics to be addressed. The culminating document will follow standard scientific writing protocols (i.e. fully cited with current up to date citation resources). In addition, within the document, the student is expected to prepare and present maps, charts, diagrams, and/or photos that meet the "Good" category or higher on the rubric for "Evaluation of Final Project Elements". The overall document must achieve a rating of "Good" or "Excellent" on the rubric for the "Evaluation of the Final Project". This two tier system ensures that not only will the overall finished product will be good or excellent, but that all of the elements will also meet a high standard.

EES 298: Water Resource Management Project Class

Week	Online Activities	Assignments and Activities
1	Course introduction, Blackboard: Scope and schedule of the final project	Data sets distributed and the goals of the final project discussed
2	Discussion board session #1	Questions about the Project
3	Discussion board session #2	Questions about Project Outline
4	Discussion board session #3	Questions about graphics
5	Discussion board session #4	Questions about tables
6	Discussion board session #5	Ongoing concerns and problems
7	Discussion board session #6	Schedule presentation of final product.
8-15	Online Presentations.	Online Presentations
16	Final Week to turn in Final Term Project	Term project Submited for grading

- Note that Discussion Board Session will be at least 6 weeks but may be extended if the students would like to continue deeper into the semester.
- Submission of the term-project after the 16th week can only occur with approval of the program coordinator and instructor.

Rubric for "Evaluation of Final Project Elements"

Category/Content	Poor 6-6.9pts	Fair 7-7.9 pts	Good 8-8.9pts	Excellent 9-10 pts
Discussion Has the analysis been written in detail with accuracy and insight?	The overall work shows limited detail, accuracy and insight.	A minority of the final product sections show some detail, accuracy and insight.	Most sections of the final product show considerable detail, accuracy and insight.	The final product shows a high degree of detail, accuracy and insight.
Maps; Organization Has the map been designed in an organized manner?	The organization of the map is displayed with limited effectiveness.	The organization of the map shows some effectiveness.	Map is displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization.
Maps; Technology Has the student exhibited an ability to use the software to achieve the desired results?	Exhibits no command of the software and is able to use it with limited effectiveness.	Exhibits satisfactory command of the software and is able to use it with some effectiveness.	Exhibits good command of the software and is able to use it effectively.	Exhibits a high degree of ability in the use of the software.
Maps; Application Does the layout contain all the necessary cartographic elements?	The layout is missing several elements. These may include a legend, compass, title etc.	The layout is missing one or two of the following: a legend, compass, title etc.	The layout is designed with effectiveness and includes necessary cartographic elements.	The layout contains all necessary elements and is designed with a high degree of effectiveness.
Diagram; Organization Has the diagram been designed in an organized manner?	The organization of the any diagram are displayed with limited effectiveness.	The organization of any diagrams show some effectiveness.	The diagrams are displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization of diagrams.
Tables; Organization Have tables been designed in an organized manner?	The organization of the tables are displayed with limited effectiveness.	The organization of the tables shows some effectiveness.	Tables are displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization of the tables.

Rubric for "Evaluation of Final Project"

Qualities & Criteria	Unacceptable (<69.9)	Good (70-89.9)	Excellent (90-100)
Format/Layout *(Weight 15%)*	Follows poorly the requirements related to format and layout.	Follows, for the most part, all the requirements related to format and layout. Some requirements are not followed or poorly done.	Closely follows all the requirements related to format and layout.
Content/Calculation/Graphics *(Weight 50%)*	The work is not objective and poorly addresses issues referred to in the proposed topic. Calculations are not necessary or inaccurate. The maps, diagrams and charts are poorly organized and displayed. They lack basic information required on all documents (scale, north arrow, etc…)	The essay is objective and for the most part addresses the topic with some depth analysis. Calculations are used properly and are accurate. The maps, diagrams and charts are well organized and displayed.	The essay is objective and addresses the issues with in-depth analysis. Any calculations are accurate and well described including defining terms. The maps, diagrams and charts are well organized and displayed.
Quality of Writing *(Weight 20%)*	The essay is not well written, and contains spelling or grammatical errors and/or poor use of English. The essay is badly organized, lacks clarity and/or does not present ideas in a coherent way.	The essay is well written without spelling errors and grammar mistakes are minimal. The essay is organized, clear and presents ideas in a coherent fashion.	The essay is well written from start to finish, without spelling, grammar errors. The essay is well organized, clear and presents ideas in a coherent fashion.
References and use of references *(Weight 15%)*	Most of the references used are not important, and/or are not of good/scholarly quality. Scholarly resources are not used effectively in the text. References are not effectively used, and/or correctly cited and/or correctly listed in the reference list according to APA style.	Most of the references used are important, and are of good/scholarly quality. References are correctly cited and correctly listed in the reference list according to APA style.	All references are important, and are of good/scholarly quality. All references are effectively used, correctly cited and correctly listed in the reference list according to APA style.

Overriding criterion: Originality and authenticity. If the final project contains elements that are identified as not being original, and/or not done by the student, the instructor has the right to fail the student's final project.

Course Policies

Minimum requirement: The project report must be presented with acceptable professional standards, i.e. clear logical layouts, neat and legible (see specific rubrics for the document and document elements). Remember that this is your culminating project from the degree. The final project should be a document that you proudly show as a reflection of your hard work and capability.

Course Assignments and Files: Students must keep a copy of their submitted materials (e.g. emails, discussion postings, assignments, etc.) as part of their coursework. Students are fully responsible for the timely re-submission of their work upon the instructor's request.

Required Materials - Hardware and Software Requirements, Cost

Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software including ArcGIS9.x. The student bears the cost of hardware and Internet access. The minimum system requirements are:

- Operating system: current MS Windos OS
- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 1 GB
- Free Disk Space: 5 GB
- Broadband Internet access
- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions.
- MicroSoft Office: Excel, Access, Word and Powerpoint.
- Adobe Acrobat PDF professional or similar software for generating PDF files.

Resources

- **Students must have Fresno State email account** Campus Email **(**http://email.csufresno.edu/)**. Your username and password will be used to login for courses and various services on campus. To access this course, you need to login to** Blackboard (http://blackboard.csufresno.edu/).
- **Student resources can be found at** Blackboard 9.1 Student Guide! **(**http://blackboard.csufresno.edu/students/index.shtml**).**
- **If you find you are unable to access the Blackboard, first contact the** Technology Innovation for Learning and Teaching (TILT) **(**http://www.csufresno.edu/tlt/) **or call the** TILT Blackboard resource center at 559-278-7373 Monday through Friday from 8:00am to 5:00pm. After hours, email TILT at tiltsupport@csufresno.edu or call 559-278-7000 seven days a week between 7:00am to 10:00pm. If there is still a problem, contact the instructor.
- When in Blackboard view the initial announcement. A link to Blackboard 9.1 Student Guide can be found at Blackboard 9.1 Student Guide! (blackboard.csufresno.edu/students/index.shtml)**. Read it through before you access the course materials below.**

How to Learn in This Web-Based Course

7. With your work or home computer connected to the internet, login to Blackboard (http://blackboard.csufresno.edu/) using the login name and password of your CSUF e-mail account. Click on the name of this course.
8. Click on **First Day: Orientation and Software Installation** to go through the brief orientation, read the syllabus, and install required computer programs (provided).
9. Click on the "Required Basic Computer Skills" to go through the Excel tutorials.
10. To begin the formal course work, first go to the "Weekly Modules" which include lecture notes and problem sets. Review the lecture notes, read the book chapters and then complete the required problem sets. Afterward, you must answer the questions posted on the "Discussion Board" to earn the attendance score.
11. Please provide your CREATIVE inputs on the "Discussion Board" (do not copy from others), so that other students may have the benefit of your queries. I will check the "Discussion Board" regularly. Personal questions (such as grade concerns) should be sent to the instructor by e-mail.
12. For e-mail communications and all submissions, you must follow the e-mail rules in this course, otherwise, your e-mail may get lost. **E-mail Rules:** In the SUBJECT line of your e-mail, type **"EES264-YourLastName-FirstName-unit #" (e.g., EES264-Smith-John-unit 1, EES264-Smith-John-question).** ***If you do it EXACTLY, your e-mail will go directly to the designated mail box for EES264, otherwise it can be lost.*** **Thanks for your corporation!! Send your e-mail to** pvandewater@csufresno.edu**.**

University Policies

Students with Disabilities:

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code:

"Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

m) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
n) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
o) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that "I have done my own work and have neither given nor received unauthorized assistance on this work." If you are going to use this statement, include it here.

Cheating and Plagiarism:

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this

definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For further information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations)

Disruptive Classroom Behavior:

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy:

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its Copyright Web Page (http://csufresno.edu/library/information/copyright/).
Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Subject-to-Change Notice

This syllabus and schedule are subject to change depending on the course progress. The above schedule and procedures are subject to changes in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent. Any substantive changes to this syllabus will be accompanied by the distribution of a revised syllabus.

Appendix B: Faculty Curriculum Vitae

Dr. R. Sean Alley
CURRICULUM VITAE

Home Address:
1281 East Bedford Avenue
Fresno, CA 93720
seanalley@yahoo.com
559.389.8577

Education:

May 2008	J.D., *magna cum laude*, George Mason University School of Law, Arlington, VA.
May 2009	Ph.D. Economics, Colorado State University, Fort Collins, CO. Dissertation: 'Demographic Considerations of Historic Registers' Advisor: Dr. Robert Kling
2003	M.A. Economics, Colorado State University, Fort Collins, CO.
2001	A.B. Economics, University of Georgia, Athens, GA.

Research Interests:

- Law and Economics
- Public Finance/State and Local Tax
- Environmental Economics
- Urban & Regional Economics
- Forensic Economics

Employment History:

Fall 2009-present	Assistant Professor, Economics Department, California State University, Fresno; Staff, Center for Economic Research and Education of Central California
2008-2009	Associate – Public Finance, McGuireWoods, LLP
2005-2008	Robert A. Levy Fellow in Law and Liberty, George Mason University School of Law
Summer 2007	Summer Associate – McGuireWoods, LLP
Summer 2006	Legal Intern – Administrative Office of U.S. Courts, Bankruptcy Judges Division
2004-2005	Temporary Instructor - Department of Economics, Colorado State University.
2003-2005	Research Assistant, 'Maximizing Protection of Ecological, Agricultural and Community Values at the Rural-Urban Fringe,' Natural Resource Ecology Lab - Colorado State University
2002-2003	Graduate Teaching Assistant - Colorado State University

Courses Taught:

- Economic Foundations of Legal Studies (GTA)
- Environmental Economics
- Regional Economics

- Intermediate Macroeconomics
- Intermediate Microeconomics
- Principles of Macroeconomics
- Principles of Microeconomics
- Gender and the Economy (GTA)
- Economics Colloquium Series -Capstone Senior Project

Research:

Peer Reviewed Journals:

The Economic Impact of the Earned Income Tax Credit (EITC) in California (with Antonio Avalos), Vol. 2 *California Journal of Politics and Policy* (2010).

The High Cost of Shareholder Participation (with Harry G. Hutchison), Vol. 11 *University of Pennsylvania Journal of Business and Employment Law* (2009).

Against Shareholder Participation as an End in Itself: A Treatment for McConvill's Psychonomicosis (with Harry G. Hutchison), Vol. 2 *Brooklyn Journal of Corporate, Financial & Commercial Law* 41 (2007).

A Comparative Approach to the Effectiveness of Concept Maps in Principles of Microeconomics between Australian and USA Students (with J. Marangos), Vol. 17 *Learning and Individual Differences* 193 (2007).

A Comparative Political Economy Approach to Farming Interest Groups in Australia and USA (with J. Marangos), Vol. 65 *The American Journal of Economics and Sociology* 497 (2006); *reprinted in* NATURAL RESOURCES, TAXATION & REGULATION: UNUSUAL PERSPECTIVES ON A CLASSIC TOPIC (Laurence Moss ed., Blackwell 2006).

Externally Funded Research:

Missed Opportunities: Unclaimed Earned Income Tax Credit Refunds Hurt California's Economy and Residents, Center for Economic Research and Education of Central California & New America Foundation, forthcoming, Co-Investigator, funded by New America Foundation, 2010.

Assessing the Economic Impact of Solar Projects in the California Central Valley, (with A. Avalos), Center for Economic Research and Education of Central California Research Paper No. 2009-02, Co-Investigator, funded by SR Solis, LLC, 2009.

Working Papers & Projects:

Historic Designation Leads to Rising Incomes, Especially in High Income Neighborhoods.

Subsidy Incidence of Build America Bonds v. Tax Exempt Municipal Bonds

Historic Registers and Neighborhood Change: The Overlooked Importance of Simultaneity.

Conference Proceedings and Invited Presentations:

October 21, 2011, 'Historic Designation Provokes Neighborhood Transition, But Only in High Income Neighborhoods: Evidence From Denver,' Missouri Valley Economics Association Annual Meetings, Kansas City, MO.

April 15, 2010, 'An Examination of Current Economic Conditions,' The Young Executives meeting, Fresno, CA.

March 18, 2010, 'Stimulus Legislation and Municipal Finance,' Fresno State Economics Colloquium Series, Fresno, CA.

March 9, 2010, 'The Financial Impact of Foregone EITC Payments in California,' California Senate Human Services Committee Hearing.

April 17, 2008, 'The High Price of Shareholder Participation,' Levy Workshop, George Mason University School of Law, Arlington, VA.

April 5, 2007, 'Historic Designation Sparks Economic Development, Especially in Affluent Areas: Evidence from Denver,' Levy Workshop, George Mason University School of Law, Arlington, VA.

September 27-30, 2004, 'A Comparative Approach to the Effectiveness of Concept Maps in Principles of Microeconomics Between Australian and USA Students,', International College Teaching Methods and Styles Conference, Reno, NV.

January 7-9, 2005, 'An Institutional Approach to the Evolution of the American Farm Bureau Federation,' Association for Evolutionary Economics (ASSA), Philadelphia, PA.

Awards and Honors:

- Robert A. Levy Fellowship in Law & Liberty.
- *Magna cum laude*, George Mason University School of Law.
- Outstanding Graduate Term Paper, *Double Dividends & Elvis Sightings: Can Green Taxes Be Used by State and Local Governments to Reduce Pollution and Raise Money?* Colorado State University, 2004.
- Member, Omicron Delta Epsilon.
- Member, Western Economics Association, International.
- Senior Staff, *Federal Circuit Bar Journal*.
- EITC research featured in *New York Times*, April 29, 2010.

Dr. Sharon Bennes

SHARON E. BENES

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CURRENT POSITION

Professor and Graduate Program Coordinator, Dept. of Plant Science, California State University, Fresno

RESEARCH

Salinity and drainage management/ Irrigation with saline water.

- Evaluation of plants (forages and halophytes) in saline environments.
- Plant response to saline irrigation (growth, evapotranspiration, trace element uptake, forage quality)
- Effects of saline irrigation on soils: management and reclamation.

Use of wastewaters for irrigation

TEACHING

Undergraduate: Soils, Soils Lab, and Crop Nutrition
Graduate: Plant Nutrition, Soil & Water Relations, and Graduate Seminar (GE crops).

EDUCATION

Ph.D., Plant Physiology: University of California, Davis CA. 1995
M.S., Plant Pathology: North Carolina State University, Raleigh. 1984
B.S. cum laude, Botany, with minor in Plant Science: University of New Hampshire, Durham. 1982

PROFESSIONAL AFFILIATIONS

Soil Science Society of America (SSSA) and the American Society of Agronomy (ASA)
California Chapter of the ASA (CA-ASA)—Governing Board (formerly)
California Certified Crop Advisors (CCA)– Advisory Board (currently)
Professional Soil Science Association of California (PSSAC)

PUBLICATIONS

Peer-Reviewed

Benes, S.E., Adhikari, D.D, Grattan, S.R. and R.L. Snyder (2012). Evapotranspiration Potential of Forages Irrigated with Saline-Sodic Drainage Water. Agric.Water Manage. *In Press.*

Juchem, S.O., **S. E. Benes**, P.H. Robinson, S.R. Grattan, P. Vasquez , P. Chilibroste and M. Brito (2012). Grazing as an alternative for utilization of saline-sodic soils in the San Joaquin Valley: selenium accretion and performance of beef heifers. Science of the Total Environment. *In Press.*

Goorahoo, D., Cassel Sharma, F., Adhikari, D.D. and **S.E. Benes** (2011). Soil-Water-Plant Relations. Chapter 3 (pp. 23-73). *In* Irrigation 6th Ed. , L. E. Stetson and B. Mecham (Eds.). Handbook compiled by the Irrigation Association (IA), Alexandria, VA.

Grattan, S.R., Oster, J.D., **Benes, S.E.** and S.R. Kaffka (2011). Chapter 22: *Use of Saline Waters for Irrigation.*
Agricultural Salinity Assessment and Management, American Society of Civil Engineers (ASCE), New York, NY. pp. 687-719.

Grattan, S.R., **Benes, S.E.**, Peters, D.W., Diaz, F. (2008). *Feasibility of Irrigating Pickleweed (Salicornia bigelovii. Torr) with Hyper-saline Drainage Water.* J Environ. Qual. 37: S-149-156S.
http://jeq.scijournals.org/content/vol37/5_Supplement/

Masters, D.G., **Benes, S.E.**, and Norman, H. (2007). *Biosaline Agriculture for Forage and Livestock Production*. Ag. Ecosyst. Environ. 119:234-248. doi:10.1016/j.agee.2006.08.003. http://www.sciencedirect.com/science?

Suyama H., **Benes, S.E.,** Robinson P.H., Getachew, G., Grattan S.R., and Grieve C.M. (2007). *Biomass yield and nutritional quality of forage species under long-term irrigation with saline-sodic drainage water: field evaluation.* Anim. Feed Sci. Technol. 135:329-345. http://www.sciencedirect.com/science

Suyama H., **Benes, S.E.,** Robinson P.H., Grattan S.R., Grieve C.M. and Getachew, G. (2007). *Forage Productivity, and Quality under Irrigation with Saline-sodic Drainage Water: Greenhouse evaluation*. Agric. Water Manage. 88:159-172. doi:10.1016/jagwat.2006.10.011. http://www.sciencedirect.com/science

Banuelos, G.S., Pasakdee, **S. Benes, S.E.**, and Ledbetter, C. (2007). *Long-term Application of Bio-solids on Apricot Production.* Communications in Soil Science and Plant Analysis 38: 1533-49.
doi: 10.1080/00103620701378474

Grattan S.R., Grieve C.M., Poss J.A., Robinson P.H., Suarez D.L. and **Benes, S.E.** (2004). *Evaluation of Salt-Tolerant Forages for Sequential Drainage Water Reuse Systems: I. Biomass Production.* Agric. Water Manag 70(2): 110-120.

Grieve C.M., Poss J.A., Grattan S.R., Suarez D.L., **Benes S.E**. and Robinson P.H. (2004). *Evaluation of Salt-Tolerant Forages for Sequential Drainage Water Reuse Systems. II. Plant Ion Relations.* Agric. Water Manag 70(2): 121-135.

Grattan S.R., Grieve C.M., Poss J.A., Robinson P.H., Suarez D.L., and **Benes, S.E.** (2004). *Irrigating Forages with Saline Drainage Water: III. Implications for Ruminant Mineral Nutrition.* Agric. Water Manag 70(2): 137-150.

Robinson P.R., Grattan S.R, Getachew G, Grieve CM, Poss JA, Suarez DS, and **S.E. Benes** (2004). *Biomass Accumulation and Potential Nutritive Value of some Forages Irrigated with Saline-sodic Drainage Water.* Anim. Feed Sci. Technol. 111: 175-189.

Benes S.E., Aragüés R., Grattan S.R. and Austin R.B. (1996). *Foliar and Root Absorption of Na^+ and Cl^- in Maize and Barley: Implications for salt tolerance screening and the use of saline sprinkler irrigation.* Plant and Soil 180: 75-86.

Benes S.E., Aragüés R., Austin R.B. and Grattan S.R. (1996). *Brief Pre- and Post-irrigation Sprinkling with Freshwater Reduces Foliar Salt Uptake in Maize and Barley Sprinkler-irrigated with Saline Water.* Plant and Soil 180: 87-95.

Benes S.E., Murphy T.M., Anderson P.D., and J.L.J. Houpis. (1995). *Relationship of Antioxidant Enzymes to Ozone Tolerance in Branches of Mature Ponderosa Pine (Pinus ponderosa Laws.) Trees Exposed to Long-term, Low Concentration, Ozone Fumigation and Acid Precipitation*. Physiologia Plantarum 94:124-134.

Not Peer-Reviewed

Benes, S. (2006). *Plant Response to Saline Irrigation.* New Ag International. June 2006 (English), pp. 64-65 and July 2006 (Spanish edition), pp. 32-33.

Benes S., Grattan S., Finch C., and L. Basinal (2005). *Chapter 5. Crop Selection for IFDM Systems*.
In: **A Technical Advisor's Manual**. Managing Agricultural Irrigation Drainage Water. A guide for developing Integrated On-Farm Drainage Management systems. Eds. J. E. Ayars and L. Basinal (eds.). Westside Resources Conservation District and California State University Fresno, Center for Irrigation Technology. pp. 5-1 to 5-7.
www.sjd.water.ca.gov/publications/drainage/ifdmtmanl/intro.pdf

Ayars, J.E., **Benes S.**, Basinal L. and T. Jacobsen (2005). *Chapter 4. Drainage Water*. In: **A Technical Advisor's Manual**. Managing Agricultural Irrigation Drainage Water. A guide for developing Integrated On-Farm Drainage Management systems. Eds. J. E. Ayars and L. Basinal (eds.). Westside Resources Conservation District and California State University Fresno, Center for Irrigation Technology. pp. 4-1 to 4-4.
www.sjd.water.ca.gov/publications/drainage/ifdmtmanl/intro.pdf

Benes S., Grattan S., Finch C., and L. Basinal (2004). *Chapter 6. Plant Selection for IFDM*. In: **A Landowner's Manual**: Managing Agricultural Irrigation Drainage Water. A guide for developing Integrated On-Farm Drainage Management systems. Eds. T. Jacobsen and L. Basinal (eds.). Grant 319H. California State Water Resources Control Board. Hudson Orth Communications, pp. 6-1 to 6-21.
http://cit.cati.csufresno.edu/DrainageManual/

Benes S., Jacobsen T., and L. Basinal (2004). *Chapter 5. Drainage Water Characteristics.* In: **A Landowner's Manual**: Managing Agricultural Irrigation Drainage Water. A guide for developing Integrated On-Farm Drainage Management systems. Eds. T. Jacobsen and L. Basinal (eds.). Grant 319H. California State Water Resources Control Board. Hudson Orth Communications, pp. 5-1 to 5-6.
http://cit.cati.csufresno.edu/DrainageManual/

Benes, S. (2003). *Irrigation with Saline Water: Minimizing the impact with proper management*. New Ag International. March 2003: 40-47.

Benes S., Peters D., and Grattan S.. (1999). *Integrated On-Farm Drainage Management: Using Plant Transpiration to Reduce Drainage Volumes.* California Agricultural Technology Institute (CATI) Publication #990602. pp. 1-4.

PROCEEDINGS PAPERS

K.C., J.R., **Benes S.**, Robinson, P.H., Grattan, S.R., Bushoven, J. and S. Gao (2011). Selenium incorporation and partitioning in '*Jose'* Tall Wheatgrass Irrigated with Saline Drainage Water. Annual meetings of the Irrigation Association, Nov. 6-8, 2011. San Diego, CA.

Benes, S.E., Suyama H., Grattan, S.R., Robinson, P. Juchem, S.O., and D. Adhikari (2010). *Forage Production under Saline Irrigation.* California Plant and Soil Conference (state-wide meeting, California Chapter of American Society of Agronomy). Feb. 2, 2010, Tulare, CA. pp. 98-104.

Benes, S.E., Juchem, S.O., Robinson, P.H., Brito, M., Getachew G., Vasqez, P., Chilibroste P., and S.R. Grattan (2008). *Forage Production using Saline Drainage Water: Assessing the Selenium Hazard for Grazing Beef Cattle.* Proceedings of the 2nd International Salinity Forum, "***Salinity, Water and Society – Global issues, local action*". 31 March 31 – 3 April, 2008, Adelaide, Australia.** http://www.internationalsalinityforum.org

Benes S., Suyama H., Robinson P., Getachew G., Grattan S.R., and C. Grieve (2005). *Forages Growing in Saline Drainage Water Re-use Systems on the Westside San Joaquin Valley of California: water use, productivity, and nutritional value.* Proceedings of the International Salinity Forum: **Managing Saline Soils and Water: Science, Technology, and Management. April 25-27, 2005. Riverside, CA.** Oral Presentation Abstracts, pp. 55-58.

Suyama H., **Benes S.,** Robinson P., Getachew G., Grattan S.R., and C. Grieve (2005). *Biomass Production and Nutritional Value of Forages Irrigated with Saline-sodic Drainage Water in a Greenhouse Study.* **Proceedings of the International Salinity Forum: Managing Saline Soils and Water: Science, Technology, and Management. April 25-27, 2005. Riverside, CA**. Poster Abstracts, pp. 175-178.

Goorahoo, D., **Benes S.,** Adhikari D., and K. Senatore (2005). *Characterization of Soils Irrigated with Saline-sodic Drainage Water: Chemical Composition.* **Proceedings of the International Salinity Forum: Managing Saline Soils and Water: Science, Technology, and Management. April 25-27, 2005. Riverside, CA.** Poster Abstracts, pp. 59-62.

Senatore K., Goorahoo, D., **Benes S.,** and J. Ayars (2005). *Characterization of Soils Irrigated with Saline-sodic Drainage Water: Soil Water Retention and Hydraulic Properties.* **Proceedings of the International Salinity Forum: Managing Saline Soils and Water: Science, Technology, and Management. April 25-27, 2005. Riverside, CA**. Poster Abstracts, pp. 143-146.

Suyama H., **Benes S.,** Robinson P., Getachew G., Grattan S.R., and C. Grieve (2005). *Biomass Production & Nutritional Value of Forages Irrigated with Saline-sodic Drainage Water: field and greenhouse studies.* **Proceedings of the California Plant & Soil Conference. CA chapter of American Society of Agronomy, Feb. 1-2, 2005, Modesto, CA., pp. 170-174.**

Benes S., Robinson P.H, Grattan S., Goorahoo D. and V. Cervinka (2004). *Saline drainage water re-use systems for the Westside San Joaquin Valley of California: candidate forages, halophytes, and soil management.* **Proceedings of the Frontis Biosaline Agriculture workshop. June 27-30th, 200, Wageningen University, The Netherlands.**

Senatore, K., Goorahoo, D., **Benes S.,** J. Ayars (2004). *Hydraulic and Chemical Properties of Soils Irrigated with Recycled Saline Sodic Drainage Water.* **Proceedings of the national meeting of the Irrigation Association of America (IAA). Nov. th, Tampa, FL.** 8 pages.

Goorahoo D., **Benes S.**, Adhikari, D. and J. Bartram (2003). *Soil Characterization of fields irrigated with recycled saline drainage waters.* **Proceedings of the national meeting of the Irrigation Association of America (IAA). Nov. 18-20th, San Diego, CA.** 12 pages.

Benes S., Grattan S., Peters D., Cervinka V., Menezes F., and Finch C. (2000). *Evapotranspiration and Productivity of Halophytes and Salt Tolerant Forages Proposed for Drainage Water Re-Use Systems for California's Westside San Joaquin Valley.* "Irrigation Australia 2000", **National meeting of the Irrigation Association of Australia. May 23-25, 2000, Melbourne, Australia.**

ORAL PRESENTATIONS (Invited)

Western Plant Health Association (WPHA) Nutrient Conference Series (Plant Nutrition and Physiology). *"What is Salinity and Where Does It Come From?".* San Luis Obispo, CA. Dec. 1, 2010.

California Plant and Soil Conference (state-wide meeting of the California Chapter of the American Society of Agronomy). *'Forage Production Using Saline Waters.".* Tulare, CA. February 2, 2010.

New Ag International Conference and Exhibition. *"Plant Response to Saline Irrigation".* Guadalajara, Mexico. April 3-5th, 2006.

Integrated On-Farm Drainage Management (IFDM) regional workshops. Presentations (2): "*Plant Selection for IFDM" and "Soil Management in IFDM systems"* Sponsored by the Westside Resource Conservation District and the Center for Irrigation Technology. Five Points, CA, October 12, 2005 and Buttonwillow, CA, Oct. 19, 2005.

Frontis Biosaline Agriculture Workshop, Wageningen University, The Netherlands. June 27-30th, 2004. Talk 1: "*Candidate salt tolerant forages and halophytes for saline drainage water re-use systems for the Westside San Joaquin Valley of California*": and Talk 2: "*Characteristics of Soils under Long Term Irrigation with Saline-Sodic Drainage Water.*

Integrated On-Farm Drainage Management (IFDM) regional workshops. Presentation on: *Plant Selection for IFDM.* Sponsored by the Westside Resource Conservation District and the Center for Irrigation Technology. Five Points, CA, Feb. 19, 2004; Los Banos, CA, Feb. 24, 2004; and Bakersfield, CA, Mar. 2, 2004.

University of California (UC) Salinity and Drainage Conference and Dept. of Water Resources (DWR) Proposition 204 funded projects: Updates. Sacramento, CA, March 2002.

ORAL PRESENTATIONS (Volunteered, without proceedings paper)

K.C., J.R., **Benes S.**, Robinson, P.H., Grattan, S.R., Bushoven, J. and S. Gao (2011). Selenium incorporation and partitioning in '*Jose'* Tall Wheatgrass Irrigated with Saline Drainage Water. 2011. Graduate Research and Creative Activities Symposium, California State University, Fresno, May 5, 2011, Fresno, CA.

K.C., J.R., **Benes S.**, Robinson, P.H., Grattan, S.R., Bushoven, J. and S. Gao. (2011). Selenium incorporation and partitioning in '*Jose'* Tall Wheatgrass Irrigated with Saline Drainage Water. 2011. 2011. Central California Research Symposium, California State University, Fresno, April 6, 2011, Fresno, CA.

Benes, S., Juchem, S.O., Robinson, P.H., Grattan, S.R., and P. Chilibroste (2009). Selenium Incorporation and Performance of Beef Cattle Grazing Pastures Irrigated with Saline-sodic Drainage Water. Annual Meetings of the ASA-SSSA-CSA (Agronomy, Soil Science, and Crop Science Societies of America). Nov. 1-5, 2009. Pittsburgh, PA.

Benes S., Suyama, H., Robinson, P.H., Getachew G., and Grattan, S.R. (2004). *Comparison of Salt Tolerant Forages Growing in Drainage Water Re-use Systems on the Westside San Joaquin Valley: water use, biomass production, and nutritional value.* 96th Annual Meeting of the Soil Science Society of America (SSSA). Nov. 1-4, 2004, Seattle, WA.

Benes S., Grattan S.R., Robinson P.H., Getachew G. and Cervinka V. (2003). *Salt Tolerant Forages for drainage water re-use systems for the Westside San Joaquin Valley of California.* 95th Annual Meeting of the Soil Science Society of America (SSSA), Denver, CO, Nov. 2- 5th.

Goorahoo D., **Benes S.,** Adhikari D. and Bartram J. (2003). *Soil Characterization and Infiltration Measurements for Fields Irrigated with Recycled Saline Drainage Waters.* 95th Annual Meeting of the Soil Science Society of America (SSSA), Denver, CO, Nov. 2- 5th.

POSTER PRESENTATIONS

K.C., J.R**., Benes, S.E**., Robinson, P.H., and S.O. Juchem (2011*). Selenium incorporation and partitioning in 'Jose' tall wheat grass (Thinopyrum ponticum var. 'Jose') irrigated with saline drainage water.* CA Plant & Soil conference, Feb. 1& 2nd, 2011. Fresno, CA.

Benes, S.E., Adhikari D, Grattan, S.R. and Snyder, R.L. (2010). *Use of Surface Renewal Method for ET estimation under Saline Conditions.* Annual meetings of the Soil Science, Agronomy, and Crop Science Societies of America, Long, Beach, CA. Oct., 31 – Nov. 3rd.

K.C., J.R., **Benes, S.E**., Robinson, P.H., and S.O. Juchem (2010*). Selenium incorporation and partitioning in 'Jose' tall wheat grass (Thinopyrum ponticum var. 'Jose') irrigated with saline drainage water.* Annual meetings of the Soil Science, Agronomy, and Crop Science Societies of America, Long, Beach, CA. Oct., 31 – Nov. 3rd.

Benes, S.E., Juchem, S.O., Robinson, P.H., Chilibroste, P., Vasquez, P., Brito, M., and Grattan, S.R. (2009). *Selenium Incorporation and Performance of Beef Cattle Grazing Pastures Irrigated with Saline-sodic Drainage Water*. Annual meeting of the California Groundwater Assocication, Sacramento, CA, March, 2009.

Chaganti V., Goorahoo, D., **Benes, S.E**., Adhikari, D.D. (2009). *Reclamation Potential of Amendments for Soils Irrigated with Saline-sodic Drainage Water.* Annual meeting of the California Groundwater Assocication, Sacramento, CA, March, 2009.

Benes, S.E., Juchem, S.O., Robinson, P.H., Chilibroste, P., Vasquez, P., Brito, M., and Grattan, S.R. (2009). *Selenium Incorporation and Performance of Beef Cattle Grazing Pastures Irrigated with Saline-sodic Drainage Water*. Proceedings of the California Plant & Soil Conference, California Chapter of the American Society of Agronomy, Feb. 3 &4, Fresno, CA.

Chaganti V., Goorahoo, D., **Benes, S.E**., Adhikari, D.D. (2009). *Reclamation Potential of Amendments for Soils Irrigated with Saline-sodic Drainage Water.* Proceedings of the California Plant & Soil Conference, California Chapter of the American Society of Agronomy, Feb. 3 &4, Fresno, CA.

Benes, S., and Grattan, S. (2007). *Forage Quality and Dry Matter Yield of Halophytes Irrigated with Saline-sodic Drainage Water.* Centennial meetings of Soil Science Society of America (SSSA), New Orleans, LA, Nov. 1-5th.

Chaganti V., Goorahoo, D., **Benes, S.E**., Adhikari, D.D. (2007). *Effect of Amendments on Hydraulic Properties of Soils Irrigated with Saline-Sodic Drainage Water: Methodology and Preliminary Results.* Centennial meetings of Soil Science Society of America (SSSA), New Orleans, LA, Nov. 1-5th.

Benes, S., Grattan, S., Adhikari, D. and Snyder R. (2006). *Lysimeter and surface renewal estimates of ET under Saline Irrigation.* Annual meetings, Soil Science Society of America (SSSA), Indianapolis, IN, Nov. 12-16.

Suyama, H., **Benes S**., Robinson, P.H., Getachew G., Grattan, S.R., and Grieve C.M., (2004). *Biomass Production and Nutritional Value of Salt Tolerant Forages Irrigated with Saline-sodic Drainage Water: field and greenhouse studies.* Annual meeting, Soil Science Society of America (SSSA). Nov. 1-4, 2004, Seattle, WA.

Goorahoo, D**., Benes S**., Senatore, K. and Adhikari, D. (2004). *Impact of Irrigation with Saline-sodic Drainage Water on Soil Hydraulic and Chemical Properties.* Annual meeting, Soil Science Society of America (SSSA). Nov. 1-4, 2004, Seattle, WA.

Suyama, H., **Benes S**., Robinson, P.H., Getachew, G., Grieve C.M., and Grattan, S.R. (2004*). Biomass Production and Nutritional Value of Salt Tolerant Forages Irrigated with Saline-sodic Drainage Water: field and greenhouse studies.* Proceedings of the California Plant & Soil Conference. CA chapter of the American Society of Agronomy, Feb. 3-4, 2004, Visalia, CA. pg. 166-167.

Senatore, K., Goorahoo, D., **Benes S**., and J. Ayars (2004). *Hydraulic Conductivity of Soils Irrigated with Recycled Saline-sodic Drainage Water. Proceedings of the California Plant & Soil Conference.* CA chapter of the American Society of Agronomy, Feb. 3-4, 2004, Visalia, CA. pg. 162-163.

TECHNICAL REVIEWS (Invited)

Ocean Desert Enterprises (ODE; Netherlands). Review of model demonstration project: cropping system & soil managementa for the San Luis Rio Colorado Delta area, S.L. Rio Colorado, Mexico. *Project visit, June 2008 and 5-member technical review committee meeting and visit,, Nov. 2008*

WaterWatch Consulting (Netherlands) & Shell Oil Co. Review of a design of constructed wetlands for remediation of oil-produced water in Oman, U.A.E. *The Hague, Netherlands, July 9&10, 2007.*

Redwood Decline Diagnosis project / Santa Clara Water District. Reviewed report from 1-year investigation by environmental consulting firm regarding causes of the tree decline. 2003.

MANUSCRIPT AND PROPOSAL REVIEW

Manuscript: ~three per year for journals such as *Agricultural Water Management, Irrigation Science, Journal of Environmental Quality (JEQ), Agriculture, Ecosystem & the Environment (AEE), Forage Science, Landscape & Urban Planning, Land Use, and American Journal of Enology & Viticulture (AJEV)*

Proposal: ~three per year for the USDA Small Business Innovative Research (SBIR) program, CSU Agricultural Research Initiative (ARI), and the California Dept. of Agriculture's Fertilizer Research and Education Program (FREP).

GRADUATE STUDENT MENTORING (M.S. Theses as Thesis Chair)

2012 Selenium Accumulation in 'Jose' tall wheat grass (Thinopyrum ponticum var. 'Jose') irrigated with saline drainage water. *Jaya Ram K.C.*

2008 Reclamation Potential of Amendments for Soils Irrigated with Saline-Sodic Drainage Water. *Vijayasatya Nagendra Chaganti*

2005 Biomass Production and Nutritional Value of Salt Tolerant Forages Irrigated with Saline-sodic Drainage Water: field and greenhouse studies. *Hitoshi Suyama*

2004 Determination of Hydraulic Parameters for Soils Irrigated with Saline-sodic Drainage Water. *Kimberley Senatore*

2004 Effects of Nitrogen Source and Amount on Lettuce Yields. *David Jamison*

2003 *Allium* spp. amendments, soil temperature, and exposure time affect seed viability for weed management in California. *Susan Burke Mallek*

2003 Lethal Temperature-time Dosages for the Root Knot Nematode *Meloidogyne incognita*, Stunt nematode *Tylenchorhynchus silvaticus* and non-plant parasitic nematodes. *Tarcisio Ruiz*

2002 Use of Sudangrass and Early Soil Testing to Optimize Nitrogen Management for Processing Tomatoes. *Carlos Fandino*

2001 Effect of Nitrogen Fertilizer Regime on Yield, Quality, and Nitrogen Utilization in Broccoli. *Andreas Loucaides*

2000 The Effect of Composted Biosolids on Fruit Quality and Trace Element Composition in Field-Grown Apricots. *Sajeemas Pasakdee*

1999 Effect of a Recalcitrant Amendment on the Competitive Ability of Purple Needlegrass and Wild Oat. *Mary McClanahan*

AWARDS

2009 "*Outstanding Advisor Award".* CSU Fresno

2001 "*Outstanding Research Award*". College of Agricultural Sciences & Technology, CSU Fresno.

2001 & 2000 Provost's Fall Convocation "*Outstanding Faculty Recognition: Research*". CSU Fresno

FOREIGN LANGUAGES

Spanish (fluent, including teaching), Italian (intermediate), French (elementary)

Dr. Florence Cassel Sharma
Center for Irrigation Technology (CIT)
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E-mail: fcasselss@csufresno.edu

EDUCATION

1998 Ph.D. *Soil Science*, University of Wyoming.
(Emphasis in Soil Physics)

Dissertation "Assessment of drip irrigation for managing nitrate contamination and sugarbeet production in Wyoming"

1994 M.S. + B.S. *Agricultural Engineering*, Ecole Superieure d'Agriculture d'Angers, France.

PROFESSIONAL EXPERIENCE

2001-Present Soil and Water Scientist, CIT, California State University, Fresno. Water resources management; surface and ground water quality; salinity Water flow and contaminant transport in surface and ground waters GIS and remote sensing applications in environmental and agricultural sciences Project/personnel management, grant funding, committee service.

2008-Present Adjunct Faculty, Department of Plant Science, California State University, Fresno. Undergraduate and graduate teaching Student advising (Graduate thesis advisory committees, independent studies).

1999-2000 Post Doctoral Research Scientist and Associate, Department of Plant Sciences, University of Wyoming.

1995-1998 Research and Teaching Assistant, Soil Environmental Sciences, Department of Renewable Resources, University of Wyoming.

Fate and transport of nutrients and pesticides in soil-water systems Speciation and transformation of nutrients and pollutants (e.g.,nitrate-nitrite-ammonium, aldicarb-sulfone-sulfoxide) in surface and ground waters. Water use efficiency; soil water quality Numerical modeling of water flow and chemical transport in multidimensional (1-, 2-, 3-D) systems

1994 Assistant Quality Manager, Roquette Laisa Espana, Spain.

1993 Research Assistant, Department of Animal Science, University of Wyoming.

1992 Research Intern and Laboratory Technician, Roquette Freres, France.

Research Assistant, Ecole Superieure d'Agriculture d'Angers, France.

1991 Research Intern, LLaneza, Spain.

TEACHING EXPERIENCE

Fall 2011. SW 104 ¡V Soil and Water Management, Department of Plant Science, CSUF. Co-instructor with Dr. Krauter. Received 2011 Coleman Fellowship to incorporate entrepreneurship components of water management and irrigation technology.

Spring 2011-2009-2008. AGRI 201 ¡V Agricultural Laboratory Techniques, Department of Plant Science, CSUF. Instructor (2 lecture hours, 3 laboratory hours). Spring 2010. PLANT 270 - Seminar: Efficient use of agricultural water. Grading of graduate student presentation, Department of Plant Science, CSUF.

Spring 2010. PLANT 170T ¡V Organic Farming. Guest lecture facilitator and Student presentation judge, Department of Plant Science, CSUF. Fall 2009. CRSC 112 ¡V Warm-season vegetables. Student presentation judge, Department of Plant Science, CSUF.

Fall 2009. SW100N ¡V Soils in the Environment (Lab). Field demonstration for undergraduate class, Department of Plant Science,

CSUF. Fall 2008. PLANT 105 ¡V Food, Society and the Environment. Guest lecture for undergraduate class, Department of Plant Science, CSUF.

Fall 2008. PLANT 170 ¡V Soils in the Environment. Guest lecture for undergraduate class, Department of Plant Science, CSUF.

Fall 2008. Fresno Green Gardeners. Class for Fresno gardeners on Water, Plant, and Soil Interactions; part of irrigation series of new Fresno program “Green Gardeners”.

Fall 2007. Gypsum Use in Agriculture. Two-day workshop for Japanese delegation, CIT, CSUF. Included lectures and field trips.

Spring 2006. IT 284 ¡V Applied Spatial Technology. Guest lecture with computer exercises using ArcGIS Spatial Analyst, Department of Industrial Technology, CSUF.

Fall 2005. IT 280 ¡V Research Methodology, Guest lecture, Department of Industrial Technology, CSUF.

Spring 2005. IT 191 ¡V Remote Sensing and GIS application, Guest lecture for undergraduate/graduate class, Department of Industrial Technology, CSUF.

Spring 2005. Soil Salinity Assessment and Mapping Workshop: Theory and Practice, San Luis National Wildlife Refuge Office, Los Banos, CA. Workshop on electromagnetic induction technique (EM) for salinity management, developed for scientists and engineers of state and federal agencies. A “Soil Salinity Assessment Manual” was also developed for this workshop (22 pp). 2002 - 2004. Lectures given at workshops and field days on use of EM technique for soil and water management. Audience included students, faculty, scientists, engineers, farmers, and consultants from UC Davis, Lawrence Berkeley National Laboratory, and CSU Fresno.

Spring 1997. Teaching Assistant for graduate/undergraduate Soil Physics Laboratory, (4 credit hours), University of Wyoming.

THESIS AND INDEPENDENT STUDY ADVISING

2008-2011: Member of 7 graduate thesis advisory committees, Department of Plant Science, CSUF:

- Efficacy of slow-release nitrogen formulation applied to vegetables (S.Yellareddygari; completed)
- Deficit irrigation applied to new bell pepper varieties (D. Scheidt; in progress)
- Effects of calcium fertigation and acidification on tomatoes grown in salt-affected soils (P. Yadavali; in progress)
- Water use efficiency and yield of tomatoes subjected to elevated CO2 levels (B. Deghanmanshadi; in progress)
- N2O emissions following fertilizer applications in vegetable and row crop systems (N. Mahal; in progress)
- Growth and quality of a nursery grown California native plant fertigated with slow release nitrogen fertilizer (G. Orozco; in progress)
- Yield, quality and growth of processing tomatoes fertilized with urea ammonium nitrate and treated with a plant enhancing formulation (F. Parra; in progress)

2008-11: Co-advisor on undergraduate/graduate research projects (PL 180, PL190) (1-2 credit hours) and independent studies, Department of Plant Science, CSUF (with Dr. Goorahoo)

- Spatial and temporal measurements of SAR, EC, pH and nitrate levels of soils
- Application of mapping software for characterizing salinity levels in tomato fields
- Growth and yield of vegetables treated with slow release Nitrogen fertilizers
- Growth and yield of cabbage fertilized with varying rates of UAN 32
- Comparison of organic and UAN-32 fertilization on yield and quality of Bok Choy
- Electrical conductivity (EC) and pH levels of soils treated with slow release N formulations
- Soil moisture monitoring for effective irrigation scheduling of vegetable and orchard crops

2006-2008: Mentored undergraduate students involved in CSUF Ag Summer Bridge Program and 4-H students on high-school science projects. 2001-Present: Supervised, trained, and funded undergraduate/graduate students and technicians of diverse socio-economic and ethnic background in areas of crop fertility; irrigation management practices; experimental design; collection and laboratory analyses of plant/water/soil samples; field and laboratory instruments; data analyses; and report writing.

RESEARCH INTERESTS

Water resources management; soil and water conservation. Vadose zone and groundwater hydrology with emphasis on fate and transport of contaminants Spatial distribution and variability of water and soil pollutants ¡Vfield studies and modeling. Development of decision support systems to improve water resources and water quality in ecosystems of California. Impacts of land application of drainage and food-processing effluent waters on soil and water quality. Nitrous oxide emissions from agricultural systems. GIS, remote sensing techniques (electromagnetic induction, satellite & aerial imagery) and geospatial analyses.

COLLABORATORS & CO-PIs

University

CSU Fresno (Dave Goorahoo, Charlie Krauter, Bruce Roberts, Sharon Benes, John Bushoven, Anil Shrestha, Xiaoming Yang, John Suen, Keith Putirka)
UC Davis (Robert Hutmacher, Blake Sanden, Susan Ustin, Mike Whiting, Richard Plant, Martin Burger)
CSU Chico (Mike Spiess)
CSU Monterey Bay - NASA Ames Cooperative Agreement (Forrest Melton, Lee Johnson, Christopher Lund)

Government

United States Department of Agriculture -USDA (James Ayars, Don Wang, Tom Trout)
Lawrence Berkeley National Laboratory -LBNL (Nigel Quinn)
United States Bureau of Reclamation -USBR (George Matanga, Jeff Milliken, Chris Eacock, Tracy Slavin)
Department of Water Resources -DWR (Jose Faria, Bekele Temesgen)
Department of Pesticide Regulation (Murray Clayton, Alfredo da Silva)
Regional Water Quality Control Board (JoAnne Kipps)
Westlands Water District (Ted Sheely)
Westside Resource Conservation District (Sarge Green)
Kaweah Delta Water Conservation District (Larry Dotson)
Santa Clara Valley Water District (Robert Siegfried)
City of Fresno (Rosa Lau-Staggs, Mark Banuelos) and City of Madera (Wayne Clay).

Industry
PureSense (John Williamson)
Aquatrols (Tom Boerth)
Mazzei Injector Inc. (Angelo Mazzei, Celia Mazzei)
Davids Engineering ¡V Davis, CA (Bryan Thoreson)
Cotton Incorporated (Edward Barnes)
Azcal Farm Management (Ted Sheely, Zach Sheely)
JG Boswell Company (Beau Howard, Doug DeVaney)
Brock Taylor Consulting
Monarch Scientific (Ron Fister)

Boyle Engineering (Alfonso Manrique)
Farming companies (Red Rock Ranch, Britz Farm, Clark Bros. Cantua Ranch, Ron Samuelson; Giacomazzi)
WaterWatch (remote sensing services for water resources management) -The Netherlands (Wim Bastiaanssen, Richard Soppe)
SEBAL North America (remote sensing services) ¡-Davis, CA (Bryan Thoreson)
In-Time (aerial imagery, crop prescription maps) -Cleveland, MS (Hendrik van Riessen, Eric Osterling)

FUNDING (total $4.2 million)

2011

NASA -California State University Monterey Bay. *Integrated information technology system for irrigation scheduling and management*. **$105,000** (2011). **F. Cassel S.** and D. Goorahoo.

Agricultural Research Initiative - CSU. *Development of an integrated decision support system to optimize irrigation scheduling and water use efficiency*. **$450,000** (2011-2014). **F. Cassel S.**, D. Goorahoo, F. Melton, L. Johnson, C. Krauter, and L. Pierce.

Agricultural Research Initiative - CSU. *Airjection irrigation impact on crop yield and soil salinity*. **$135,000** (2011-2014). D. Goorahoo and **F. Cassel S.**

Aquatrol. *Effect of surfactant on nitrogen and water use efficiency in tomatoes*. **$26,565** (2011-2012). D. Goorahoo, **F. Cassel S.**, and and D. Adhikari.

2010

California Department of Water Resources. *Estimating leaching requirements in drainage reuse systems from soil salinity surveys***. $91,466** (2010-2012). **F. Cassel S.** and D. Zoldoske.

JG Boswell Company. *Evaluating irrigation and cultural management alternatives through field-scale salinity and water table characterization.* **$69,600** (2010-2011). ***F. Cassel S.***, D. Goorahoo, and B. Roberts.

Agricultural Research Initiative - CSU. *Nitrous oxide emissions from California orchard and vegetable cropping systems.* **$ 239,900** (2010-2013). D. Goorahoo, **F. Cassel S.**, and S. Ashkan.

2009

California Department of Water Resources. *IFDM - EM 38 Survey of Britz Farms.* **$17,215** (2009). **F. Cassel S.** and D. Zoldoske.

Agricultural Research Initiative - CSU. *Utilizing Ethanol CO_2 emissions to increase crop productivity and water-use efficiency.* **$310,000** (2009-2012). **F. Cassel S.**, S. Ashkan, D. Goorahoo, D. Adhikari, and D. Zoldoske.

Monarch Scientific. *Peach Shelf Life Study.* **$4,172** (2009-2010). **F. Cassel S.** and D. Goorahoo.

2008

Monarch Scientific. *Comparative Yield of Tomatoes Fertilized with Slow-Release and Readily Available Nitrogen Sources.* **$8,100** (2008). **F. Cassel S.** and D. Goorahoo.

California Department of Water Resources. *Response of Swamp Timothy (Crypsis Schoenoides) to Modified Hydrology.* **$52,532** (2008-2009). D. Zoldoske and **F. Cassel S.**

Agricultural Research Initiative - CSU and Azcal Farm Management. *Reclamation of Saline-Sodic Soils for Tomato Production using Calcium Fertigation and Acidification.* **$112,500** (2008-2012). **F. Cassel S.** and D. Goorahoo.

Agricultural Research Initiative - CSU. *Integrating Remote Sensing Techniques to Determine Extent of Salinity in San Joaquin Valley of California.* **$250,000** (2008-2011). **F. Cassel S.**, D. Zoldoske, and X. Yang.

2007

Dutch Brothers Enterprises, LLC. *Evaluating Soil Health Improvements and Water Savings using UNLO2K.* **$23,085** (2007-2008). **F. Cassel S.**, D. Goorahoo, and D. Zoldoske.

Agricultural Research Initiative - CSU. *Use of Elephant Grass as a Bio-Filter for Fields Irrigated With Dairy Effluent and Processing Wastewater.* **$105,000** (2007-2011). D. Goorahoo, **F. Cassel S.**, and D. Adhikari.

2006

Westside Resource Conservation District. *Salinity Mapping at Red Rock Ranch and Britz Farm.* **$14,283** (2006-2009). **F. Cassel S.** Department of Pesticide Regulation.

Vertical Transport Study in Soil. $105,000 (2006-2008). J. Suen, D. Goorahoo, and **F. Cassel S.**

2005

Agricultural Research Initiative - CSU. *Estimating Crop Evapotranspiration and Soil Salinity from Remote Sensing Imagery.* **$140,000** (2005-2008). **F. Cassel S.** and D. Zoldoske.

Kaweah Delta Water Conservation District. *Oakes Basin Recharge Improvement Project.* **$13,024** (2005-2006). **F. Cassel S.**, J. Tischer, and D. Zoldoske.

Imperial Valley Conservation Research Center Committee (IVCRCC). *Nutrient Control of Agricultural Runoff.* **$105,000** (2005-2008). D. Goorahoo and **F. Cassel S.**

Beef Packer Inc. *Vadose monitoring plan for wastewater holding pond.* **$ 19,344** (2005-2006). D. Goorahoo and **F. Cassel S.**

2004

Department of Water Resources - California Bay-Delta Authority. *Training and Development of Instructional Materials for Real-Time Salinity Management from Seasonal Wetlands.* **$69,850** (grant extension) (2004-2005). N. Quinn and **F. Cassel S.**

Agricultural Research Initiative - CSU. *Use of Remote Sensing Techniques for Improving Soil and Crop Management Practices.* **$213,000** (2004-2007). **F. Cassel S.**, M. Spiess, B. Taylor, and D. Zoldoske.

Agricultural Research Initiative - CSU. *Assessment of Canal Seepage using Electromagnetic Technique.* **$96,000** (2004-2007). **F. Cassel S.** and D. Zoldoske.

United States Bureau of Reclamation. *Remote Sensing of Evapotranspiration for Verification of Regulated Deficit Irrigation.* **$120,000** (2004-2005). **F. Cassel S.** and D. Zoldoske.

Biomatrix Inc. (Hong Kong). *Efficacy of Manure Based Fertilizer System (MBFS) on Bell Pepper.* **$14,168** (2004-2005). D. Goorahoo and **F. Cassel S.**

Boyle Engineering Corporation. *Soil Water Quality Monitoring for Estimation of Potential Denitrification Losses.* **$13,938** (2004-2005). D. Goorahoo and **F. Cassel S.** (with City of Madera Wastewater Treatment Plan and Regional Water Quality Control Board)

2003

National Science Foundation. *Development of an XRF lab.* **$198,106** (2003-2004). K. Putirka, J. Suen, J. Wagner, H. Ferriz, P. Harikumar, and **F. Cassel S.**

Agricultural Research Initiative - CSU. *Spatial Variability of Organic and Nitrogen Loading from Winery Stillage Application.* **$55,000** (2003-2006). D. Goorahoo and **F. Cassel S.**

United States Bureau of Reclamation. *Soil Hydraulic Properties and Salinity Assessment at Red Rock Ranch.* **$75,000** (2003-2005). D. Goorahoo, F. Cassel S, and S. Benes.

California Department of Food and Agriculture. *Open-Field CO2 Enrichment using Drip Irrigation Systems.* **$77,000** (2003-2004). **F. Cassel S.**, D. Goorahoo, and S. Ashkan.

California Department of Food and Agriculture - Agricultural Research Initiative. *Assessing Spatial and Temporal Variability of Soil salinity on Farms Implementing Integrated Drainage Management Practices.* **$250,000** (2003-2006). **F. Cassel S.** and D. Zoldoske.

CKLS Inc. (Hong Kong). *Efficacy of Manure Based Fertilizer N201 on Broccoli.* **$17,078** (2003-2004). D. Goorahoo and **F. Cassel S.**

2002

Agricultural Research Initiative - CSU. *Salinity Assessment for Precision Farming in Cotton Systems.* **$50,600** (2002-2005). **F. Cassel S.**, D. Goorahoo, and D. Zoldoske.

Agricultural Research Initiative - CSU. *Integrated On-Farm Drainage Management (IFDM): Plant water use, forage quality, and soil management.* **$269,470** (2002-2005). S. Benes, S. Grattan, D. Goorahoo, P. Robinson and **F. Cassel S.**

City of Fresno. *Stillage Site Vadose Zone Monitoring.* **$73,893** (2002-2003). **F. Cassel S.**, D. Goorahoo, and M. McClanahan. (with Regional Water Quality Control Board).

Cotton Incorporated. *Precision Farming Demonstration in California.* **$19,500** (2002). **F. Cassel S.** and D. Goorahoo.

2001-1997

Department of Water Resources - CALFED. *Assessing Spatial and Temporal Variability of Soil salinity on Farms Implementing Integrated Drainage Management Practices.* **$175,010** (2001-2003). **F. Cassel S.**, D. Goorahoo, D. Zoldoske, and P. Canessa.

Environmental Protection Agency. *Evaluation of Various BOD Loading Rates for Land Application of Food-Processing Wastewater on Soil and Subsurface Water Quality.* **$35,735** (2001-2002). **F. Cassel S.**, D. Goorahoo, and S. Sharmasarkar.

United States Department of Agriculture-WAES. *Assessment of Integrating Management of Irrigation and Cropping Practices for Controlling Nitrate Pollution.* **$40,000** (1997-1999). S. Sharmasarkar, S.D. Miller, **F. Cassel S.**, L.J. Held, J.T. Cecil, P. Stahl and G. Vance.

GRANTS AS COLLABORATOR

United States Bureau of Reclamation. *Development of seasonal wetland best management practices for water conservation and salinity management using high resolution remote sensing, direct evapotranspiration monitoring and modeling.* **$178,000** (3 years). T. Slavin, N. Quinn, J. Burns, and E. Holroyd. Collaborator **F. Cassel S.**

Agricultural Research Initiative - CSU. *Evaluation of alternative saline drainage water disposal methods.* **$ 40,100** (2001-2005). D. Zoldoske. Collaborators: D. Goorahoo, **F. Cassel S.**, and G. Jorgensen.

PENDING GRANTS

USDA ¡V NIFA. *Development of an Irrigation Scheduling Decision Support System for Agricultural Producers.* **$749,688** (2012-2015). **F. Cassel S.**, D. Goorahoo, S. Ashkan, F. Melton, L. Johnson, S. Green, J. Ayars, and K. Vang.

NASA. *Mitigation of Drought Impacts on Agriculture through Satellite Irrigation Monitoring and Management Support.* **$186,930** (2012-2013). F. Melton, R. Nemani, L. Johnson,L. Pierce, C. Lund (CSUMB), B. Temesgen (DWR), **F. Cassel S.**, D. Goorahoo, D. Adhikari, and S. Ashkan (CSUF).

NSF. *Integration of satellite and surface observations to quantify regional evapotranspiration for improved agricultural water resource management in California.* **$150,000** (2012-2013). P.I.: F. Melton (CSUMB), **F. Cassel S.** (CSUF).

Agricultural Research Initiative - CSU. *Development of Sustainability Metrics for Agricultural Irrigation Water Use Efficiency.* **$150,000** (2012-2014). L. Johnson, F. Melton, **F. Cassel S.**, and D. Goorahoo.

Agricultural Research Initiative - CSU. *Measuring nitrate concentrations in deep drainage under drip irrigation.* **$300,000** (2012-2014). F. Melton, M. los Huertos, C. Lund, L. Johnson (CSUMB), D. Adhikari, **F. Cassel S.**, D. Goorahoo (CSU Fresno).

PROJECTS AS RESEARCH SCIENTIST, RESEARCH ASSISTANT, AND RESEARCH INTERN

Integrated Pest Management Programs on Pest Control in Wyoming. Pest management and economic health of diversified dryland cropping systems (1999-2000)

USDA-CSREES. Price Discovery in Alternative Trading Institutions and Delivery Methods (2000).

National Jointed Goatgrass Research Initiative Program. Integrated management systems for jointed goatgrass in the Central Great Plains (1996-1999)

Wyoming Integrated Pest Management Program. Weed distributions under diversified cropping systems (1999).

Wyoming Agricultural Experimental Station - Assessment of drip irrigation for managing nitrate contamination and sugarbeet production in Wyoming (1995-1998).

Roquette Laisa Espana, Spain. Implementation of a quality assurance system for I.S.O. 9002 certification (M.S. Thesis, 1993-1994).

University of Wyoming. Post-mortem collagen content in meat (1993).

Ecole Superieure d'Agriculture d'Angers. Tree and fruit nutrient analyses in apples as affected by irrigation regime (1992)

Llaneza, Spain. Orchard management, pest control, fertility, and irrigation requirement for citrus groves, fruit and nut orchards (1991).

Bornes, France (sheep farming enterprise; 1990-1991). Influence of soil depth on barley yield, Use of fodder crop during spring.

HONORS AND AWARDS

2011:	Recipient of Coleman Fellowship. Life-time, national award for teaching "Entrepreneurship in Water Management and Irrigation Technology".
2011:	Recipient of Outstanding Partnership, Federal Laboratory Consortium, Far West Region (with NASA, USDA, DWR)
2009:	Recipient of Outstanding Research and Scholarly Activity Award. CSU Fresno ¡V Jordan College of Agricultural Sciences and Technology.
2005-2007:	Recipient of professional development awards. CSU Fresno ¡V College of Agricultural Sciences and Technology.
2002-2003:	Nominated for the Outstanding Research Award, College of Agricultural Sciences and Technology, CSU Fresno (2002 & 2003).
1999:	Nominated for the Outstanding Dissertation Award, University of Wyoming.
1998-1999:	Biographical citation and "Outstanding Merit and Accomplishment" certificate by Who's Who Among Students in American Universities and Colleges.
1998:	Biographical citation and "Academic Excellence, Community Leadership and Positive Performance" certificate by Dean's List Among Students.
1996-1997:	"High Standards of Scholarship and Leadership" certificates by Gamma Sigma Delta, Honor Society of Agriculture and Alpha Zeta, Honor Society of Agriculture.
1996, 1998:	Western Society of Soil Science. Travel Grants for Presenting Research in Professional Meetings.
1996-1998:	University of Wyoming. Travel Grants for Presenting Research in Professional Meetings.
1994:	French Ministry of Foreign Trade (Formation Au Commerce Exterieur; FACE) and French Ministry of Agriculture. Research and study grant.
1994:	Roquette Laisa Espana, Spain. Research and study grant. $3,000.
1993:	European Economic Community - Agence nationale ERASMUS/CNOUS. Travel grant for study and research in US. $1,000.

MEMBERSHIPS

Soil Science Society of America
Canadian Society of Soil Science

American Society of Agronomy
California Chapter of American Society of Agronomy
American Geophysical Union
Crop Science Society of America
American Society of Horticultural Science
U.S. Society for Irrigation and Drainage Professionals
American Society of Agricultural and Biological Engineers

PROFESSIONAL SERVICES

Committees

2011: - Governing Board Member, California chapter of American Society of Agronomy.
- Member, Planning committee, Multi-State Salinity Coalition.
- Member, Focus Group for Jordan Agricultural Research Building, Jordan College of Agricultural Sciences and Technology, CSU Fresno.

2009-present: Member, Proposal writing committee, Water Resources and Policy Initiatives, The California State University.

2009: Member, Jordan building planning advisory group, Jordan College of Agricultural Sciences and Technology, CSU Fresno.

2006-present: Member, Research and Scholarly Activities Committee (RSAC), Jordan College of Agricultural Sciences and Technology, CSU Fresno.

2006-2007: Member (organizing committee), Coordinator (conference proceedings and poster presentations), Co-organizer (conference program, speakers), International Water Technology Conference, CSU Fresno.

2002-2007: Member, Search committee for following positions at CSU Fresno: Administrative Support Assistant II, Data Base Design Analyst, Air Quality Research Scientist, Gas Chromatograph Analyst, Agricultural Engineer, and Research Scientist.

1998-2001: Member-at-Large, Executive Council of American Association for the Advancement of Science, Pacific Division.

University activities

2007, 2009-2011: Volunteer, Student Score Database Entry, Future Farmers of America (FFA), Plant Science Department, CSU Fresno.

2008: Volunteer, Ornamental Horticulture Workshop, CSU Fresno for 4-H Club members and students from local high schools (Topic: efficient water use in California).

2006-2009: Volunteer, WPHA Dinner, Plant Science Department, CSU Fresno.

2001-2005: Volunteer, CATI/CIT booth, Annual World Ag Expo, Tulare, CA.

Reviews

1998-2010: Grant proposals for USDA-ARS, CSUF-ARI, Wine Institute, and Westside Resources Conservation District. Peer-reviewed journal articles for Journal of Environmental Quality, Precision Agriculture, USDA (2007), Canadian Journal of Soil Science (2009), and Irrigation Science (2010, 2011, 2012).

Extension/Workshops

2001-2010: Developed workshops and disseminated research results to international delegations (Australia, China, Egypt, Iraq, Israel, Japan), universities, federal, state and local agencies, growers, farm advisors.

2010: Participated in workshop for a US Marine Corps detachment. California State University Consortium for International Development (CID), Fresno, CA.

2007 and 2009: Organized field trips for Japanese and Israeli delegations (irrigation systems and water management of several Central Valley farms).

Others

2008: Judge, Undergraduate speech contest for Students of Agronomy, Soils and Environmental Sciences (SASES), ASA-CSSA-SSSA meetings, Houston, TX.

2008: Volunteer, Teaching class for Fresno Gardeners on Water, Plant, and Soil Interactions; part of irrigation series of new Fresno program "Green Gardeners" developed by Ecology Action.

2006- 2008: Mentor, High school and undergraduate students on science school projects.

CERTIFICATES, TRAINING AND PROFICIENCIES

Certificate of Completion "The World of Water Analysis", Dionex seminar (2009). ¡§Raster GIS & Analysis¡¨, San Francisco State University, College of Extended Learning, San Francisco (2005) -1.6 credit units.

Certificate of Completion "Introduction to ArcGIS 9 and Environmental Applications to GIS", Northwest Environmental Training Center, San Jose, CA (2005).

"Remote Sensing in GIS, Part I & Part II", San Francisco State University, College of Extended Learning, San Francisco (2003) - 3.2 credit units.

Certificate of Completion ¡§Introduction to Information Production & Decision Support: Geographic Information systems with ArcMap 8.x", The Interdisciplinary Spatial Information systems Center, CSU Fresno (2003).

"Geo-Spatial Technologies in Agriculture" certificate, UC Kearney Agricultural Center and Environmental Research Systems Institute (2002).

Certificate, "Nitrate in Groundwater: Sources, Impacts and Solutions". Fresno, CA (2001).

Languages: Spanish, French (fluent in both oral and written).

FIELD AND ANALYTICAL EXPERIENCE

Field and Greenhouse:

Water-Plant measurements: Crop evapotranspiration using weighing lysimeters, Bowen ratio, and surface renewal methods; Photosynthesis rate, stomatal conductance, transpiration rate, sub-stomatal CO2 concentration, leaf water stress; Leaf Area Index; crop fractional cover.

Soil measurements: Tensiometer, Capacitance probes, Neutron probe, TDR, Guelph permeameter, Mini-disk and double-ring infiltrometers, Flumes, Suction lysimeters.

Others: Electromagnetic induction meters (EM-31 and EM-38); GPS; Irrigation system design and water application scheduling (drip, sprinkler, flood).

Laboratory:

Plant: Weed separation from soil by Froth-Flotation technique using Elutriator.

Chemical analyses: pH, Eh, EC, TDS, cations, anions, total N (Kjeldahl), titration, buffers. Instruments: pH/Eh Meters, Electrical Conductivity Bridge, Technicon Auto Analyzer, UV-Visible Spectrophotometer, Ion Chromatographer, Atomic Absorption Spectrophotometer, Lachat Flow Injection Analyzer, Discrete Analyzer, Total Organic Carbon Analyzer.

Physical analyses: Soil water content/potential, hydraulic conductivity, solute displacement, temperature and thermal diffusivity, retention curves; sprinkler system performance testing.

CITATIONS IN PERIODICALS

Fresno State news (November issue) and **California Agricultural Technology Institute** - Update (Fall 2011). *Tomatoes get CO2 enrichment during growth trials.* (http://www.fresnostatenews.com/2011/11/tomatoes-get-co2-enrichment-during-fresno-state-growthtrials/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+fresnostatenews+%28FresnoStateNews.com%29)

California Agricultural Technology Institute - Update. *Remote sensing addresses West Side salinity problems.* Winter 2010-11.

Ag Alert. *Irrigation research helps farmers switch to new crops.* October 2009.

Fresno State news. *Fresno State researchers explore subsurface drip irrigation.* August 2009. (fresnostatenews.com/2009/08/fresno-state-researchers-explore-subsurface-drip-irrigation-2/)

California Agricultural Technology Institute - Update . Seeking to reclaim West Side Soils. Summer 2009.

Ag Alert. Farms find ways to grow crops with salty water. May 2009.

California Agricultural Technology Institute - Update. *From one desert to another.* Winter 2008-09.

University of California Cooperative Extension. *4-H Guidelines.* October 2008.

The Fowler ensign. *County 4-H clubs combine forces to expand composting project; study entomology and conservation.* September 18, 2008.

California Agricultural Technology Institute - Update. *Soil moisture study targets water basin.* Spring 2007.

California Agricultural Technology Institute - Update. *Eye in the sky measures crop water use.* Fall 2006.

California Agricultural Technology Institute - Update. *Groundwater testing strategies.* Fall 2005.

California Agricultural Technology Institute - Update. *Golf courses consider recycled water use.* Summer 2005.

American Vegetable Grower. *Breathe Deep*. March 2005.

California Farm Equipment. *Soft drink staple boosts plant yield.* September 2004.

California Agricultural Technology Institute - Update. *CO2 applications evaluated in commercial strawberry fields.* Summer 2004.

Fresno Bee. *Deal fosters water center - Fresno State institute will join US initiatives on China, job creation.* March 2004.

California Agricultural Technology Institute - Update. *Soil salinity mapping expected to aid growers.* Summer 2003.

California Farmer. *High water marks.* January 2003.

California Farmer. *Mapping a menace.* September 2002.

Western Farm Press. *Variable rate cotton planting.* Vol. 24, Number 9. 2002.

California Agricultural Technology Institute - Update. *Mapping soil salinity.* Spring 2002.

California Agricultural Technology Institute - Update. *New researcher to aid in soil moisture, dairy studies*. Spring 2001.

PUBLICATIONS

BOOK CHAPTERS

1. Goorahoo, D., **F. Cassel S.**, D. Adhikari, and S. Benes. 2011. Soil-Water-Plant Relations. In L. E. Stetson and B. Mecham (eds.), *Irrigation 6th edition*, Chapter 3, Irrigation Association. p 23-73.
2. **Cassel S., F.**, D. Goorahoo, D. Zoldoske, and D. Adhikari. 2009. Mapping soil salinity using ground-based electromagnetic induction technique. *In* G. Metternicht and A. Zinck (eds.), *Remote Sensing of Soil Salinization: Impact on Land Management*, Chapter 11, CRC Press, Boca Raton, FL, p. 199-233. (**Invited**)

3. **Cassel S., F.** 2007. Soil Salinity Mapping Using ArcGIS. In F.J. Pierce (ed.), *GIS Applications for Agriculture*, Chapter 8, CRC Press, Boca Raton, FL, p. 141-162. (**Invited**)

REFEREED JOURNAL ARTICLES

1. YellaReddy, S.K.R, D. Goorahoo, and **F. Cassel S.** 2011. Yield and nitrate leaching responses of vegetables to conventional and slow release nitrogen fertilizer applications. In Preparation for Submission to *Journal of Agricultural Research*.
2. **Cassel S., F.,** D. Goorahoo, D. Adhikari, and S. Ashkan. 2008. Photosynthesis response curves for strawberries subjected to elevated CO2 levels. *In* F. Takeda, D.T. Handley, and E.B. Poling (eds.), 2007 North American Strawberry Symposium, North American Strawberry Growers Association, Kemptville, ON, Canada. p. 141-145.
3. Goorahoo, D., D. Adhikari, D. Zoldoske, and **F. Cassel S.** 2008. Potential for AirJectionR Irrigation in Strawberry Production*. In* F. Takeda, D.T. Handley, and E.B. Poling (eds.), 2007 North American Strawberry Symposium, North American Strawberry Growers Association, Kemptville, ON, Canada. p. 152-159.
4. Adhikari D., J. Ayars, D. Goorahoo, and **F. Cassel S.** 2008. Micro sprinkler irrigation using SCADA and sensor network for freeze protection. Arab Water World Magazine, March issue, Beirut, Lebanon. pp 22-26.
5. **Cassel S., F.** and D. Zoldoske. 2006. Assessing canal seepage and soil salinity using the electromagnetic remote sensing technology. *In* G. Lorenzini and C.A Brebbia (eds) *Sustainable Irrigation management*, Technologies and Policies. WIT Press. p. 55-63.
6. Goorahoo, D., E. Norum, **F. Cassel S.**, and D. Adhikari. 2004. Development of a Standardized Testing Protocol for Soil Moisture Sensors. *International Water and Irrigation*. 24(2):21-22.
7. **Cassel S., F**., D. Zoldoske, and M. Spiess. 2003. Assessing spatial and temporal variability of soil salinity on farms implementing integrated drainage management practices. CATI Publication #030603, Fresno, CA, 40 pp.
8. **Cassel S., F.,** D. Zoldoske, T. Jacobsen, and E. Norum. 2002. Using electromagnetic sensing technique for assessing soil salinity and canal seepage. *In* G. Becciu et al. (eds) New Trends in Water and Environmental Engineering for Safety and Life, Capri, Italy. p. 89.
9. **Cassel S., F**., M. McClanahan, D. Goorahoo, S. Sharmasarkar, J. Kipps, S. Klein, R. Crites, and J. Smith. 2002. BOD loading impact on land application percolate water quality. Water Environment Federation, Alexandria, VA. 19 pp.
10. **Cassel S., F**., S. Sharmasarkar, S. Miller, G. Vance, and R. Zhang. 2001. Assessment of drip and flood irrigation on water and fertilizer use efficiencies for sugarbeets. *Agricultural Water Management*. 46(3):241-251.
11. **Cassel S., F**., S. Sharmasarkar, L. Held, S. Miller, G. Vance, and R. Zhang. 2001. Agro-economic analysis of drip irrigation for sugarbeet production. *Agronomy Journal*. 93:517-523.
12. **Cassel S., F.**, S. Sharmasarkar, R. Zhang, G. Vance, S. Miller, and M. Reddy. 2000. Modeling nitrate movement in sugarbeet soils under flood and drip irrigation. *International Commission of Irrigation and Drainage Journal*. 49:43-54.
13. **Cassel S., F**., S. Sharmasarkar, S. Miller, L. Held, G. Vance, and R. Zhang. 2000. Assessment of microirrigation for sugarbeet production. *Journal of Sustainable Agriculture*. 17(2/3):17-32.

14. **Cassel S., F.,** S. Sharmasarkar, R. Zhang, G. Vance, and S. Miller. 1999. Micro-spatial variability of soil nitrate following nitrogen fertilization and drip irrigation. *Water, Air, and Soil Pollution Journal.* 116:605-619.
15. Reddy, M., D. Wilamowski, and **F. Cassel S.** 1999. Optimal scheduling of irrigation canal laterals*. International Commission of Irrigation and Drainage*. 48(3):1-12.
16. Sharmasarkar, S., G. Vance, and **F. Cassel S.** 1998. Analysis and speciation of selenium ions in coal mine environments*. Environmental Geology*. 34:31-38.
17. Sharmasarkar, S**., F. Cassel S.**, R. Zhang, and G. Vance. 1997. Fate of nitrate and aldicarb under irrigation management. What's New in the Toolbox: *Applied Research for Management of Wyoming's Water Resources.* p. 87-91.
18. **Cassel S., F**., R. Zhang, and G.F. Vance. 1996. Modeling unsaturated water flow in a three-dimensional soil system under drip irrigation. *In* H.J. Morel-Seytoux (ed.) Hydrology Days, American Geophysical Union. p. 49-60.
19. Sharmasarkar, S., G. Vance, and **F. Cassel S.** 1996. Selenite-selenate speciation in mine soils and salt solutions: a comparison of atomic absorption spectroscopy and ion chromatography. *In* W.L. Daniels, J.A. Burger, and C.E. Zipper (eds.) *Success and Failures: Applying Research Results to Insure Reclamation Success.* p. 424-429.

TECHNICAL REPORTS

2011

1. **Cassel S., F.** and D. Zoldoske. Estimating crop evapotranspiration and soil salinity from remote sensing imagery. Final report, Agricultural Research Initiative. 22 pp.
2. **Cassel S., F.**, D. Zoldoske, and X. Yang. Integrating remote sensing techniques to determine extent of salinization in the San Joaquin Valley of California. Annual report, Agricultural Research Initiative.
3. **Cassel S., F.**, D. Goorahoo, and B. Roberts. 2011. Soil salinity maps and data analyses for surveyed fields. Series of interim reports submitted to JG Boswell Company as part of project "Evaluating irrigation and cultural management alternatives through field-scale salinity and water table characterization".
4. Goorahoo, D., **F. Cassel S.**, and D. Adhikari. 2011. Use of Elephant Grass as a Bio-filter for Fields Irrigated with Dairy Effluent and Processing Wastewater. Annual report, Agricultural Research Initiative. 5 pp.
5. Goorahoo, D., and **F. Cassel S.** 2011, Nitrous oxide emissions from California orchard and vegetable cropping systems. Annual report, Agricultural Research Initiative. 10 pp.

2010

6. **Cassel S., F.** 2010. Electromagnetic induction technology measures soil moisture. Research report, California Agricultural Technology Institute. 4 pp.
7. **Cassel S., F.**, and D. Goorahoo. 2010. Post-harvest quality of peaches as influenced by N fertilization sources - shelf-life comparative study. Final report, Monarch Scientific. 11pp.
8. Goorahoo, D., and **Cassel S., F.**. 2010. Use of Elephant Grass as a Bio-filter for Fields Irrigated with Dairy Effluent and Processing Wastewater. Annual report, Agricultural Research Initiative. 3 pp.

9. Goorahoo, D., **Cassel S., F.**, Yellareddygari, S.K.R., and N. Mendez. 2010. Efficacy of EarthRenew organic matter in a granule for vegetable production ¡V Phase 2 Pot and field studies with warm season vegetables. Interim report, California State University. 22 pp.

2009

10. **Cassel S., F.** 2009. Response of swamp timothy (Crypsis schoenoides) to modified hydrology. Final report, Department of Water Resources. 20 pp.
11. **Cassel S., F.**, and D. Goorahoo. 2009. Reclamation of saline-sodic soils for tomato production using calcium fertigation and acidification¡¦. Annual report, Agricultural Research Initiative. 3 pp.
12. Goorahoo, D., **Cassel S., F.**, D. Adhikari, and D. Zoldoske. 2009. Nutrient Control of Agricultural Runoff Water. Final report submitted to Imperial Valley Conservation Research Center Committee, John R. (Dick) Kershaw. 17pp.
13. Goorahoo, D. and **Cassel S., F.** 2009. Review of Preliminary Analysis of Pond Cycling Study and Core Sampling Study Data Submitted by Carollo Engineers. Submitted to Ms. Rosa Lau-Staggs, Chief of Environmental Services & Mr. Mohammad Moaddab, Wastewater Reclamation Coordinator, City of Fresno, Fresno-Clovis Regional Wastewater Reclamation Facilities.

2008

14. **Cassel S., F.**, D. Goorahoo, D. Adhikari, and D. Zoldoske. 2008. Evaluating soil health improvements and water savings using Unlo2k. Final report, Dutch Brothers enterprises, LLC. 30 pp.
15. Goorahoo, D., **Cassel S., F.**, J. Suen, and D. Adhikari. 2008. Vertical transport study in soil. Final report, California Department of Pesticide Regulation, Environmental Monitoring Branch. 35 pp.
16. Goorahoo, D., **Cassel S., F.**, and D. Adhikari. 2008. Spatial variability of organic and nitrogen loading from winery stillage application. Final report, ARI-CAST, California State University, Fresno, CA. 9 pp.
17. **Cassel S., F.**, D. Zoldoske, and S. Mettler. 2008. Assessment of canal seepage using electromagnetic technique. Final report, ARI-CAST, California State University, Fresno, CA. 20 pp.

2007

18. **Cassel S., F.** 2007. Investigation of potential seepage areas around the Oakes recharge basin. Final report, Kaweah Delta Water Conservation District, CA. 60 pp.
19. **Cassel S., F.**, D. Zoldoske, and S. Mettler. 2007. Assessing spatial and temporal variability of soil salinity on farms implementing integrated drainage management practices. Final report, ARI-CDFA, California State University, Fresno, CA. 44 pp.
20. **Cassel S., F.**, D. Goorahoo, D. Adhikari, and S. Ashkan. 2007. Open-field CO2 enrichment using drip irrigation systems. ARI-CDFA, California State University, Fresno, CA. 13 pp.
21. **Cassel S., F.**, D. Zoldoske, and D. Goorahoo. 2007. Salinity assessment for precision farming in cotton systems. Final report, ARI-CAST, California State University, Fresno, CA. 14 pp.
22. **Cassel S., F.** 2007. Soil salinity appraisal in two agricultural fields. Final report, California State University, Fresno, CA. 26 pp.

2006

23. **Cassel S., F.** 2006. Remote sensing of evapotranspiration for verification of regulated deficit irrigation. Final Report, USBR, Sacramento, CA. 58 pp.

2005

24. **Cassel S., F.** 2005. Analyses of remote sensing and SEBAL data using GIS. Training Manual. USBR, Sacramento, CA. 22 pp.
25. **Cassel S., F.** 2005. Validation and analyses of SEBAL-processed satellite images for path/row 42/35. USBR, Sacramento, CA. 27 pp.
26. **Cassel S., F.** 2005. Soil Salinity Assessment Manual - guide for conducting soil salinity surveys, analyzing data, and generating maps. Manual developed for LBNL for project entitled "Real-Time Water Quality monitoring and Habitat Assessment in the San Luis National Wildlife Refuge", California DWR ¡V CALFED Drinking Water Program. 22 pp.
27. **Cassel S., F.**, M. Spiess, B. Taylor, and D. Zoldoske. 2005. Use of remote sensing techniques for improving soil and crop management practices. Annual report, ARI-CAST, California State University, Fresno, CA. 3 pp.
28. Zoldoske, D., D. Goorahoo, **F. Cassel S.**, and G. Jorgensen. 2005. Evaluation of alternative saline drainage water disposal methods. Final report, ARI-CAST, California State University, Fresno, CA. 6 pp.
29. **Cassel S., F.** and B. Thoreson. 2005-2007. Remote sensing of evapotranspiration for verification of regulated deficit irrigation. Quarterly reports, USBR, Sacramento, CA.18 pp.

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89. Adhikari, D., **F. Cassel S.**, D. Goorahoo, A. Shrestha, and S. Ashkan. 2004. Photosynthetic responses to enriched atmospheric carbon dioxide in strawberry leaves. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. (CD)
90. Ng, J., A. Chu, D. Goorahoo, **F. Cassel S.**, and D. Adhikari. 2004. Growing broccoli with a sustainable manure-based fertilizing system (MBFS). Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. (CD)
91. Horney, R., **F. Cassel S.**, B. Taylor, D. Munk, B. Roberts, R. Plant. 2004. Temporal evaluation of reclaiming salt-affected soil. Proceedings, 7th International Conference on Precision Agriculture and other Precision Resource Management, Minneapolis, MN. In D.J. Mulla, ed. Madison, Wisconsin: ASA-CSSA-SSSA (CD).
92. **Cassel S., F.** 2004. Use of Electromagnetic Technique for the Reclamation of Saline Soils. Abstracts, Eurosoil 2004, Freiburg, Germany. p. 129.
93. Goorahoo, D., and **F. Cassel S.** 2004. Vadose zone monitoring for organic and nitrogen loading from winery stillage application. Abstracts, Eurosoil 2004, Freiburg, Germany. p. 414.
94. **Cassel S., F.**, D. Goorahoo, D. Adhikari, and M. McClanahan. 2004. Effects of winery wastewater application on soil water quality. Proceedings, 25th Annual Central California Research Symposium, Fresno, CA.
95. **Cassel S., F.**, D. Zoldoske, T. Jacobsen, E. Norum, and S. Mettler. 2004. Soil salinity surveys using EM technology. Presentations at workshops ¡§Managing Agricultural Drainage Water¡¨. Five Points and Los Banos, CA.
96. **Cassel S., F.**, J. Tischer, and D. Zoldoske. 2004. Canal seepage investigation using the electromagnetic technique. Presentation at Northern California Water Association manager meeting. Western Canal Water District, Nelson, CA.

97. **Cassel S., F.**, D. Goorahoo, and D. Adhikari. 2004. Evaluating percolate water quality following land application of winery processing wastewater. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Visalia, CA. p. 174.
98. Goorahoo, D., **F. Cassel S.**, G. Carstensen, and S. Ashkan. 2004. Crop growth enhancement with CO2 injection into the crop canopy with drip irrigation. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Visalia, CA. p. 155.
99. **Cassel S., F.**, M. McClanahan, S. Sharmasarkar, and D. Goorahoo. 2004. Water quality assay in land treated with tomato-processing wastewater in central California. Sustainable Land Application Conference, University of Florida, IFAS - Soil and Water Department. Lake Buena Vista, FL. p. 90.

2003

100. **Cassel S., F.**, B. Taylor, B. Roberts, and D. Zoldoske. 2003. Site-specific salinity management for cotton production using remote sensing techniques. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. (CD)
101. **Cassel S., F.**, D. Zoldoske, E. Norum, and T. Jacobsen. 2003. Detecting canal seepage using the electromagnetic induction method. Proceedings, Technical Conference, Irrigation Association, San Diego, CA.
102. Goorahoo, D., E. Norum, **F. Cassel S.**, and D. Adhikari. 2003. Development of a standardized testing protocol for soil moisture sensors: current status and preliminary test results. Proceedings, Technical Conference, Irrigation Association, San Diego, CA.
103. **Cassel S., F.** 2003 & 2002. Soil EC maps. Presentations at Precision Agriculture Field Day #2 & #1, Lemoore, CA.
104. **Cassel S., F.** 2003. Soil Salinity Mapping and Wastewater Application. Presentation at California Water Institute & Lawrence Berkeley National Laboratory Collaboration & Brainstorming Mini-Conference, Fresno, CA.
105. **Cassel S., F.** D. Goorahoo, M. McClanahan, and G. Carstensen. 2003. Evaluation of sub-surface and ground water quality following land application of food-processing effluents. Presentation to the Cochran delegation. CSU Fresno (invited).
106. **Cassel S., F.**, D. Zoldoske, T. Jacobsen, S. Mettler, and E. Norum. 2003. Using Electromagnetic Sensing Technique for Assessing Soil Salinity and Canal Seepage. Presentation to the Cochran delegation, CSU Fresno (Invited)
107. **Cassel S., F.**, M. McClanahan, S. Sharmasarkar, and D. Goorahoo. 2003. Assessing the Impacts of food-processing effluent land application on subsurface water quality. Proceedings, 24th Annual Central California Research Symposium, Fresno, CA.
108. **Cassel S., F.**, M. McClanahan, S. Sharmasarkar, and D. Goorahoo. 2003. Effects of BOD loading on percolate water quality following land application of food processing wastewater. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Sacramento, CA. p.163.

2002

109. **Cassel S., F.**, and Brock Taylor. 2002. Precision farming demonstration in California. Presentation at Cotton Workgroup and Cotton Incorporated State Support Committee Meeting, Tulare, CA.

110. **Cassel S., F.**, D. Zoldoske, T. Jacobsen, and E. Norum. 2002. Using electromagnetic sensing technique for assessing soil salinity and canal seepage. Presentation at New Trends in Water and Environmental Engineering for Safety and Life. Capri, Italy.
111. **Cassel S., F.**, D. Zoldoske, T. Jacobsen, and E. Norum. 2002. Use of electromagnetic survey to assess potential canal seepage. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Sacramento, CA. p.169.
112. **Cassel S., F.**, D. Zoldoske, T. Jacobsen, and E. Norum. 2002. Assessing Potential Canal Seepage with Electromagnetic Technique. Proceedings, 23rd Annual Central California Research Symposium, Fresno, CA. p. 89.

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113. **Cassel S., F.**, D. Goorahoo, and S. Sharmasarkar. 2001. Electromagnetic assessment of soil salinity under integrated on-farm drainage management in the Westside San Joaquin Valley. Abstracts, International Union of Soil Science- Bouyoucous Conference SSSA - UC, USDA -ARS George E. Brown Jr. Salinity Laboratory, Riverside, CA. p.57.
114. Goorahoo G., **F. Cassel S.**, and G. Carstensen. 2001. Biological and chemical treatment of dairy stream effluent. Presentation at Edison AgTAC, Tulare, CA.

2000

115. **Cassel S., F.** and S. Sharmasarkar. 2000. Sensitivity and risk factor modeling for converting sugarbeet irrigation to sprinkler system. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 318.
116. Sharmasarkar, S. and **F. Cassel S.** 2000. Micro-spatial analysis of soil and plant nitrate under low-volume irrigation. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI.

1999

117. **Cassel S., F.**, S. Sharmasarkar, S. Miller, and L. Held. 1999. Environmental and economic evaluation of sprinkler irrigation and sugarbeets. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 33.
118. **Cassel S., F.**, S. Sharmasarkar, and S. Miller. 1999. Geostatistical analysis of soil nitrate in a sprinkler-irrigated field. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 288.
119. **Cassel S., F.**, S. Sharmasarkar, S. Miller, and L. Held. 1999. Assessing agricultural productivity under micro-scale irrigation. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol 18, Part 1. p.80.
120. Sharmasarkar S., **F. Cassel S.**, S. Miller, and J. Cecil. 1999. Effect of irrigation management on water and fertilizer conservation for sugarbeets. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 288.
121. Miller, S., S. Sharmasarkar, and **F. Cassel S.** 1999. Preliminary evaluation of weed population control using different cropping systems. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 33.
122. Sharmasarkar, S., **F. Cassel S.**, S. Miller, and L. Held. 1999. Effects of alternative irrigation system on pollution control and crop sustainability. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol 18, Part 1. p. 81.

123. Sharmasarkar, S., **F. Cassel S.**, S. Miller, and L. Held. 1999. Low-volume irrigation applications for agrochemical management and sustainable crop production. Presentation, American Farm Bureau Foundation for Agriculture, Meet the Researchers Program, 80th Annual Convention, Albuquerque, NM.

1998

124. **Cassel S., F.**, S. Sharmasarkar, S. Miller, L. Held, G. Vance, and R. Zhang. 1998. Assessing the efficacy of microirrigation for sugarbeet production. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p.34.
125. **Cassel S., F.**, S. Sharmasarkar, S. Miller, J. Cecil, M. Reddy, G. Vance, and R. Zhang. 1998. Design and in-situ application of microirrigation for sugarbeet production. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 344.
126. **Cassel S., F.**, S. Sharmasarkar, S. Miller, L. Held, G. Vance, and R. Zhang. 1998. Efficacy of drip irrigation for managing nitrate contamination and sugarbeet production. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol. 17, Part 1. p. 39.
127. Sharmasarkar, S., **F. Cassel S.**, S. Miller, L. Held, and G. Vance. 1998. Water and contaminant management with low-volume irrigation practices. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 341.
128. Sharmasarkar, S., **F. Cassel S.**, G. Vance, R. Zhang, and S. Miller. 1998. Modeling nitrate movement under microirrigation. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol. 17, Part 1. p. 40.
129. Sharmasarkar, S., **F. Cassel S.**, S. Miller, J. Cecil, L. Held, J. Fornstrom, G. Vance, and R. Zhang. 1998. Application of Low-Volume Irrigation Technologies for Managing Agrochemical Use in Wyoming. University of Wyoming. Presentation at Wyoming Extension Showcase on Technology, Casper, WY.

1997

130. **Cassel S., F.**, S. Sharmasarkar, L. Held, S. Miller, R. Zhang, and G. Vance. 1997. Economic analyses of irrigation management for sugarbeet production. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 328.
131. **Cassel S., F.**, S. Sharmasarkar, R. Zhang, G. Vance, and S. Miller. 1997. Soil nitrate movement under drip and flood irrigation: column studies and computer modeling. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 35.
132. **Cassel S., F.**, S. Sharmasarkar, R. Zhang, G. Vance. 1997. Best irrigation practices for controlling soil nitrate pollution. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol. 16, Part 1. p. 44.
133. Sharmasarkar, S., **F. Cassel S.**, S. Miller, R. Zhang, and G. Vance. 1997. Comparative assessment of different irrigation practices for agro-environmental management. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 333.
134. Sharmasarkar, S., **F. Cassel S.**, R. Zhang, and G. Vance, and S. Miller. 1997. Effect of irrigation management on a restricted use pesticide, aldicarb. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 35.
135. Sharmasarkar, S., **F. Cassel S.**, R. Zhang, and G. Vance. 1997. Dynamics of a restricted use pesticide (Temik) under microirrigation applications. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol. 16, Part 1. p. 63.

1996

136. **Cassel S., F.**, R. Zhang, G. Vance, and S. Sharmasarkar. 1996. Nitrate transport in a 3-dimensional soil system under different irrigation practices. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 340.
137. **Cassel S., F.**, R. Zhang, S. Sharmasarkar, and G. Vance. 1996. Soil nitrate movement under simulated flood and drip irrigation practices. Proceedings, Annual Meeting, AAAS Pacific Division, San Francisco, CA. Vol. 15, Part 1, p. 37.
138. **Cassel S., F.** 1996. Assessing nitrate transport under drip and flood irrigation. Presentation to Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, WY.
139. Sharmasarkar, S., **F. Cassel S.**, R. Zhang, and G. Vance. 1996. Geostatistical analysis of selenium in coal mine environments. Agronomy Abstracts, Annual Meetings, ASA-CSSA-SSSA, Madison, WI. p. 340.

B. DAVE GOORAHOO Ph.D.

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EDUCATION

Ph.D. Soil Science (Major: Soil Physics)
UNIVERSITY OF GUELPH (1994 - 1999)
Land Resource Science
Guelph, Ontario, Canada. N1G 2W1

M.Sc. Soil Science (Major: Soil Fertility)
UNIVERSITY OF GUELPH (1991 - 1993)
Land Resource Science
Guelph, Ontario, Canada. N1G 2W1

B.Sc. Agriculture (Upper Second Class Honours)
UNIVERSITY OF THE WEST INDIES (1986 - 1990)
St. Augustine, Trinidad, West Indies

AWARDS AND RECOGNITION

- 2011- Nominee for Campus Advisers Network (CAN) for the outstanding advisor award
- 2011-Second vice-president, California chapter of American Society of Agronomy.
- 2010- Secretary Treasurer- California chapter of American Society of Agronomy.
- 2010- Committee Member, Planning Multi-State Salinity Coalition (2010-2011)
- 2008- Coleman Fellowship for "Entrepreneurship in Organic Farming".
- 2008- Winner of Outstanding Research Award, College of Agricultural Sciences Technology, California State University Fresno.
- 2002-2004- Nominated for the Outstanding Research Award, College of Agricultural Sciences Technology, California State University Fresno.
- 1994 – Ontario Graduate Scholarship (OGS)+-Scholarship awarded by Government of Ontario for Doctoral studies at an Ontario University.
- 1991 - University of Guelph Graduate Fellowship. Granted by the awards committee of Board of Graduate Studies based on academic standings.
- 1990 - Faculty of Agriculture Prize. University of the West Indies. Outstanding academic achievement during Year III of B.Sc. program.
- 1990 - Frederick Hardy Prize. University of the West Indies. Highest average marks in soil science courses and research project.
- 1990 - Silver Gilt Medal. University of the West Indies. Best undergraduate student in final year exams, Faculty of Agriculture.

ADDITIONAL CERTIFICATES

- 2008- California Certified Organic Farmers (CCOF) certification for plot on campus.
- 2008- Certificate of completion for HYDRUS 3DWorkshop from Univ. of Hawaii Manoa
- 2002- Geo-Spatial Technologies in Agriculture. A symposium sponsored by U.C. Kearney Agricultural Center and Environmental Research Systems Institute.

- 2000 – Using Lagoon Water Nutrients for Crop Production. A Short course for crop consultants conducted by University of California Cooperative Extension (UCCE).
- 1997 - Ground Penetrating Radar (GPR). Awarded for completion of the sensors & software course on GPR presented by Sensors and Software Inc., Waterloo, Canada.
- 1993 -University Teaching: Theory and Practice. A certificate program for Graduate Students and Postdoctoral Fellows sponsored by the Faculty of Graduate Studies and Teaching Support Services at the University of Guelph, Ontario, Canada.

MAJOR RESEARCH INTERESTS

- Interdisciplinary approaches involving soil scientists, agronomists, growers, and environmentalists aimed at developing best management practices for vegetable crop production and water use efficiency.
- Interaction of nutrient cycling and transport of water and chemicals within the Soil-Plant-Air-Continuum (SPAC).
- Organic Farming: Principles, Opportunities and Challenges
- "Ag-Environ" research and teaching highlighting the impact of various agricultural practices on the air, soil and water resources.
- Vadose zone and groundwater hydrology with emphasis on contaminant transport related to agricultural practices.

PROFESSIONAL EXPERIENCE

- Aug. 2006- Present: Assistant Professor –Vegetable Crops Production in Plant Science Dept., Jordan College of Agricultural Science and Technology (JCAST), California State University, Fresno.
- Aug. 2006- Present: Research Soil Scientist – Center for Irrigation Technology (CIT). Jordan College of Agricultural Science and Technology (JCAST), California State University Fresno. Appointment based on release time secured from my teaching appointment in the Plant Science Department.
- Oct. 2001 – Aug. 2006: Adjunct Professor in Plant Science Dept., College of Agricultural Science and Technology (CAST), California State University, Fresno.
- Dec. 1999 – Aug. 2006: Research Soil Scientist at Center for Irrigation Technology, California State University, Fresno. Supervisor: Dr. David Zoldoske
- Jul. 1999 - Dec. 1999: Post-doctoral Fellowship at Soil Science Department, University of Saskatchewan. Supervisor: Dr. R. Gary Kachanoski.
- Jul. 1998 – Jun. 1999: Visiting scholar at Soil Science Department, University of Saskatchewan, Canada.
- Jun. 1998: Graduate research assistantship. University of Guelph, Canada . Duties involved soil sampling, plant and soil analyses, laboratory and field work.

TEACHING EXPERIENCE

- Spring 2011- CRSC 115- Organic Crop Production; PL 251- Graduate course- Soil-Plant-Water Relations,
- Fall 2010- CRSC111 –Warm Season Vegetable Production; SW100N-Soils in the Environment.
- Summer 2010- Study Abroad Course- Plant 170T-"Culture, Cuisine and Agriculture of rinidad and Tobago".
- Spring 2010- PLANT 170T- Organic Farming: Principles, Opportunities and Challenges; PLANT105 –Food Society and Environment; PLANT 270T- Graduate Seminar course "Efficient use of Agricultural Water".
- Fall 2009- SW100N-Soils in the Environment; CRSC 112-Cool Season Vegetable Production.
- Spring 2009- PLANT105 –Food Society and Environment; PLANT 170T- Organic Farming: Principles, Opportunities and Challenges.

- Fall 2008- PLANT105 –Food Society and Environment; PLANT 170T- Soils in the Environment; CRSC111 –Warm Season Vegetable Production; PLANT 250- Energy and Agriculture (Graduate level course)- Co-lecturer with Dr. A. Alexandrou.
- Spring 2008. PLANT105 –Food Society and Environment; Plant 170T- Organic Farming.
- Fall 2007- PLANT105 –Food Society and Environment, and CRSC112 –Cool Season Vegetable Production. PL 256- Graduate course- Plant-Water Relations
- Spring 2007. PLANT105 –Food Society and Environment; CRSC111 –Warm Season Vegetable Production; and PLANT 270- Graduate Seminar course- Efficient Use of Agricultural Water.
- Fall 2006. PLANT105 –Food Society and Environment, and CRSC112 –Cool Season Vegetable Production in the Plant Science Department, California State University, Fresno
- Spring 2006. PLANT105 –Food Society and Environment in the Plant Science Department, California State University, Fresno
- Fall 2005. SW001- Introduction to Irrigated Soils in the Plant Science Department, California State University, Fresno.
- Spring 2005. Guest lectured for Dr. J. Farrar's class PL 170- Sustainable Agriculture. Topic covered was "N, P and K Management for Sustainable Agriculture "
- Spring 2005. Guest lectured for Dr. S. Benes' graduate class PL253- Soil-plant water relations. Topics covered were "Water Flow and Solute Transport in the Vadose Zone", "Nitrate Leaching and Vadose Zone Monitoring".
- Fall 2004. PL256- Plant–Water Relations. A graduate level course in the Plant Science Department, California State University, Fresno (CSUF).
- Spring 2002: Geol 220- Groundwater Hydrology. Co-lecturer with USDA Hydrologist, Dr. Richard Soppe. A graduate course in the Department of Earth and Environmental Science, California State University, Fresno.
- Spring 2002: Geol 177- Quantitative methods for earth Science. An undergraduate course in the Department of Earth and Environmental Science, California State University, Fresno
- Fall Semesters 2000 and 2001. Taught course SW001- Introduction to Irrigated Soils in the Plant Science Department, California State University, Fresno (CSUF).
- Spring 2001 & 2003 semesters. Guest lectured for Dr. S. Benes' graduate class PL253- Soil-plant water relations. Topic covered was "Overview of Water Flow and Solute Transport in Soils"
- Spring 2001 semester. Guest lectured for Dr. C.F. Krauter's undergraduate class SW-002. Topics covered were soil water content, soil water potential and soil water characteristics curves.
- Spring 2001 semester. Guest lectured for Dr. S. Benes' undergraduate class SW-101. Topic covered was Potassium Deficiency Symptoms in Plants.
- Jan. 1992 – Dec. 1996: Graduate teaching assistantship. University of Guelph. Teaching assistant for the "Soils in the Environment". Lecturing, grading and laboratory demonstrations.
- Sept. 1993 & Sept. 1994: Workshop demonstrations on grading and marking of papers. University of Guelph. Presented to new graduate students.

THESIS AND UNDERGRADUATE RESEARCH ADVISING

- 2006- Present: **Major advisor for <u>eight</u> graduate** students' thesis research projects in the Plant Science department on:
  - Airjection® irrigation and organic vegetable production
  - Growth and yield of vegetables treated with slow release Nitrogen fertilizers
  - Nitrous oxide emissions from fertilizer application to cotton, forages and vegetables
  - Fertigation and calcium management practices for processing tomatoes
  - Deficit irrigation practices on yield and quality of bell peppers
  - Water use efficiency and yield of tomatoes subjected to elevated CO_2 levels
  - Nitrogen usage and leaching potential of nursery grown California native plants

- Remote sensing technologies for optimizing irrigation scheduling for vegetable crops

- 2006- Present: **Member of thesis advisory committee** for **THREE graduate** students' thesis research projects in the Plant Science department on:
  - Germination rates of turf grasses to salinity levels
  - Phenotypic analysis and marker addition in recombinant inbred pepper populations
  - Reclamation potential of amendments for Soils Irrigated with Saline-Sodic Drainage Water

- 2006- Present: **Major advisor for nine undergraduate** research projects in Plant Science department on:
  - Application of mapping software for characterizing salinity levels in tomato fields
  - Growth and yield of vegetables treated with slow release Nitrogen fertilizers
  - Growth and yield of bell peppers treated with compost tea
  - Germination rate of Bok Choy seeds subjected to increasing salinity levels
  - Growth and yield of Bok Choy grown with conventional and organic Nitrogen fertilizers
  - Growth and yield of cabbage fertilized with varying rates of UAN 32
  - Electrical conductivity (EC) and pH levels of soils treated with slow release N formulations
  - Spatial and temporal measurements of SAR, EC, pH and nitrate levels of soils
  - Soil moisture monitoring for effective irrigation scheduling of vegetable and orchard crops

- 2001- 2006: Member of thesis advisory committee for Fresno State M.S. **graduate** students in: Plant Science Dept. (6 completed); and College of Engineering (1 completed) on:
  - Phosphate fertilizer movement with high frequency micro irrigation
  - Hydraulic properties of soils irrigated with saline-sodic water
  - Ammonia emissions from fertilizer applications
  - Irrigation and Calcium management practices for controlling *Erwinia* in potatoes
  - Nitrogen fertilization and utilization in Broccoli
  - Nitrogen fertilization and utilization in Lettuce
  - Use of Sudan grass as a scavenging crop following N fertilization of tomatoes
  - Denitrification- Nitrification dynamics in soils receiving waste water (Engineering)

- 2001- 2006: Co-advisor with CSUF Plant Science faculty on independent study projects for graduate students on topics listed below
  - Use of RETC program for modeling hydraulic properties of soils (with Dr. Krauter)
  - Measurement of photosynthesis using CIRAS II (with Dr. Krauter)
  - Electromagnetic (EM) technology for soil salinity mapping (with Dr. Benes)
  - Chemical composition of soils irrigated with winery effluent (with Dr. Benes)

RESEARCH EXPERIENCE

- Changes in soil physical, chemical and biological properties for field undergoing transition from conventional to organic farming (*In progress*)
- Evaluating potential forages as bio-filters for excess nitrates (*In progress)*
- Nitrous oxides emissions from agricultural cropping systems (*In progress)*
- Optimizing tomato production and calcium uptake in salt affected soils (*In progress)*
- Efficacy of slow release fertilizers on yield and quality of vegetable (*In progress)*
- Impact of root zone air injection on vegetable yield and water use

- Efficacy of manure based Nitrogen fixing fertilizer on yield and quality of vegetables
- Impact of CO_2 enrichment on Crop Production and Water use Efficiency
- Evaluating treatment practices for dairy effluent stream
- Spatial and temporal variability of soil salinity and nitrogen loading for irrigated fields
- Ammonia emissions from agricultural operations.
- Infiltration on soils exposed to Integrated On Farm Drainage Management (IFDM)
- Soil Physical Parameters for Predicting Dairy Effluent flow and solute transport
- Real time ammonia and methane emissions from dairy operations

FUNDED RESEARCH GRANTS

- Aquatrols Inc. Effect of surfactant on nitrogen and water use efficiency in tomatoes. $27,500 (2011-2012). **D. Goorahoo,** F. Cassel S. and D. Adhikari.
- California State University-Fresno. Office of Undergraduate studies. Comparison of organic and UAN-32 fertilization on yield and quality of Bok Choy. $1,000 (2011-2012). Touyee Thao and **D. Goorahoo** (faculty advisor).
- CSU-ARI- Air-jection® Irrigation Impact on Crop Yield and Soil Salinity. $135,000. (2011-2014). **D. Goorahoo** and F. Cassel S.
- CSU-ARI- Development of an integrated decision support system to optimize irrigation scheduling and water use efficiency. $450,000 (2011-2014). F. Cassel S., **D. Goorahoo**, F. Melton, L. Johnson, C. Lund, C. Krauter, and L. Pierce.
- NASA –California State University Monterey Bay. Integrated information technology system for irrigation scheduling and management. $100,000 (2010-2011). F. Cassel S. **and D. Goorahoo.**
- California State University-Fresno. Office of Undergraduate studies. Effect of vermicompost tea and irrigation rates on growth and yield of bell peppers. $1,000 (2010-2011). Tari Lee Frigulti and **D. Goorahoo** (faculty advisor).
- CSU-ARI & California Department of Food and Agriculture (CDFA). Nitrous Oxide Emissions From California Orchard And Vegetable Cropping Systems. $389,000 (2009-2013). **D. Goorahoo**, F. Cassel S., and Bill Salas
- Agricultural Research Initiative – CSU. Utilizing Ethanol CO_2 emissions to increase crop productivity and water-use efficiency. $310,000 (2009-2012). F. Cassel S., S. Ashkan, **D. Goorahoo**, D. Adhikari, and D. Zoldoske.
- JG Boswell Company. Evaluating irrigation and cultural management alternatives through field-scale salinity and water table characterization. $69,600 (2010-2012). F. Cassel S., **D. Goorahoo**, and B. Roberts.
- Monarch Scientific. Peach shelf life study. $4,197 (2009-2010). F. Cassel S. and **D. Goorahoo.**
- Plant Science Department. Promoting soil health and providing economic alternatives to farmers while transitioning from conventional to organic farming. $35,000 (2009-2011). **D. Goorahoo,** S. Pasakdee, J. Farrar and G. Srinivasan. Seed grant for new faculty.
- California Department of Food and Agriculture, Fertilizer Research and Education Program (CDFA-FREP). Measuring and Modeling Nitrous Oxide Emissions from California Cotton, Corn and Vegetable Cropping Systems. $150,000 (2009-2012). **D, Goorahoo** and F. Krauter and W. Salas.
- Provost Research Activity Award (RAA). Investigating Unstable Flow in Soils and Its Impact on Groundwater Contamination. $25,000 (2008-09). Z. Wang, **D. Goorahoo** and M. Xiao
- Cooperative State Research, Education, and Extension Service/USDA. Sustainable Agroecosystems and Efficient Resource Management (SAERM) Research and Education Program. $250,000 (2008-2011). Pasakdee, S., Srinivasan, G., **Goorahoo, D**., Bushoven, J.T. Tenbergen, K., Einhorn, T., Farrar, J., and S. Gu.
- Monarch Scientific. Yield comparison and root analysis in tomato fields of the Westside San Joaquin Valley $5,016 (2008). F. Cassel S. and **D. Goorahoo.**
- Azcal Farm Management. Reclamation of saline-sodic soils for tomato production using calcium fertigation and acidification. $11,250 (2008-2009). F. Cassel S. and **D. Goorahoo.**

- Associated Students, Inc. (ASI) Instructional Related Activities Grant. Students for Environmentally Responsible Agriculture (SERA) Club. $2,594 (2008-09) to attend Ecological Farming Conference in Pacific Grove. **Dave Goorahoo** and Derek Blevins.
- Associated Students, Inc. (ASI) Instructional Related Activities Grant. Study Abroad Program "Agriculture, Culture and Cuisine of Trinidad and Tobago." $15,000 (2008-09). Sean Seepersad, **Dave Goorahoo** and Klaus Tenbergen.
- The Lyles Center for Innovation and Entrepreneurship and the Coleman Foundation. Coleman Fellowship for the 2008-2009 year. **Dave Goorahoo**, Department of Plant Science for the course "Organic Farming for Entrepreneurs". Value: $5,000.
- CSU- ARI. Comparison of Surface Renewal and Bowen Ratio Evapo-transpiration Estimates for Crops Irrigated with Saline Drainage Water. $100,000 for 2007-2010. D. Adhikari, J.Ayars, S. Benes, and **D, Goorahoo.**
- Agricultural Research Initiative – CSU. Use of Elephant Grass as a Bio-filter for Fields Irrigated with Dairy Effluent and Processing Wastewater. $105,000 (2007-2010). **D. Goorahoo**, F. Cassel S. and D. Adhikari.
- Dutch Brothers Enterprises, LLC. Evaluating soil health improvements and water savings using UNLO$_2$K. **$23,085** (2007-2008). F. Cassel S., **D. Goorahoo**, and D. Zoldoske.
- Agricultural Research Initiative – CSU. Reclamation of saline-sodic soils for tomato production using calcium fertigation and acidification. **$90,000** (2007-2009). F. Cassel **S.** and **D. Goorahoo.**
- Department of Pesticide Regulation. Vertical Transport Study in Soil. $105,000 (2006-2008). J. Suen**, D. Goorahoo**, and F. Cassel S.
- Propane Education and Research Council Grants Program. Proposal Title: "Investigation of the effects of Thermal Pest Control technology on common insect and fungal diseases and yield/quality parameters in California grapes, tomatoes and lettuce." A. B. Lawson principal investigator. J Farrar, S Gu, **D Goorahoo** co-principal investigators. Budget $143,000 for one year. Awarded. Nov 2007.
- Division of Graduate Studies (DGS). Graduate Faculty/Program Enhancement Award. For Plant science students development. $3,000 AY 2006-07. **D.Goorahoo.**- Faculty advisor for graduate student.
- Benes, S., Robinson, P., **Goorahoo, D**., & Grattan, S. (2006). Integrated On-Farm Drainage Management (IFDM Phase 3): management factors related to soil quality and sustainable forage production (Vol. $326,850): California Agricultural Technology Institute (CATI).
- Imperial Valley Conservation Research Center Committee (IVCRCC). Nutrient control of agricultural runoff. March 2005- December 2008 2006. Funded: $105,000. **. D. Goorahoo** and Florence Cassel
- California State University/Agricultural Research Initiative (CSU/ARI): The impact of air injected into water delivered through subsurface drip irrigation (SDI) tape on the growth and yield of **vegetables and fruits**. $51,200**. C**ompleted in July 2007. **D. Goorahoo**, D. Zoldoske, E. Norum and A Mazzei.
- California Department of Food and Agriculture Crop Specialty Program - Agricultural Research Initiative Program (CSU/CDFA). The impact of air injected into water delivered through subsurface drip irrigation (SDI) tape on the growth and yield of **Tomatoes**. $51,200**.** Completed December 2006. **D. Goorahoo**, D. Zoldoske, E. Norum and A Mazzei.
- California Department of Food and Agriculture Crop Specialty Program - Agricultural Research Initiative Program (CSU/CDFA). The impact of air injected into water delivered through subsurface drip irrigation (SDI) tape on the growth and yield of M**elons**. $51,200**.** Completed in December 2006. **D. Goorahoo**, D. Zoldoske, E. Norum and A. Mazzei
- Beef Packer Inc. Vadose monitoring plan for wastewater holding pond. Nov 2005. Funded from Nov.2005- Oct 2006. $ 19,344. **D. Goorahoo** and Florence Cassel S.
- CK life Sciences and Biomatrix^{TM} of Hong Kong. Efficacy of manure based N fixing fertilizing system on broccoli and peppers grown in California. Funded: $31,246. Completed March 2007. **D. Goorahoo** and F. Cassel.
- Denitrification studies for Boyle Engineering with the City of Madera Wastewater and Regional Water Quality Board for $13,674. Completed December 2006. **D. Goorahoo** and Florence Cassel S.
- California State University/Agricultural Research Initiative (CSU/ARI): *Spatial Variability of Organic and Nitrogen Loading from Winery Stillage Application.* Funded: $55,000 ARI + $73,893 External match = $128,893. July 2003. **D. Goorahoo** and F. Cassel Sharmasarkar.

- California Department of Food and Agriculture Crop Specialty Program - Agricultural Research Initiative Program: *Open-Field CO_2 Enrichment Using Drip Irrigation Systems*. $77,000. January 2003 - December 2003. F. Cassel Sharmasarkar, **D.Goorahoo**, and S. Ashkan.
- California State University/Agricultural Research Initiative (CSU/ARI): *Dairy Air Quality Monitoring–An Investigation of the Occurrence and Mitigation of Ammonia, Particulates and Ozone Precursors Associated With California Dairies.* Funded: $208,500 for first year, pending California State budget signing. C.F. Krauter, T. Cassel and **D. Goorahoo**.
- California State University/Agricultural Research Initiative (CSU/ARI): *Assessing Spatial and Temporal Variability of Soil Salinity on Farms Implementing Integrated Drainage Management Practices.* Funded: $250,000 over 3 years. F. Cassel Sharmasarkar, **D. Goorahoo,** and D. Zoldoske.
- California State University/Agricultural Research Initiative (CSU/ARI): *Integrated On-Farm Drainage Management (IFDM):Plant water use, forage quality, and soil management.* Funded: $269,470 over 3 years. S.E. Benes, S.R. Grattan, **D. Goorahoo**, P. Robinson and F. Cassel Sharmasarkar.
- California Water Institute (CWI): *Determination of soil physical parameters for predicting dairy effluent infiltration and saline groundwater upflow in the San Joaquin Valley, CA*. Funded: $45,000 for 1 year. **D. Goorahoo** and R. Soppe.
- California Water Institute (CWI): *Nitrogen Budgets for Dairy Effluent Stream*. Funded: $35,000 for 1 year. **D. Goorahoo** and C.F. Krauter.
- California Air Resources Board (ARB): *ROG Sampling and Analysis At Sites Related to Agricultural Operations and Natural Soil/Vegetation Communities In California.* Funds Requested: $100,000 over 2 years. **D. Goorahoo** and C.F. Krauter.
- California State University/Agricultural Research Initiative (CSU/ARI): *Atmospheric Ammonia Monitoring Over Agricultural and Natural Vegetation With A Tunable Diode Laser*. Funded: $314,386 ARI + $305,676 External match = $620,062. November 2001 to July 2003. C.F. Krauter, C. Potter, S. Klooster**, D. Goorahoo** and J. Pisano.
- CALFED Water Use Efficiency Program: *Assessing Spatial and Temporal Variability of Soil salinity on Farms Implementing Integrated Drainage Management Practices*. Funded: $175,010. July 2001 to June 2004. F. Cassel Sharmasarkar, **D.Goorahoo**, D. Zoldoske, and P. Canessa.
- Cotton Incorporated: *Precision Farming Demonstration in California*. Funded: $19,500. June 2001 to May 2002. F. Cassel Sharmasarkar and **D.Goorahoo**.
- Environmental Protection Agency. *Evaluation of Various BOD Loading Rates for Land Application of Food-Processing Wastewater on Soil and Subsurface Water Quality*. Funded: $35,735. July 2001 to October 2001. F. Cassel Sharmasarkar , **D. Goorahoo**, and S. Sharmasarkar.
- California State University/Agricultural Research Initiative (CSU/ARI): *Evaluation of the Addition of Surfactant to Irrigation Water for Improving Irrigation Efficiency on Commercial Turf Systems.* Funded: $23,500. October 2000 to March 2002. **D. Goorahoo**, D. Zoldoske and C. Miller.
- California State University/Agricultural Research Initiative (CSU/ARI): *Testing of a New Forage Grass (Pennisetum sp.) with a Subsurface Drip Irrigation System to Determine the Relationship between Water Consumption, Yield, Nutritional Value, Nitrogen Consumption, and Soil/Plant Nitrate Balance.* Funded: $27,800. October 2000 to July 2002. D. Zoldoske, E. Norum, **D. Goorahoo**, and M. Rothberg.
- California State University/Agricultural Research Initiative (CSU/ARI): *Evaluation of Alternative Saline drainage Water Disposal Methods.* Funded: $85,220. October 2000 to July 2003. D. Zoldoske , **D. Goorahoo**, and D. Davis.
- California State University/Agricultural Research Initiative (CSU/ARI): *Evaluation of Lagoon Buffer as a Best Management Practice for Dairy Effluent Stream.* Funded: $217,744. April 2000 to December 2002. **D. Goorahoo,** D. Zoldoske and J. Gregory.
- Mazzei and Toro Ag. Industry Support: *Air Injection in subsurface drip irrigation for increasing crop yields.* Funded: $5,000. Spr. 2000. D. Zoldoske, E. Norum, G. Carstensen and **D.Goorahoo**.

EXTENSION SERVICES/ENGAGEMENT WITH AG INDUSTRY

- **Goorahoo D**., F. Cassel S., D. Zoldoske, N. Reddy, D. Adhikari, A. Mazzei, and R. Funnuchi. 2010. Optimizing vegetable and fruit production with AirJection® irrigation. 2010 Irrigation Performance

Summit (March 19th). Claude Laval Water and Energy Technology Incubator, Fresno, CA. (*Invited* by Puresense®).

- Cassel S., F. and **D. Goorahoo**. 2009. Electromagnetic surveys for soil salinity assessment and management. Workshop for JG Boswell delegates (October 13th). Claude Laval Water and Energy Technology Incubator, Fresno, CA.
- Cassel S., F., **D. Goorahoo**, and D. Adhikari. 2009. Soil salinity mapping. Presentation to the Egyptian Irrigation Specialists delegation, UCD International Programs (August 18th). California Agriculture and Technology Institute, CSU Fresno.
- **Goorahoo D**., N. Reddy, D. Adhikari, F. Cassel S., D. Zoldoske, A. Mazzei, and R. Funnuchi. 2009. Optimizing vegetable and fruit production with AirJection® irrigation. Presentation to the Egyptian Irrigation Specialists delegation, UCD International Programs (August 18th). California Agriculture and Technology Institute, CSU Fresno.
- Adhikari D. D., D. Zoldoske, **D. Goorahoo**, G. Orozco and E. Norum. 2009. Soil Moisture Sensors and SMART controllers: current and future research. Presentation to the Egyptian Irrigation Specialists delegation, UCD International Programs (August 18th). California Agriculture and Technology Institute, CSU Fresno.
- 2006-Present: Azcal Farm Management- Ted Sheeley –commercial grower in Lemoore (ARI and grower funded projects). Joint research on soil acidification and calcium fertilization in saline tomato fields (Florence Cassel S. and Dave Goorahoo).
- 2007-Present: Commercial fruit and nut tree grower in Easton, CA- Ron Samuelson-. Joint research on industry project funded by Monarch Scientific slow-release fertilizer application (Florence Cassel S. and Dave Goorahoo).
- 2005-Present: Red Rock Ranch – John Diener and Britz Farms, commercial enterprises in Five Points (ARI and Westside Resource Conservation District funded projects). Joint research on soil salinity mapping using EM-38 instrument (Florence Cassel S. and Dave Goorahoo).
- 2006-Present: Earth Renew™ group-Al Fedkenheuer. Joint research on evaluation of treated cattle manure for optimizing crop production (Dave Goorahoo and Florence Cassel S.).
- 2007-Present: Ron Fister – Monarch Scientific. Evaluation of slow-release nitrogen fertilizers on vegetables and almond orchards (Dave Goorahoo and Florence Cassel S.)
- 2006- Present: Other engagements include work with Pure Sense, Aqua-Phyd, Monarch Scientific, as state agencies (California Department of Water Resources, Westside Resources Conservation District)
- 2005: Coordinated and led a visit to a leading vegetable producer in Mendota, S&S ranch, for the new CSUF farm operations director and other interested faculty and research staff.
- 2005: Air Injection into the root zone. A 2nd presentation made to group of Japanese visiting scientists and farmers at the Mazzei Injectors Inc. on June 04th 2005.
- 2004. Air Quality Concerns and Research Currently being Conducted by CIT and Plant Science Dept. at CSUF. Guest speaker at Students for Environmentally Responsible Agriculture (SERA) meetings in Fresno on February 24th 2004.
- 2004: Presentation and booth display of Laser equipment on "Use of Lasers for Air Quality Monitoring" at the Center for Advanced Research and Technology (CART) Symposium on "Air Quality Concerns". April 2004
- 2003. Air Quality-Agriculture Related Research at CSUF. Update of research as part of the CWI General meeting in Fresno on August 25th 2003.
- 2003. Air Injection into the root zone. Presented to group of Japanese visiting scientists and farmers. At CIT in Fresno on September 04th 2003.
- April 2003: Four presentations on "Soil science and careers in agriculture" were made to middle school students at the GEAR UP West Fresno School District career day.
- 2000- 2005: Various presentations to cooperators, growers and funding agencies on the progress of the research projects.
- May 11, 2001: Presented an "Update on CSU/ARI Project: Evaluation of Lagoon Buffer as a Best Management Practice for dairy effluent Stream" to cooperators, dairy industry, public and governmental agencies. Seminar held at Center for Irrigation Technology (CIT), Fresno.
- Feb. 9, 2001: Presented an overview of "Biological and Chemical Treatment of Dairy Effluent Stream at a dairy seminar put on by CIT at the Edison AgTac venue in Tulare, CA.

- Nov. 14, 2000. Presented "Ammonia Emissions from Fertilizers in Relation to Irrigation Practices" at the California Dept. of Food and Agriculture (CDFA)- Fertilizer Research and Education Program (FREP) Conference at Tulare, CA. This presentation was a part of the concurrent sessions conducted by CIT.

OTHER QUALIFYING EXPERIENCE

- 2006-Present: Campus advisor for the student group **SERA (Student for Environmentally Responsible Agriculture).**
- 2006- Chaired a search committee for the hiring of an Agricultural Engineer State position at CIT.
- 2005, 2006 and 2007: Mentored students involved in the Ag Summer Bridge Students at CSUF.
- 2004: Mentored a Clovis West High student on his research project entitled "Effect of Wind on Transpiration in Tomato Plants". Student eventually won first place at the county level and was among the top three projects at the State level.
- 2003: Organized and conducted a soil demonstration workshop for high school students involved in the Farms Leadership program.
- Chaired a search committee for the hiring of a Trainee Technician State position at CIT.
- Served as search committees for the hiring of the following Fresno State positions: Research Assistant in the Plant Science Dept. (Twice); Soil and Water Scientist at CIT; and Resource Specialist at the California Water Institute (CWI).
- July 03-present: Attend monthly meetings of the SJV Agricultural Technology group and the Dairy subcommittee group, whose goal is the coordinate agricultural related research in the San Joaquin Valley.
- June 03- July 04: Attended meetings of the CSUF Air Quality Group whose goal is to address air quality concerns in the region
- 2001- present: Supervision of an ethnically diverse group of student assistants and technical staff.
- Coordination of soil sampling crew assembly and sampling design for various CIT projects.
- 2000-2005: Volunteer at the CATI/CIT booths at the Annual World Ag Expo (formerly the Tulare Ag. Show) in Tulare, CA.
- 2000- 2005: Volunteered as either a student group leader or as a soils pit supervisor at the annual Soil judging competition of the Future Farmers of America (FFA) held at CSUF.
- Peer reviewed journal articles for the Soil Science Society of America Journal and the Journal of Environmental Quality.1993 -1997: Graduate student representative on Land Resource Science Selection Committee for incoming graduate students. Univ. of Guelph.
- 1988 - 1990. Faculty of Agriculture Student representative for class of 1990. Univ. of The West Indies.

VOLUNTEERED COMMUNITY SERVICES DURING 2007-2011

- State FFA Vegetable Judging Contest, 15 hrs/year
- Organized two Vegetable judging stations for Fresno County 4-H, 6hrs/year
- Mentored Grade 7 student's Fresno county science fair project entitled "Growing Broccoli with Reduced Water"- 20hrs/year
- Serve on the education and scholarship committee, and on the annual faire Organizing committee for the Central California Caribbean Association- 14hrs/year
- Mentored Grade 6 student's Fresno county science fair project entitled "Fertilizer Effect on Corn Growth"- 20hrs/year
- Reviewed manuscripts in Journal of Environmental Quality and Journal of Soil Science – 14 hrs/year
- "Soils in the Environment" book review for Elsevier press- 6 hrs/year
- Serve on of the Transition Steering Committee (TSC) for the Sustainable Agriculture Education Association (SAEA). The primary goal of SAEA is to promote and disseminate curricula, best educational and experiential learning practices, and research related to the teaching and learning of sustainable agriculture.- 15hrs/year
- Co-Chair of the conference subcommittee of SAEA. Participate in monthly conference call meetings and plan the next SAEA conference- 15hrs/year.

- Serve on the book review subcommittee of the North American Colleges and Teachers of Agriculture (NACTA)- 5hrs/year
- Serve on the Governing Board of the California Chapter of the American Society of Agronomy. 20hrs/year
- Served food at the Fresno State Farm market summer festival on Saturday June 30th 2007- 6hrs/year
- Represented the Plant Science Department at the 2007 Smittcamp Honors College Annual Open House held on September 22nd 2007- 4 hrs/year
- Students for Environmentally Responsible Agriculture Advisor- 10hrs/year
- Coordinated the participation of the Plant Science Department team in the CAST Olympics held on September 7th 2007 (we won the 2nd prize)- 2hrs/year.
- Attend monthly meetings of the Central California Caribbean Association and be part of the subcommittee responsible for promoting Fresno State and in particular agricultural research and environmental awareness- 15 hrs/ year.

PUBLICATIONS, PROJECT REPORTS, POSTERS, AND ORAL PRESENTATIONS

1. PEER REVIEWED MATERIALS

2010-2011 AY- WORK IN PROGRESS FOR PEER REVIEWED PUBLICATIONS

1. Maestas, R., A. Alexandrou, J. Bushoven, **D. Goorahoo** and D. Adhikari. 2011. Carbon Footprint and Energy Inputs from Turf Maintenance Equipment on a Golf Course in California. Submitted to Agricultural Engineering International: the CIGR Ejournal. (*In Review*).

2. Reddy, N., and D. Goorahoo. 2011. Assessing Nitrogen Rates for Organic Vegetables Subjected to AirJection® Irrigation. *To be re-submitted* to International Journal of Vegetable Science.

3. Goss, M.J., A.Tubeileh and **D. Goorahoo.** 2011. Review Paper: Food safety issues with organic fertilizers. *In Preparation for Submission to Special Issue of "Biosolids Soil Application: Agronomic and Environmental Implications 2012" which will be published in* Applied and Environmental Soil Science.

4. YellaReddy, S.K.R, D. Goorahoo, and F. Cassel S. 2011. Yield and nitrate leaching responses of vegetables to conventional and slow release nitrogen fertilizer applications. *In Preparation for Submission to* African Journal of Agricultural Research (AJAR).

2010-2011 AY- PEER REVIEWED PUBLICATION

1. **Goorahoo, D**, F. Cassel Sharma, D. Adhikari, and S.E. Benes. 2011. Soil water and plant relations. Chapter 3 (pages *In* Irrigation 6th Edition, edited by L. E. Stetson and B. Mecham. Handbook compiled by the Irrigation Association (IA), Alexandria, VA. Book to be released at authors' book signing event on November 7th 2011 at IA show in San Diego, CA.

2008-2009 AY- PEER REVIEWED PUBLICATIONS

1. Cassel S., F., **D. Goorahoo**, D. Zoldoske, and D. Adhikari. 2009. Mapping Soil Salinity Using Ground-Based Electromagnetic Induction. *In* Remote Sensing of Soil Salinization: Impact and Land Management, G. Metternicht and A. Zinck (eds), CRC Press, book chapter 11, p. 199-234.

2. Alexandrou, A. P. Vyrlas, D. Adhikari and **D. Goorahoo**. 2009. Energy Inputs for Cantaloupe Production in San Joaquin Valley, California. Agricultural Engineering International: the CIGR Ejournal. Manuscript 1150-2220-1. Vol. IX. June, 2009.

2007-2008 AY- PEER REVIEWED PUBLICATIONS

1. **Goorahoo D**., D. Adhikari, D. Zoldoske, F. Cassel S., A. Mazzei, and R. Fanucchi. 2008. Potential for AirJection® Irrigation in Strawberry Production. pp 152-155 In : Takeda, F., D.T. Handley, and E.B. Poling (ed.). Proc. 2007 N. American Strawberry Symposium. North American Strawberry Growers Association, Kemptville, ON Canada.

2. Cassel S., F., **D. Goorahoo**, D. Adhikari, and S. Ashkan. 2008. Photosynthesis Response Curves for Strawberries Subjected to Elevated CO_2 Levels. pp 141-145 In : Takeda, F., D.T. Handley, and E.B. Poling (ed.). Proc. 2007 N. American Strawberry Symposium. North American Strawberry Growers Association, Kemptville, ON Canada.

3. Adhikari D., J. Ayars, **D. Goorahoo** and F. Cassel S. 2008. Micro Sprinkler Irrigation using SCADA and sensor network for freeze protection. Arab Water World Magazine, March issue, Beirut, Lebanon, pp 22-26.

2. PROJECT REPORTS

2010-2011 AY PROJECT REPORTS

1. **Goorahoo, D.,** S. Ashkan and W. Salas. 2011. CDFA- Nitrous Oxide Emission-Annual report for project: "*Measuring and modeling nitrous oxide emissions from California cotton, corn, and vegetable cropping systems".* Reporting period: July 01st 2010 to June 30th 2011. 10 pp.
2. Cassel S., F., **D. Goorahoo**, and B. Roberts. 2011. Soil salinity maps and data analyses for field 35NW. Interim report #4 as part of "Evaluating irrigation and cultural management alternatives through field-scale salinity and water table characterization". Submitted to: JG Boswell Company. March 25th 2011.
3. **Goorahoo, D**., Cassel S., F., and D. Adhikari. 2010. ARI Annual report for project: Use of Elephant Grass as a Bio-filter for Fields Irrigated with Dairy Effluent and Processing Wastewater. Reporting period: July 1, 2009 - June 30, 2010. Submitted on Oct. 10th 2010. ARI project #: 07-2-011. 3 pp.

2009-2010 AY PROJECT REPORTS

1. **Goorahoo, D.,** S. Ashkan and W. Salas. 2010. CDFA- Nitrous Oxide Emission-Annual report for project: "*Measuring and modeling nitrous oxide emissions from California cotton, corn, and vegetable cropping systems".* Reporting period: July 01st 2009 to June 30th 2010. 11 pp.

2. Cassel S., F., and **D. Goorahoo**. 2010. Post-harvest quality of peaches as influenced by N fertilization sources - shelf-life comparative study. Submitted to Monarch Scientific, Alpharetta, GA. Final report- July 21, 2010. 11pp.

3. **Goorahoo, D**., Cassel S., F., Yellareddygari, S.K.R., and N. Mendez. 2010. Efficacy of EarthRenew organic matter in a granule for vegetable production – Phase 2 Pot and field studies with warm season vegetables. Interim report- June 2010, California State University, Fresno. 22 pp.

4. Cassel Sharma, F., **D. Goorahoo**. 2009. ARI Annual report for project: *Reclamation of saline-sodic soils for tomato production using calcium fertigation and acidification'.* Reporting period: July 1, 2008 - June 30, 2009. Submitted on October 26th 2009. ARI /Foundation project #: 08-2-025. 3 pp.

5. **Goorahoo, D.**. Cassel S., F., and D. Adhikari. 2009. ARI Annual report for project: *Use of Elephant Grass as a Bio-filter for Fields Irrigated with Dairy Effluent and Processing Wastewater.* Reporting period: July 1, 2008 - June 30, 2009. Submitted on September 30th 2009. ARI /Foundation project #: 07-2-011. 3 pp.

6. **Goorahoo, D**., V. Bremer- Blanch, A. Ferry, and G. Orozco. 2009. Best management practice workbook for reducing air pollution in organic tree fruit production. FINAL REPORT for California Agricultural Resource for Organic Transitions (CAROT). In Response to Valley CAN Project awarded to CAROT, CSU-Fresno Foundation Subcontract # 37647. Updated November 19th 2009. 32 pp.

7. **Goorahoo, D.,** and F. Cassel S. 2009. Efficacy of EarthRenew® OM Plus Fertilizer formulation for vegetable production. Phase 2- Pot and field studies with warm season vegetables. Interim report- Dec 2009, California State University, Fresno. 4 pp.

2008-2009 AY PROJECT REPORTS

1. **Goorahoo, D**., and F. Cassel S. 2009. Efficacy of EarthRenew® OM Plus Fertilizer Formulation for Vegetable Production. Phase 2- Pot and Field Studies with Warm Season vegetables. Report for Jan- June 2009. Submitted to Al Fedkenheuer, President EarthRenew Organics, Ltd. And EarthRenew, Inc.

2. **Goorahoo, D.**, F. Cassel S., D. Adhikari, and D. Zoldoske. 2009. Nutrient Control of Agricultural Runoff Water. Final project report for SRWCB 319 grant . Submitted to Imperial Valley Conservation Research Center Committee, John R. (Dick) Kershaw Updated May 20th 2009. 17pgs.

3. Goorahoo, D. and F. Cassel Sharma. 2009 . Review of Preliminary Analysis of Pond Cycling Study and Core Sampling Study Data Submitted by Carollo Engineers. Submitted to Ms. Rosa Lau-Staggs, Chief of Environmental Services & Mr. Mohammad Moaddab, Wastewater Reclamation Coordinator, City of Fresno, Fresno-Clovis Regional Wastewater Reclamation Facilities. June 26th 2009.

4. Goorahoo, D., F. Cassel S., and D. Adhikari. 2008. Interaction of Aqua-Phyd Treated Water and Fertilizer in Vegetable Production: Phase 1- Pot Studies with Broccoli. Final Report- Updated November 2nd 2008. Submitted to Chuck Wagner & Jerry Rai at AQUA-PHYD, Inc. Report posted on company's website at: http://www.aqua-phyd.com/Flash/growing-broccoli.pdf

5. **Goorahoo, D**., F. Cassel S., D. Adhikari and N. Reddy. 2008. Efficacy of EarthRenew® OM Plus Fertilizer Formulation for Vegetable Production. Phase 1- Pot Studies with Broccoli. Final Report- Updated July 23rd 2008. Submitted to Al Fedkenheuer, President EarthRenew Organics, Ltd. And EarthRenew, Inc.

2007-2008 AY PROJECT REPORTS

1. **Goorahoo, D**., Suen, J., & Cassel S., F. 2008. Vertical transport study in soil. Annual progress report to the California Department of Pesticide Regulation, Environmental Monitoring Branch.

2. **Goorahoo, D**. 2008. Agricultural Research Initiative (ARI) – CSU - Final report on Evaluation of Lagoon Buffer as a Best Management Practice for Dairy Effluent Stream. 11pgs. Project # 00-2-015. Co-PI: David Zoldoske.

3. **Goorahoo, D**. 2008. Agricultural Research Initiative (ARI) – CSU - Final report on Spatial Variability of Organic and Nitrogen Loading from Winery Stillage Application. 9pgs. Project # 00-2-015. Co-PIs: Florence Cassel S. and Diganta Adhikari.

4. **Goorahoo, D**. 2008. Agricultural Research Initiative (ARI) – CSU - Final report on the Impact of Air Injected into Water Delivered through Subsurface Drip Irrigation (SDI) Tape on the Growth and Yield of Vegetables and Fruits. 10pgs. Project # 03-2-009. Co-PIs: David Zoldoske and Diganta Adhikari.

5. **Goorahoo, D.** 2008. Agricultural Research Initiative (ARI) – CSU - Final report on Monitoring Real Time Emissions of Ammonia, Methane and Hydrogen Sulfide at Dairies. 16pgs. Project # 02-2-012 Co-PI: Charles F Krauter.

6. **Goorahoo, D.** 2008. CDFA Specialty Crop Grant - Final report on the The Impact of Air Injected into Water Delivered through Subsurface Drip Irrigation (SDI) Tape on the Growth and Yield of **Melons.** 11pgs. Project # 03-8-003 Co-PIs: Diganta Adhikari, David Zoldoske and Florence Cassel S.

7. **Goorahoo, D.** 2008. CDFA Specialty Crop Grant - Final report on the The Impact of Air Injected into Water Delivered through Subsurface Drip Irrigation (SDI) Tape on the Growth and Yield of **Tomatoes**. 10pgs. Project # 03-8-004 Co-PIs: Diganta Adhikari, David Zoldoske and Florence Cassel S.

2006-2007 AY PROJECT REPORTS

1. D. Goorahoo, D., Suen, J., and Cassel S., F. (2006). *Vertical transport study in soil*: Report submitted to the California Department of Pesticide Regulation, Environmental Monitoring Branch. Foundation Grant #: Submitted Nov 1st 2006.

2. F. Cassel Sharma, **D. Goorahoo**, D. Adhikari and S. Ashkan. 2007. *Open-Field CO_2 Enrichment Using Drip Irrigation Systems*. Annual report for CDFA Specialty Crop Grant # 03-8-009-11. Submitted Jan 30th 2007.

3. D. Goorahoo, and J. Ayars. 2007. *Determination of soil physical parameters for predicting infiltration and saline groundwater upflow in San Joaquin Valley, California.* Final report for California Water Institute (CWI) Grant # 20054. Submitted on Feb. 24th 2007.

4. D. Goorahoo, and J. Ayars. 2007. *Determination of soil physical parameters for predicting infiltration and saline groundwater upflow in San Joaquin Valley, California.* Final report for California Water Institute (CWI) Grant # 20054. Submitted on Feb. 24th 2007.

5. D. Zoldoske, D. D. Adhikar**i** and **D. Goorahoo. (**2007). *Standardized Testing of Soil Moisture Sensors.* Annual report for funding year 2006-07. CSU-ARI funded project: Project: Sensor testing/062-024-13. Submitted July 20th 2007.

3. POSTERS & ORAL PRESENTATIONS

POSTERS, AND ORAL PRESENTATIONS IN 2010-2011 AY

1. **Goorahoo, D**., K. Tenbergen, and S. Seepersad. 2011. Exploring International Cuisine and Agriculture through a Short Term Study Abroad Experiential Learning Opportunity. North American Colleges and Teachers of Agriculture (NACTA) conference. Edmonton, Alberta Canada. June 15-7th 2011.

2. Yadavali, P., F. Cassel S., **D. Goorahoo,** S. Benes. 2011. Effect of Calcium Fertigation and Acidification on Yield and Quality of Tomatoes Grown in Salt-Affected Soils. 3rd Annual Graduate Research and Creative Activities Symposium for Master's and Doctoral Students. CSU- Fresno. Thursday, May 5, 2011.

3. Yadavali, P., F. Cassel S., and **D. Goorahoo**. 2011. Yield and Blossom End Rot in Tomatoes Fertigated with Calcium Thiosulfate". California Chapter-American Society of Agronomy (February 1st) Plant and Soil Conference. Fresno. CA. Second place winner among Graduate student posters.

4. Mendez, N., **D. Goorahoo**, F. Cassel S., and G. Orozco. 2011. Nitrous Oxide and Carbon Dioxide Emissions from Tomatoes Subjected to Open Field CO_2 Canopy Enhancement. California Chapter-American Society of Agronomy (February 1st). Plant and Soil Conference. Fresno. CA.

5. Orozco, G., F. Cassel S., **D. Goorahoo**, and S. Ashkan. 2011. Soil respiration rates for tomatoes subjected to elevated carbon dioxide levels. California Chapter-American Society of Agronomy (February 1st). Plant and Soil Conference. Fresno. CA.

6. Cassel S., F., G. Orozco, **D. Goorahoo**, S. Ashkan, and N. Mendez. 2011. Effects of Enhanced Atmospheric Carbon Dioxide Levels on Tomato Yields and Soil Respiration Rates. Water Resources and Policy Initiatives, Long Beach, CA (April 27th).

7. Yadavali, P., F. Cassel S., and **D. Goorahoo**. 2011. Fertigation and Acidification Techniques for Reclamation of Saline-Sodic Soils in Westside San Joaquin Valley, California. Water Resources and Policy Initiatives, Long Beach, CA (April 27th).

8. **Goorahoo, D**., S.K.R. Yellareddygari, and F. Cassel S. 2011. Yield and Nitrate Leaching Potential for Vegetables Grown with UAN and Slow Release Nitrogen Fertilizers. Water Resources and Policy Initiatives, Long Beach, CA (April 27th).

9. Cassel S., F., S.K.R. Yellareddygari, and **D. Goorahoo.** 2010. Yield and soil leaching responses of vegetables to conventional and slow release nitrogen fertilizer formulations. Agronomy Abstracts Annual Meetings, ASA-CSSA-SSSA, Madison, WI (November 2nd).

10. Yadavali, P., **D. Goorahoo,** F. Cassel S., and S. Benes. 2010. Evaluating different management strategies to increase calcium availability of tomatoes in saline sodic soils. Agronomy Abstracts Annual Meetings, ASA-CSSA-SSSA, Madison, WI (November 2nd).

POSTERS, AND ORAL PRESENTATIONS IN 2009-2010 AY

1. **Goorahoo, D.,** F. Cassel S., and S. Benes. 2010. Reclamation and management strategies for salt affected agricultural lands in the San Joaquin Valley, CA. Canadian Society of Soil Science meeting, Saskatoon, Canada. June 19-24th 2010.
2. Yellareddygari, S.K.R**., D. Goorahoo**, and F. Cassel S. 2010. Evaluation of slow-release nitrogen fertilizers for optimizing yields and reducing leaching. Canadian Society of Soil Science meeting, Saskatoon, Canada. June 19-24th 2010.
3. Yadavali, P., F. Cassel S., and **D. Goorahoo**. 2010. Comparison of Fertilizer and Irrigation Techniques for Reclaiming Salt Affected Soils. Graduate Research and Creative Activities Symposium, California State University, Fresno. May 6th 2010.
4. Yellareddygari, S.K.R., **D. Goorahoo** and F. Cassel S. 2010. Slow Release Nitrogen Fertilizers for Optimizing Yields and Reducing Leaching. Graduate Research and Creative Activities Symposium. California State University, Fresno. May 6th 2010.
5. Yadavali, P., F. Cassel S., and **D. Goorahoo**. 2010. Comparison of three soil reclamation techniques for growing processing tomatoes in Westside SJV. Proceedings, 31st Annual Central California Research Symposium, Fresno, CA. April 23rd 2010- CSU-Fresno.
6. Yellareddygari, S.K.R., **D. Goorahoo**, and F. Cassel S. 2010. Efficacy of a slow release nitrogen fertilizer formulation. Proceedings, 31st Annual Central California Research Symposium, Fresno, CA. April 23rd 2010- CSU-Fresno.
7. Mendez, N., **D. Goorahoo**, and F. Cassel S. 2010. Evaluation of an eco-fertilizer and urea ammonium nitrate for growing bell peppers. Proceedings, 31st Annual Central California Research Symposium, Fresno, CA. April 23rd 2010- CSU-Fresno.
8. Orozco G, D.D. Adhikari, and **D. Goorahoo.** 2010. Response of Soil Moisture Sensor Readings to Soil Temperature. Proceedings, 31st Annual Central California Research Symposium, Fresno, CA. April 23rd 2010- CSU-Fresno.
9. Cassel S., F., **D. Goorahoo**, and P. Yadavali. 2010. Irrigation strategies for managing salt-affected soils in the San Joaquin Valley, CA. Proceedings, Multi-State Salinity Coalition, Las Vegas, NV. February 17th -20th 2010
10. **Goorahoo, D**., F. Cassel S., and S.K.R. Yellareddygari. 2010. Remote sensing as an environmental and agricultural decision making tool for salinity management. Proceedings, Multi-State Salinity Coalition, Las Vegas, NV. February 17th -20th 2010.
11. Yadavali, P., F. Cassel S., and **D. Goorahoo**. 2010. Yield and quality of tomatoes subjected to calcium fertigation and acidification in saline-sodic soils. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Visalia, CA. February 2nd & 3rd 2010. (Received 2nd prize for graduate student).

12. Yellareddygari, S.K.R., **D. Goorahoo**, F. Cassel S, and C. Gonsalves Catalan. 2010. Yield and Leaching Potential of Slow Release Nitrogen Fertilizer Formulations Applied to Tomatoes. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Visalia, CA. February 2nd & 3rd 2010. (Received 1st prize for graduate student).
13. Mendez, N., **D. Goorahoo**, F. Cassel S., and S.K.R. Yellareddygari. 2010. Efficacy of EarthRenew OM Plus® Fertilizer for Bell Pepper Production - Phase 1: Greenhouse Pot Studies. Proceedings, California Plant and Soil Conference. California Chapter of ASA and California Plant Health Association, Visalia, CA. February 2nd & 3rd 2010. (Received 1st prize for undergraduate student).
14. Orozco G., D. D. Adhikari, and **D. Goorahoo**. 2010. Response of Soil Moisture Sensor Readings to Salinity. Poster Presentation at the 2010 California Plant & Soil Conference- Optimizing Agriculture with Diminishing Resources. CA Chapter of the American Society of Agronomy. Tulare CA. Feb 2-3, 2010. (Received 2nd prize for undergraduate student).
15. **Goorahoo, D**., C. F. Krauter, F. Cassel S, S. Ashkan and W. Salas. 2009. Nitrous oxide emissions from fertilizer practices. 17th Annual Fertilizer Research and Education Program (FREP) Conference & Western Plant Health Association (WPHA) Central Valley Regional Nutrient Seminar- *"Fresh Approaches to Fertilizing Techniques- 2009"*. November 17-18th, 2009. Visalia CA.
16. **Goorahoo, D**., F. Cassel S, and S. Benes. 2009. Soil salinity characterization in the Westside San Joaquin Valley, CA. Multi-State Salinity Coalition, Indian Wells, CA. September 29th & 30th 2009.

POSTERS, AND ORAL PRESENTATIONS IN 2008-2009 AY

1. Cassel S. F, **D. Goorahoo**, and S. Benes. 2009 Knowing your soils – How salinity impacts irrigation decisions. Presentation at the Special Grower Education Event: Managing Irrigation in a Water-Short Year. Workshop organized by PureSense and the Center for Irrigation Technology on April 22, 2009. Location: Claude Laval Water and Energy Technology (WET) Incubator.

2. Goorahoo, D., S. Benes, and F. Cassel S**.** 2009. *Agriculture and Soil Salinity in the San Joaquin Valley (SJV) California.* Presentation given on April 9th 2009 to an Iraqi delegation visiting Fresno to learn about agricultural practices relevant to salt affect soils in Iraq. Location: Claude Laval Water and Energy Technology (WET) Incubator.

3. Goorahoo, D., F. Cassel S and S. Benes**.** 2009. *Managing Soil Salinity in the San Joaquin Valley (SJV).* 2nd Presentation given on April 9th 2009 to an Iraqi delegation visiting Fresno to learn about agricultural practices relevant to salt affect soils in Iraq. Location: Claude Laval Water and Energy Technology (WET) Incubator.

4. Goorahoo, D., N. Reddy, D. Adhikari, F. Cassel S, D. Zoldoske, A. Mazzei, and R. Fannuchi. 2009. *Optimizing N Management and Crop Water Use Efficiency with AirJection® Irrigation.* Concurrent session on Nitrogen Management at the California Chapter of the Agronomy Society of America (CALASA) meetings in Fresno. Feb. 2-3rd 2009.

5. Adhikari, D., D. Zoldoske, **Goorahoo, D.**, F. Cassel S, and P. Gupta. 2008. *Monitoring and Control of SMART Irrigation system.* 2008 Irrigation Show, Innovations in Irrigation Conference, Nov. 2 – 4 in Anaheim, CA.

6. Goorahoo, D., D. Adhikari, N. Reddy, F. Cassel S, D. Zoldoske, A. Mazzei, and R. Fannuchi. 2008. *Optimizing Crop Water Use Efficiency with AirJection® Irrigation.* 2008 Irrigation Show, Innovations in Irrigation Conference, November 2 – 4 in Anaheim, CA.

7. **Goorahoo, D**., S. Pasakdee, and G. Srinivasan. 2008. Organic Agriculture at Fresno State: Education, Research and Engagement. Presentation to the CSU-Fresno –University Agricultural Laboratory (UAL) Board on October 20th 2008.

8. Cassel S., F., **D. Goorahoo**, D. Adhikari, and D. Zoldoske. 2008. *Mitigating Nitrate Levels in Agricultural Runoff with Barrier Crops.* Joint meetings of the GSA, ASA-CSSA-SSSA held in Houston TX in October 4-8th 2008.

9. Goorahoo, **D**., F. Cassel S., D. Adhikari, and D. Zoldoske. 2008. *Nitrogen Loading in Soils Irrigated with Tertiary Treated Municipal Wastewater.* Joint meetings of the GSA, ASA-CSSA-SSSA held in Houston TX in October 4-8th 2008.

10. Adhikari, D., **D. Goorahoo**, F. Cassel S., F., and D. Zoldoske. 2008. *"SMART" Controllers and Sensors: Critical Components of Automated Irrigation Systems.*. Joint meetings of the GSA, ASA-CSSA-SSSA held in Houston TX in October 4-8th 2008.

POSTERS, AND ORAL PRESENTATIONS IN 2007-2008 AY

1. **Goorahoo, D.**, S. Pasakdee, and N. Reddy. 2008. Status of Organic Farming at Fresno State. Presented on April 25th 2008 as part of the CAST-RSAC seminar series. Fresno campus, CA.

2. **Goorahoo, D.**, D. Adhikari, D. Zoldoske and F. Cassel S. 2008. Research Update- AirJection® Irrigation. Presentation given as part of the UCCE seminar on Irrigation of row crops and vegetables held at Five Points CA on April 24th 2008.

3. Cassel S. F, **D. Goorahoo**, S. Ashkan D. Adhikari, and D. Zoldoske 2008. Research Update- Potential for Improving Crop Productivity and Water-Use Efficiency Using CO2 Emissions. Presentation give as part of the UCCE seminar on Irrigation of row crops and vegetables held at Five Points CA on April 24th 2008.

4. Adhikari D., **D. Goorahoo**, F. Cassel S. and D. Zoldoske. 2008. Optimizing Water Use Efficiency using "SMART" sensors and controllers. Presentation at Central California Research Symposium, Fresno, CA, April 2008.

5. **Goorahoo, D.** 2008. Optimizing Water Use Efficiency in Vegetable Cropping Systems in California. Presented to Fresno City College Science club on March 7th 2008.

6. **Goorahoo, D.** , Cassel S., F.,T. Jacobsen, and D. Adhikari. 2007. Gypsum Considerations For Crop Production Presentation given to a Japanese delegation visiting CIT to learn about applications and effects of gypsum in agriculture, Fresno, CA (Nov, 27, 2007).

7. Cassel S., F., **D. Goorahoo**, T. Jacobsen, and D. Adhikari. 2007. Assessing gypsum levels and variability in fields. Presentation given to a Japanese delegation visiting CIT to learn about applications and effects of gypsum in agriculture, Fresno, CA (Nov, 26, 2007).

8. Jacobsen T., **D. Goorahoo**, F. Cassel S., and D. Adhikari. 2007. Soil and water chemistry as related to gypsum. Presentation given to a Japanese delegation visiting CIT to learn about applications and effects of gypsum in agriculture, Fresno, CA (Nov, 27, 2007).

9. Cassel S., F., **D. Goorahoo**, D. Adhikari and S. Ashkan. 2007. Effects of Elevated Open-Field CO2 Levels on Photosynthesis Response Curves in Strawberries. Presentation at the Annual Meetings of American Society of Agronomy-Crop Society of America – Soil Science Society of America, New Orleans, LA, Nov 2007.

10. Adhikari D., **D. Goorahoo**, and F. Cassel S. 2007. Automated Feedback Irrigation: A Means for Freeze Damage Prevention. Presentation at the Annual Meetings of American Society of Agronomy-Crop Society of America – Soil Science Society of America, New Orleans, LA, Nov 2007.

11. Ashkan S., **D. Goorahoo**, F. Cassel S. and D. Adhikari. 2007. Effects of Elevated CO2 on Berry Production in California. Presentation at the Annual Meetings of American Society of Agronomy-Crop Society of America – Soil Science Society of America, New Orleans, LA, Nov 2007.

12. **Goorahoo D**., Diganta D Adhikari, Namratha Reddy and David Zoldoske 2007. Application of AirJection® Irrigation in Organic Farming Systems. Poster presentation at ASA Annual Meetings New Orleans LA, Nov 2007.

13. Reddy N., **D. Goorahoo** and D. Adhikari 2007. Assessing Nitrogen Rates for Organic Bell Pepper Production Subjected to Airjection® Irrigation. Poster presentation at ASA Annual Meetings New Orleans LA, Nov 2007.

14. Chaganti V., **D. Goorahoo**, S. Benes and D. Adhikari 2007. Effect of Amendments on Hydraulic Properties of Soils Irrigated with Saline-Sodic Drainage Water: Methodology and Preliminary Results. Poster presentation at ASA Annual Meetings New Orleans LA, Nov 2007.

15. Adhikari D., **D. Goorahoo** and F. Cassel S. 2007. Micro Sprinkler Irrigation using SCADA and Sensor Network for Freeze Protection. Presentation at the Irrigation Association Show, San Diego, CA, Dec 07.

POSTERS, AND ORAL PRESENTATIONS IN 2006-2007 AY

1. Cassel S., F., **D. Goorahoo**, D. Adhikari, and M. Rothberg. 2007. Elephant Grass: A Promising Bio-Filter Crop for Controlling Nutrient Losses in Soils Irrigated with Effluent Waters. International Water Technology Conference Proceedings, CSU Fresno.

2. Cassel S., F., S. Ashkan, **D. Goorahoo,** D. Adhikari, and D. Zoldoske. 2007. Potential of utilizing ethanol CO_2 emissions to increase crop productivity and water-use efficiency. California Plant and Soil Conference, Sacramento, CA. p. 197.

3. **A**dhikari, D., **D. Goorahoo,** D. Zoldoske, and F. Cassel S. 2007. Standardized testing of an amplitude domain reflectometry (ADR) soil moisture sensor. California Plant and Soil Conf. Sacramento, CA. p. 193.

4. Ashkan, S., **D. Goorahoo**, F. Cassel S., and D. Adhikari. 2007. Utilizing CO_2 Emissions in California Agricultural Systems: Potential for Mitigating Global Warming from Ethanol Production. Fourth USDA Greenhouse Gas Conference, Baltimore, MD.

5. Ashkan, S., Cassel S., F., **Goorahoo, D.**, & Adhikari, D. D. (2007). Improving Water-Use Efficiency through Crop Canopy CO2 Enrichment. Paper presented at the International Water Technology Conference, California State University, Fresno, CA.

6. Ashkan, S., Goorahoo, D., Cassel S., F., & Adhikari, D. D. (2007). Utilizing CO_2 Emissions in California Agricultural Systems: Potential for Mitigating Global Warming from Ethanol Production. Paper presented at the Fourth USDA Greenhouse Gas Conference.

7. Cassel S., F., & **Goorahoo, D**. (2007). Monitoring soil salinity in on-farm drainage management systems using the electromagnetic technique. Paper presented at the International Water Technology Conference, California State University, Fresno, CA.

8. Chaganti, V., **Goorahoo, D.**, Benes, S., & Adhikari, D. D. (2007). Characterization of hydraulic properties for salt affected soils using a mini disk infiltrometer Paper presented at the 28th Annual Central California Research Symposium California State University, Fresno, CA.

9. Chaganti, V., **Goorahoo, D**., Benes, S., & Adhikari, D. D. (2007). Infiltration rates for soils under long term irrigation with saline-sodic drainage water: Methodology and Preliminary results. Paper presented at the 2007 -California Plant and Soil Conference: Opportunities for California Agriculture Sacramento, CA.

10. **Goorahoo, D**., Adhikari, D. D., & Cassel S., F. (2007). Vadose zone monitoring for nitrogen and organic loading of effluent waters. Paper presented at the International Water Technology Conference, California State University, Fresno, CA.

11. **Goorahoo, D**., Adhikari, D. D., Zoldoske, D., Cassel S., F., & Norum, E. (2007). Assessment of Standardized Testing Protocol for Soil Moisture Sensors. Paper presented at the International Soil Moisture Sensor Conference, Honolulu, HI.

12. **Goorahoo, D**., Adhikari, D. D., Zoldoske, D., Mazzei, A., & Fanucchi, R. (2007). Application of AirJection® Irrigation to Cropping Systems in California. Paper presented at the International Water Technology Conference California State University, Fresno, CA.

13. **Goorahoo, D**., Adhikari, D. D., Zoldoske, D., Mazzei, A., & Fanucchi, R. (2007). Potential for AirJection® Irrigation in Organic Farming Systems. Paper presented at the 2007 -California Plant and Soil Conference: Opportunities for California Agriculture, Sacramento, CA.

14. Reddy Gari, N. P., **Goorahoo, D**., & Adhikari, D. D. (2007). Determination of soil water retention curves for coarse and fine textured soils using a dewpoint potential meter. Paper presented at the 28th Central California Research Symposium, California State University, Fresno, CA.

15. Reddy Gari, N. P., **Goorahoo, D**., Adhikari, D. D., & Ashkan, S. (2007). Respiration, Oxygen and Moisture Profiles for Soil Subjected to AirJection® Irrigation: Methodology and Preliminary Results. Paper presented at the 2007 - California Plant and Soil Conference: Opportunities for California Agriculture, Sacramento, CA.

16. Krauter, C., Beene, M., & **Goorahoo, D**. (2006). Ammonia Emissions From Dairy Operations in California. Paper presented at the Workshop on Agricultural Air Quality: The State of the Science, Annapolis, MD.

17. Krauter, C., Beene, M., **Goorahoo, D**., & Blake, D. (2006). Determining Reactive Organic Gas Emissions from Different Manure Handling Methods at California Dairies Paper presented at the Environmental Protection Agency's 18th Emissions Inventory Conference

Posters, and Oral Presentations Between 2005- August 2006

1. Adhikari, D., **D. Goorahoo**, and F. Cassel S. 2005. Vadose zone monitoring of fields irrigated with recycled processing and municipal wastewaters. Proceedings of the Technical Conference of the Irrigation Association, Phoenix, AZ in November.

2. Adhikari, D., **D. Goorahoo**, David Zoldoske & Edward Norum 2006. Standardized Testing of Soil Moisture Sensors used in "Smart Controller" Irrigation Systems. Presentation at the technical session of the 4th World Congress of Computers in Agriculture, Orlando Fl.

3. Krauter, C., Beene, M., Goorahoo, D., & Blake, D. (2006, June). A Program for Determining Reactive Organic Gas Emissions from at California Dairies Paper presented at the Workshop on Agricultural Air Quality: The State of the Science, Annapolis, MD.

4. Cassel S., F., **D. Goorahoo**, M. Rothberg, and D. Adhikari. 2005. Benefits of a new forage grass for controlling nutrient levels in effluent-irrigated soils. Proc, 26th Annual Central CA Res. Symp, Fresno, CA. p. 100.

5. Cassel S., F., D. Adhikari, and **D. Goorahoo.** 2006. Characterizing spatial variability of soil salinity in fields receiving winery wastewaters. California Plant and Soil Conference, Visalia, CA. p. 213.

6. Cassel S., F., D. Adhikari, and **D. Goorahoo.** 2005. Salinity mapping of fields irrigated with winery effluents. Proceedings of the Technical Conference of the Irrigation Association, Phoenix, AZ in November.

7. **D. Goorahoo,** C. Krauter, L. B. Goodrich, and M. Beene. 2005. Use of Laser Technology to Monitor Ammonia Emissions from Dairy Lagoons. Poster and oral presentation at 14th Annual EPA Air Emissions Inventory Conference. Las Vegas NV April 11-14th 2005.

8. M. Beene, C. Krauter, **D. Goorahoo**, and B. Roberts. 2005. Ammonia Emissions from Nitrogen Applied in a Site-Specific Manner. Poster presentation at 14th Annual EPA Air Emissions Inventory Conference. Las Vegas NV April 11-14th 2005.

9. **D. Goorahoo,** C. Krauter, and J. Gregory. 2005**.** Impact of Lagoon Buffering on Ammonia Emissions from Lagoons. Oral presentation accepted for 6th Annual Central California Research Symposium, CSU-Fresno-April 21st 2005.

10. **D. Goorahoo**, S.E. Benes, D. Adhikari and K. Senatore. 2005. Characterization of Soils Irrigated with Saline-Sodic Drainage Water: Chemical Composition. Paper accepted for presentation at the International Salinity Forum to be held in Riverside CA from April; 24-28th 2005.

11. K.A. Senatore, **D. Goorahoo**, S.E. Benes and J.E. Ayars. 2005. Characterization of Soils Irrigated with Saline-Sodic Drainage Water: Soil Water Retention and Hydraulic Properties. Paper accepted for presentation at the International Salinity Forum to be held in Riverside CA from April; 24-28th 2005.

12. Adhikari D**.,** and **D. Goorahoo** 2005. Response of Digital Electromagnetic Probe to Soil Moisture and Electrical Conductivity. Presented at the CA Chapter of ASA, Feb 2005.

13. Cassel F., **D. Goorahoo,** D. Adhikari and M.Rothberg 2005. Potential Use of a New Forage Grass for BMP Involving Irrigation with Dairy Wastewaters. Presented at the CA Chapter of ASA, Feb 2005.

14. Adhikari D., **D. Goorahoo** and D. Zoldoske 2005. Development of a Standardized Testing Protocol for Soil Moisture Sensors. Proceedings of the 19th Annual CSU Student Research Symposium to held on April 29th 2005.

15. Adhikari D., F Cassel, **D. Goorahoo**, A. Shrestha and S. Ashkan 2005. Impact of Open Field Carbon-Dioxide Enrichment on Growth and Yield of Strawberry. Proceedings of the 26th Annual Central California Research Symposium, CSU-Fresno- April 21st 2005.

16. Benes S., **Goorahoo D**., Grattan S., Sharmasarkar S. and Cervinka V. 2005. Integrated On-Farm Drainage Management (IFDM) on the Westside San Joaquin Valley: Soil Characteristics and Infiltration.

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17. Benes S., Robinson P., Grattan S. **Goorahoo D**. and Cervinka V. 2004. Bio-Saline Ag Workshop, In: Saline drainage water re-use systems for the Westside San Joaquin Valley of California: candidate forages, halophytes, and soil management. Proceedings of the Frontis Biosaline Agriculture workshop, Wageningen University, The Netherlands. June 27-30th, 2004.

18. Benes S.E**.,** Robinson P.H, Grattan S.R., **Goorahoo D**. and V. Cervinka 2004. Saline drainage water re-use systems for the Westside San Joaquin Valley of California: candidate forages, halophytes, and soil management. Proceedings of the Frontis Biosaline Agriculture workshop, Wageningen University, The Netherlands. June 27-30th, 2004.

19. Senatore, K., **Goorahoo, D.**, Benes S**.,** J. Ayars. 2004. Hydraulic and Chemical Properties of Soils Irrigated with Recycled Saline Sodic Drainage Water. Proceedings of the national meeting of the Irrigation Association of America (IAA). Nov. th, Tampa, FL. 8 pages.

20. **Goorahoo, D.,** Benes S.E**.,** Senatore, K. and Adhikari, D. 2004. Impact of Irrigation with Saline-sodic Drainage Water on Soil Hydraulic and Chemical Properties. National meetings of the Soil Science Society of America (SSSA). Nov. 1-4, 2004, Seattle, WA.

21. Senatore, K., **Goorahoo, D**., Benes S.E., and J. Ayars 2004. Hydraulic Conductivity of Soils Irrigated with Recycled Saline-sodic Drainage Water. Proceedings of the California Plant & Soil Conference. CA chapter of the American Society of Agronomy, Feb. 3-4, 2004, Visalia, CA. pg. 162-163.

22. **D. Goorahoo,** F. Cassel S and D. Adhikari. 2004. Efficacy of Manure Based Fertilizer System on Broccoli. Final Report- Submitted to CK Life Sciences International Inc. HK.

23. **D. Goorahoo,** and C. Krauter. 2004. Emissions of Ammonia, Methane and Hydrogen Sulfide at Dairies. Final Report Project Number: 02 GOD-01-CC- Submitted to California Dairy research Foundation (CDRF).

24.**D.Goorahoo,** and F. Cassel S. 2004. Vadose Zone Monitoring for Organic and Nitrogen Loading from Winery Stillage Application. Poster presentation at EUROSOIL 2004- Annual meeting of European Soil Scientists held in Frieburg, Germany- Sept 2004.

25**.** F. Cassel S., **D. Goorahoo**, and D. Zoldoske. 2004. Use of Electromagnetic Technique for the Reclamation of Saline Soils. Oral presentation at EUROSOIL 2004- Annual meeting of European Soil Scientists held in Frieburg, Germany- Sept 2004.

26**. D. Goorahoo,** S. Benes, K. Senatore, and D. Adhikari. 2004. Impact of Irrigation with Saline-Sodic Drainage Waters on Soil Hydraulic and Chemical Properties. Presented at the ASA-CSSA-SSSA-CSSS Annual Meetings in Seattle, WA Sept 2004.

27. B. Goodrich, C. Krauter, M. Beene, and **D. Goorahoo**. 2004. Ammonia Flux Profiles and Preliminary Reactive Organic Gasses Emission Rates at California Dairies. Presented at the ASA-CSSA-SSSA-CSSS Annual Meetings in Seattle, WA Sept 2004.

28. Adhikari D**.,** F Cassel S, **D. Goorahoo**, A Shrestha and S Ashkan., 2004.Photosynthesis Response to Enriched Atmospheric Carbon Dioxide in Strawberry Leaves. Presented at ASA-CSSA-SSSA-CSSS Annual Meetings in Seattle, WA Sept 2004.

29. Ng J., A. Chu, **D. Goorahoo**, F Cassel, D. Adhikari 2004. Growing Broccoli with a Sustainable Manure-Based Fertilizing System (MBFS). Presented at ASA-CSSA-SSSA-CSSS Annual Meetings in Seattle, WA Sept 2004.

30. **Goorahoo D**., S. Benes, K. Senatore and D. Adhikari 2004. **I**mpact of Irrigation with Saline-Sodic Drainage Waters on Soil Hydraulic and Chemical Properties. Presented at ASA-CSSA-SSSA-CSSS Annual Meetings in Seattle, WA Sept 2004.

31. **Goorahoo D.**, D. Adhikari**,** G Carstensen and D Zoldoske 2004. Impact of Aerated Subsurface Irrigation Water on the Growth and Yield of Crops. Presented at the Irrigation Association (IA) show in Tampa Florida on Nov. 2004

32. **Goorahoo D.**, F. Cassel, M.Rothberg, D. Adhikari**,** D Zoldoske and E Norum. 2004. Potential use of a New Forage Grass (*Pennisetum Sp.)* in Best Management Practices Involving Irrigation with Food Processing and Dairy Wastewaters. Presented the IA show in Tampa Florida on Nov. 2004.

33. **Goorahoo, D**., E. Norum, F. Cassel S**.**, and D. Adhikari. 2004. Development of a Standardized Testing Protocol for Soil moisture Sensors. International Water and Irrigation. 24(2):21-22.

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34. Krauter, C. F., D. Goorahoo and M. Beene. 2003. Atmospheric Ammonia Profiles Over Various Crops in the San Joaquin Valley. Proceedings of the California Plant and Soil Conference. American Society of Agronomy meeting in Modesto, CA in February, 2003.

35. Krauter C., D. Goorahoo, C. Potter and S. Klooster 2003. Ammonia Flux Profiles For Various Soil and Vegetation Communities in California. Proceedings of the EPA Emission Inventory Conference in San Diego California on April 30th 2003.

36. Krauter, C.F., D. Goorahoo, C. Potter and S. Klooster. 2003. Atmospheric Ammonia Flux Profiles Related to Soil Fertility Management. Proceedings of the California Department of Food and Agriculture Fertilizer Education Program Conference, Tulare, CA. November, 2003.

37. **Goorahoo, D**., F. Cassel S., and G. Carstensen. 2003. Crop Growth Enhancement with CO_2 Injection into the Crop Canopy with Drip Irrigation. Final Report. The Agricultural Gas Company, Fresno, CA. 27 pp.

38. Krauter C., **D. Goorahoo,** C. Potter and S. Klooster 2003. Ammonia Flux Profiles For Various Soil and Vegetation Communities in California. Poster presented at the EPA Emission Inventory Conference in San Diego California on April 30th 2003.

39. Carstensen G., and **D. Goorahoo**. 2003. A Preliminary Study of Relationship Between E-Coli, Total Suspended Solids and Ammonium in Dairy Lagoon Effluent. Poster presented at (a) the Central California Research Symposium at CSUF on April 17th 2003, and (b) California Plant and Soil Conference Feb.5-6 in Modesto, CA.

40. Shrestha A., S. Ashkan, **D. Goorahoo**, and G. Carstensen. 2003. Effect of Elevated CO_2 on C_3 Crop Endurance to a C_4 Weed – Some Preliminary Findings. Poster presented at the National Integrated Pest Management (IPM) meeting held in Indianapolis, IN, April 8-10, 2003.

41. Cassel Sharmasarkar, F., M. McClanahan, S. Sharmasarkar, and **D. Goorahoo**. 2003. Assessing the impacts of food-processing effluent land application on subsurface water quality. Poster presented at (a) the Central California Research Symposium at CSUF on April 17th 2003, and (b) California Plant and Soil Conference Feb.5-6 in Modesto, CA.

42. **Goorahoo D.**, G. Carstensen and D. Zoldoske, S Kostka, K. Mauser and M. Franklin 2003. Addition of surfactant to improve irrigation efficiency in commercial turf systems. Poster presented California Plant and Soil Conference Feb.5-6 in Modesto, CA.

43. **Goorahoo D**., S. Benes, and D. Adhikari. 2003. Infiltration in soils irrigated with saline-sodic drainage waters: experimental design and data analysis techniques. Poster presented at California Plant and Soil Conference Feb.5-6 in Modesto, CA.

44. Fandino C., S. Benes, D. May, J.P. Mitchell and **D. Goorahoo.** 2003. Use of Sudan grass and early soil testing as a means to optimize nitrogen management for processing tomatoes. Presented at California Plant and Soil Conference Feb.5-6 in Modesto, CA.

45. **Goorahoo D**., and C. Krauter. 2003. Compensating for ammonia losses during fertigation. Presented at the Vegetables West Expo in Salinas CA. on February 20, 2003.

46. Krauter C, **D. Goorahoo**, and M. Beene. 2003. Air Quality Research Related to Dairy Operations. Presented at the Air and Waste Annual Technical Conference in Bakersfield on March 25th 2003

2002

47. Beene M., C. Krauter and **D. Goorahoo**. 2002. Seasonal ammonia emissions from crops in the San Joaquin Valley, California. Presented at the Annual Crops, Soils and Agronomy Societies of America meeting held in Indianapolis, IN., in November 2002.

48. **Goorahoo D.**, G. Carstensen and D. Zoldoske, S Kostka, K. Mauser and M. Franklin 2002. Addition of Surfactants to improve irrigation efficiency in turf systems. Presented at the Annual Crops, Soils and Agronomy Societies of America meeting held in Indianapolis, IN., in November 2002.

49. Krauter, Charles and Dave Goorahoo. 2002. Ammonia Emissions from Nitrogen Fertilizer Applications - Field Sampling Methodology. College of Agricultural Sciences & Technology Faculty Seminar Series, March, 2002

50. Krauter, Charles, Dave Goorahoo, Steven Klooster, and Christopher Potter. 2002. Ammonia Emissions and Fertilizer Application Practices in California's Central Valley. Emissions Inventory Conference. Air Quality Planning and Standards Division, Environmental Protection Agency. Atlanta, GA, April, 2002

51. Cassel S., F., M. McClanahan, **D. Goorahoo**, S. Sharmasarkar., J. Kipps, S. Klein, R. Crites, and J. Smith. 2002. BOD loading impact on land application percolate water quality. Water Environment Federation 75th Annual Technical Exhibition and Conference, Alexandria, VA. 19 pp.

52. Cassel Sharmasarkar, F., M. McClanahan, S. Sharmasarkar, and **D. Goorahoo**. 2002. Evaluation of Various BOD Loading Rates for Land Application of Food-Processing Wastewater. Final Report. United States EPA, Washington D.C.

53. Beene M., C. Krauter and **D. Goorahoo**. 2002. Seasonal ammonia emissions from crops in the San Joaquin Valley, California. Presented at the Annual Crops, Soils and Agronomy Societies of America meeting held in Indianapolis, IN., in November 2002.

54. **Goorahoo D.**, G. Carstensen and D. Zoldoske, S Kostka, K. Mauser and M. Franklin 2002. Addition of Surfactants to improve irrigation efficiency in turf systems. Presented at the Annual Crops, Soils and Agronomy Societies of America meeting held in Indianapolis, IN., in November 2002.

55. Beene M., C. Krauter and **D. Goorahoo.** 2002. Seasonal ammonia emissions from crops in the San Joaquin Valley, California. Presented at the Annual Crops, Soils and Agronomy Societies of America meeting held in Indianapolis, IN., in November 2002.

2001 AND EARLIER

56. Krauter, Charles, Dave Goorahoo, Steven Klooster, and Christopher Potter. 2001. Ammonia Emission Related to Nitrogen Fertilizer Application Practices, Proceedings of the California Department of Food and Agriculture Fertilizer Education Program Conference, Tulare, CA, November, 2001

57. **Goorahoo, D.**, G. Carstensen And A. Mazzei. 2001. A pilot study on the impact of air injected into water delivered through subsurface drip irrigation tape on the growth and yield of bell peppers. California Agricultural Technology Institute (CATI) Report # 010201.

58. **Goorahoo D**., C. F. Krauter, C. Potter, S. Klooster, And D. Fitz. 2000. Ammonia emissions from nitrogen fertilizer application practices. Presented at 2000 ASA, CSSA and SSSA Annual Meetings in Minneapolis, MN. p.47 in Annual Meeting Abstracts.

59. **Goorahoo, D**. , R.G. Kachanoski, And D.L. Rudolph. 1998. Spatial covariance of effective retardation coefficient and soil hydraulic properties. Presented at 1998 ASA,CSSA and SSSA Annual Meetings in Baltimore, MD. p.182 in Annual Meeting Abstracts.

60. SI, B., **D. Goorahoo**, G. Parkin, and R.G. Kachanoski. 1995. Measurement of soil hydraulic and transport properties using a multistep infiltration/drainage method. Presented at 1995 ASA,CSSA and SSSA Annual Meetings in St. Louis, Missouri. p.208 in Agronomy Abstracts.

61. Tel, D.A., and **D. Goorahoo**. 1993. Ammonium determination in oxalic acid sorbent using a TRAACS 800 autoanalyzer. Method presented at the International Symposium on Soil Testing and Plant Analysis: Precision Nutrient Management. August 14 - 19, 1993. Olympia, Washington. U.S.A.

62. Goss, M.J.., D.A.J. Barry, and **D. Goorahoo**. 1993. Evaluating nitrogen budgets for assessment of the effectiveness of farming systems in limiting nitrate contamination of groundwater. p 233-235 in: Agricultural Research to Protect Water Quality. Proceedings of the Conference February 21-24, 1993, Minneapolis, MN. Soil and Water Conservation Society, Ankeny, IA, USA.

63. Goss, M.J.., D.A.J. Barry, and **D. Goorahoo**. 1993. Impact of Animal Production on Soil and Water Quality. In Proceedings of the 29th Annual Nutrition Conference for Feed Manufacturers, 20-21 April 1993, University of Guelph, Guelph, Ontario. The Canadian Feed Industry Association. p.108-120.

64. Goss, M.J., D.A.J. Barry, **D. Goorahoo** and P.S. Smith. 1994. A nitrogen budget prediction of nitrate in groundwater at a farm using sewage sludge. p. 231- 236. *In* Clapp, C.E., W.E. Larson, and R. H. Dowdy (eds.). *Sewage sludge: land utilization and the environment.* SSSA misc. publication, Madison, WI.

65. Goss, M.J., D.A.J. Barry and **D. Goorahoo**. 1992. Sources and processes associated with nutrient contamination of water resources. p 45-58. *In* M.H. Miller, J.E. FitzGibbon, G.C. Fox, R.W. Gillham and H.R. Whiteley (eds.) *Agriculture and Water Quality.* Centre for Soil and Water Conservation, Guelph, Ontario.

66. Goss, M.J. and **D. Goorahoo**. 1996 Nitrate contamination of groundwater: measurement and prediction. fertilizer Research 42: 331-338.

67. Barry, D.A.J., **Goorahoo, D**. and Goss, M.J. 1993. Estimation of nitrate concentrations in groundwater using a whole farm nitrogen budget. *Journal of Environmental Quality* 22 767-775.

68. Goss, M.J., Barry, D.A.J., and **Goorahoo, D**. 1993. Evaluating nitrogen budgets for assessment of the effectiveness of farming systems in limiting nitrate contamination of groundwater. p 233-235. *In Agricultural Research to Protect Water Quality*. Proceedings of the Conference February 21-24, 1993, Minneapolis, MN. Soil and Water Conservation Society, Ankeny, IA, USA.

69. Goss, M.J., Barry, D.A.J., and **Goorahoo, D**. 1993. Impact of animal production on soil and water quality. p 108-120. *In*: *Proceedings of the 29th Annual Nutrition Conference for Feed Manufacturers*, 20-21 April 1993, University of Guelph, Guelph, Ontario. The Canadian Feed Industry Association.

UNPUBLISHED THESES AND PROJECTS

- 1999. Spatial variability of hydraulic and transport properties for coarse porous media. PhD. Thesis.
- 1993. The use of whole farm nitrogen budgets to estimate nitrate concentrations in groundwater for three organic farms in Bruce County. M.Sc. Thesis.
- 1990. Response of maize to N and K fertilizers in Talparo clay (A Vertisol). Third Year Research Project in B.Sc. program.

INDUSTRIAL EXPERIENCE

- 1978 - 1988. Operating Technician at Trinidad & Tobago Methanol Company (TTMC), Trinidad & Tobago Oil Company (TRINTOC), and Federation Chemicals (FEDCHEM) Ammonia and Urea Fertilizer Manufacturers.

COMPUTER SOFTWARE KNOWLEDGE

- Spreadsheet software: Excel, MATHCAD, Quattro Pro, Cohort & Costat, and SAS. Word processing: WordPerfect and Word.
- 'G-Stat' and 'GS^{+}' Geostatistical software.
- Graphics software: Powerpoint, SURFER, and Sigma Plot.
- Modeling: Familiarity with HYDRUS NLEAP, FLOTRANS, FLOWPATH, CXTFIT and RETC.for.

PROFESSIONAL MEMBERSHIPS AND EXTRA CURRICULAR ACTIVITIES

- 2010-2011: Appointed 2nd Vice President on the Governing Board of the California Chapter of the American Society of Agronomy.
- 2009-2010: Appointed secretary- treasurer on the Governing Board of the California Chapter of the American Society of Agronomy.
- 2008- 2010 Co-Chair of the conference subcommittee of SAEA. Participate in monthly conference call meetings and plan the next SAEA conference
- 2007- 2010 Steering committee member for the Sustainable Agriculture Education Association (SAEA). The primary goal of SAEA is to promote and disseminate curricula, best educational and experiential learning practices, and research related to the teaching and learning of sustainable agriculture
- 2006- Present. Member of NACTA- North American Colleges and Teachers in Agriculture
- 1991- Present. Member of Soil Science and Agronomy Societies of America.
- 2000- Present. Member of Canadian Soil Science Society.
- 1993 - 1997. Graduate student representative on Land Resource Science Selection Committee for

incoming graduate students. University of Guelph.

- 1988 - 1990. Faculty of Agriculture Student representative for class of 1990. University of The West Indies.

THOMAS T. HOLYOKE, Ph.D.
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http://www.csufresno.edu/polysci/fac_staff/faculty/holyoke.shtml

EDUCATION

Doctor of Philosophy, 2004. Political Science, The George Washington University, Washington, D.C.
Field Exams: American Politics, Political Methodology

Master of Philosophy, 2001. Political Science, The George Washington University, Washington, D.C.

Master of Arts, 1996. Political Science, Syracuse University, Syracuse, New York

Bachelor of Arts, 1992. Political Science, Drake University, Des Moines, Iowa

FOCUS OF CURRENT TEACHING

Synopsis: Currently my teaching focuses primarily on American politics at the national level, especially interest group and legislative political. I also teach courses on social movements, water politics, and the methods of social science research including data analysis. Recent courses include:

- Introduction to American Government
- Legislative Politics
- Interest Group Politics
- Social Movement Politics
- Water Politics (undergraduate and graduate levels)
- Statistical Analysis Methods (undergraduate and graduate levels)

FOCUS OF CURRENT RESEARCH

Synopsis: I am currently pursuing two main research programs. One focuses on interest group politics and group formation, primarily in American politics, but with some work on nongovernmental organization advocacy in Europe. The other focuses on the public policy process, especially western water policy and charter school and education policy at the state and local level.

- Interest Group Politics and Collective Action
- Water Politics and Policy
- Education and Charter School Policy
- Banking and Community Development Policy
- Nonprofit and Voluntary Sector

ACADEMIC APPOINTMENTS

Associate Professor of Political Science, California State University, Fresno, 2010 – Present

Assistant Professor of Political Science, California State University, Fresno, 2005 – 2010

Assistant Professor of Political Science, Hastings College, 2003 – 2005

Teaching Fellow, Department of Political Science, The George Washington University, 2002 – 2003

Banneker Research Fellow, Center for Washington Area Studies, The George Washington University, 1999 - 2003

Teaching Assistant, Department of Political Science, The George Washington University, 2001

BOOKS

Holyoke, Thomas T. 2011. *Competitive Interests: Competition and Compromise in American Interest*
Group Politics. Washington, D.C.: Georgetown University Press.

PEER-REVIEWED JOURNAL ARTICLES AND BOOK CHAPTERS

Interest Group Politics and Collective Action

Holyoke, Thomas T., Heath Brown, and Jeffrey R. Henig. 2012. "Shopping in the Political Arena: Strategic Venue Selection by Organized Interests in a Federal System." *State and Local Government Review* 44(1): 1-13.

Holyoke, Thomas T. N.d. "The Interest Group Effect on Contact with Congress." *Party Politics* Forthcoming.

Holyoke, Thomas T. 2009. "Interest Group Competition and Coalition Formation." *American Journal of Political Science* 53(April): 360 – 375.

Holyoke, Thomas T. 2008. "Interest Group Competition and Cooperation at Legislative Hearings." *Congress and the Presidency* 35(Autumn): 17 – 38.

Holyoke, Thomas T., Jeffrey R. Henig, Heath Brown, and Natalie Lacireno-Paquet. 2007. "Institutional Advocacy and the Political Behavior of Charter Schools." *Political Research Quarterly* 60(June): 202 – 214.

Holyoke, Thomas T. 2004. "By Invitation Only: Interest Group Access to the Oval Office." *American Review of Politics* 25(Fall): 221 – 240.

Holyoke, Thomas T. 2003. "Choosing Battlegrounds: Interest Group Lobbying Across Multiple Venues." *Political Research Quarterly* 56(September): 325 – 336.

Education and School Choice Policy

Holyoke, Thomas T., Jeffrey R. Henig, Heath Brown, and Natalie Lacireno-Paquet. 2009. "Policy Dynamics and the Evolution of State Charter School Laws." *Policy Sciences* 42(February): 33 – 55.

Holyoke, Thomas T. 2008. "Dimensions of Charter School Choice." *Journal of School Choice* 2(September): 302 – 317.

Lacireno-Paquet, Natalie and Thomas T. Holyoke. 2007. "Moving Forward and Spinning Wheels: A Comparison of Charter School Politics in Michigan and the District of Columbia." *Educational Policy* 21(January): 185 – 214.

Henig, Jeffrey R., Natalie Lacireno-Paquet, Thomas T. Holyoke, and Heath Brown. 2006. "Does Mission Matter? Exploring a Typology of Charter School Orientation." In *A Guide to Charter Schools* eds. Myron S. Kayes and Robert Maranto. Latham, MD: Rowman and Littlefield.

Henig, Jeffrey R., Thomas T. Holyoke, Heath Brown, and Natalie Lacireno-Paquet. 2005. "The Influence of Founder Type on Charter School Structures and Operations." *American Journal of Education* 111(August): 487 – 522.

Henig, Jeffrey R., Heath Brown, Thomas T. Holyoke, and Natalie Lacireno-Paquet. 2004. "Research on Emergent Phenomena: Responses and Speculations." *Social Science Quarterly* 85(December):1072 – 1077. ***Response to the critics.***

Brown, Heath, Jeffrey R. Henig, Natalie Lacireno-Paquet, and Thomas T. Holyoke. 2004. "Scale of Operations and Locus of Control in Market Versus Mission-Oriented Charter Schools." *Social Science Quarterly* 85(December): 1035 – 1051.

Henig, Jeffrey R., Thomas T. Holyoke, Natalie Lacireno-Paquet and Michele Moser. 2003. "Privatization, Politics, and Urban Services: The Political Advocacy Behavior of Charter Schools." *Journal of Urban Affairs* 25(February): 37 – 54. ***Best Article on Urban Affairs Award for 2004 from the Urban Affairs Association.***

Lacireno-Paquet, Natalie, Thomas T. Holyoke, Michele Moser and Jeffrey R. Henig. 2002. "Creaming Versus Cropping: Charter School Enrollment Practices in Response to Market Incentives." *Education Evaluation and Policy Analysis* 24(Summer): 145 – 158.

Environmental and Native American Policy

Holyoke, Thomas T. 2011. "The Failure of Indian Casino Advocacy in New York." In *The New Politics of Indian Gaming: The Rise of Reservation Interest Groups*, eds. Kenneth N. Hansen and Tracey A. Skopek. Las Vegas, NV: University of Nevada Press.

Holyoke, Thomas T. 2010. "Democratic Limits of Political Conflict." In *Stewardship of Public Lands: Politics and the Yellowstone Ecosystem*, ed. N. Scott Cole. Washington, D.C.: American Association of State Colleges and Universities.

Holyoke, Thomas T. 2009. "Institutional Constraints on Legislative Lobbying: Lobbying for Indian Casinos in New York State." *Social Science Journal* 46(December):756 – 775.

Banking and Community Development Policy

Holyoke, Thomas T. 2004. "Community Mobilization and Credit: The Impact of Nonprofits and Social Capital on Community Reinvestment Act Lending." *Social Science Quarterly* 85(March): 187 – 205.

Holyoke, Thomas T. 2002. "Expanding the Limits of Power: The Federal Reserve and the Implementation of Functional Regulation in the Gramm-Leach-Bliley Era." *Review of Policy Research* 19(Winter): 95 – 119.

Holyoke, Thomas T. 2001. "The Community Reinvestment Act and Community Organization in Washington, D.C." in *Changing Financial Markets and Community Development*, eds. Jackson L. Blanton, Alicia Williams, and Sherrie L.W. Rhine. Board of Governors of the Federal Reserve System: Washington, D.C.

Holyoke, Thomas T. 2000. "The Battle is Over, But the War Goes On: Reflections on the Financial Modernization Act of 1999." *Policy Perspectives* 8(Fall): 2 – 12.

Santiago, Nellie R., Thomas T. Holyoke and Ross D. Levi. 1998. "Turning David and Goliath into the Odd Couple: The Community Reinvestment Act and Community Development Financial Institutions." *Journal of Law and Policy* 6(Fall): 571 – 651.

NON-PEER REVIEWED PUBLICATIONS OF INTEREST

2010. Book Review of *Lobbying and Policy Change* by Baumgartner, Berry, Hojnacki, Kimball, and Leech (Chicago: Chicago University Press, 2009) in *Journal of Politics* 73(December).

Holyoke, Thomas T. 2009. "Foundations and Future Directions: An Exploration of Competitive Interest Group Politics." *VOX-POP Newsletter for Political Organizations and Parties* 28(1): 3 – 4.

Holyoke, Thomas T. 2008. "Housing Policy." In *Encyclopedia of American Government and Civics.* Eds. Lori Cox Han and Michael Genovese. Facts-On-File.

Holyoke, Thomas T. 2008. "Rider." In *Encyclopedia of American Government and Civics*. Eds. Lori Cox Han and Michael Genovese. Facts-On-File.

Holyoke, Thomas T. 2008. "Political System." In *International Encyclopedia of the Social Sciences,* 2nd Edition. Ed. William A. Darity. Farmington Hills, MI: Thomas – Gale

Holyoke, Thomas T. 2008. "Pressure Groups." In *International Encyclopedia of the Social Sciences,* 2nd Edition. Ed. William A. Darity. Farmington Hills, MI: Thomas – Gale

Holyoke, Thomas T. 2005. "Exploring Competition and Bargaining Among Interest Group Lobbyists in Washington." *PS: Political Science and Politics* XXXVIII(October): 811.

WORKS IN PROGRESS

Book manuscript – *In the Pursuit of Interests*, **under contract with Westview Press.**

"Exaggerated Interests: Truthfulness in the Lobbying of Administrative Agencies by Competing Interest Groups" with Hyoung-Goo Kang (under review)

"Following the Leader? A Dynamic Model of Member Participation in Interest Groups."

"Electoral Accountability and Fiscal Policy in the American States: A Reassessment" with Jeff Cummins.

"End of the Beginning for *The End of Liberalism*" for the *Oxford Handbook of the Classics of Public Policy and Administration,* eds. Edward Page, Steven Balla, and Martin Lodge. New York: Oxford University Press.

SELECTED RESEARCH REPORTS AND OCCASIONAL PAPERS

(authored or contributed significantly to)

"Strategic Venue Selection by Charter Schools" with Heath Brown and Jeffrey R. Henig. Occasional Paper #173, National Center for the Study of Privatization in Education, Teachers College, Columbia University, 2009.

Communicating with Congress: How the Internet has Changed Citizen Engagement. Congressional Management Foundation, Washington, D.C., 2008

House Staff Employment Survey, 2004. Congressional Management Foundation, Washington, D.C., 2005.

"The Influence of Founder Type on Charter School Structures and Operations" with Jeffrey R. Henig, Heath Brown, and Natalie Lacireno-Paquet. Occasional Paper #77, National Center for the Study of Privatization in Education, Teachers College, Columbia University, 2004.

Growing Pains: An Evaluation of Charter Schools in the District of Columbia; 1999-2000. Center for Washington Area Studies, The George Washington University, Washington, D.C., 2001.

Making a Choice, Making a Difference: An Evaluation of Charter Schools in the District of Columbia. Center for Washington Area Studies, The George Washington University, Washington, D.C., 1999.

Arbitrage and its Impact on Local Governments. National Association of Counties Masco Scholar Research Paper Series, Washington, D.C., 1999.

Banking and Community Reinvestment in New York State. New York State Senate Minority Task Force on Banking and Community Reinvestment, 1996.

Highway Spending and the Road Use Tax Fund. Iowa Goods Roads Association, Des Moines, Iowa, 1994.

Iowa Motor Truck Association: Delivering 50 Years of Progress. Iowa Motor Truck Association, Des Moines, Iowa, 1992.

CONFERENCE PRESENTATIONS

Cummins, Jeff and Thomas T. Holyoke. 2012. "Electoral Accountability and Fiscal Policy in the American States." Accepted for presentation at the Western Political Science Association, Portland, Oregon.

Holyoke, Thomas T. 2011. "A Dynamic Model of Member Participation in Interest Groups." Presented at the Annual Meeting of the Western Political Science Association, San Antonio, Texas.

Holyoke, Thomas T. 2010. "Interest Group Competition and Legislative Gridlock." Presented at the Annual Meeting of the Western Political Science Association, San Francisco, California.

Brown, Heath and Thomas T. Holyoke. 2008. "Shopping For a Venue: Charter Schools and their Political Activities." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Holyoke, Thomas T. 2008. "The Internal Politics of Interest Groups: The "Maturing" of Charter School Collective Action in Washington, D.C." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Holyoke, Thomas T. 2008. "Following the Leader? Choosing to Engage in Collective Action for Choice-in-Education Policy." Presented at the Annual Meeting of the Western Political Science Association, San Diego, California.

Lacireno-Paquet, Natalie and Thomas T. Holyoke. 2007. "Moving Forward or Sliding Backwards: The Evolution of Charter School Policies in Michigan and the District of Columbia." Presented at the Annual Meeting of the American Education Research Association, Chicago, Illinois.

Brown, Heath and Thomas T. Holyoke. 2007. "Competition and Cooperation." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Holyoke, Thomas T. and Ashlin Mattos. 2007. "Crapping Out: The Failure of Indian Casino Advocacy in New York." Presented at the Annual Meeting of the Western Political Science Association, Las Vegas, Nevada.

Holyoke, Thomas T. 2007. "The Influence and Timing of Legislative Pressure in Interest Group Coalition Formation." Presented at the Annual Meeting of the Southern Political Science Association, New Orleans, Louisiana.

Holyoke, Thomas T. 2007. "Charter School Interests and the Choice to Engage in Collective Action." Presented at the Annual Meeting of the Southern Political Science Association, New Orleans, Louisiana.

Lacireno-Paquet, Natalie and Thomas T. Holyoke. 2006. "A Movement on Hold: The Politics of Charter Schools in Michigan." Presented at the Annual Meeting of the American Education Research Association, San Francisco, California.

Holyoke, Thomas T. and Ashlin Mattos. 2006. "Rolling the Dice: The Politics of Indian Tribal Advocacy and Reservation Gaming." Presented at the Annual Meeting of the Western Political Science Association, Albuquerque, New Mexico.

Holyoke, Thomas T., Jeffrey R. Henig, Heath Brown, and Natalie Lacireno-Paquet. 2005. "Collective Action and Institution Advocacy by Charter Schools in the States." Presented at the Annual Meeting of the American Political Science Association, Washington, D.C.

Holyoke, Thomas T. 2005. "Interest Group Bargaining." Presented at the Annual Meeting of the Great Plains Political Science Association, Kearney, Nebraska.

Walker, Tessa, David Brown, Thomas T. Holyoke, and Elizabeth Frombgen. 2005. "Internationalism and the War in Iraq: American Foreign Affairs Attitudes and Opinions in Rural America." Presented at the Annual Meeting of the Great Plains Political Science Association, Kearney, Nebraska.

Holyoke, Thomas T. 2004. "Giving a Little to Get a Little: A Bargaining Model of Interest Group Coalition Formation." Presented at the Annual Meeting of the American Political Science Association, Chicago, Illinois.

Holyoke, Thomas T., Jeffrey R, Henig, Heath Brown, and Natalie Lacireno-Paquet. 2004. "The Political Behavior of Charter Schools." Presented at the Annual Meeting of the American Political Science Association, Chicago, Illinois.

Brown, Heath, Jeffrey R. Henig, Thomas T. Holyoke, and Natalie Lacireno-Paquet. 2004. "Scale of Operations and Locus of Control in Market Versus Mission Charter Schools." Presented at the Annual Meeting of the American Education Research Association, San Diego, California.

Holyoke, Thomas T. 2004. "Derailing the Trains: Interest Group Competition and Legislative Gridlock." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Brown, Heath, Jeffrey R. Henig, Natalie Lacireno-Paquet, and Thomas T. Holyoke. 2003. "Scale of Operations and Locus of Control in Market vs. Mission-Oriented Charter Schools." Presented at the 25th Annual Research Conference of the Association for Policy Analysis and Management, Washington, D.C.

Ram, Melanie H. and Thomas T. Holyoke. 2003. "From the Sidelines to the Headlines: How the Roma Gained a 'Voice' in European Politics." Presented at the Annual Meeting of the American Political Science Association, Philadelphia, Pennsylvania.

Holyoke, Thomas T. 2003. "Madam Chair, We Respectfully Disagree: Interest Group Competition and Congressional Testimony." Presented at the Annual Meeting of the American Political Science Association, Philadelphia, Pennsylvania.

Henig, Jeffrey R., Thomas T. Holyoke, Heath Brown, and Natalie Lacireno-Paquet. 2003. "The Influence of Founder Type on Charter School Structures and Operations." Presented at the Annual Meeting of the American Political Science Association, Philadelphia, Pennsylvania.

Holyoke, Thomas T. 2003. "A Clash of Interests: Interest Group Competition and National Policymaking." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Moser, Michele, Heath Brown, Thomas T. Holyoke, Jeffrey R. Henig, and Natalie Lacireno-Paquet. 2002. "Straddling the Line - Charter Schools and Public Policy." Presented at the 24th Annual Research Conference of the Association for Public Policy Analysis and Management, Dallas, Texas.

Holyoke, Thomas T. 2002. "By Invitation Only: Controlling Interest Group Access to the Oval Office." Presented at the Spring Symposium, Center for the Study of the Presidency, Washington, D.C.

Henig, Jeffrey R., Michele Moser, Thomas T. Holyoke, Natalie Lacireno-Paquet, and Heath Brown. 2002. "The Political Dynamics of Charter School Policies." Presented at the Annual Meeting of the American Political Science Association, Boston, Massachusetts.

Holyoke, Thomas T. 2001. "The Community Reinvestment Act and Community Organization in Washington, D.C." Presented at the 23rd Annual Research Conference of the Association for Public Policy Analysis and Management, Washington, D.C.

Holyoke, Thomas T. and Jeffrey R. Henig. 2001. "Shopping in the Political Arena: Venue Selection and the Advocacy Behavior of Charter Schools." Presented at the Annual Meeting of the American Political Science Association, San Francisco, California.

Holyoke, Thomas T. 2001. "Community Organization and Community Reinvestment Act Lending in Washington, D.C." Presented at the 2nd Annual Community Affairs Research Conference, Board of Governors of the Federal Reserve System, Washington, D.C.

Holyoke, Thomas T. and Jeffrey R. Henig. 2001. "All For One, or Each for Themselves? Collective Action by Charter Schools in Washington, D.C." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Lacireno-Paquet, Natalie, Thomas T. Holyoke, Jeffrey R. Henig and Michele Moser. 2000. "Creaming the Top or Cropping the Bottom: Can the Creaming Issue be Put to Rest?" Presented at the 22nd Annual Research Conference of the Association for Public Policy Analysis and Management, Seattle, Washington.

Henig, Jeffrey R., Michele Moser, Thomas T. Holyoke and Natalie Lacireno-Paquet. 2000. "Charter Schools as Political Actors: Understanding the Political Dimensions of Charter Schools." Presented at the 2000 Charter Schools National Conference hosted by the U.S. Department of Education, Washington, D.C.

Holyoke, Thomas T. 2000. "Choosing Battlefields: A Game Theoretic Examination of How Interest Groups Select Lobbying Venues." Presented at the Annual Meeting of the American Political Science Association, Washington, D.C.

Holyoke, Thomas T. 2000. "Cross Venue Lobbying: The Case of Financial Modernization." Presented at the Annual Meeting of the Midwest Political Science Association, Chicago, Illinois.

Holyoke, Thomas T. 1999. "Financial Arbitrage and Local Governments: An Analysis of the Impact of the 1986 Tax Reform Act." Presented to the Tax and Finance Steering Committee at the 64th Annual Conference of the National Association of Counties, St. Louis, Missouri.

FELLOWSHIPS, AWARDS, AND VISITING PROFESSORSHIPS

Visiting Professor, University Studies Abroad Consortium in Chengdu, China, 2012

Outstanding Reviewer of the Year Award from *Political Research Quarterly* for 2010

Provost's Research Enhancement Grant Award, California State University, Fresno, 2010

Visiting Professor, University Studies Abroad Consortium at the University of the Basque Country, Donostia – San Sebastián, Spain, Fall Semester of 2008

Provost's Most Promising New Faculty Award, California State University, Fresno, 2008

Provost's Research Award, California State University, Fresno, 2006 & 2007

Centennial Center Visiting Scholar, American Political Science Association, 2004, 2005 & 2006

Marguerite Ross Barnett Award, American Political Science Association, 2005

Research Grant, Hal Dittmer Research Fund for Excellence, Hastings College, 2004

Support Grant for Empirical Implications of Theoretical Models Summer Institute (funded by the National Science Foundation), Washington University, St. Louis, 2004

Research and Travel Grant, The Lilly Corporation, 2004

Best article in *Journal of Urban Affairs* by the Urban Affairs Association, 2003

University Teaching Fellowship, The George Washington University, 2002 – 2003

Social Science Dissertation Grant, The George Washington University, 2002

Fellow, Center for the Study of the Presidency, Washington, D.C., 2001 – 2002

Benjamin Banneker Research Fellow, Center for Washington Area Studies, The George Washington University, 1999 – 2000

Wesley A. Masco Scholar, National Association of Counties, 1999

Legislative Fellow, New York State Senate, 1995 – 1996

CONSULTING WORK

Central Valley Political Archives, Henry Madden Library, California State University, Fresno, 2006 – Present

Congressional Management Foundation, 2004 – Present

Strategic Assets Consulting, 2008

Educational Services Unit #9, Hastings Nebraska, 2005

Financial Markets Center, 2002

ADDITIONAL PROFESSIONAL EXPERIENCE

Research Assistant, Financial Markets Center, 2000

Research Assistant, National Association of Counties, 1999 – 2001

Legislative Director, Office of New York State Senator Nellie Santiago, 1996 – 1998

Legislative Fellow, New York State Senate, 1995 – 1996

Research Assistant, Western Highway Institute, 1995

Intern, Office of U.S. Senator Charles E. Grassley, 1992 & 1993

Government Affairs Assistant, Iowa Motor Truck Association, 1992 – 1994

Intern, Office of Governor Terry E. Branstad, 1991

Intern, Iowa Campaign Finance Disclosure Commission, 1991

PROFESSIONAL SERVICE

Member, Founding Editorial Board of *Interest Groups and Advocacy*, 2011 – Present.

Member of the Executive Council of the Political Organizations and Parties Section of the American Political Science Association, 2010 – Present

Manuscript and grant proposal reviewer (in the last three years)

American Political Science Review
American Journal of Political Science
Congress and the Presidency
Interest Groups and Advocacy
Legislative Studies Quarterly
Journal of Politics
Political Research Quarterly
Publius: The Journal of Federalism
National Science Foundation
Houghton Mifflin Publishing
Wadsworth, Thomas Learning Publishers

Charles Redd Award for Best Paper on the Politics of the American West Award Committee, Western
Political Science Association, 2010 – 2012 (committee chair in 2012)

Pi Sigma Alpha Award Committee, Western Political Science Association, 2007 – 2008

INSTITUTIONAL SERVICE

University Academic Senate Executive Committee (CSU, Fresno), 2010 – Present

University Academic Senate (CSU, Fresno), 2006 – Present

University Honorary Doctoral Degree Committee, 2010 – Present

Advisory Board Member, Water Archives of the Valley, Henry Madden Library (CSU, Fresno), 2009 – Present

Curriculum Committee, College of Social Sciences (CSU, Fresno), 2009 – Present

Smittcamp Honors College Faculty (CSU, Fresno), 2006 – Present

Masters of Public Administration Consultative Committee (CSU, Fresno), 2005 – Present

Search Committee for Director of the Smittcamp Honors College (CSU, Fresno) – 2009

Research Committee, College of Social Sciences (CSU, Fresno), 2006 – 2009

Economics faculty search committee (Hastings College), 2003

Truman scholarship nomination committee (Hastings College), 2003 – 2005

Intellectual property rights committee (Hastings College), 2003 – 2004

Institutional Review Board for Human Subjects Research (Hastings College), 2004 – 2005

PROFESSIONAL AFFILIATIONS

American Political Science Association
- Political Organizations and Parties Section
- Political Methodology Section

Midwest Political Science Association
Southern Political Science Association
Southwestern Social Science Association
Western Political Science Association

Dr. Donald B. Hunsaker, Jr.

CURRICULUM VITAE

RESEARCH INTERESTS:

Environmental Education, Active Learning, Air Pollution, Atmospheric Sciences, Industrial Ecology, Sustainable Development, Environmental Impact Assessment, National Environmental Policy Act (NEPA) Implementation, Impact of Environmental Regulations on New Energy Technologies, Environmental Auditing, Environmental Education

EDUCATION:

2008 Certificate in Community College Faculty Preparation, California State University, Fresno, January 2007—Summer 2008.

1980 D.Env., Environmental Science and Engineering, University of California, Los Angeles, California. Focused on atmospheric resources. Fall 1976—Summer 1980.

1976 M.S., Analytical Chemistry, Wayne State University, Detroit, Michigan. Focused on organic spectrophotometry & atmospheric chemistry. Fall 1974—Spring 1976.

1974 B.S., Chemistry, University of Wisconsin, Whitewater, Wisconsin. Minor: mathematics. Fall 1972—Spring 1974.

1972 Thornton Community College, South Holland, Illinois. Completed 66 semester units of general education, science and mathematics courses. Fall 1970-Spring 1972.

WORK EXPERIENCE:

Southern Oregon University, Ashland, OR, 2011—present

Instructor, Department of Environmental Studies

Develop and teach online environmental science course for Fall 2012; teach Introduction to Earth Science (Fall 2011); teach Energy & Climate Change (2012).

Rogue Community College, Medford, 2011—present

Instructor, Department of Social Science

Develop and teach online geography courses emphasizing sustainability and environmental issues (Fall 2011 through Spring 2012).

California State University, Fresno, 2008—2011 (retired)

Director, Institute of Climate Change, Oceans & Atmosphere, 2008—2011

Helped establish new research institute to facilitate basic and applied interdisciplinary research in the areas of climate change, ocean science and atmospheric science. Served as the first director of the institute. Responsible for program development, building teams, and forging key relationships.

Lecturer, Department of Earth and Environmental Sciences, 2008—2011

Taught classes in introductory environmental science, oceanography/climate change, and atmospheric science. Served on university faculty committees.

WORK EXPERIENCE (cont.):

Advised undergraduate environmental science majors. Developed and taught new online courses; designated Fresno State e-scholar for online teaching and learning.

State Center Community College District, Fresno City College, 2009—2011

Adjunct Faculty, Division of Mathematics, Science and Engineering, 2009--2011.
Developed and taught Physical Science 7 (introductory environmental science).

San Joaquin Valley Air Pollution Control District, Fresno, California, 2002—2008

Plan Development Supervisor, 2003—2008

Supervised a section of seven professional staff in the development of long-range plans to achieve healthy air quality in the 25,000 square mile San Joaquin Valley Air Basin. Accomplishments include the *2004 Extreme Ozone Attainment Demonstration Plan*, the *2005 Amendments to the 2003 PM10 Plan*, the *2006 PM10 Plan, the 2007 Ozone Plan, the 2007 PM10 Maintenance Plan and Request for Redesignation, and the 2008 PM2.5 Plan*.

Special Projects Coordinator, 2002—2003

Developed the *2002-2005 Rate of Progress Plan for San Joaquin Valley Ozone*. Served as the District's point of contact for the new 8-hour ozone standard. Tracked emissions reductions needed for attaining the federal 1-hour ozone standard in the San Joaquin Valley Air Basin. Led staff work to successfully request reclassification to extreme nonattainment for the federal 1-hour ozone standard.

San Joaquin River Parkway and Conservation Trust, Fresno, California, 2001-2002

Land Stewardship Director

Supervised a section of about 30 permanent and seasonal staff in the implementation of land restoration programs, recreation programs, and land acquisition programs. Developed proposals for habitat restoration, recreational facility development, and historic building preservation. Served as contact person on interagency teams for land conservation.

California Department of Transportation, Fresno, California, 1998—2001

Senior Environmental Planner

Supervised staff responsible for preparation of complex environmental documents for large-scale highway projects in the Central Region of the California Department of Transportation. Activities include preparing environmental documents, directing supporting technical studies, interfacing with regulatory agencies, and developing mitigation for potential impacts. Developed training program for large, rapidly growing

WORK EXPERIENCE (cont.):

environmental staff. Developed new branch for document publication and quality control, including staff recruiting, development, and supervision. Initiated and participated in the adoption by Caltrans of a new job classification statewide (Research Writer). Worked on assignment to Caltrans Headquarters on environmental document process improvements. Served as liaison with the Federal Highway Administration.

Associate Environmental Planner

Coordinated the environmental planning, research, and interdisciplinary analysis of the environmental impacts of the proposed State Route 120 Oakdale Expressway Project. Developed the Draft Environmental Impact Report/Environmental Impact Statement for the project, which included update and revision of supporting technical studies, and interface with internal and external project partners.

California State University, Fresno, 1998—2008, Department of Earth and Environmental Sciences

Adjunct Professor

Taught Natural Science 115, Environmental, Earth and Life Science. Developed lesson plan for lecture and laboratory course in Atmospheric Resources. Gave invited seminars on sustainable development, industrial ecology, biomimetics, quantitative evaluation of structure/activity relationships, and air pollution in the San Joaquin Valley. Conducted environmental impact assessments for the California Department of Transportation through the California State University Fresno Foundation.

Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1981–1998

Technical Assistant, 1996-1998

Provided technical support and assistance to the Associate Laboratory Director (ALD) for Life Sciences and Environmental Technologies. Duties included strategic planning of research and development; developing systems for selecting, presenting, and tracking major goals and obligations; and assisting and advising the ALD in meeting commitments. Involved in developing new research programs in biomaterials and biomimetic processes.

R&D Group Leader II, Program Leader 1995-1996

In the Environmental Sciences Division, conducted technology assessments, evaluations of potential environmental effects of technology development and deployment, and regulatory analyses. Responsible for new initiative development in industrial ecology and life cycle assessment. Co-leader and contributor to environmental analyses supporting life cycle assessment of U.S. Department of Energy assets. Led development of successful proposal for the design of environmentally friendly products through the use of advanced computing techniques to better understand structure/activity relationships. Conducted environmental compliance assessments for air emissions and petroleum/oils/lubricants management for the U.S. Air Force. Worked part-time from May 1996 through October 1996 while conducting a part-time assignment at the University of Tennessee Center for Clean Products and Clean Technologies.

WORK EXPERIENCE (cont.):

Manager, Pollution Prevention Center, 1993-1995
Oak Ridge Centers for Manufacturing Technology
In the Engineering Technology Division, responsible for preparing research proposals, initiating technology transfer, and assisting in the development and deployment of energy-efficient and environmentally-conscious manufacturing processes. Served as focal point for integrating research and development and manufacturing expertise to address specific issues related to the environmental impact of manufacturing operations. Developed proposals in several program areas, including cooperative research and development agreements, Small Business Technology Transfer program, and the Environmental Technology Initiative.

Technical Assistant, 1991-1993
Provide technical support and assistance to the Associate Laboratory Director (ALD) for Environmental, Life, and Social Sciences. Duties include strategic planning; developing systems for selecting, presenting, and tracking major goals and obligations; and assisting and advising the ALD in meeting commitments. Established proposal review and selection process for funding basic and applied research in the environmental, life and social sciences. Played key role in obtaining federal line item funding for new scientific research facilities.

R&D Group Leader II/Program Leader, 1990-1991
Leader of the Atmospheric Sciences Group in the Energy Division. Supervised three research staff and one clerical. Responsible for work assignments, performance reviews, quality assurance, and development of research proposals for the Group. Obtained funding for and led a National Environmental Policy Act (NEPA) follow-up study of DOE alcohol fuel projects. Continued NEPA leadership responsibilities, including co-direction of the NEPA support program for the U.S. Army Chemical Stockpile Disposal Program and leadership of NEPA support to the U.S. Air Force for base realignment and closure.

Research Staff Member, 1981-1990
Project manager and contributor on over thirty interdisciplinary environmental impact assessments for various technologies. Responsible for interface with sponsors, cost control, and preparation of products; as contributor, responsible for air quality and noise impact assessments. Manager of the Alcohol Fuels Environmental Program and Strategic Petroleum Reserve NEPA Support Program. Supervised twelve members of research staff. Conducted environmental audits and training for the U.S. Department of Energy and the U.S. Department of Defense. Conducted time series analyses of sulfur dioxide emissions from coal-fired electric utility boilers to the atmosphere in order to evaluate proposed emissions standards.

WORK EXPERIENCE (cont.):

University of Tennessee, Knoxville, Tennessee, 1996

Research Staff Member, Center for Clean Products and Clean Technologies

Served as project manager to develop a life cycle assessment tool for the automotive industry. Project was jointly funded by the U.S. Environmental Protection Agency and the Saturn Corporation. Principal activities included staff recruitment and supervision, development of a project workplan, and interface with government and corporate sponsors. Position was part-time in conjunction with continued employment at Oak Ridge National Laboratory.

Association of Bay Area Governments, Berkeley, California, 1979-1981

Environmental Engineer III

Assisted in developing regional air quality and energy plans for the San Francisco Bay Area. Evaluated the environmental impacts of regional development plans. Compiled regional emission inventories for air quality plans. Reviewed environmental impact statements for consistency with regional plans. Developed and implemented public participation programs for environmental and energy use policies.

Woodward-Clyde Consultants, San Francisco, California, 1978-1979

Staff Scientist

Prepared fugitive dust emission inventories for several uranium mines in support of air quality permits. Performed and supervised complex terrain modeling of fugitive dust emissions and evaluated the potential effectiveness of dust suppression technologies.

Technology Service Corporation, Santa Monica, California, 1977-1978

Technical Engineer

Evaluated the Empirical Kinetic Modeling Approach for its potential effectiveness in developing successful emission control strategies for attaining the ambient ozone standard in major U.S. metropolitan areas; characterized vehicle use in five major air quality control regions for development of mobile source emission control strategies.

TEACHING EXPERIENCE:

Southern Oregon University, Ashland, OR, 2011—present

Instructor, Department of Environmental Studies

Develop and teach online environmental science course for Fall 2012; teach Introduction to Earth Science (Fall 2011); teach Energy & Climate Change (2012).

TEACHING EXPERIENCE (cont.):

Rogue Community College, Medford, 2011—present

Instructor, Department of Social Science

Develop and teach online geography courses emphasizing sustainability and environmental issues.

California State University, Fresno, 1998—2011 (retired)

Adjunct Professor, Department of Earth and Environmental Sciences (1998-2008)

Lecturer, Department of Earth and Environmental Sciences (2008—2011)

Earth and Environmental Sciences 167, Oceans, Atmosphere and Climate Change (3 credit hours). Covers the science of oceans and atmosphere, including the role of each in climate change. Includes the study of the Earth at the sea's edge and below its surface including ocean basin formation. Fall 2008, Fall 2010, Spring 2011.

PSM02, Environmental Policy for Water Management (3 credit hours)
In the summer of 2011, developed new online course on environmental policy as related to the development of water resource projects. This course is to be offered beginning Spring 2013 as part of a new online Professional Science Masters degree.

Earth and Environmental Sciences 127, Environ. Impact Assess: Science & Policy
In the summer of 2011, developed new course for environmental science degree majors that examines the policy and science of environmental impact assessment. Online and face-to-face versions developed. For deployment starting Fall 2012.

Extended Education 212, Certificate in Air Quality Management (3 credit hours)
Served as instructor of record and taught sessions for extension course covering the science of air pollution in the San Joaquin Valley, including the social, health and economic implications of air pollution and air pollution monitoring and control. Distance learning. Fall 2006

Natural Science 115, Environmental, Earth and Life Science (3 credit hours)
Environmental problems related to population, energy and resource use, and pollution. Examines social and ethical issues along with technical and scientific factors. Independent work on case studies required. Typical enrollment in all sessions for recent years is about 50. Taught sessions in Spring 2002, Spring 2003, Fall 2003, Fall 2005, Spring 2006, Fall 2006, Fall 2008, Spring 2009, Fall 2009, Spring 2010, Fall 2010, Spring 2011.

Natural Science 4, Science and Nonsense (3 credit hours)
A critical thinking class that gives an overview of the scientific method, and then has students work in groups to use the method to investigate and report on a paranormal phenomenon. Students then work individually or in groups using the scientific method to investigate a well-established scientific hypothesis or theory. Taught Fall 2009.

TEACHING EXPERIENCE (cont.):

Earth and Environmental Science 109, Atmospheric Science (3 credit hours), lecture and laboratory. Spring 2009, Spring 2010. Taught as Earth and Environmental Science 190

(lecture only) due to low enrollment. Covers atmospheric properties, meteorology and climate, air pollution, global warming, stratospheric ozone, and air quality management.

Geology 150T, Studies in Earth Science (Atmospheric Pollution) 3 credit hours (2 hr lecture and 3 hr laboratory per week) Developed lecture and laboratory outline for new course in Atmospheric Pollution and the Environment. Class cancelled due to insufficient enrollment. Spring 1999.
*Geology 201*Served as guest lecturer for various environmental topics. Lectured on "Industrial Ecology" (Spring 1998) and "Intelligent Materials and Environmental Life Cycle Design Advisor" (Fall 1999).

State Center Community College District, Fresno City College, 2009--2011

Developed and taught Physical Science 7, at Fresno City College. This course covers environmental problems related to population, energy and resource use, and pollution. It examines social and ethical issues along with technical and scientific factors. Independent work on case studies is required. Taught Fall 2009, Fall 2010. Enrollment is 60-75.

California Department of Transportation, Fresno, 1998—2001

Instructor, Caltrans Central Region, Fresno, California (2000-2001)

Developed and taught short courses on the National Environmental Policy Act, the California Environmental Quality Act, and on writing and editing environmental documents. Typical enrollment was 15-25 students, usually representing newly hired or reassigned employees.

California Department of Transportation, Fresno, 1998—2001

Training Officer, Caltrans Central Region (2000)

Developed workplan for training rapidly growing environmental staff. Planned training needs assessments and used results to identify needed courses and training modules. Identified state and commercially provided training to meet staff needs. Sought state funds for meeting training needs identified.

U.S. Department of Energy, Office of NEPA Oversight, 1986—1987

Instructor

Taught courses on the National Environmental Policy Act and the National Historic Preservation Act for senior management of the U.S. Department of Energy (DOE) at various DOE facilities in the U.S.

TEACHING EXPERIENCE (cont.):

University of California at Los Angeles, Summer 1980

Teaching Assistant

Environmental Science and Engineering 400D (8 credit hours)
Taught principles of environmental impact assessment to graduate students using a solar-thermal power plant sited in the California desert as a case study. Topics included data collection, data analysis, summarizing findings, and report writing.

Wayne State University, Department of Chemistry, Fall 1974—Spring 1976

Teaching Assistant

Taught laboratory and lecture classes in general and organic chemistry as follows:

General Chemistry I—CHM 1220 or equivalent (4 credit hours). Introduction to the principles of chemistry for students with high school background in chemistry. Covers chemical structure, bonding, and reactivity.

Organic Chemistry I—CHM1240 or equivalent (4 credit hours). Introductory organic chemistry combined with the general principles of chemistry. Carbon compounds, chemical bonding, acid-based chemistry, stereochemistry and organic reactions.

Organic Chemistry I Laboratory—CHM1250 or equivalent (1 credit hours). Integrated general/organic chemistry laboratory focusing on spectroscopy, acid-based chemistry, molecular modeling and organic reactions, and chromatography.

PROFESSIONAL/ACADEMIC HONORS:

Exceptional Service Award, 2003—2008, San Joaquin Valley Unified Air Pollution Control District, Fresno, California (September 2008)
Service, Teamwork, Attitude, Respect (STAR) Performance Award for Supervisors, 2006-2007, San Joaquin Valley Unified Air Pollution Control District, Fresno, California (June 2007).
Award of Excellence, Online Communications, Society of Technical Communications, *Valuable Technologies for Science and Society* (1999)
Achievement Award, Publications, Society of Technical Communications, *Valuable Technologies for Science and Society* (1998)
Who's Who Environmental Registry (1991)
Outstanding Young Men of America (1985)
Men of Achievement, Volume II (1985)

Who's Who in the South and Southwest, 19th Edition (1984-1985)

Sigma Xi (1981)
Regent's Fellow, University of California, Los Angeles (1976-1977)
Phi Lambda Upsilon Honorary Chemistry Fraternity (1975)
Wayne State Fellow, Wayne State University (1974-1975)
Graduated Magna Cum Laude, University of Wisconsin (1974)
Phi Kappa Phi Honor Society (1974)

American Chemical Society Award for Outstanding Undergraduate Work in Analytical Chemistry (1973)
Phi Theta Kappa Honor Society (1972)
F. W. Ring Scholarship Award for Outstanding Achievement in the Physical and Mathematical Sciences, Thornton Community College (1972)
Honor Entrance Scholarship, Thornton Community College (1970)

SELECTED ADDITIONAL EDUCATION AND TRAINING:

"eScholar Program," selected to received intensive training on developing online instructional materials, California State University, Fresno, Summer 2011.

"Promoting Active Learning and Critical Thinking," *Certificate of Participation*, *Magna cum laude*, Office of the Provost and Vice President for Academic Affairs and the Center for the Enhancement of Teaching and Learning, California State University, Fresno, May 15, 2009.

Professional Development Certificate Program, California State University, Fresno, *Center for the Enhancement of Teaching and Learning*, Fall 2007

"Negotiation Skills Workshop," State Training Center, Sacramento, California, January 29-30, 2001, Fresno, California.

Transportation NEPA and Decisionmaking: Managing and Documenting the Process," Shipley Group, Sacramento, California, December 12-15, 2000.

"Technical Editing Workshop," State Training Center, Sacramento, California, October 27, 2000.

"Written Communication," State Training Center, Sacramento, California, September 11-15, 2000.

"Green Engineering and Management," Office of Executive Education and Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, Pennsylvania, July 19-21, 1995.

"Design for Environment: Fundamentals of Sustainable Development," University of Michigan, Continuing Engineering Education, Ann Arbor, Michigan, June 19-21, 1995.

"Environmentally Conscious Design and Manufacturing Short Course," University of New Mexico, Albuquerque, New Mexico, March 14, 1995.

"Writing R&D Proposals," Self Management Institute, Inc., Oak Ridge, Tennessee, August 23–24, 1994.

"Program Development Training," Self Management Institute, Durango, Colorado, October 1993.

"The Seven Habits of Highly Effective People," Covey Leadership Center, Oak Ridge, Tennessee, September–November 1993. Recipient of Covey Award in recognition of personal effort in applying the principles learned in the course.

SELECTED ADDITIONAL EDUCATION AND TRAINING (cont.):

"21st Century Approaches to Industrial Ecology and Strategic Environmental Planning," George Washington University, Advanced Engineering Education, School of Engineering and Applied Science, Washington, D.C., October 13–15, 1993.

"Training in Strategic Planning," Pennsylvania State University, Continuing Education and Management Development Programs and Services, Oak Ridge, Tennessee, June 1992.

"Senior Management Course in Environmental Laws and Regulations," U.S. Department of Energy, Oak Ridge, Tennessee, September 4-5, 1990.

"Engineer/Scientist as a Manager," College of Business Administration, University of Tennessee, Knoxville, Tennessee, September 1989.

"Effective Listening," MMES Human Resource Development course, Oak Ridge, Tennessee, March 1987.

"Building & Motivating a Winning Team," MMES Human Resource Development course, Oak Ridge, Tennessee, March 1987.

"Conflict Management," Hayes and Associates, Winston Salem, North Carolina, November 1986.

"Environmental Auditing," APCA Short Course, Air Pollution Control Association, Pittsburgh, Pennsylvania, June 16, 1985.

Environmental Technical Information Systems Workshop, U.S. Army, Construction Engineering Research Laboratory and the University of Illinois at Champaign-Urbana, April 1985.

"Fugitive VOC Tagging and Monitoring Programs," Air Pollution Control Association,

Continuing Education Course, APCA, Pittsburgh, Pennsylvania, June 30, 1983.

"Project Management," Batelle Columbus Laboratories, Columbus, Ohio, September 1982.

"Hazardous Waste Incineration," Air Pollution Control Association, Continuing Education Course, APCA, Pittsburgh, Pennsylvania, June 1982.

"System Reliability Engineering and Risk Assessment," College of Engineering, University of Tennessee, Knoxville, Tennessee, April 26-May 14, 1982.

"Statistical Evaluation Methods for Air Pollution Data," U.S. Environmental Protection Agency, Air Pollution Training Institute, San Francisco, California, February 15, 1980.

PROFESSIONAL ACTIVITIES:

Member, Sigma Xi
Member, Association of Environmental Engineering and Science Professors
Member, Phi Lambda Upsilon

PROFESSIONAL ACTIVITIES (cont.):

Member, Phi Theta Kappa Alumni Association

Past Member, American Chemical Society
Past Member, National Association of Environmental Professionals
Member, Board of Directors, National Association of Environmental Professionals (NAEP), 1986-1993
Secretary, NAEP, 1989-1990
Vice President, NAEP, 1990-1991
President, NAEP, 1991-1992

INVITED PARTICIPANT:

Association for Behavior Analysis International, 2010 Annual Conference, San Antonio, Texas, Invited participant on panel discussion to start new initiative in human behavior and environmental issues, May 28-31, 2010.

Workshop on Climate Change Adaptation for Natural Resources of Fresno, Madera, Tulare, and Kings Counties, Fresno, California, organized by the Geos Institute, Ashland, Oregon, August 2010.

Stakeholder Workshop: How Do We Adapt to Climate Change and Have a Robust Economy?, Fresno, California, organized by the Geos Institute and the Local Government Commission, September 2010.

Coalition of Urban and Metropolitan Universities Annual Meeting, Fresno, California. Invited to give presentation on "Working with City of Fresno Staff on Sustainability Projects", October 2010.

Southern Sierra Science Symposium, USDA Forest Service, National Park Service, Visalia, California, September 4-5, 2008.

PM2.5 Implementation Workshop, Sponsored by the U.S. Environmental Protection Agency, Chicago, Illinois, June 20-21, 2007.

U.C. Davis-California Department of Transportation Workshop on Transportation Control Measures: Developing Sound State Implementation Plans (SIPs) While Avoiding Conformity Problems, Organized by the University of California Davis-Caltrans Air Quality Project, Kemper Hall, U.C. Davis, February 27, 2006.

Materials Data Base Requirements in Support of Design for Environment: Implementing Industrial Ecology, Workshop sponsored by Lawrence Livermore National Laboratory, Livermore, California, June 12–14, 1996.

The Role of Engineers in Sustainable Development, Conference sponsored by the Engineering Foundation and the American Association of Engineering Societies, Snowbird, Utah, August 4–8, 1995.

NEPA Integration: Effective, Efficient Environmental Compliance in the 1990's. Conference organized by the President's Council on Environmental Quality, Fairfax, Virginia, March 13–15, 1991.

INVITED PARTICIPANT (cont.):

NEPA and Base Realignment and Closure. Symposium organized by the U.S. Army Environmental Policy Institute, Washington, D.C., October 19, 1990.

Preparation and Review of Environmental Impact Statements. Conference organized by the President's Council on Environmental Quality, West Point, New York, November 1987.

The Role of Environmental Impact Assessment in the Decisionmaking Process, Heidelberg, FRG (one of four U.S. representatives). Seminar organized by the Federal Ministry for the Environment, August 1987.

Conferences, Symposia, and Sessions Organized:

Member, Program Committee, *Science and Technology for Sustainability: Environmental Technologies, Pollution Prevention, Industrial Ecology, Life Cycle Analysis.* Lockheed Martin Corporation, Oliver Springs, Tennessee, November 15, 1995.

General Conference Chairman, *16th Annual Conference of the National Assoc. of Environmental Professionals,* Baltimore, Maryland, April 28-May 1, 1991.

Symposium Chairman, "NEPA Symposium," held in conjunction with the *15th Annual Conference of the National Association of Environmental Professionals,* San Antonio, Texas, June 19-22, 1990.

Session Chairman, "NEPA Follow Up Studies," *The Scientific Challenges of NEPA: Future Directions Based on 20 Years of Experience,* Ninth Oak Ridge National Laboratory Life Sciences Symposium, Knoxville, Tennessee, October 24-27, 1989.

Member, Conference Committee, *The Scientific Challenges of NEPA: Future Directions Based on 20 Years of Experience,* Ninth Oak Ridge National Laboratory Life Sciences Symposium, Knoxville, Tennessee, October 24-27, 1989.

Session Chairman, "SARA/Title III," *14th Annual Conference of the National Association of Environmental Professionals,* Reno, Nevada, June 19-21, 1989.

Session Chairman, "NEPA Issues," *13th Annual Conference of the National Association of Environmental Professionals,* Orlando, Florida, June 1988.

PUBLICATIONS:

Book Chapters/Transactions:

Bernard, D. P., D. B. Hunsaker, Jr., and D. R. Marmorek, "Tools for Improving Predictive Capabilities of Environmental Impact Assessments: Structured Hypotheses, Audits and Monitoring," pp. 547–564 in *Environmental Analysis: The NEPA Experience*, S.G. Hildebrand and J.B. Cannon, eds., Lewis Publishing Co., Boca Raton, Florida (1993).

Hirsch, A. J. and D. B. Hunsaker, Jr., "NEPA Follow Up Studies," pp. 511–515 in *Environmental Analysis: The NEPA Experience*, S.G. Hildebrand and J.B. Cannon, eds., Lewis Publishing Co., Boca Raton, Florida (1993).

Cushman, R. M., D. B. Hunsaker, Jr., M. S. Salk, and R. M. Reed, "Global Climate Change and NEPA Analyses," pp. 442–462 in *Environmental Analysis: The NEPA Experience*, S.G. Hildebrand and J.B. Cannon, eds., Lewis Publishing Co., Boca Raton, Florida (1993).

Wilbanks, T. J., D. B. Hunsaker, Jr., C. H. Petrich, and S. B. Wright, "Potentials to Transfer the U.S. NEPA Experience to Developing Countries," pp. 728–742 in *Environmental Analysis: The NEPA Experience*, S.G. Hildebrand and J.B. Cannon, eds., Lewis Publishing Co., Boca Raton, Florida (1993).

Hunsaker, Jr., D. B., "Environmental Assessments: Uncertainties in Implementation," pp. 199-212 in *The Role of Environmental Impact Assessment in the Decisionmaking Process,* H. Paschen, ed., Umweltbundesamt, Federal Republic of Germany, 1989.

Hunsaker, Jr., D. B., and D. W. Lee. "Environmental Impact Analysis of Abnormal Events: A Follow-Up Study," pp. 379-398 in *Audit and Evaluation in Environmental Assessment and Management: Canadian and International Experience,* Vol. II, Minister of Supply and Services, Canada, 1987.

Hunsaker, Jr., D. B., T. E. Perardi, and F. Umeda, "The Impact of Vegetative Hydrocarbon Emissions on Ambient Ozone Levels and Control Program Development," pp. 156-168 in *Transactions, Environmental Impact of Natural Emissions,* V. P. Aneja, ed., Air Pollution Control Association, Pittsburgh, Pennsylvania, 1984.

Journal Articles:

Hunsaker, Jr., D. B., "National Environmental Policy Act (NEPA) Process," (Book Review), *Environmental Management*, **16**(6), pp 819-821, November-December 1992.

Hunsaker, Jr., D. B., "NEPA and the NAEP: A Record of Success, A Mandate for the Future," *The Environmental Professional,* **13**(2), 93-94 (1991).

Hunsaker, Jr., D. B., J. F. McBrayer, and J. L. Elmore, "Ethanol Production and the Environment," *Energy--The International Journal* **14**(8), 451-468 (August 1989).

Richter Pack, S., C. C. Travis, J. P. Witherspoon, D. B. Hunsaker, and J. W. Webb, "Ranking Remedial Action Technologies," *Hazardous Waste and Hazardous Materials* **4**(4), 363-375 (December 1987).

PUBLICATIONS (cont.):

Kornegay, F. C., D. B. Hunsaker, Jr., and R. L. Miller, "Estimated Weather-Induced Impacts of the West Desert Pumping Proposal on Air Force Operations at the Utah Test and Training Range," *The Environmental Professional* **9**, 67-78 (1987).

Hunsaker, C. T., D. B. Hunsaker, Jr. et al., "Assessing the Environmental Impacts of Solar/Fossil Power Plants," *Environmental Impact Assessment Review* **4**, 242-248 (1983).

Hunsaker, Jr., D. B., and G. H. Schenk, "The Determination of Thiols with Diphenylpicrylhydrazyl as a Spectrophotometric Reagent," *Talanta* **30**, 475-480 (1983).

Conference Proceedings:

Harmsen, F.J., P. Van de Water, D.B. Hunsaker, and V. Luo, "Future Climate Change Impacts on Fresno County, California, Mitigation Strategies and Public Policy, *Geological Society of America Annual Meeting*, Portland, OR (Nov 2009).

Hunsaker, D.B., P. Van de Water, F. Harmsen and V. Luo, "The Implications of Climate Change for Fresno, California," *This Way to Sustainability V*, California State University, Chico, November 5-8, 2009.

Sumpter, B.G., D.W. Noid, J. Wassom, and D. Hunsaker, "Design, Analysis, and Characterization of Materials Using Computational Neural Networks," *Computing in Science and Engineering*, 1997 Extended Abstracts for the Special Symposium, Birmingham, Alabama, Industrial Engineering and Chemistry Division, American Chemical Society (ACS), May 5–6, 1997, ACS, Washington, D.C., p. 102.

Hunsaker, D.B. Jr., T.R. Curlee, J.T. Ensminger, R.G. Rivera, and K. Yuracko, "The Industrial Ecology of Asset Management: A Case Study," *Environmentally Conscious Design and Manufacturing: Recent Advances*. Proceedings of the Fourth International Congress, Cleveland, Ohio, July 23–25, 1996. ECM Press, Albuquerque, New Mexico, 1996, pp. 321–328.

Hunsaker, Jr., D.B. and L.A. Langley, "The Importance of Pollution Prevention in Economic Competitiveness," *Conference Program*, Pollution Prevention XI Conference, U.S. Department of Energy, Knoxville, Tennessee, May 1995.

Hunsaker, Jr., D.B., "Achieving Pollution Prevention Through Partnerships," *Conference Program*, Pollution Prevention X Conference, U.S. Department of Energy, Denver, Colorado, May 1994.

Hunsaker, Jr., D. B. and G. F. Kelman, eds. *Proceedings, 1991 Conference of the National Association of Environmental Professionals*, held in Baltimore, Maryland, April 28-May 1, 1991.

Hunsaker, Jr., D. B., and F. C. Kornegay, "Estimating the Air Quality Impact of Flare Operations," paper No. 85-64.7 in *Proceedings, 78th Annual Meeting and Exhibition, Air Pollution Control Association,* held in Detroit, Mich. on June 16-20, 1985, Air Pollution Control Association, Pittsburgh, Penn., 1985.

PUBLICATIONS (cont.):

Roop, R. D., W. P. Staub, D. B. Hunsaker, Jr. et al., "Corrective Measures to Stabilize Subsidence of Low-Level Waste Trenches," in *Proceedings, Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste, and Hazardous Waste,* held in Fort Collins, Colorado in February 1984.

Hunsaker, Jr., D. B., "Demonstrating Air Quality Improvements: A Review of Alternatives," paper No. 84-67.1 in *Proceedings, 77th Annual Meeting and Exhibition of the Air Pollution Control Association,* held in San Francisco, Calif., June 20-24, 1984, Air Pollution Control Association, Pittsburgh, Penn., 1984.

Hunsaker, Jr., D. B., "The Implications of Air Quality Planning Programs on Regional Energy Use," pp. 222-228 in *Proceedings, 30th Annual Technical Meeting,* held in Orlando, Fla. on May 1-3, 1984, Institute of Environmental Sciences, Mount Prospect, Ill., 1984.

Reed, A. W., D. B. Hunsaker, Jr., R. Dickinson Roop, and J. Warren Webb, "Evaluation of NEPA-Based Environmental Commitments at Four Geopressured Geothermal Design Wells," *Proceedings, 1983 Annual Meeting,* Geothermal Resources Council held in Portland, Oregon, October 24-27, 1983.

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Hunsaker, Jr., D. B. and R. M. Moreland, "Compilation of a Biogenic Hydrocarbon Emissions Inventory for the San Francisco Bay Area," paper No. 82-51.5 in *Proceedings, 75th Annual Meeting and Exhibition,* held in New Orleans, Louisiana on June 20-25, 1982, Air Pollution Control Association, Pittsburgh, Penn., June 1982.

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Miscellaneous:

Harmsen, F., D. Hunsaker, P. Van de Water, and Y.V. Luo, "Mitigation and Adaptation Strategies for Climate Change in Fresno, California." Institute of Climate Change, Oceans and Atmosphere, California State University Fresno, August 2008.

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K.L. Yuracko, T.J. Blasing, R.B. Braid, T.R. Curlee, S. Das, C. Easterly, J.T. Ensminger, S.W. Hadley, D.B. Hunsaker, Jr., D. Jones, L.N. McCold, R.C. Miller, R. Perlack, R.G. Rivera, G.R. Southworth, D.P. Vogt, "Life Cycle Analysis for Scrap Metal Disposition: A Case Study at the Oak Ridge K-25 Site," Prepared for the U.S. Department of Energy, Office of Environmental Management, November 1995.

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D. E. Reichle and D. B. Hunsaker, Jr., "Biological and Environmental Research Program at Oak Ridge National Laboratory, FY 1993-1995", ORNL/M-2617, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January 1993.

A. W. Trivelpiece, et al., "Oak Ridge National Laboratory Institutional Plan, FY 1993-1998," ORNL/PPA-92/3, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 1992.

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Ensminger, J. T., C. R. Boston, E. L. Hillsman, D. B. Hunsaker, Jr., R. O. Johnson, E. J. Liebsch, J. Morrisey, L. W. Rickert, W. P. Staub, V. R. Tolbert, and G. P. Zimmerman. Final Phase I Environmental Report, Disposal of Chemical Agents and Munitions Stored at Pine Bluff Arsenal, Pine Bluff, Arkansas. ORNL/TM-11209, Oak Ridge National Laboratory, Oak Ridge, Tennessee, October 1991.

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Hunsaker, Jr., D. B., R. B. McLean, W. M. Willis, G. F. Cada, E. J. Liebsch, R. L. Graham, C. T. Garten, C. T. Hunsaker, A. W. Campbell, G. Marland, and R. L. Miller, "Assessing the Potential Environmental Impacts of Proposed Rules Affecting Future Electric Power Generation in the United States," ORNL/TM-11301, May 1990.

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Hunsaker, Jr., D. B., G. P. Zimmerman, R. L. Miller, W. P. Staub, E. L. Hillsman, R. O. Johnson, V. R. Tolbert, R. L. Kroodsma, L. W. Rickert, D. C. West, and G. O. Rogers, "Disposal of Chemical Agents and Munitions Stored at Anniston Army Depot, Anniston, Alabama, Final Phase I Environmental Report," U.S. Department of the Army, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Maryland, July 1989.

Hunsaker, Jr., D. B., "Roles and Responsibilities of Cooperating Agencies in Conducting Site-Specific NEPA Reviews for the Chemical Stockpile Disposal Program," presented at the National Cooperating Agencies Meeting for the U.S. Army's Chemical Stockpile Disposal Program, Atlanta, Georgia, March 9, 1989.

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Trijonis, J. and D. B. Hunsaker, Jr., *Verification of the Isopleth Method for Relating Photochemical Oxidant to Precursors,* EPA-600/3-78-019, PB-278 196, prepared for the U.S. Environmental Protection Agency, Environmental Sciences Research Laboratory, Research Triangle Park, North Carolina, under Contract Number 68-02-2299 by Technology Service Corporation, Santa Monica, California, February 1978.

Environmental Impact Statements and Assessments:

Final Environmental Impact Statement/Environmental Impact Report, Oakdale Expressway Project, State Route 120, California Department of Transportation and Federal Highway Administration, Sacramento, California, June 2001 (with others).

Final Environmental Impact Statement, Disposal of Chemical Agents and Munitions Stored at Pine Bluff Arsenal, Arkansas, U.S. Army, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Maryland, May 1996 (with others).

Environmental Assessment, The Construction of a Boundary Fence Around Cheyenne Mountain Air Force Base, Colorado, Department of the Air Force, 1010th Civil Engineering Squadron, Cheyenne Mountain Air Force Base, Colorado, July 1991 (with others).

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Environmental Assessment, Strategic Petroleum Reserve, Sulphur Mines Decommissioning and Big Hill Expansion, DOE/EA-0401, U.S. Department of Energy, January 1990 (with others).

Draft Environmental Impact Statement, Closure of Mather Air Force Base, Headquarters, Air Training Command, Randolph Air Force Base, Texas. November 1989 (with others).

Final Environmental Impact Statement, Clean Coal Technology Demonstration Program, U.S. Department of Energy, Washington, D.C., DOE/EIS-0146, November 1989 (with others).

PUBLICATIONS (cont.):

Environmental Assessment, Withdrawal of the 320th Bombardment Wing from Mather Air Force Base, Headquarters, Air Training Command, Randolph Air Force Base, Texas, November 1989.

Draft Environmental Impact Statement, Clean Coal Technology Demonstration Program, Draft Programmatic Environmental Impact Statement, U.S. Department of Energy, Washington, D.C., DOE/EIS-0146D, June 1989 (with others).

Programmatic Environmental Impact Analysis, Innovative Clean Coal Technology Program, DOE/PEIA-0002, U.S. Department of Energy, September 1988 (with others).

Final Environmental Assessment, Strategic Petroleum Reserve Texoma Complex Distribution Enhancements, Orange and Jefferson Counties, Texas, Calcasieu and Cameron Parishes, Louisiana, DOE/EA-0272, U.S. Department of Energy, March 1987 (with others).

Final Environmental Impact Statement, West Desert Pumping Project, Salt Lake City, Utah, U.S. Department of Interior, Bureau of Land Management and U.S. Air Force (USAF), July 1986 (with others).

Final Revised Environmental Assessment, SPR Seaway Complex Distribution Enhancements, DOE/EA-0252, U.S. Department of Energy, March 1986 (with others).

Draft Environmental Impact Statement, West Desert Pumping Project, Salt Lake City, Utah, ORNL/FPO-85/192, U.S. Department of Interior, Bureau of Land Management and U.S. Air Force, February 1986 (with others).

Final Environmental Assessment, Strategic Petroleum Reserve Seaway Complex Distribution Enhancements, Brazoria, Galveston and Harris Counties, Texas, DOE/EA-0252, U.S. Department of Energy, May 1985 (with others).

Final Environmental Assessment, Agrifuels Refining Corporation--Loan Guarantee Application, Iberia Parish, Louisiana, DOE/EA-0165, U.S. Department of Energy, May 1985 (with others).

Final Revised Environmental Assessment, Continuous Electron Beam Accelerator Facility, Newport News, Virginia, DOE/EA-0257, U.S. Department of Energy, April 1985 (with others).

Final Environmental Assessment, Circle Energies Corporation--Loan Guarantee Application, Washington County, Nebraska, DOE/EA-0248, U.S. Department of Energy, December 1984 (with others).

Environmental Assessment, Niland Development Project, Geothermal Loan Guaranty, Imperial County, California, DOE/EA-0247, U.S. Department of Energy, October 1984 (with others).

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Draft Environmental Assessment--Ultrasweet Plan of Utilization, Federal Lease CA-6219, East Mesa KGRA, Imperial County, California, EA 183-82, U.S. Dept. of the Interior, Minerals Management Service, August 1982 (with others).

Environmental Assessment, Gulf Coast Resources, Inc.-Loan Guarantee Application, Lee County, Iowa, DOE/EA-0167, U.S. Department of Energy, June 1982 (with others).

Environmental Assessment, Agrifuels Refining Corporation--Loan Guarantee Application, Iberia Parish, Louisiana, DOE/EA-0165, U.S. Department of Energy, June 1982 (with others).

Draft Environmental Impact Statement, Conversion to Coal, Consolidated Edison Ravenswood Generating Station, Boilers 30N and 30S, New York City, Queens Borough, New York, DOE/EIS-0087-D, U.S. Department of Energy, April 1982 (with others).

Draft Environmental Impact Statement, Conversion to Coal, Consolidated Edison Arthur Kill Generating Station, Boilers 20 and 30, New York City, Staten Island, New York, DOE/EIS-0088-D, U.S. Department of Energy, April 1982 (w/ others).

Environmental Assessment, U.S. Ethanol Corporation-Loan Guarantee Application, East Baton Rouge Parish, Louisiana, DOE/EA-0164, U.S. Department of Energy, April 1982 (with others).

Programmatic Draft Environmental Assessment (PDEA) for the Fallon Naval Air Station Geothermal Development Program, Fallon, Nevada, U.S. Navy, prepared for Naval Air Station Fallon, September 1981 (with others).

COMMUNITY ACTIVITIES:

Member, Board of Directors, San Joaquin Valley Paleontology Foundation, 2001—2002

Member of Board of Directors for nonprofit organization focused on identifying and preserving Madera County's unique paleontological resources. Issues addressed by the Board include planning for the Paleontology Museum for public display of the many resources discovered in Madera County.

Chairman, Roane County Environmental Review Board, 1996–1998

Chaired eleven-member county-level board that advised the County Executive andCounty Commission on matters concerning the environment. Activities included site inspections of industries, review of environmental permit applications, review of environmental documents for proposed facilities, liaison with the County Industrial Board, the County Planning Commission, and the Local Oversight Committee. Chaired all monthly meetings.

Member, Board of Directors, Local Oversight Committee, 1996–1998

Advised the U.S. Department of Energy on the environmental effects of proposed actions, including waste disposal, privatization of nuclear facilities and processes, environmental monitoring, and relinquishment of government facilities.

COMMUNITY ACTIVITIES (cont.):

Member, Citizen's Advisory Group, Molten Metal Technol. Corp., 1996–1998

Advised Molten Metal Technology on county perspectives on possible expansion of proprietary waste treatment operations in Roane County, Tennessee.

Vice-Chairman, Roane County Environmental Review Board, 1992–1996

See above

Member, Board of Directors, Roane Clean Community Systems, 1989–1991

Helped direct the operations of a local "Keep America Beautiful" organization. Organized and implemented program for recognizing homes and businesses that exemplified community spirit through exceptional landscaping and property improvements (Annual Roane County Beautification Program, 1990-1991).

Member, Site Evaluation Committee, Roane County Industrial Board, 1995

Advised Board on the environmental implications of alternative sites for new industrial park.

Dr. Peter K. Van de Water

CURRICULUM VITA

Peter Kent Van de Water, Ph.D.
California State University Fresno

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EDUCATION

1999 Ph.D. in Geosciences, University of Arizona, Tucson AZ, 85721. $\delta^{13}C$ and stomatal density variability in modern and fossil leaves of key plants in the western United States.

1993 Master of Science in Geosciences, University of Arizona, Tucson AZ, 85721. Ecophysiological response of Pinus flexilis to atmospheric CO_2 enrichment during deglaciation.

1987 Bachelor of Science, Department of Geology, Washington State University, Pullman WA, 99164.

1987 Bachelor of Arts, Department of Anthropology, Washington State University, Pullman WA, 99164.

1982 Associate Arts and Sciences, Clark Community College, Vancouver WA, 98663.

TEACHING EXPERIENCE

Present Position
Assistant Professor, Department of Earth and Environmental Sciences, California State University Fresno, Fresno, CA 93740-8039.

Courses Taught (Fall 2007 to present)

Term	Course	Enrollment
Fall 2007	EES 167 (Oceans and Atmospheres)	8
Fall 2007	NSCI 115 (Environmental Earth and Life Science)	49
Fall 2007	NSCI 115 (Environmental Earth and Life Science)	20
Spring 2008	EES 167 (Oceans and Atmospheres)	40
Spring 2008	EES 167 (Oceans and Atmospheres)	40
Spring 2008	NSCI 115 (Environmental Earth and Life Science)	23
Fall 2008	EES 167 (Oceans and Atmospheres	26
Fall 2008	NSCI 115 (Environmental Earth and Life Science)	53
Fall 2008	NSCI 115 (Environmental Earth and Life Science)	29
Fall 2008	EES 4 (Environmental Science)	23
Spring 2009	EES4 (Environmental Science)	22
Spring 2009	NSCI 115 (Environmental Earth and Life Science)	49
Spring 2009	EES 124 (Geochemistry)	11

Spring 2009	EES 124 (Geochemistry Lab)	11
Spring 2009	EES 250T (Terrestrial Paleoenvironments)	6
Fall 2009	NSCI 115 (Environmental Earth and Life Science)	48
Fall 2009	NSCI 115 (Environmental Earth and Life Science)	46
Fall 2009	EES 4 (Environmental Science)	22
Spring 2010	115 (Environmental Earth and Life Science)	17
Spring 2010	115 (Environmental Earth and Life Science)	11
Spring 2010	EES 4 (Environmental Science)	24
Fall 2010	NSCI 115 (Environmental Earth and Life Science)	50
Fall 2010	EES 4 (Environmental Science)	22
Fall 2010	EES 4 (Environmental Science)	8
Fall 2010	EES 290 Independent Study	1
Spring 2011	EES 4 (Environmental Science)	22
Spring 2011	EES 4 (Environmental Science)	21
Spring 2011	EES 124 (Geochemistry)	11
Fall 2011	EES 4 (Environmental Science)	24
Fall 2011	EES 4 (Environmental Science)	22
Fall 2011	EES 4 (Environmental Science)	13
Fall 2011	NSCI 115 (Environmental Earth and Life Science)	57
Fall 2011	EES 190 Independent Study	1
Fall 2011	EES 290 Independent Study	2

Courses taught 2001 to 2003: Earth Surface Processes, Sedimentology/Stratigraphy, Applied Geomorphology, Earth History, Long-term Environmental Change.

Graduate Student Committees:

- Danny Tovar, Earth and Environmental Sciences, Estimated Completion Fall 2010.
- Robin Trayler, Earth and Environmental Sciences, Estimated Completion Spring 2011
- Bradley Schrader, Biology, Estimated Completed Spring 2010
- Paul Troop, Earth and Environmental Science, Estimated Completion Fall 2012
- Landon Bunderson, Ph.D. candidate, Dept. of Biology, University of Tulsa, Tulsa OK
- William Steinert, Earth and Environmental Science, Estimated Completion Fall 2013
- Singleton Thibodeaux-Yost, Earth and Environmental Sciences, Estimated Completion Fall 2013

UNIVERSITY/COMMUNITY SERVICE

University:

University Committee on Liberal Studies (Fall 2008)
University Committee on Research (Spring 2009 to present)

College of Science and Mathematics:

Faculty Lead on establishment of an Online PSM (Professional Science Masters degree) in Water Resource Management through the Earth and Environmental Sciences Dept.
College of Science and Mathematics Curriculum Committee (Fall 2008 to present)
College of Science and Mathematics Research Committee (2007 – 2008 academic years)

Department of Earth and Environmental Science:

Building Renovation Committee – Fall 2007
In-House Environmental Science Degree Committee – Spring 2007
Instillation of new Environment Science (EES4) laboratory curriculum – Summer 2010
Head of the Environmental Science degree program – Fall 2009
Reformulation of In-House Environmental Science Degree – Fall 2010-ongoing
Committee on EES Assessments
Head of Search Committee for "Hydrogeologist" Position – Fall 2011

Community:

Weather and Pollen forecaster for the southern Great Plains during the *Juniperus ashei* pollination season - December 15th, 2007 to February 1st, 2008.
Co-Coach Girls 6 to 8 years old, Hamilton Tornados Soccer Team - Fall 2008
Weather and Pollen forecaster for the southern Great Plains during the *Juniperus ashei* pollination season - December 15th, 2008 to February 1st, 2009.
Speaker at "Café Scientific" on "Mitigation strategies for climate change in Fresno CA." – January 2009
Speaker at Fresno Clean Air Coalition Meeting –April 2009
Co-Host San Joaquin Parkway Party- June 2009
Weather and Pollen forecaster for the southern Great Plains during the *Juniperus ashei* pollination season - December 15th, 2009 to February 1st, 2010.
Fresno State Ethics Center Lecture, *Adaptation to Climate Change In Fresno, CA 2009*
Earth Day Celebration Committee 2010
Speaker at Fresno State Earth Day Celebration 2010
Speaker at Fresno Stakeholder Workshop on Climate Changes – September 23, 2010.
Radio Interview "Science behind Climate change" – October 2, 2010.
Speaker at Strategies for a Resilient and Prosperous Fresno Workshop – October 21, 2010
Weather and Pollen forecaster for the southern Great Plains during the *Juniperus ashei* pollination season - December 15th, 2010 to February 1st, 2011.
Speaker at Understanding Climate Change Mitigaton & Adaptation in California Agriculture – May 12, 2011
Speaker at Metro Summer Program for Teachers – July 18, 2011

Professional Societies:

American Association for the Advancement of Science (2004 to present)
American Geophysical Union – (1990 to present)
International Aerobiology Association (2009 to present)
Pan-American Aerobiology Association (2009 to present)
Geological Society of America (2009 to present)

Professional Affiliations:

Research Professional, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO 80309-0450. (2002 to 2003)

Research Geologist, Mendenhall Post-Doctoral Fellowship, U.S. Geological Survey, Denver Federal Center, Denver, CO 80225 (2003 to 2005)

Research Fellow, National Research Council, U.S. Environmental Protection Agency, Western Ecology Division, Corvallis OR 97333. (2005 to 2006)

Professional Expertise:

- Collection, processing, analysis, and interpretation of botanical micro- and macrofossil samples (pollen, spores, leaves, twigs, needles, etc.).
- Collection, processing, analysis, and interpretation of stable isotopic samples.
- Description and interpretation of sedimentary profiles.
- Analysis of sample material using standard and electron microscopy.
- Operation, installation, and maintenance of scientific equipment within a laboratory setting.
- Development and implementation of large research databases (Accent, Dbase)
- Design and documentation of "Standard Operating Procedure" protocols
- Design and implementation of "Quality Assurance" and "Quality Control" protocols.
- Geology and paleoecology course development and instruction.

Positions Held:

2005-2006: Research Fellow, National Research Council, U.S. Environmental Protection Agency, Western Ecology Division, Corvallis OR 97333.

2003 – 2005 Research Geologist, Mendenhall Post-Doctoral Fellowship, U.S. Geological Survey, Denver Federal Center, Denver, CO 80225. .

2003 – Instructor, Department of Geology, Oregon State University, Corvallis, OR 97331.

2003 – Instructor, Long-Term Environmental Change, Department of Geography, University of Oregon, Eugene, OR 97403.

2002 – 2003 Research Professional, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO 80309-0450. .

2002 – Instructor, Department of Geology, Oregon State University, Corvallis, OR 97331

2002 – Instructor, Department of Geography, University of Oregon, Eugene, OR 97403.

2001 – Instructor, Department of Geology, Oregon State University, Corvallis, OR 97331.

2001 – 1998 Research Investigator, Aerobiology Laboratory, Department of Biology, The University of Tulsa, Tulsa OK, 74104.

1998 – 1994 Laboratory Supervisor, Arizona Prevention Center, University of Arizona Health Sciences Center, Tucson AZ, 85721.

1998 – 1994 Research Assistant, Laboratory of Tree Ring Research, The University of Arizona, Tucson AZ, 85721.

1995 and 1988 Laboratory Technician, Desert Research Institute, University of Reno System, Reno NV, 89506.

1991-1994 Laboratory Technician, Division of Respiratory Sciences, University of Arizona, Tucson AZ, 85721.

1993, 1990, and 1984 –1988 Research Assistant, Paleoenvironmental Laboratory, Department of Anthropology, Washington State University, Pullman WA, 99164.

1990 and1991 Laboratory Technician, Laboratory of Tree-ring Research, University of Arizona, Tucson AZ, 85721.

1988 – 1993 Teaching Assistant, Laboratory of Tree-ring Research, University of Arizona, Tucson AZ, 85721.

1989 -1990 Laboratory Technician, United States Geological Survey, Tumomoc Hill, Tucson AZ, 85745.

1987 Archeological and Paleoenvironmental Consultant, Center for Northwest Anthropology, Washington State University, Pullman WA, 99164.

1986 Archeology Surveyor, Center for Northwest Anthropology, Washington State University, Pullman WA, 99164.

Research Grants, Scholarships and Contracts:

Grants

2011 Release time funding for proposal development of "Physical, Biological, Cultural, and Economic Impacts of Metering Residential Water Use in Fresno, CA.". Proposal to be submitted to NSF. ($4,968.00).

2010 Co- Principal Investigator, National Science Foundation, Terrestrial Late Pleistocene paleoenvironment back to MIS 3 from fossil microflora and tree rings in recently excavated landslide deposits, western Oregon (subcontract $38K)

2010 Research Grant, Science Undergraduate/Graduate Research Experience Program (SUGREP), College of Science and Mathematics, California State University, Fresno ($1K)

2009 Faculty Performance Award (2009 – 2010 academic year), California State University, Fresno ($999.99)

2009 **Submitted – not funded in 2010,** Co-Principal Investigator. National Science Foundation, Science Master's Program in Water Resource Management. Grant (700K)

2009 Co-Principal Investigator. National Science Foundation, Opportunities for Enhancing Diversity in the Geosciences (OEDG) grant (1.4M)

2009 **Submitted – not funded in 2010**, Co-Prinicipal Investigator. National Science Foundation. Multi-proxy study of recently-excavated landslide deposits with subfossil trees around MIS 3 to infer terrestrial environment and radiocarbon fluctuations in the Pacific Northwest (~20 to 60 ka). (subcontract $25K)

2009 Co-Principal Investigator. National Air and Space Administration - Integration of Airborne Aerosol Prediction Systems and Vegetation Phenology to Track Pollen for Asthma Alerts in Public Health Decision Support Systems (subcontract $87K).

2008 **Submitted – not funded 2009**, Co-Principal Investigator. U.S. Environmental Protection Agency STAR Grant - Effect of climate change on aeroallergens and human health over 20-30 years (subcontract $170K).

2008 Co-Principal Investigator. US Department of Agriculture - Consequences of global change for the cryptic invasion by transgenes of native and weedy species (subcontract $160K).

2007 Faculty Performance Award (2007 – 2008 academic year), California State University, Fresno ($1.2K)

2005 Principle Investigator. National Research Council - The use of modeled atmospheric wind trajectories to determine potential downwind gene flow; a case study using GM-bentgrass. (1 year Salary, $43K).

2003 Principle Investigator. Wind Trajectory Analysis, U.S. Evironmental Protection Agency, Corvallis OR 97333. ($1.8K).

2001 Co-Principle Investigator. Wind Trajectory Analysis and Weather Forecasting, The University of Tulsa, Tulsa OK, 74104. ($6K)

2001 Co- Principle Investigator. Idaho Paleoenvironment Research and Summary, Idaho State University, Pocatello ID, 83209. ($15K).

2001 Co-Principle Investigator. Wind Trajectory Analysis and Weather Forecasting, The University of Tulsa, Tulsa OK, 74104. ($2K)

1999 Co-Principal Investigator. Stomatal Density Analysis, Desert Research Institute, Reno NV, 89512. ($5K)

1998 Co-Principal Investigator. Pollen Analysis: Jim Donovan Project, Carl Hayden Bee Laboratory, U.S. Department of Agriculture, Tucson AZ ($1.1K).

1997 Co-Principal Investigator. Pollen Analysis: Park and Preserve Use By *Choeronycteris mexicana*. Arizona Department of Game and Fish. ($2K)

1995 Co-Principal Investigator. Pollen Analysis: San Pedro Midden Project, Arizona Sonoran Desert Museum, Tucson AZ (0.9K).

1994 Collaborator, NSF – Geological Records of Global Change Program (NSF#9418269), "Leaf Stomatal Density and Carbon Isotope Responses to CO_2 Variations During the Past 40,000 Years," Collaborator, Dec. 1994-May 1998 ($198K).

1994 Lucy Cranwell Smith Grant for Research, Department of Geosciences. Academic year 1993-1994, University of Arizona, Tucson.

1994 Co-Principal Investigator. Pollen analysis: Santa Cruz Project, Desert Archeology, Tucson AZ, 85719.

1994 Co-Principal Investigator. Reference Pollen: U.S. Geological Survey, Reston VA, 22092, Mail Stop 956. ($1.5K)

1993 Co-Principal Investigator. Pollen Analysis: Bat Project, Organ Pipe National Monument, Ajo AZ, 85321 ($0.8K)

1993 Co-Principal Investigator. Pollen Analysis: Botswana Bee Project, Carl Hayden Bee Laboratory, U.S. Department of Agriculture, Tucson AZ ($0.5K).

1993 Co-Principal Investigator. Pollen Analysis: Lake Cahuilla Project, Adobe Brick Project, Brian F. Mooney Associates, San Diego CA. ($1.5K).

1992 Co-Principal Investigator. Reference Pollen, U.S. Geological Survey, Reston VA, 22092 ($1K)

1991 Co-Principal Investigator. Plant Silicate Separation, Schuk Toak Mitigation, Desert Archeology, Tucson AZ ($1.1K).

1991 Co-Principal Investigator. Pollen Analysis, Brawley Wash Project, Arizona Sonoran Desert Museum, Tucson AZ ($2K).

1990 Co-Principal Investigator From 1990 to 1999. Pollen Extraction, Dr. Suzi K.Fish, Arizona State Museum ($15K)

1990 William Mcginnis Desert Research Scholarship, Department of Arid Lands Studies, University of Arizona, Tucson AZ, 85721 ($2K).

Publications:

Dissertation/Thesis

1999 $\delta^{13}C$ and Stomatal Density Variability in Modern and Fossil Leaves of Key Plants in the Southwestern U.S. Ph.D. Dissertation, Department of Geosciences, University of Arizona

1993 Ecophysiological Response of *Pinus flexilis* to Atmospheric CO_2 Enrichment During Deglaciation. M.S. Thesis, Department of Geosciences, University of Arizona.

Journal Articles

2011 Meredith G. Schafer, Andrew A. Ross, Jason P. Londo, Connie A. Burdick, E. Henry Lee, Steven E. Travers, Peter K. Van de Water, Cynthia L. Sagers. The Establishment of Genetically Engineered Canola Populations in the U.S. PLoS ONE 6(10): e25736. doi:10.1371/journal.pone.0025736

2009 Dundas, Robert G., Yesenia Ibarra, Frederika J. M. Harmsen, Peter K. Van de Water. *Bison* cf. *B. latifrons* from the Late-Pleistocene Broach Locality, Fresno, California. *Current Research in the Pleistocene 26:149-151.*

2008 Levetin, Estelle and Peter K. Van de Water. Changing pollen types/concentrations/ distributions in the United States: Fact or Fiction. *Current Allergy and Asthma Reports* 8: 418-424.

2007 Van de Water, Peter K., Lidia S. Watrud, E. Henry Lee, Connie Burdick, and George King. Long-distance GM pollen movement of creeping bentgrass using modeled wind trajectory analysis. *Ecological Applications* 17(4): 1244-1256.

2004 Watrud, Lidia S., E.Henry Lee, Anne Fairbrother, Connie Burdick, Jay R. Reichman, Mike Bollman, Marjorie Storm, George King and Peter K. Van deWater. 2004. Evidence for landscape-level, pollen-mediated gene flow from genetically modified creeping bentgrass with *CP4 EPSPS* as a marker. *Proceedings of the National Academy of Sciences* 101(40):14533-14538.

2004 Thompson, Robert S., Shafer, Sarah L., Strickland, Laura E., Van de Water, Peter K., Anderson, Katherine H. Quaternary vegetation and climate change in the western United States: Developments, perspectives, and prospects. *In,* The Quaternary Period in the United States (A.R. Gillespie, S.C. Porter and B.F. Atwater, eds.), Developments in Quaternary Science, 1, Elsevier, Amsterdam. P. 403-426.

2003 Van de Water, Peter K., Keever, Thomas, Main, Charles E., and Levetin, E. An assessment of predictive forecasting of *Juniperus ashei* pollen movement in the southern Great Plains, USA. *International Journal of Biometerology*, 48:74-82.

2003 Levetin, E. and Van de Water, P.K. Pollen Count Forecasting. *Immunology and Allergy Clinics of North America*. 23:423-442.

2003 Van de Water, Peter K. Identified Charred Wood from the 1989 Excavations. *In* (Wyckoff, D.G., Theler, J.L. and Carter, B.J., eds.) The Burnham Site in Northwestern Oklahoma: *Glimpses Beyond Clovis?* Chapter 14. Sam Noble Oklahoma Museum of Natural History and Oklahoma Anthropological Society, Memoir 9, pg. 315.

2002 Van de Water, P.K., Leavitt S.W., and Betancourt, J.L. Leaf $\delta^{13}C$ variability with elevation, slope aspect, and precipitation in the southwest United States. *Oecologia,* 132:332-343.

2002 Van de Water, P.K. The effect of chemical processing on the $\delta^{13}C$ value of plant tissue. *Geochimica et Cosmochimica Acta*, 66:1211-1219.

2002 Pedicino L.C., Leavitt S.W., Betancourt J.L., and Van de Water P.K. Historical variations in $\delta^{13}C_{leaf}$ of herbarium specimens in the southwestern U.S. *Western North American Naturalist*, 62:348-359.

2002 Terwilliger, V.J., Betancourt, J.L., Leavitt, S.W., and Van de Water P.K. Leaf cellulose dD and $d^{18}O$ trends with elevation differ in direction among co-occurring, semiarid plant species. *Geochimica et Cosmochimica Acta* 66:3887-3900.

2001 Van de Water P.K., and Levetin E. The contribution of upwind pollen sources to the characterization of *Juniperus ashei* phenology. *Grana,* 40:133-141.

2001 Levetin E. and Van de Water P.K. Environmental contributions to allergic disease. *Current Allergy and Asthma Reports,* 1:506-514.

2000 Lebowitz M.D., O'Rourke M.K., Rogan S.P., Reses J., Van de Water P.K., Blackwell S., Moschandreas D.J., Gordon S.M. and Robertson G.L.. 1999. Indoor and outdoor PM10 and associated metals and pesticides in Arizona. *Inhalation Toxicology,* 12 (1): 139-144.

2000 O'Rourke M.K., Van de Water P.K., Jin S., Rogan S.P., Weiss A.D., Gordon S.M., Moschandreas D.M. and Lebowitz M.D. Evaluation of primary metals from NHEXAS Arizona: distributions and preliminary exposures. *Journal of Exposure Analysis and Environmental Epidemiology*, 9:435-445.

1999 Lebowitz M.D., O'Rourke M.K., Moschandreas D.M., Rogan S.P., Van de Water P.K., Gordon S.M., Needham L., and Robertson G.L. Volatile Organic Compounds: Exposures and biomarkers in the National Human Exposure Assessment Survey in Arizona, USA. Proceedings, Indoor Air '99. Edinburgh, Scotland. Volume 2: 306-311.

1994 Van de Water P.K., Leavitt S.W., and Betancourt J.L. Trends in stomatal density and $^{13}C/^{12}C$ of *Pinus flexilis* leaves during the last Glacial-Interglacial cycle. *Science*, 264:239-243.

Journal Manuscripts

Submitted

Pending; Van de Water, Peter K., and Peachey, William D. Diet of *Choeronycteris mexicana* based on pollen analysis of guano collected from Southern Arizona. P. 16 (*Western North American Naturalist*).

In-Process: Van de Water, Peter K, Landon D. Bunderson and Estelle Levetin. Estimation of the yearly contribution of carbon from *Juniperus ashei* pollen shed onto the landscape. To be submitted to; Biogeochemical cycles.

In-Process: Van de Water, Peter K. The stomatal frequency response of *Pinus monophylla* needles to the historic rise in atmospheric CO_2. To be submitted to; Global Change Biology.

Conference Abstracts:

2011 Van de Water, P., L. D. Bunderson, J. Luvall, E. Levetin. Atmospheric characteristics and allergenic pollen dispersal. American Academy of Asthma, Allergy and Immunology 2011 Annual Meeting. March 18-22, 2011, San Francisco, CA (**Poster Presentation**).

2011 Luvall, J.E., W. Springer, E. Levetin, A. Huerta, S. Nickovic, G. Pejanovic, P. Van de Water, O. Meyers, A. Budge, T. Crimmins, H. Krapfi, A. Zelicoff. Use of MODIS satellite images and an atmospheric dust transport model to evaluate *Juniperus* spp. pollen phenology and dispersal to support public health alerts. American Academy of Asthma, Allergy and Immunology 2011 Annual Meeting. March 18-22, 2011, San Francisco, CA (**Poster Presentation**).

2011 L. D. Bunderson, P. Van de Water, J. Luvall, E. Levetin. Northern New Mexico spring pollen levels. American Academy of Asthma, Allergy and Immunology 2011 Annual Meeting. March 18-22, 2011, San Francisco, CA (**Poster Presentation**).

2010 Van De Water, P. K., S. W. Leavitt, I. P. Panyushkina, A. J. T. Jull, N. R. Testa, and J. Squire. Tree trunks from MIS3 revealed in Pacific Northwest landslide deposits. 2010 Fall American Geophysical Union Meeting, December 14, 2010, San Francisco, CA (**Poster Presentation; Abstract accepted 10/15/2010**)

2010 Schafer, M.G., A. Ross, J.P. Londo, C.A. Burdick, E.H. Lee, S. E. Travers, P.K., Van de Water, and C.L. Sagers. Evidence for the Establishment and Persistence of Genetically Modified Canola Populations in the U.S. Ecological Society of America Annual Meeting. August 1-6, 2010, Pittsburgh PA (**Poster Presentation**)

2010 Travers, Steven, Van de Water, Peter K., Londo, Jason, Sagers, Cynthia, Implications of Climate Change and Flowering Time Shifts for Native-Native and Crop-Native Pollen Flow Evolution meetings. June 25-29, 2010, Portland OR (**Poster Presentation**)

2009 Van de Water, P.K., Leavitt, S.W., Jull, T., Squire, J. and Testa, N. Tree Boles revealed in Pacific Northwest landslide deposits provide tree-ring record for period prior to deglaciation. Geological Society of America Meeting. Oct. 18-21 2009, Portland OR (**Poster Presentation**)

2009 Ibarra, Yesenia, Robert G Dundas., Frederika J. Harmsen, and Peter Van de Water, Late Pleistocene *Bison* CF. B. *Latifrons* from Fresno, California with comments on the age of the upper unit of the Modesto formation. Geological Society of America Meeting. Oct. 18-21 2009, Portland OR (**Poster Presentation**)

2009 Harmsen, Frederika J., Peter Van de Water, Donald Hunsaker, and Vivian Liu, Future climate change impacts on Fresno County, California: Mitigation strategies and public policy. Geological Society of America Meeting. Oct. 18-21 2009, Portland OR (**Poster Presentation**)

2006 Van de Water, P.K., Watrud, L.S., Lee, E.H., Burdick, C.A., King, G. Atmospheric and environmental conditions affecting long-distance pollen-mediated gene flow in *Agrostis stolonifera*. Ecological Society of America Annual Meeting. Aug. 6-11 2006, Memphis TN (**Poster Presentation**)

2004 Van de Water, P.K. Betancourt, Julio L. and Leavitt, Steven W. Distribution patterns and carbon acquisition physiology of the C_4 shrubs *Atriplex* spp. in the southwestern USA across the last glacial-interglacial cycle. Geological Society of America Annual Meeting. Nov. 7-10 2004C_a , Denver CO (**Oral Presentation**)

2004 Van de Water, Peter K., Shafer, Sarah L., and Thompson, Robert S. Late Quaternary history of pinyon pines and woodland junipers across western North America. Ecological Society of America 89th Annual Meeting. Aug. 1-6 2004, Portland OR (**Poster Presentation**).

2004 Watrud, Lidia S., Van de Water, Peter K., Burdick, Connie, Lee, E. Henry. The use of modeled atmospheric wind trajectories to determine potential downwind gene flow; a case study using GM-bentgrass. Ecological Society of America 89th Annual Meeting. Aug. 1-6 2004, Portland OR (**Poster Presentation**).

2004 Van de Water, Peter K. and Barnum, Elizabeth. Differential response in plant taxa morphology and physiology during increases in Late-Quaternary atmospheric CO_2 concentrations affect plant-climate interactions. American Geophysical Union Fall Meeting, Dec. 13-17 2004, San Francisco CA (**Poster Presentation**).

2003 Van de Water, P.K. Leavitt, Steven W. and Betancourt, Julio L. Historic carbon isotopic shifts in pinyon pines and woodland junipers are unprecedented during the Quaternary history of these taxa. American Geophysical Union Fall Meeting, Dec. 8-12 2003, San Francisco CA (**Poster Presentation**).

2003 Shafer, Sarah L., Thompson, Robert S., Strickland, Laura E., Anderson, Katherine H., Kerwin, Michael W. and Van de Water, Peter K. Relationships between plant traits and climate in western North America. XVI INQUA Congress, Jul. 23-30 2003, Reno NV (**Poster Presentation**).

2002 Van de Water P.K. Ecophysiological and morphological changes in plant macro-fossils from the arid interior west as atmospheric CO_2 shifted during the terminal Pleistocene. Ecological Society of America Annual Meeting, Aug. 5-8 2002, Tucson AZ (**Oral Presentation**).

2000 Van de Water P.K., Leavitt S.W. and Betancourt J.L. The Late Quaternary carbon isotopic record from the packrat midden record of the southwestern U.S.A. Geological Society of America Annual Meeting Abstracts and Program, Nov. 12-15 2000, Reno NV. No. 52396 (**Oral Presentation**).

2000 Van de Water P.K. and Levetin E. The effect of drought conditions on the release of *Juniperus asheii* pollen in south-central Texas. Annual Symposium of the Pan-American Aerobiology Association, Apr. 28-May 2 2000, Albany NY, p. 18 (**Oral Presentation**).

2000 Van de Water P.K., Keever T., Main C.E., and Levetin E. Forecasting Long-Distance transport of allergenic mountain cedar (*Juniperus asheii*) pollen from source areas in central Texas and south-central Oklahoma. American Academy of Allergies, Asthema and Immunology, Annual Meeting, Mar. 3-8 2000, San Diego CA. *The Journal of Allergy and Clinical Immunology,* 105:S231 (**Poster Presentation**).

2000 Levetin E., Van de Water P.K., and Main C.E. Aerobiology of *Juniperus ashei* pollen. American Academy of Allergies, Asthema and Immunology, Annual Meeting, Mar. 3-8 2000, San Diego CA. *The Journal of Allergy and Clinical Immunology,* 105:S230 (**Poster Presentation**).

1999 Van de Water, P.K., Leavitt S.W. and Betancourt J.L. The eco-physiological response of past plant populations to changing atmospheric CO_2 concentrations during deglaciation. XVI International Botanical Congress Abstracts, August 1-7, 1999, St. Louis MO p. 502 (**Poster Presentation**).

1999 Van de Water P.K. and Levetin E. Characterization of the 98/99 *Juniperus ashei* Pollen Season In South Central Texas and Long Distance Transport into Tulsa Ok, XVI International Botanical Congress Abstracts, August 1-7, 1999, St. Lois MO, p. 499 (**Poster Presentation**).

1999 Van de Water P.K. and Levetin E. Characterization of the 1998/1999 *Juniperus ashei* pollen season in south central Texas and the record of long distance transport events into Tulsa Oklahoma. Pan-American Aerobiology Association, Aerobiology '99, May 28-June 1, 1999, Tucson, AZ, p. 4 (**Oral Presentation**).

1998 Van de Water P.K. The use of computer-based imaging systems to identify species specific morphological elements on pollen grains, with an application to the dietary analysis of Mexican Long-tongued bat (*Choeronycteris mexicana*) guano collected in Cienega Creek Natural Preserve, Pima County, Arizona: U.S.A. 6th International Congress on Aerobiology, August 31 –September 5, 1998, Perugia, Italy, p. 50 (**Oral Presentation**).

1997 Van de Water P.K., Lebowitz M.D., Weiss A., and Gordon S.M. Comparison and calibration of the Spectrace 9000 portable XRF with other analysis methods: Preliminary analysis of NHEXAS Arizona soil and vacuum dust samples. International Society of Exposure Analysis, 7th Annual Meeting, November 1997, Research Triangle Park, NC, p.174 (**Poster Presentation**).

1997 Van de Water P.K., and Rogan S.P. Calculation of start-up times (ramp time) for pumps used in air sampling during the NHEXAS Arizona project. International Society of Exposure Analysis, 7th Annual Meeting, November 1997, Research Triangle Park, NC, p.173 (**Poster Presentation**).

1997 Van de Water P.K., and Peachey W.D. Dietary analysis of the Mexican long-tongued bat (*Choeronycteris mexicana*) using pollen analysis of guano collected in Cienega Creek natural preserve. North American Symposium on Bat Research, 27th Annual Meeting, October 1997, Tucson AZ. p.64 (**Oral Presentation**).

1997 Van de Water P.K., Leavitt S.W., and Betancourt J.L. Inter- and intra-plant variability of carbon isotopes and the packrat midden record. Ecological Society of America Annual Meeting, August 1999, Albuquerque NM (**Oral Presentation)**.

1997 Van de Water P.K., Leavitt S.W., Betancourt J.L., and Pedecino L.C. $\delta^{13}C$ variability in modern *Atriplex* communities; implication for reconstructing $\delta^{13}C$ of past atmospheres. 14th Annual Pacific Climate Workshop, April 1997, Santa Catalina Island CA (**Oral Presentation**).

1996 Van de Water P.K., Leavitt S.W., and Betancourt J.L. $\delta^{13}C$ Variability in Modern *Atriplex*; Implication for Reconstructing $d^{13}C$ of Past Atmospheres. American Quaternary Association, 14th Biennial Meeting, Flagstaff AZ. p. 138 (**Poster Presentation**).

1996 Betancourt J.L., Aasen-Rylander K., Leavitt S.W., Van de Water P.K., and Pedecino L.C. Stand-Level Variations in $\delta 30^{13}C$ of Pinyon Pine Leaf Cellulose at Sunset Crater, Arizona: Implications for the 022Fossil Record. American Quaternary Association, 14th Biennial Meeting May 1996, Flagstaff AZ. p. 64 (**Poster Presentation**).

1994 Van de Water P.K., Leavitt S.W., and Betancourt J.L. Trends in Stomatal Density and $^{13}C/^{12}C$ ratios of *Pinus flexilis* needles during the last Glacial-Interglacial cycle. 45th American Institute of Biological Sciences Annual Meeting, Knoxville TN, p.176 (**Oral Presentation**).

1994 Van de Water P.K., Leavitt S.W., and Betancourt J.L. Ecophysiological Responses to CO_2 Enrichment During Deglaciation: Stomatal Densities and $^{13}C/^{12}C$ From Leaves in Packrat Middens. Geological Society of America 1991 Annual Meeting, San Diego CA. p. 86 (**Poster Presentation**).

Symposiums:

2011 Cynthia L. Sagers (Organizer), Peter K. Van de Water (Co-Organizer), Steven Travers (Moderator). Domestication, feral species and the importance of agriculture to the future of plant diversity. 2011 Ecological Society of America Meetings, August 7 -12, 2011, Austin TX (**Proposal submitted**).

Other Presentations:

2010 Half-hour interview on the "The Maddy Forum" about the science behind climate change. Interviewed by Stacie Dabbs; Recorded September 29th, 2010; Aired on KSFR FM on October 2nd, 2010.

Other Publications:

2008 **Report to the City of Fresno;** Harmsen, Fraka, Hunsaker, Donald, Van de Water, Peter, Luo, Yupeng Vivian. 2008. Mitigation and Adaptation strategies for climate change in Fresno California, 111 pgs. Report commissioned through ICOA (Institute of Climate, Oceans and Atmosphere), College of Science and Mathematics, Fresno State University.

1995 ***NHEXAZ Project Standard Operating Procedures;***

The NHEXAZ Project (National Human EXposure assessment AriZona) was a multi-year investigation into the exposure of residents in the state of Arizona to heavy metals, pesticides and volatile organic compounds. I served as the Arizona lab director during the life of the project. The research was conducted under an EPA Cooperative agreement with the University of Arizona CR 821560. I was primary author of 16 standard operating procedures (SOP). Each of the SOP's were subject to internal and external review as well as QA/QC audit of the procedure once implemented. A detailed list is available upon request.

Dr. Zhi (Luke) Wang

CURRICULUM VITAE

Zhi WANG

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Education

1997 Ph.D., Hydrology and Soil Physics, Katholieke Universiteit Leuven, Belgium
1985 M. Sc., Irrigation and Drainage Engineering, Northwestern Agricultural University, China
1982 B. Eng., Civil and Hydraulic Engineering, Xi'an University of Technology, China

Dissertation, thesis and project design

Ph.D. Dissertation: "Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media", KU Leuven Dissertation #347, 1997. Fully published in four articles in **Water Resources Research**, 1997-98.

M. Sc. Thesis: "Experimental Study of the Long Border Segment Irrigation Systems". Fully published in **Irrigation and Drainage** (Chinese), 5(4): 15-26 1986.

B. Eng. Project and Thesis: Design of the Multi-Stage Pumping Stations in Jingtai County, Gansu Province; Thesis on Computer analysis of the safe concrete block sizes to stabilize pipelines. 1982.

Professional Experience

2008-present: Associate Professor, Department of Earth and Environmental Sciences, California State University, Fresno.
2003-2007: Assistant Professor, Dept of Earth and Env Sciences, CSU Fresno.
1998-2002: Post doctoral researcher, Dept of Environmental Sciences, University of California, Riverside (advisor: Prof. William A. Jury, member of the US Academy of Sciences).
1993-1997: Graduate Researcher, Institute for Land and Water Management, Catholic University Leuven, Belgium (advisor: Prof. Jan Feyen, former director of the Institute).
1985-1992: Assistant Professor (1988-92), Director of the Irrigation Engineering Division, College of Civil and Hydraulic Engineering, Northwestern A&F University, China.

Honors and Awards

Provost's Research Activity Award ($25,000), California State University, Fresno (March 2008)
Selected Scientist on E-print Network (www.osti.gov/eprints), US Department of Energy, Office of Scientific and Technical Information (2006-)
Selected California Concerned Scientist, signed letters to California State Governor and Legislators, leading to new laws to limit the green house gas emissions in California (April 2005) and the destruction of forest land for bio-fuel crops (April 2009)
Elected president of Chinese American Faculty Association at CSUF (2005-06)
Doctoral Full Scholarship and Research Fund, K.U. Leuven (Belgium 1993-97)
Elected President of Chinese Student Association of Leuven (1995-96)
Outstanding Teacher, Northwestern Agricultural University, China, 1987-90

International Services

Guest Professor (2009-2014), Research Center for Echo-Environ. Sci., Chinese Academy of Sciences
Adjunct Professor (2010- 2012), Institute for Water and Environment, ChangAn University, Xian, China
HouJi Guest Professor (2010-2014), Northwest A&F University, Yangling, China

Memberships in Professional Organizations

American Geophysical Union (AGU, 1998-)
American Society of Agronomy (ASA, 1998-)
Soil Science Society of America (SSSA, 1998-)
European Geophysical Society (EGS, 1995-98),
American Association for the Advancement of Science (AAAS, 1998-2000)

PROFESSIONAL AND SOCIETY SERVICES

External Scientific Society Services and Assignments

Professional Service Committees

- Member, Graduate Student Award Committee, Soil and Water Conservation (Section-6), Soil Science Society of America (2006-)
- Member, Western Regional Soil Physics Research Project W-1188 (2002-)
- Member, Central Sierra Watershed Committee (2003-)
- Member, Madera County Water Advisory Commission – Subcommittee (2008-)

Session Chair, International Conference

- Session #341: Surface, Subsurface Hydrological Processes and the Impact of Land Use Changes. Centennial ASA-CSSA-SSSA International Annual Meetings in **New Orleans**, LA, Nov. 4-8, 2007.

Invited Guest Speaker at Professional Conferences

- GIS-based modeling of water quality and water supply in Fresno River Watershed. The 12th Annual California GIS Conference (**Santa Barbara**, CA, April 5-7, 2006);
- GIS Day 2006, **Fresno**, CA, November 15, 2006)
- Soil Science Society of America 91st Annual Meeting (**Salt Lake City**, UT, 1999);
- International Conference on Water-Repellent Soils (**Wagningen,** The Netherlands, 1998).

Invited Reviewer (External Grant Proposals)

- US National Science Foundation (NSF), Geoscience – Hydrology proposals (2000-02, 07-09)
- U.S. State Department, Civilian Research and Development Foundation proposals (2003)
- Israel Science Foundation (2009)

Invited Reviewer (International Journal Manuscripts)

- ASCE Journal of Irrigation and Drainage Engineering,
- Catena
- Ecological Modeling
- Environmental Fluid Mechanics
- Environmental Management
- European Journal of Soil Science
- Geoderma
- Journal of Colloid and Interface Science

- Journal of Contaminant Hydrology
- Journal of Earth System Science
- Journal of Environmental Quality
- Journal of Hazardous Materials
- Journal of Hydrology
- Science of the Total Environment
- Soil Science
- Soil Science Society of America Journal
- Vadose Zone Journal
- Water Resources Research

Invited Special Seminars

Wang, Z., Effects of Unstable Flow on Water System Contamination and Remediation. Department Earth and Environmental Sciences, California State University - Fresno, **Fresno**, CA, April 5, 2002.

Wang, Z., Effects of Unstable Flow on Water System Contamination and Remediation. Department Environmental Sciences, Rutgers University, The State University of New Jersey, **New Brunswick**, NJ, March 13, 2002.

Wang, Z., Measurement and Prediction of Unstable Flow in the Vadose Zone and Groundwater Aquifers, Department of Civil and Environmental Engineering, University of Tennessee, **Knoxville**, TN, February 13, 2002.

Wang, Z., Measurement and Prediction of Preferential Flow and Solute Transport in Soils, Soil and Water Science Department, University of Florida, **Gainesville**, FL, May 3, 2001.

Wang, Z, Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media, Department of Environmental Sciences, University of California, **Riverside**, CA, April 9, 1998.

California State University, Fresno Campus Committees and Duties

- University Graduate Committee (2007-2010)
- University Task Force on Grants and Contracts, CSUF (2002-03);
- University Air Quality Resources Group, CSUF (2003-)
- University Coordinator, Unitrack AP Environmental Science program for high schools (Clovis West, Clovis and CART) since 2003
- CSU Fresno RISE Program faculty mentor (2004-)
- College Curriculum Committee (2004-2008)
- College International Education Committees (2005-2008)
- Inter-College Equal Employment Officer (EEO) on Faculty Search committees – Department of Industrial Technology and Department of Viticulture (2007 and 2008)
- Department Faculty RTP (retention, tenure and promotion) Committee Chair (2008)
- Department Graduate Faculty Committee (2002-)
- Undergraduate Program Coordinator, the Joint BS Environmental Science Program with CSU Fresno and UC Riverside (2005-)
- Department GIS computer lab supervisor (2002-)
- Web master: Department website (www.csufresno.edu/ees, 2002-)
- Web master, Asian Faculty and Staff Association of CSUF website (www.csufresno.edu/afsa) (2009-)

TEACHING

Teaching and Supervising Activities

New Courses Developed and Cataloged at CSU Fresno

1. EES 004: Environmental Science - for GE (taught since Fall 2006)
2. EES 108: Soil and Water Science (approved in Fall 2004)
3. EES 109: Atmospheric Science (approved in Fall 2004)
4. EES 178: Geostatistics (taught since Fall 2006)
5. EES 230: Contaminant Transport (graduate course approved in Fall 2008)
6. EES 115: Environmental Earth and Life Science (Web-based, taught since Spring 2007)

Courses Taught at CSU Fresno

1. EES 004: Environmental Science (2006-)
2. EES108: Soil and Water Science (2010-)
3. EES 112: Earth System History (2009-)
4. EES 117: Hydrogeology (2002)
5. EES 177: Quantitative Methods for Earth Science (2003-2004)
6. EES 178: Geostatistics (2006-)
7. EES 180: Computer Applications in Geology (2003-2006)
8. **EES 186: Environmental GIS (2002- present)**
9. EES 217T: Contaminant Hydrology (2003-04)
10. EES 217T: Unsaturated Zone Hydrology (2003-04)
11. NSCI 115: Environmental Earth and Life Science – for distance learning mode (2004-)
12. NSCI 115: Environmental Earth and Life Science – for web-based instruction (2007-)
13. NSCI 115: Environmental Earth and Life Science (2002-2005)

Courses Taught Elsewhere

- Surface Irrigation Engineering - Design and Field Evaluations, graduate course taught at **Universidad de Cuenca, Ecuador** (Feb-March 1997)
- *Irrigation and Drainage Engineering (undergraduate),* ***Northwestern Agricultural University, China*** *(1985-1992)*
- Economic Evaluation of Irrigation Projects (undergraduate), **Northwestern Agricultural University, China** (1985-1992)

Funded Teaching Project at CSU Fresno

- CSU Fresno Assessment funding Award ($5,000), Office of the Provost and Office of Institutional Assessment, Assessment and Planning (2005-06).

Visiting Scientist and Scholar Advising

Zili He Northwest A&F University, China Nov 2007- July 2009

Graduate Student Advising at CSU Fresno (as Major Advisor)

Student name	*Degree*	*These Topic*	*Completion Date*
James R. Meier	MS Geology	Groundwater bank	**Aug 2005**
Ori Sartono	MS Geology	Fractured rock Aquifer	**Aug 2007**
Sana Alsaoudi	MS Geology	SJR Water source isotope	**Dec 2007**
Jorge Baca Jr	MS Geology	Fresno R watershed erosion	**Oct 2009**
Doug DeFlitch	MS Geology	SJ River sediment transport	**April 2010**
Joe Knight	MS Geology	SJV Selenium transport	Aug 2006- present
Ronald Holcomb	MS Geology	Watershed assessment	Aug 2004- present
Ashley Ross	MS Geology	Kings R Watershed Erosion	Aug 2009-present

Graduate Student Advisory Committees at CSU Fresno

Student name	*Degree*	*Department*	*Major Advisor*	*Completion Date*
Nelson F. Bernal	MS Geology	EES	John Suen	Dec 2007
Rose Marrero-Cuebas	MS Geology	EES	John Suen	Dec 2007
Susan Bratcher	MS Geology	EES	John Suen	Dec 2007
Sean P. Boyd	MS Geology	EES	Fraka Harmsen	in progress
Zachary Hoover	MS Biology	Biology	Steve Blunmenshire	in progress
Brett Moore	MS Biology	Biology	Steve Blunmenshire	in progress

Undergraduate Thesis Advising at CSU Fresno (as Major Advisor)

Student name	*Degree*	*These Topic*	*Graduation Date*
Louis Tesseo	B. Sc. Geology	GIS Snow-pack calculation	**May 2007**
Brent Vanderburgh	B. Sc. Geology	GIS Snow water calculation	**May 2008**

Undergraduate Program Advising (as major advisor)

- Geology majors (4): Graduated in 2005-08.
- Environmental Science majors (27): As Coordinator of the Joint BS in Environmental Science program between CSUF and UCR:

RESEARCH

Research Interests

- Measurement and prediction of surface and subsurface water flow and contaminant transport
- Fluid Mechanics in porous media including soils and underground aquifers for water and oil
- Evaluation, measurement and prediction of soil and groundwater quality
- Climate change effects on hydrological processes and eco-system sustainability at various scales
- Measurement and prediction of unstable (finger) flow in soils and geological formations
- GIS applications in natural resources, watershed and groundwater management and modeling
- Development and calibration of hydraulic devices and structures for discharge measurement
- Irrigation engineering and pumping system design, simulation and installation

Publications

In Peer-reviewed Journals:

1. Liu, X., B. He, Z. Li, J. Zhang, L. Wang, Z. Wang. Influences of land terracing on agricultural and ecological environment in Loess Plateau regions, China. **Environmental Earth Sciences**, DOI: 10.1007/s12665-010-0567-6, 2010.
2. Liang, X., D. Su, S. Yin, and Z. Wang. Leaf water absorption and desorption functions for three turfgrasses. **Journal of Hydrology**, 376: 243–248, 2009.
3. He, Z., Z. Wang, C.J. Suen, and X. Ma. Climate Change Impacts on Water Availability in the Upper San Joaquin River Watershed, California. (submitted) 2009.
4. Yu, Xinxiao, Derong Su, Yuan Tian, and Z. Wang. Performance of the ridge-furrow rain harvesting system in semiarid regions of China. (resubmitted), 2009.
5. Li, He-li, Huai-en Li, Zhi Wang, Wen-juan Shi. Research of Finger Flow in Porous Media: Review and Perspective, **Soils**, 41: 27-33, 2008.
6. Kim, S.B., H.S. On, D.J. Kim, W. A. Jury, and Z. Wang. Determination of bromacil transport as a function of water and carbon content in soils. **Journal of Environmental Science and Health Part B**, 42, 529–537, 2007.
7. Wang, Z. Watershed Monitoring and Hydrologic Simulation using GIS, **CSU Geospatial Review**, Vol. 4, Spring 2006.
8. Mathieu, J., Z. Wang, J. Feyen, D. Elrick and M. Vanclooster. Correction to "Prediction of fingering in porous media". **Water Resources Research**., Vol. 41, No. 4, W04005, doi:10.1029/2004WR003831, 2005.
9. Wang, Z. Invited Book Review: Seepage in soils – principles and applications by Lakshmi N. Reddi. John Wiley & Sons, Inc. **Vadose Zone Journal**, 3:728-729, 2004.
10. Wang, Z., W.A. Jury, A. Tuli, and D.J. Kim. Unstable flow during redistribution: Controlling factors and practical implications. **Vadose Zone Journal**, 3: 549-559, 2004.
11. Wang, Z, A. Tuli, and W.A. Jury. Unstable flow during redistribution in homogeneous soil, **Vadose Zone Journal**, 2: 52-60. 2003.
12. Jury, W.A., Z. Wang, and A. Tuli. A conceptual model of unstable flow in unsaturated soil during redistribution, **Vadose Zone Journal**, 2: 61-67, 2003.
13. Wang, Z., L. Wu, T. Harter, J. Lu and W.A. Jury. A field study of unstable preferential flow during soil water redistribution. **Water Resources Research** 39 (4): 1075, doi:10.1029/2001WR000903. 2003.
14. Wang, Z., A. Chang, L. Wu, and D. Crowley. Assessing the soil quality after long-term wastewater irrigation - principal component and factor analysis. **Geoderma** 114: 261-278, doi:10.1016/S0016-7061(03)00044-2. 2003.
15. Wang, Z, J. Lu, L. Wu, T. Harter, and W.A. Jury. Visualizing preferential flow in field soils using ammonium carbonate and a pH indicator, **Soil Science Society of America Journal**, 66, 347-351, 2002.
16. Wang, J., B. Fu, Y. Qiu, L. Chen, and Z. Wang. Geostatistical analysis of soil moisture variability on Da Nangou catchment of the loess plateau, China. **Environmental Geology**, 41: 113-120, 2001.
17. Jury, W. A., and Z. Wang. Unresolved Problems in vadose zone hydrology and contaminant transport. In **Dynamics of Fluids in Fractured Rock**, AGU Geophysical Monograph 122, edited by B. Faybishenko, P. A. Witherspoon and S. M. Benson. pp. 67-72, 2000.
18. Wang, Z., L. Wu, and Q. J. Wu. Water-entry value as an alternative indicator of soil water repellency and wettability, **Journal of Hydrology**, 231-232: 76-83, 2000.
19. Wang, Z., Q.J. Wu, L. Wu, C.J. Ritsema, L.W. Dekker and J. Feyen, Effects of soil water repellency on infiltration rate and flow instability. **Journal of Hydrology**, 231-232:265-276, 2000.
20. Zerihun, D., J. Feyen, J. M. Reddy and Z. Wang. Minimum cost design of furrow irrigation systems. **Transactions of the ASAE**, 42(4): 945-955, 2000.
21. Wang, Z., Jan Feyen, and D.E. Elrick. Prediction of Fingering in porous media. **Water Resources Research,** 34: 2183-2190, 1998.

22. Wang, Z., Jan Feyen and C. J. Ritsema. Susceptibility and predictability of conditions for preferential flow. **Water Resources Research**, 34: 2169-2182, 1998.
23. Wang, Z., J. Feyen, M. Th. van Genuchten and D. R. Nielsen. Air entrapment effects on infiltration rate and flow instability. **Water Resources Research**, 34(2): 213-222, 1998.
24. Wang, Z., J. Feyen, D. R. Nielsen and M. Th. van Genuchten. Two-phase flow infiltration equations accounting for air entrapment effects. **Water Resources Research**, 33(12): 2759-2768, 1997.
25. Zerihun, D, Z. Wang, J. Feyen and J. M. Reddy. Empirical functions for dependent furrow irrigation parameters. 2: Applications, **Irrigation Science**, 17:121-126, 1997.
26. Zerihun, D., Z. Wang, S. Rimal, J. Feyen and J. M. Reddy. Analysis of surface irrigation performance terms and indices. **Agricultural Water Management**, 34:25-46, 1997.
27. Wang Z., D. Zerihun, and J. Feyen. General irrigation efficiency for field water management. **Agricultural Water Management** , 30(2): 123-132, 1996.
28. Wang, Z., J. M. Reddy and J. Feyen. Improved 0-1 programming model for optimal flow scheduling in irrigation canals, **Irrigation and Drainage Systems**, 9: 105-116, 1995.
29. Wang, Z. and J. Feyen. Unsaturated infiltration properties affected by soil air pressure. **Unsaturated Soils** (edited by E. E. Alpnso and P. Delage, A.A. Balkema Publisher, Rotterdam), Vol. 1: 417-422, 1995.
30. Wang, Z.Y., Z. M. Zhen and Z. Wang. The use and conveyance of hyper-concentrated turbid flow. **ICID Bulletin CIID**, 43(2) 117-126, 1994.
31. Lin, X. C., Z. Wang, W. Meng, L. Zhao, W.Z. Fan and Q.L. Shen. A quantitative evaluation of on-farm irrigation methods and techniques, **Journal of Northwestern Agricultural University** (Acta Univ. Agric. Boreali-occidentalis), 23(5): 17-22, 1995.
32. Wang, Z., F. S. Zhu and X. M. Liu. Experimental study of parabolic throat-less flumes. **Journal of Water Resources**, 23(7):12-23, 1994.
33. Wang, Z., Ai-Min Zhang and De-Hua Liao. Field study of on-farm irrigation efficiencies in XiYingHe irrigation district. **Water Resources & Water Engineering**, 4(1):17-25, 1993.
34. Wang, Z. and F. Zhu. Optimal flow regulation in canal systems using 0-1 programming method, **Irrigation & Drainage**, 11(3): 8-13. 1992.
35. Wang, Z., Parabolic cut-throat flumes for U-shaped canals, **Shaanxi Water Conservancy**, (4): 16-19, 1990.
36. Xiong, Y.Z., S. Kang, Z. Wang, X.C. Ling, and Z.N. Wang. Water saving irrigation in semi-arid regions of northwestern China, in **Water-Saving Agriculture and Development of Irrigation & Drainage Technologies**, Oct., 1989, 16-21, 1989.
37. Wang, Z. Recession/advance model for design of Long Border Segment Irrigation systems, **People's Yellow River**, 1989(3): 33-37, 1989.
38. Wang, Z. Evaluating application parameters of soil infiltration characteristics, **Irrigation & Drainage and Small Hydro-Power**, 1989(1): 30-33, 1989.
39. Wang, Z., An analytical model for predicting surface flow advance and the rational length of borders, **Irrigation & Drainage and Small Hydro-Power**, (1): 30-33, 1987.
40. Wang, Z. A mathematical model for border irrigation flow advancement, **Journal of Northwestern Agricultural University** (Acta Univ. Agric. Boreali-occidentalis, China), 15(4): 47-54, 1987.
41. Wang Z. and F. Zhu. Venturi-pipe devices for open canal water measurement**, Water Measurement Techniques and Devices**, 4: 58-64, 1986.
42. Wang, Z. Simulation and design of Long Border Segment Irrigation Systems, **Irrigation & Drainage**, 5(4): 15-26, 1986.

Abstracts in Conference Proceedings:

1. Ori Sartono, Z. Wang, C. J. Suen, and K. D Schmidt. Parameterization of a fractured hardrock aquifer in western foothills of the Sierra Nevada, California, *GSA Abstracts with Programs*. Vol. 39, No. 6, 2007.
2. Wang, Z., William A. Jury, and Atac Tuli. Observation and Modeling of Unstable Flow during Soil Water Redistribution. *Proceedings of the 2nd International Symposium on the Dynamics of Fluids in Fractured Rock*, Lawrence Berkeley National Laboratory, Berkeley, CA, Feb. 10-12, 2004.
3. Wang, Z. Does Water Flow Become Unstable in All Soils? *Proceedings of the Twenty-Fourth Annual Central California Research Symposium*. California State University, Fresno**.** CA, April 17, 2003.
4. Wang, Z. Effects of soil water repellency on infiltration rate and flow instability. International Workshop on "*Soil Water Repellency - origins, assessment, occurrence, consequences, modeling and amelioration*", Wageningen, The Netherlands, September 2-4, 1998.
5. Wang Z. and J. Feyen. Effects of air entrapment on water flow. *Proceedings of the International Conference Kearney Foundation of Soil Science*, Vadose Zone Hydrology: Cutting across Disciplines. University of California, Davis, sep. 6-8:163-164, 995.
6. Wang, Z. and J. Feyen. Inter-displacement behaviors between air and water during unsaturated infiltration. In: *Annales Geophysicae of the XXth general Assembly of the EGS*, Hamburg, Germany, Apr. 3-4, 7pp. 1995.
7. Wang, Z.. and J. Feyen. Effect of air entrapment on water flow and solute transport. *Proceedings of International workshop on Water and Matter Transport at Various Scales*. Leuven, Belgium April 18-19, 1995.
8. Zerihun D, Z. Wang, J. Feyen and J. M. Reddy. Performance Curves for Border irrigation. *Proceedings of the first International Conference on Water Resources Engineering*, ASCE (August 14-18, 1995, San Antonio, Texas, USA), edited by W.H. Espey, Jr. and P.G. Combs, Vol. 2: 1595-1599, 1995.
9. Feyen J., W. Mulonga, F. Liu, D. Zerihun and Z. Wang, 1994. Computer applications in irrigation and drainage education, research and practice. *Proceedings of the 5th MANCID* (Malaysian National Commission on Irrigation and Drainage) *Annual National Conference on "Hydroinformatics - Information technology for Irrigation, Drainage and Water Resources*. Pangkor Island, Malaysia. Nov. 25-27, 1996.
10. Wang, Z. and J. Feyen. A criterion for design, evaluation and optimization of on-farm irrigation systems. *Proceedings of the 45th ICID International Executive Council Meeting and 17th European Regional Conference* on "Effective and ecological sound use of irrigation waters", Varna, Bulgaria, May, 1994.
11. Wang, Z. and F. Zhu. Parabolic throat-less flumes for open channel discharge measurement, *Proceedings of the International Conference on Agricultural Engineering* (Beijing): V86-V92, 1992.
12. Wang, Z. and F. Zhu. Water-saving agriculture in Shaanxi Province, Proceedings of the *Symposium on Water Resources Utilization in NW China*, October, 1990, Xi'an. pp:20, 1990.

Conference Presentations (underlined are Students and Advisees)

1. Wang, Z. (oral presentation). The effects of first floods and soil erosion on water quality in the Fresno River watershed. Central Sierra Watershed Committee meeting. **Oakhurst**, California, April 28, 2010.
2. DeFlitch, Douglas., Zhi Wang (oral presentation). Measurement and monitoring of bedload sediment transport along the upper San Joaquin River. The 31st Annual Central California Research Symposium, **Fresno**, California, April, 23, 2010.
3. Wang, Z. (oral presentation). Assessment of eco-system health, services and restoration - Case studies in California and the Loess Plateau of China. Chinese Academy of Sciences. **Beijing**, China, April 2, 2010.
4. Wang, Z. (oral presentation). Eco-hydrology, infiltration, irrigation engineering and

hydrogeology with applications in California and the Loess Plateau of China. Institute for Water and Environment, ChangAn University, **Xi'An**, China, January 2-18, 2010.

5. Wang, Z. (oral presentation). Eco-hydrological measurement and simulation of watershed sustainability with respect to global climate change. Chinese Academy of Sciences. **Beijing**, China, Dec 28, 2009.
6. Suen, C. John, Bernad. F. Nelson, Ori Sartono, Z. Wang (poster presentation). Using isotope hydrology, fracture mapping, and pump tests to characterize groundwater flow through the fractured rock terrane of the Sierra Nevada foothills, GSA Annual Meeting, **Portland**, Oregon, October 18-21, 2009.
7. Wang, Z**,** Zili He, John Suen, Xiaoyi Ma (Oral presentation). Climate Change Impacts on the Headwaters of San Joaquin River, California. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
8. Baca, Jorge Jr., Zili He, Zhi Wang, Steve Blumenshine (Poster). Estimating Soil Erosion Potential within the Fresno River Watershed using the RUSLE model and GIS. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
9. Moore, Brett**,** Steve Blumenshine, Zhi Wang, Zili He (Poster). Influence of sedimentation on the distribution of macroinvertebrates in the upper Fresno River. The 30th Annual Central California Research Symposium, **Fresno**, California, April, 30, 2009.
10. Wang, Z. (oral presentation). Estimating Soil Erosion Potential in the Fresno River Watershed using the RUSLE Model and GIS. Central Sierra Watershed Committee meeting. **Oakhurst**, California, May 27, 2009.
11. Wang, Z. (oral presentation). Impacts of the first flood events and sedimentation on water quality in the Fresno River wathershed. Central Sierra Watershed Committee meeting. **Oakhurst**, California, February 25, 2009.
12. Wang, Z., and S. Blumenshine (oral presentation). Monitory plan for the upper Fresno River watershed. Oakhust area public information meeting sponsored by Central Sierra Watershed Committee. **Oakhurst**, California, October 16, 2008.
13. Wang, Z., Louis A. Tesseo (Poster). Upper San Joaquin River: A Geostatistical Analysis of the Snowpack water yield in the upper San Joaquin River watershed. GIS Day at Fresno State, **Fresno**, CA, Nov. 14, 2007.
14. Ori Sartono, Nelson F. Bernal, C. John Suen, Zhi Wang (Poster). Groundwater Flow through a Fractured Rock Aquifer in the Sierra Nevada Foothills of California. AGU 2007 Fall Meeting, **San Francisco**, California, December 10-14, 2007.
15. Wang, Z., Louis A. Tesseo (Oral presentation). Spatial Analysis of Snowpack Water Resources in Sierra Nevada for San Joaquin River. International Annual Meetings of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America in **New Orleans**, Louisiana. Nov. 4-8, 2007.
16. Xinxiao Yu, Derong Su, Yuan Tian, Zhi Wang (Oral presentation)., Performance of ridge and furrow water-harvesting system in Loess Plateau of China. International Annual Meetings of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America in **New Orleans**, Louisiana. Nov. 4-8, 2007.
17. Ori Sartono, Zhi Wang, C. John Suen, and K. D Schmidt (Poster). Parameterization of a fractured hard rock aquifer in western foothills of the Sierra Nevada, California, GSA Annual Meeting and Exposition. **Denver,** Colorado, Oct 28-31, 2007.
18. Wang, Z. (Invited Oral Presentation). Geospatial Analysis in Earth and Environmental Sciences, GIS Day 2006 for San Joaquin Valley, **Fresno**, CA, November 15, 2006.
19. Wang, Z. (Invited Oral presentation). GIS-based modeling of water quality and water supply in Fresno River Watershed. The 12th Annual Cal GIS Conference, Fess Parker's Doubletree Resort, **Santa Barbara**, CA, April 5-7, 2006.

20. Wang, Z. (Oral presentation). Characterizing Mass and Energy Transport at Different Scales. Western Regional Soil Physics Research Project W-1188 Annuposital Meeting, Desert Research Institute, 755 E. Flamingo Road, **Las Vegas**, NV, Jan. 2-4, 2006.
21. Wang, Z., Ronald E. Holcomb, Ori Sartono, Jim Meier (Oral presentation). Moving Toward GIS-Based Modeling of Watersheds and Groundwater Banks in San Joaquin Valley. Western Regional Soil Physics Research Project W-1188 Annual Meeting, **Las Vegas**, NV, Jan. 2-4, 2005.
22. Wang, Z., William A. Jury, and Atac Tuli. (Poster presentation). Observation and Modeling of Unstable Flow during Soil Water Redistribution. The 2nd International Symposium on the Dynamics of Fluids in Fractured Rock, Lawrence Berkeley National Laboratory, **Berkeley**, CA, Feb. 10-12, 2004.
23. Wang, Z., S. Blumenshine, and M McClanahan. (Oral presentation). Fresno River Monitoring. Central Sierra Watershed committee meeting, **Oakhurst**, CA, April 28, 2004.
24. Wang, Z., William A. Jury, and Atac Tuli. (Oral presentation). Critical depth of infiltration for unstable flow during redistribution. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 4-7, 2004.
25. Wang, Z., O. Satono, S. Blumenshine, and M McClanahan. (Oral presentation). GIS-Aided Watershed Modeling. GIS Day 2003, California State University, **Fresno**, CA, November 19, 2003.
26. Wang, Z., William A. Jury, and Atac Tuli. (Oral presentation). Does Water Flow Become Unstable in All Soils? Twenty-Fourth Annual Central California Research Symposium. California State University, **Fresno.** CA, April 17, 2003.
27. Wang, Z., S. Blumenshine, and M McClanahan. (Oral presentation). Fresno River Monitoring Plan and initial results. Central Sierra Watershed committee meeting, **Oakhurst**, CA, September 4, 2003.
28. Wang, Z. (Oral presentation). Contaminant flow in water. Western Athletic Conference (WAC) Universities Academic Alliance Symposium on Energy & Water Issues in Homeland Security and Health Disparities. **San Jose, California**. June 5-7. 2003.
29. Jury, W.A., and Z. Wang. (Oral presentation). Experimental and theoretical studies of unstable flow during soil water redistribution. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 6-8, 2003.
30. Wang, Z. A. Tuli and W. A. Jury. (Poster presentation) Evidence of unstable preferential flow during soil water redistribution. AGU 2002 Fall Meeting, **San Francisco**, USA, December 4-10, 2002.
31. Wang, Z., W.A. Jury and L. Wu. (Oral presentation). Preferential flow in non-structured field soils. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 2-5, 2001.
32. Wang, Z., W.A. Jury and L. Wu. (Oral presentation). Measurement and prediction of unstable flow, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America 91ST Annual Meeting, **Salt Lake City**, Oct. 31 – Nov. 4, 1999.
33. Jury, W.A., and Z. Wang. (Oral presentation by Dr. Jury). Recent Developments and Unresolved Problems in Vadose Zone Hydrology and Contaminant Transport. International Symposium (in Honor of Paul A. Witherspoon) on "Dynamics of Fluids in Fractured Rocks: Concepts and Recent Advances", Ernest Orlando Lawrence Berkeley National Laboratory, **Berkeley**, California, February 10-12, 1999.
34. Wang, Z. and L. Wu. (Oral presentation). Effects of soil water repellency on infiltration rate and flow instability. International Workshop on "Soil Water Repellency - origins, assessment, occurrence, consequences, modeling and amelioration", **Wageningen**, The Netherlands, September 2-4, 1998.
35. Wang, Z. (Oral presentation). Prediction and observation of preferential flow in porous soils. US West Region Soil Physics Workshop (W-188), **Las Vegas**, January. 5-8, 1998.
36. Wang, Z., Jan Feyen, D.E. Elrick. (Poster presentation). Prediction of fingering in porous media. AGU 1997 Fall Meeting, **San Francisco**, USA, December 8-12, 1997.
37. Wang, Z., Jan Feyen and C. J. Ritsema. (Poster presentation). Susceptibility of conditions for preferential flow. 22nd General Assembly of EGS, **Vienna**, Austria, 21-25 April 1997.

38. Wang, Z., and J. Feyen. (Presentations, demonstrations, field experiments, exercises and exams). Surface Irrigation System Measurement and Design, International Post-graduate Program by University of Leuven and Universidad de Cuenca, **Cuenca**, Ecuador, Feb 23-Mar. 8, 1997.
39. Wang, Z., J. Feyen. (Poster presentation). Two-phase flow infiltration equations accounting for air entrapment effects, EGS XXI General Assembly, **The Hague**, The Netherlands, May 6-10, 1996.
40. Wang, Z. and J. Feyen. (Poster presentation). Fingered Flow Visualization in Two Dimensional Columns. Gordon Research Conference on "Modeling of Flow in Permeable Media", Proctor Academy, **Andover**, New Hampshire, USA, August 4-9, 1996.
41. Wang, Z., J. Feyen. (Poster presentation). Air entrapment effects on infiltration rate and flow instability. International workshop on "Vadose Zone Hydrology: Cutting across disciplines", University of California, **Davis**, Sept. 6-8, 1995.
42. Wang, Z. and J. Feyen. (Oral presentation by Dr. DJ Kim). Unsaturated infiltration properties affected by soil air pressure. First International Conference on Unsaturated Soils, **Paris**, France, Sept. 6-8, 1995.
43. Wang, Z. and J. Feyen. (Oral presentation). Inter-displacement behaviors between air and water during unsaturated infiltration. European Geophysical Society (EGS) X General Assembly, **Hamburg**, Germany, April 3-7, 1995.
44. Wang, Z.. and J. Feyen. (Oral presentation). Effect of air entrapment on water flow. Workshop on Water and Matter Transport at Various Scales. **Leuven**, Belgium, April 18-19, 1995.
45. Wang, Z. and J. Feyen, (Oral presentation). A criterion for design, evaluation and optimization of on-farm irrigation systems. 45th ICID Executive Council Meeting & 17th European Regional Conference on the theme "Effective and ecological sound use of irrigation waters with special reference to European countries", **Varna**, Bulgaria, May 16-22, 1994.
46. Wang, Z. and F. Zhu. (Oral presentation). Parabolic cutthroat flumes for open channel discharge measurement. International Conference on Agricultural Engineering, **Beijing**, China. Oct. 1992.

On-going Research Projects

1. **Department of Defense (DOD): Shallow Saline Aquifer Monitoring Program at NAS Lemoore**. 2010-1011 ($63,572). Principal Investigator: Z. Wang (hydrologist). The major objective is to develop a groundwater monitoring program in concert with parallel studies on plant and wildlife habitats at NSA Lemoore. A Rockwork model will be developed to study the saline groundwater dynamics and the geology of the aquifers. Based on that, MODFLOW and GIS models will also be created for trend analysis and predictions. Recommendations on water supply, plant and wildlife choices will be developed based on specific studies on the shallow saline groundwater aquifer, saline-sodic soil, irrigation water quality, plant suitability and wildlife habitats.
2. **California Department of Water Resources (CA-DWR)**: **Upper F*resno River Watershed Assessment Project.*** *2008-2010* ($187,366). Principal Investigators: Z. Wang (hydrologist) and S. Blumenshine (ecologist). Collaborators: Madera County and Central Sierra Watershed Committee. Major objectives are to develop GIS-based nutrient loading and vegetation distribution models that are capable of analyzing the fate and transport of nutrients and invasive plants in the Fresno River watershed. Using the data collected by the team, chart and quantify the septic systems, roads, water quality and species distribution within the watershed, identify watershed land use patterns associated with high nutrient loads and invasive weeds, and finally create a GIS-based geodatabase information system (web server) to help identify areas where nutrient input are highest, sources of point or non-point nature, and measures for watershed restoration.
3. **CA-DWR**: **Upper San Joaquin *River Watershed Assessment Project***. *2008-2010* ($94,778). Principal Investigator: John Suen (hydrgeologist), Co-PIs: Z. Wang (hydrologist) and S. Blumenshine (ecologist). Collaborators: Sierra Resources Conservation District and Central Sierra Watershed Committee. Major objectives are to conduct a comprehensive assessment of the watershed in the following areas: Evaluation of water quantity and quality concerning the Sierra Navada snow packs,

streams, lakes and groundwater; Climate change effects on the snow packs and the entire ecosystems; Impacts of regional air pollution on water quality and vegetation in the watershed; Status of hydrogeology, topography, soils and other physical aspects; Status of forest, aquatic habitats, biodiversity, invasive species and groundwater dependent ecosystems; Elements of hydrologic cycle including precipitation, evapotranspiration, groundwater recharge and infiltration; and Policy and management issues pertinent to the long-term sustainability and environmental conservation of the watershed.

Recently Funded Research Projects

4. **US National Science Foundation (NSF): "Geoscience Mentoring, Education, Training, Research and Outreach (METRO) Center at CSU Fresno."** NSF OEDG (Opportunities for Enhancing Diversity in the Geosciences) program. PI: Alam Hassan; Collaborators: Zhi Wang et al. **Funded** for **$1.4 millions** to set up the METRO Center at CSU Fresno.
5. **NSF: Acquisition of an X-ray Diffraction Instrument.** 2004-2005. Total funding $148,421, PI: Keith Putirka, Co-PI: Z Wang. The range of research projects include: 1) issues in regional geology, volcanology and metamorphic petrology, 2) the identification of asbestiform minerals related to construction projects, 3) igneous barometery and the refinement of unit cell parameters of clinopyroxenes, 4) study of soil mechanics and soil contamination through the analysis of clay minerals and gypsum mineral fractions in agricultural soils, 5) problems in groundwater flow, and the relationship between mineralogy and clay fraction on flow-rates and mode of water transport through soils, and 6) the analysis of dust particles produced from dairy operations, recognized as a significant health hazard in regard to air quality.
6. **California EPA**: **Fresno River-Hensley Lake Water Quality Monitoring.** 2003-04. Total funding $134,600. Principal Investigator: Z Wang and S. Blunmenshire. The main tasks include: Sampling and monitoring of water discharge, water quality (physical, nutrients, algae) and disease-causing bacteria concentrations along the main Fresno River, its 7 tributaries and the Hensley Lake with a total of 24 monitory sites.

Research Proposals and Funding History

7. **NSF: Resilience in an urban socioecological system: water management as a driver of landscape and biodiversity in Fresno-Clovis, California.** Submitted on July 7, 2009 to NSF ULTRA program. PIs: Madhusudan Katti et al.; Participants: Zhi Wang et al. The requested total budget was $299,232, **pending** for review and decision.
8. **CSUF-ARI (Agricultural Research Initiative): The Impact of Climate Change and Air Quality on Central San Joaquin Valley Agriculture** (Pre-proposal). Submitted on September 8, 2009. PI. Donald Hunsaker; Co-PIs: Fraka Humsen, Alam Hassan; Collaborators: Charles Krauter, Zhi Wang. The requested total funding was $450,000, **pending** for review and decision.
9. PI, **Measurement and Modeling of Unstable Flow in Soils**, NSF 2008, not funded. Collaborators: Ming Xiao (CSUF), Jiri Simunek (UC Riverside) and Atac Tuli (UC Davis).
10. PI, **Development of Sequentially Activated Micro-Flood Irrigation Systems to Reduce Agricultural Runoff**. CSU ARI, 2007-08, not funded (collaborating with CIT–Center of Irrigation Technology at CSU Fresno). We propose to develop and implement a Sequentially Activated Micro–Flood Irrigation System (SAMFIS) in which a low cost Sequential Irrigation Valve will be used as the critical water-flow control device. The new concept of surface irrigation technology will result in a scientifically designed and technically programmed system that can be achieved without changing the existing field layouts and without arbitrary human intervention.
11. PI, **Water and Nitrogen Management in Surface Irrigated Crop Production Systems in San Joaquin Valley**. California DWR – Water Use Efficiency Program. 2007-08, not funded. This project seeks to develop new design and management approaches and guidelines for improving

the efficiencies of Irrigation and ferti-gation in San Joaquin Valley. A training program will be developed to teach and demonstrate effectiveness of using surface irrigation models to improve water use efficiencies. Application guidelines will be developed for field water and fertilizer management.

12. Co-PI, **Establishing a Water Coalition Support Center in CA's Central Valley**. USDA 2004-07, $1.2 million, not funded (Co-PIs: D. Wichelns and K. Longley). The goal is to establish a Water Coalition Support Center that will provide technical, scientific, and policy expertise required to support efforts to improve water quality under the Conditional Waiver Program.
13. PI, **Internal Grant from CSU Fresno: Assessment Proposal Funding Award**. Office of Institutional Research, Assessment and Planning ($5,000. Co-PI: Robert Dundas). This project was designed to conduct a comprehensive test on the prerequisite courses before students begin the field course (Geology 107- Advanced Field Methods, 3 units, 9 lab hours). This assessment will permit us to evaluate student preparedness for the culminating experience course and to identify areas where the Department could improve the curriculum and note areas where we are doing well.
14. PI, **Internal Grants from College of Science and Mathematics at CSUF**. Faculty Performance Award ($6,000) - 2003-2007; Faculty Research Equipment Awards ($66,686) including ***Hydrology and Environmental Science Lab Setup***: EasyChem Analyzer ($45,000), 2005-06, Dewpoint Water potentiometer-WP4-T ($7,242.29), 2004-05, Data acquisition system ($5,641), 2003-04, Portable TDR for measuring soil water content ($8,803), 2002-03; College Minigrants: Education-Assisted Measurement and Modeling of Watersheds and Groundwater ($2,500), 2005-06, Measurement and modeling of stormwater and contaminant flow ($2,500), 2004-05, Light transmission investigation of water and contaminant movement in soils ($2,500), 2003-04; College Scholarly and Creative Activity Award (24 WTUs), 2002-06; College Instructional Equipment award - ***GIS Lab upgrade***: 14 computers, one scanner and one plotter (~$40,000) 2004-05, 12 computers and monitors ($7,216) 2003-04; New Faculty Start-up fund ($20,000), 2002-03.
15. Co-PI, **Prediction of DNAPL Fate in Heterogeneous Aquifers Under Uncertainty**. (pending, collaborating with Los Alamos National Lab, UC Riverside and Colorado State University). DOE Environmental Management Program, 2004-06 (not funded). Develop an improved predictive capability of DNAPL fate in heterogeneous aquifers with uncertainties; Based on a systematic analysis of the microscale physics using the Lattice Boltzmann method. The small-scale dynamics will be integrated into macroscale descriptions using stochastic theory. Incorporate stochastic analysis into the linear instability criteria developed by Wang et al. [1998] for the description of finger flow formation, propagation, and persistence in heterogeneous media. The end product will be used to evaluate the performance of various remediation techniques employed at DOE sites.
16. Post-doc Soil Physicist, Characterization of **Preferential flow in spatially variable unsaturated field soils** (PI: Dr. William A. Jury). BARD, The United States – Israel Binational Agricultural Research and Development Fund, 1998-2001. Dye tracing and multiple tracer experiments on undisturbed field plots to reveal information about the flow velocity, spatial prevalence, and time evolution of a preferential flow event. Numerical experiments to determine whether preferential flow observations are consistent with Richards' equation. Develop a flow model that incorporates preferential flow.
17. Post-doc Soil Physicist, **Sustainability of Long-term Reclaimed Wastewater Irrigated Cropland - A Field Evaluation of Soil Quality** (PI: Dr. Andrew Chang). The Kearney Foundation of Soil Science, 1998-2000. Field study for the effects of long term wastewater irrigation on soil's ability to sustain plant growth and to attenuate pollutants. Geostatistical analyses of soil physical, chemical and biological attributes to characterize soil qualities at two

field sites outside the City of Bakersfield, CA. Development of integrated indicators of soil quality for assessment of soil and environmental degradation.

18. PI. **Dynamic Simulation of Liquid-Air Displacement and Preferential Flow in Porous Media**. Doctoral Full Scholarship and Research Fund, Bf720K/year, University of Leuven, Belgium, 1993-97. Experimental measurement and theoretical analyses of inter-displacement behaviors between air and an infiltrating liquid in unsaturated porous media; derivation of infiltration equations accounting for air entrapment effects; experimental study and theoretical prediction of unstable preferential flow in porous media.
19. PI. **Experimental and Numerical Simulation of Level Basin Irrigation Systems**, National Natural Science Foundation of China (NSFC 59209099), RMB¥50K, 1993-95. Theoretical and experimental study for the effect of air entrapment on water infiltration; Numerical modeling of the overland flow and subsurface infiltration hydraulics; optimization of system design variables based on soil and flow properties.
20. Co-PI. **Optimum Control of Flow in Irrigation Canal Systems** (PI: Dr. F. Zhu). Education Research Fund, Chinese Education Commission, RMB¥40K, 1990-92. Optimization of canal system operation and control regimes; Beneficial use of hyper-concentrated turbid flow; Development of a 0-1 programming model for optimal control of flow in irrigation canals.
21. Co-PI, **Water Control and Measurement Structures for Sediment-laden Flow** (PI: Dr. F. Zhu). Hydraulic Science Foundation, Water Resources Department of China, RMB¥30K, 1985-89. Development of Venturi type flowmeters and Flumes for discharge measurement in Trapezoidal and U-shaped open canals transporting sediment-laden flow.
22. Co-PI, **Utilization and Transportation of Hyper-concentrated Turbid Flow** (PI: Dr. F. Zhu). Hydraulic Science Foundation, Water Resources Department of China, RMB¥30K, 1986-89. Monitoring and prediction of floods in watersheds; Measurement of flow rate, sediment concentration and particle distribution; Transportation of turbid flow through canals; Fluid dynamics of turbid flow in canals and groundwater recharging fields.

Dr. William F. Wright

William F. Wright
Associate Professor of Civil Engineering
California State University, Fresno
Engineering East m/s 94, 2320 E. San Ramon, Fresno, CA 93740-8030
Work: (559) 278-5591; Fax: (559) 278-7002

EDUCATION

Ph.D., Civil & Environmental Engineering, University of California, Davis, 2000

Dissertation: Characterization & optimization of vapor-phase biofilter transient loading response

M.S., Civil & Environmental Engineering, University of California, Davis, 1995

B.S., Civil Engineering, University of California, Berkeley, 1986

A.S., Chemistry, Yuba Community College, Marysville, California, June 1982.

EMPLOYMENT HISTORY

California State University Fresno: Associate Professor of Civil Engineering (2006-present)
Assistant Professor of Civil Engineering (2000-2006)
Lecturer of Civil Engineering (1999-2000)

Responsibilities: Teaching, advising, supervision, coordination, research, & university service:

- Coordinator: · Graduate Program --Master of Science in Civil Engineering (Fall 2009 – present)
  · ENGR 11 Engineering Applications course for high school juniors & seniors (2003-06)
- Courses: Civil Engineering Hydraulics (lecture & lab); Water Resources Engineering (lecture & design lab); Environmental Engineering (lecture & lab); Design of Water Quality Control Processes (lecture & design lab); Advanced Water Quality (graduate level course, two semester sequence); Project Design/Civil Engineering Practice; Introduction to Civil Engineering; & Critical Reasoning.
- Advising: Senior Projects, Internship in Civil Engineering (ASCE Student Chapter) Independent Study (graduate & undergraduate); Master's projects & theses.
- Supervision: Graduate and undergraduate student research assistants & a teaching assistant.
- Research: *Detailed on subsequent pages*
- Service: · Chair, Lyles College of Engineering (LCOE) Consultative Body (Fall 2009- present)
  · Chair, LCOE Research and Scholarly Activities committee
  · *Other service is detailed on subsequent pages.*

University of California, Davis, Graduate Teaching & Research Assistant (1991-1999): Teaching undergraduate students; research; supervising undergraduate research assistants.

Cal-Trans/U.C. Davis, CA, Engineering Assistant (Summer 1996): Storm water quality data analysis project.

ECO:LOGIC, Roseville, CA, Engineering Assistant (Summer 1994): Wastewater treatment facilities plan update project for Clearlake Oaks, CA.

Black & Veatch Consulting Engineers, Los Angeles, CA, Staff Civil Engineer (1986-91): Modernization and expansion of the Hyperion Wastewater Treatment Plant for the City of Los Angeles, CA.

University of California, Berkeley, Undergraduate Research Assistant (1984-1986): Research.

Cal-Trans, San Francisco, CA, Engineering Assistant (Summer 1984): Highway design projects.

Yuba Community College, Marysville, CA, Tutor for math and physics (1982-83).

Mt. Konocti Growers, Inc., Kelseyville, CA, Foreman (Summers, 1982-83): 18-person "set-off" line crew.

REGISTRATION & CERTIFICATION

Registered Civil Engineer, State of California, License No. 46361.

Certified Master Modeler using WaterCAD for water distribution systems

COURSES & ASSIGNED TIME

Spring 2011

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180B Senior Project (Supervision, 2.5 students)
CE 190 Independent Study (Supervision, 1 undergraduate senior student taking CE 246B)
CE 246B Advanced Water Quality (Lecture)

Assigned Time: MSCE Graduate Program Coordination & Assessment (2.00 WTUs)

Fall 2010

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 01)
CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 03)
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 180B Senior Project (Supervision, 4 students)
CE 190 Independent Study (Supervision, 1 student)
CE 290 Independent Study (Supervision, 1 student)

Assigned Time: MSCE Graduate Program Coordination & Assessment (2.67 WTUs)

Spring 2010

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180B Senior Project (Supervision, 6 students)
CE 190 Independent Study (Supervision, 2 undergraduate senior students taking CE 246A)
CE 246A Advanced Water Quality (Lecture)

Fall 2009

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 01)
CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 03)
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)

CE 180B Senior Project (Supervision, 6 students)
CE 190 Independent Study (Supervision, 1 student)

Spring 2008 --> Sabbatical

Fall 2008

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 01)
CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 03)
CE 144 Design of Water Quality Control Processes (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 4 students)
CE 193 Internship in Civil Engineering (Supervision, 3 students)

Spring 2008

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 128 Civil Engineering Hydraulics (Web-Enhanced Lecture)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 4 students)
CE 193 Internship in Civil Engineering (Supervision, 1 student)

Fall 2007

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 01)
CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 03)
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 5 students)
CE 193 Internship in Civil Engineering (Supervision, 7 students)
CE 291T Research. Methods in Civil Engr. (1 of 3 faculty responsible) (Lecture & Supervision, 8 students)

Spring 2007

CE 128 Civil Engineering Hydraulics (Web-Enhanced Lecture)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 6 students)
CE 190 Independent Study (Supervision, 2 students)
CE 193 Internship in Civil Engineering (Supervision, 8 students)
CE 290 Independent Study (Supervision, 1 student)
CE 298 Project (Supervision, 2 students)

Fall 2006

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 01)
CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture) (Section 02)
CE 142 Environmental Engineering (Web-Enhanced Lecture)

CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 6 students)
CE 190 Independent Study (Supervision, 1 student)
CE 193 Internship in Civil Engineering (Supervision, 5 students)
CE 290 Independent Study (Supervision, 2 students)
CE 291T Research Methods in Civil Engineering (1 of 3 faculty responsible; Lecture & Supervision, 5 students)
ENGR 11 Engineering Applications (Coordinator + 3 Lectures)

Spring 2006

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 6 students)
CE 193 Internship in Civil Engineering (Supervision, 8 students)
CE 290 Independent Study (Supervision, 1 student)
ENGR 11 Engineering Applications (Coordinator + 3 Lectures)

Fall 2005

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 128 Civil Engineering Hydraulics (Web-Enhanced Lecture)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 5 students)
CE 190 Independent Study (Supervision, 2 students)
CE 193 Internship in Civil Engineering (Supervision, 6 students)
CE 290 Independent Study (Supervision, 1 student)
CE 298 Project (Supervision, 2 students)
ENGR 11 Engineering Applications (Coordinator + 2 Lectures)

Spring 2005

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Web-Enhanced Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 5 students)
CE 190 Independent Study (Supervision, 2 students)
CE 193 Internship in Civil Engineering (Supervision, 11 students)
CE 246B Advanced Water Quality (Lecture)
CE 290 Independent Study (Supervision, 1 student)
ENGR 11 Engineering Applications (Coordinator + 5 Lectures)

Fall 2004

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 4-students)

CE 190 Independent Study (Supervision, 1 student)
CE 193 Internship in Civil Engineering (Supervision, 5-students)
CE 246A Advanced Water Quality (Lecture)
CE 290 Independent Study (Supervision, 1 student)
ENGR 11 Engineering Applications (Coordinator + 2 Lectures)

Spring 2004

CE 85 Introduction to Civil Engineering (Web-Enhanced Lecture)
CE 129 Engineering Hydraulics Laboratory
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 5 students)
CE 193 Internship in Civil Engineering (Supervision, 5-students)
ENGR 11 Engineering Applications (Coordinator + 2 Lectures)

Fall 2003

CE 128 Civil Engineering Hydraulics (Web-Enhanced Lecture)
CE 142 Environmental Engineering (Web-Enhanced Lecture)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 1-student)
CE 193 Internship in Civil Engineering (Supervision, 8-students)
ENGR 1T Engineering Applications (Coordinator + 2 Lectures)

Spring 2003

CE 129 Engineering Hydraulics Laboratory
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 180A Project Design (Lecture & Project Coordination)
CE 180B Senior Project (Supervision, 6 students)
CE 185 Civil Engineering Practice (Lecture)
CE 193 Internship in Civil Engineering (Supervision, 6-students)
ENGR 1T Engineering Applications (Coordinator + 1 Lecture)
GME 5 Critical Reasoning (Lecture)

Fall 2002

CE 128 Civil Engineering Hydraulics (Lecture)
CE 129 Engineering Hydraulics Laboratory (Supervision of GA Instructor)
CE 142L Environmental Quality Laboratory (Supervision of GA Instructor)
CE 144 Design of Water Quality Control Processes (Lecture)
CE 144 Design of Water Quality Control Processes (Design Laboratory)
CE 180B Senior Project (Supervision, 4-students)
CE 193 Internship in Civil Engineering (Supervision, 4-students)
CE 246A Advanced Water Quality (Lecture)
CE 290 Independent Study (Supervision, 1 student)
CE 298 Project (Supervision, 4 students)
CE 299 Thesis (Supervision, 1 student)
GME 5 Critical Reasoning (Lecture)

Spring 2002

CE 128 Civil Engineering Hydraulics (Lecture)
CE 129 Engineering Hydraulics Laboratory
CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 142 Environmental Engineering (Lecture)
CE 180B Senior Project (Supervision, 3 students)
CE 290 Independent Study (Supervision, 1 student)
CE 298 Project (Supervision, 1 student)

Fall 2001

CE 128 Civil Engineering Hydraulics (Lecture)
CE 142 Environmental Engineering (Lecture)
CE 142L Environmental Quality Laboratory
CE 180B Senior Project (Supervision, 1 student)
CE 290 Independent Study (Supervision, 1 student)
CE 299 Thesis (Supervision, 1 student)

Assigned Time: 2000-01 CSU Award for Research, Scholarship, & Creative Activities (3 WTUs)

Spring 2001

CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 142L Environmental Quality Laboratory
CE 180B Senior Project (Supervision, 4 students)
CE 190 Independent Study (Supervision, 1 student)
CE 246B Advanced Water Quality (Lecture)

Assigned Time: New Preparation/ New Faculty (3 WTUs)

Fall 2000

CE 142 Environmental Engineering (Lecture)
CE 144 Design Of Water Quality Control Processes (Lecture)
CE 144 Design Of Water Quality Control Processes (Design Laboratory)
CE 180B Senior Project (Supervision, 4 students)
CE 246A Advanced Water Quality (Lecture)

Assigned Time: New Preparation/ New Faculty (3 WTUs)

Spring 2000

CE 141 Water Resources Engineering (Lecture)
CE 141 Water Resources Engineering (Design Laboratory)
CE 142 Environmental Engineering (Lecture)
CE 142L Environmental Quality Laboratory
CE 180B Senior Project (Supervision, 3 students)

Assigned Time: New Preparation/ New Faculty (3 WTUs)

Fall 1999

CE 142 Environmental Engineering (Lecture)
CE 142L Environmental Quality Laboratory

CE 144 Design Of Water Quality Control Processes (Lecture)
CE 144 Design Of Water Quality Control Processes (Design Laboratory)
CE 180B Senior Project (Supervision, 2 students)
CE 246A Advanced Water Quality (Lecture)

Assigned Time: New Preparation/ New Faculty (3 WTUs)

PROFESSIONAL SOCIETY MEMBERSHIP

American Society of Civil Engineers (Fresno Branch; Director of Student Club Activities)
Water Environment Federation (member)

PUBLICATIONS

Journal Articles (Refereed)

Chung, J., Rittmann, B.E., **Wright, W.F**., and Bowman, R.H. (2007) "Simultaneous Bio-reduction of Nitrate, Perchlorate, Selenate, Chromate, Arsenate, and Dibromochloropropane Using a Hydrogen-Based Membrane Biofilm Reactor," *Biodegradation*, 18:199–209.

Wright, W.F. (2005) "Transient Response of Vapor-Phase Biofilters." *Chemical Engineering Journal*, 113: 161-173.

Wright, W.F., E.D. Schroeder, D.P.Y. Chang (2005) "Transient Response of Flow-Direction-Switching Vapor-Phase Biofilters." *J. Environ. Eng.*, ASCE. 131(7): 999-1009.

Wright, W.F., Schroeder, E.D., Chang, D.P.Y. (2005). "Regular Transient Loading Response in A Vapor-Phase Flow-Direction-Switching Biofilter." *J. Environ. Eng.*, ASCE 131(12): 1649-1658.

Wright, W.F., E.D. Schroeder, D.P.Y. Chang, & K. Romstad. (1997) "Performance of a Pilot-scale Compost Biofilter Treating Gasoline Vapor." *Journal of Environ. Eng.*, ASCE, 123(6): 547-555.

Conference Articles

Wright, W.F., Bowman, R.H., Chung, J., Rittmann, B.E. "Bench and pilot-scale testing of a hydrogen-based membrane biofilm reactor for economical treatment of nitrate in contaminated groundwater" *Proc. Groundwater Resources Association of California - Nitrate in California's Groundwater: Are We Making Progress?*, April 2006 (Paper distributed as a handout; Abstract published).

Rittmann, B.E., Chung, J., Wright, W.F., and Bowman, R.H. "Remediation of perchlorate and other co-contaminants using the hydrogen-based membrane biofilm reactor." *Proc. American Chemical Society Annual Conference,* Washington D.C. August 28-September 1, 2005. (platform presentation).

Wright, W.F. "Dairy manure particle size distribution, properties, and implications for manure handling and treatment" *Proc. American Society of Agricultural Engineers Annual International Meeting*, Tampa, Florida. July 17-20, 2005 (platform presentation)

Wright, W.F. "Defining manure solid-liquid separation unit efficiency" *Proc. American Society of Agricultural Engineers Annual International Meeting*, Tampa, Florida. July 17-20, 2005 (platform presentation)

Wright, W.F., Bowman, R.H., Chung, J., Rittmann, B.E. "Economical nitrate reduction for contaminated drinking water sources using hydrogen-based membrane biofilm reactor." *Proc. American Water Works Association 2005 Annual Conference*, June 2005 (platform presentation)

Wright, W.F. "Transient response of flow-direction-switching biofilters." *Proc., 2004 Conference on Biofiltration for Air Pollution Control,* University of Southern California, The USC Center for Sustainable Cities, and the Reynolds Group, Redondo Beach CA, October 19 to 22, 2004. ed. J. Devinny, 115-124. (Platform/oral presentation given)

Wright, W.F., E.D. Schroeder, & D.P.Y. Chang. "Characterization of regular transient loading response of a flow-direction-switching vapor-phase biofilter." *Proc., 1998 Conference on Biofiltration*, University of Southern California and the Reynolds Group, Tustin, CA, eds. D.S. Hodge and F.E. Reynolds, 143 - 152. (Platform presentation)

Romstad, K., J.H. Scarano, W.F. Wright, & E.D. Schroeder. "Performance of a full-scale compost biofilter treating gasoline vapor." *Proc., 1998 Conference on Biofiltration*, University of Southern California and the Reynolds Group, Tustin, CA, eds. D.S. Hodge and F.E. Reynolds, 25 - 32.

Wright, W.F., E.D. Schroeder, & D.P.Y. Chang. "Characterization of regular transient loading response of a flow-direction-switching vapor-phase biofilter." *Proc., 91st Annu. Meeting and Exhibition of the Air & Waste mgmt. Assn.,* Paper No. 98-WAA-07P, San Diego, CA. (Poster presentation)

Kinney, K.A., W.F. Wright, D.P.Y. Chang, & E.D. Schroeder. (1998) "Biodegradation of vapor-phase contaminants." Chapter in *Bioremediation: Principles and Practice*, eds. S.K. Sikdar & R.L. Irvine, Technomic Publishing Co., Inc., Lancaster, PA, 1: 601-632.

Wright, W.F., Y. Davidova, E.D. Schroeder, D.P.Y. Chang, K. Romstad, & S. Weigel. "Performance of a compost biofilter treating gasoline from a soil vapor extraction operation." *Proc., 1995 Conference on Biofiltration*, University of Southern California and the Reynolds Group, Tustin, California, eds. D.S. Hodge and F.E. Reynolds, 19-43. (Platform presentation).

Research Reports

Wright, W.F., deHaai, A., Teng, J. (2007) "Options for Removing Geosmin at the Clovis Surface Water Plant, Feasibility Report Part 1 of 3: Study Parameters and Initial Screening of Potential Treatment Processes." Draft Final submitted to the City of Clovis, CA, on July 9, 2007.

Wright, W.F., deHaai, A., Teng, J., Stratman, T., Yang, A. (2007) "Options for Removing Geosmin at the Clovis Surface Water Plant, Feasibility Report Part 2 of 3: Performance Evaluation of GAC, PAC, O_3/H_2O_2, and UV/H_2O_2" Draft Final submitted to the City of Clovis, CA, on 7/20/07

Wright, W.F., deHaai, A., Teng, A. (2007) "Options for Removing Geosmin at the Clovis Surface Water Plant, Feasibility Report Part 3 of 3: Feasibility Evaluation of the Most Promising Treatment Processes -- GAC, O_3/H_2O_2, and UV/H_2O_2." Draft Final submitted to the City of Clovis, CA, on June 29, 2007.

Wright, W.F., Stratman, T., Yang, A. (2005). "Comparison of powdered and granular adsorbent materials for removal of geosmin in the Clovis area surface water supply," Draft final report submitted to Provost & Pritchard Engineering Group for presentation to the City of Clovis.

Bowman, R., Wright, W., Rittmann, B., Chung, J (2004). "Economical Nitrate Reduction From Drinking Water Sources." Interim Progress Report for the Small Business Innovation Research Program of the

U.S. Department of Agriculture (Phase I Grant No. 2004-33610-14413). Applied Process Technology, Inc., in cooperation with Northwestern University (Dr. Bruce Rittmann) and California State University at Fresno

Wright, W.F. "Investigate the nature of dairy manure particles, their impact on treatability, treatment design, & fate of residual constituents of concern." Final project report submitted to the California Water Institute. July 31, 2004. Length: 67-pages plus attachments (data analysis).

PRESENTATIONS

Professional Technical Conference Presentations

Wright, W.F., Bowman, R.H., Chung, J., Rittmann, B.E. "Bench and pilot-scale testing of a hydrogen-based membrane biofilm reactor for economical treatment of nitrate in contaminated groundwater" *Proc. Groundwater Resources Association of California - Nitrate in California's Groundwater: Are We Making Progress?*, April 2006 (Poster presentation).

Wright, W.F. "Dairy manure particle size distribution, properties, and implications for manure handling and treatment" *Proc. American Society of Agricultural Engineers Annual International Meeting*, Tampa, Florida. July 17-20, 2005 (platform presentation)

Wright, W.F. "Defining manure solid-liquid separation unit efficiency" *Proc. American Society of Agricultural Engineers Annual International Meeting*, Tampa, Florida. July 17-20, 2005 (platform presentation)

Wright, W.F., Bowman, R.H., Chung, J., Rittmann, B.E. (2005) "Economical nitrate reduction for contaminated drinking water sources using hydrogen-based membrane biofilm reactor." *Proc. American Water Works Association 2005 Annual Conference*, June 2005 (platform presentation)

Wright, W.F. "Transient response of flow-direction-switching biofilters." *2004 Conference on Biofiltration for Air Pollution Control,* University of Southern California, The USC Center for Sustainable Cities, and the Reynolds Group, Redondo Beach CA, October 19 to 22, 2004. ed. J. Devinny, 115-124. (Platform/oral presentation given)

Other Symposium and Meeting Presentations

Garcia, S., Wright, W.F. "Viability of Grundfos Biobooster Pressurized Biofilm Reactor for Treating Fruit Processing Wastewater" Blue Tech Valley Water Conference, Clovis, CA, May 3 & 4, 2011 (Poster presentation).

Wright, W.F. Presented to the Mathematics Engineering Science Achievement (MESA) Schools Program at CSU Fresno for the MESA Saturday Academy on the topic of Environmental Engineering. Attendance was greater than 100 students (Oct. 23, 2010).

Wright, W.F. (Co-presenter) "NSF Engineering Research Center for Smart Water Systems," International Center for Water Technology (ICWT), Fresno, CA, January 12, 2010.

Annual Central California Research Symposium at CSU Fresno (Platform presentations; abstracts published).

"Screening of Methods for Removing Geosmin at a Municipal Water Plant in California's Central Valley." April 6, 2011

"Bench and pilot-scale testing of a hydrogen-based membrane biofilm reactor for reduction of nitrate in contaminated groundwater." April 21, 2005, Pg. 70

"Characterization of regular transient loading response in a vapor-phase flow-direction-switching biofilter," April 22, 2004

"Regular Flow-Direction-Switching Increased Elimination Capacity In A Vapor-Phase Biofilter During Transient Loading Events," April 17, 2003.

Wright, W.F. "Investigate the nature of dairy manure particles, their impact on treatability, treatment design, and fate of residual constituents of concern," California Water Institute, CSU Fresno, February 14, 2003 (Invited).

Wright, W.F. Visited Clovis East High School & spoke to students in advanced placement biology, math, and physics classes for 20-minutes each about our civil engineering program, other engineering majors, & a new Environmental Science program on campus (February 25, 2003).

Wright, W.F. Presented to ASCE student body on the annual ASCE Environmental Engineering competition. Attendance was approximately 60 people (September 26, 2001).

Wright, W.F. Prepared a 30-minute presentation for the Mathematics, Engineering, Science Achievement Program "Shadow Days" (March 29, 2001).

Wright, W.F., Larralde, J., El-Zeiny, A. Co-presented to Cal-Trans employees the CSUF Masters in Civil Engineering Program at their facility on. Attendance was approximately 100 people (November 8, 2000).

Wright, W.F. delivers a four-hour lecture on chemistry at the Fundamentals of Engineering Workshop (once or twice each year).

Wright, W.F. Discussed how to succeed in a 4-year university engineering program to students at Yuba Community College, CA (twice in mid 1980's).

Wright, W.F. Encourages high School Students to consider engineering as a career in Yuba City, CA (mid 1980's).

RESEARCH

0Proposals (Grants) Funded:

CSU Fresno, Undergraduate Student Research. "Providing Wastewater Treatment for Small, Rural Disadvantaged Communities," 6/10 to 5/11 ($1,000 student funding). *P.I. William Wright.*

CSU Fresno, Graduate Student Research Grant Awards. "Providing Safe Drinking Water for Small Rural Economically Disadvantaged Communities," 8/10 to 6/12 ($2,000 student funding). *P.I. William Wright.*

2007-08 CSU Awards For Research, Scholarships, & Creative Activities on the subject " Origins and Management of Odiferous Micropollutants in Potable and Non-Potable Domestic Water Supplies," funded for summer 2009 ($5,000). *P.I.*

Los Angeles County Sanitation Districts. "Monitoring, Sampling, and Testing at the L.A. County JWPCP Composting Research Facility," funded from 10/05 to 10/06 ($19,796). *P.I.*

Subcontract with Provost & Pritchard Engineering Group on a grant from the city of Clovis, CA on the subject "City of Clovis Surface Water Treatment Plant Taste and Odor Study," funded from 7/05 to 6/06 ($38,092). *Subcontract P.I.*

Los Angeles County Sanitation Districts. “Monitoring, Sampling, and Testing at the L.A. County JWPCP Composting Research Facility,” funded from 10/04 to 9/05 ($12,220). *P.I.*

Subcontract with Applied Process Technology, Inc. on a grant from the U.S. Department of Agriculture, Small Business Innovation Research Program (SBIR) Phase I on the subject "Economical Nitrate Reduction From Drinking Water Sources," funded from 5/04 to 10/04 ($7,000). *Subcontract P.I.*

2003-04 CSU Awards For Research, Scholarships, & Creative Activities on the subject "Reduction of livestock-generated air pollution using biofiltration technology," funded from 7/04 to 6/05 ($5,000). *P.I.*

California Water Institute "Investigate the Nature of Dairy Manure Particles, Their Impact on Treatability, Treatment Design, and Fate of Residual Constituents of Concern," funded from 7/02 to 6/03 ($10,000). *P.I.*

2000-01 CSU Awards For Research, Scholarships, & Creative Activities on the subject "Characterization of dairy operation manure stream particle size distribution and volatile solid fraction," funded from 7/02 to 6/03 ($5,000). *P.I.*

Proposals (Grants) Pending:

California State University Fresno, Lyles College of Engineering. “Creation of Water-Related Teaching and Research Laboratory Infrastructure in the LCOE,” submitted 2/1/2011 (Proposal total: $233,300; Request from LCOE: $139,800; remaining $93,500 from donations, Lyles Gift Match, & Other funding sources). *P.I. William Wright.* ***Pending***

Research Experience:

Research at CSU Fresno, 1/09 - present. Origins and Management of Odiferous Micropollutants in Reclaimed Domestic Wastewater.

Research at CSU Fresno, 7/05 - present. Management options to control the taste and odor-causing compound in the City of Clovis drinking water supply.

Research at CSU Fresno, 6/04 – 8-05. Biological treatment of nitrate in groundwater using hollow-fiber membrane biofilm reactor technology (collaborative effort with northwestern University and Applied Process Technology, Inc.).

Research at CSU Fresno, 7/04 - present. Reduction of livestock-generated air pollution using biofiltration technology.

Research at CSU Fresno, 8/01 – 8/04. Analysis of dairy manure particle size and composition for evaluation of treatment and nutrient control; Biological treatment of groundwater for nitrate removal.

Doctoral Research, U.C. Davis, 1/97 - 7/99. Laboratory-scale biofiltration system investigating transient loading response characteristics and performance optimization.

Supervision of Research Assistants, U.C. Davis, 4/97 - 8/98. Design and construction of a laboratory-scale biofiltration system for investigating transient loading response characteristics.

Post-Masters Research, U.C. Davis, 9/94 - 4/96. Pilot-scale biofiltration system treating petroleum vapor at a soil-vapor-extraction operation.

Masters Research, U.C. Davis, 7/92 - 4/94. Prototype-scale biological expanded-bed reactor system treating fuel-tank rinsates.

Undergraduate Research Assistant, U.C. Berkeley, 6/85 - 12/85 & 3/86 - 5/86. Laboratory-scale enhanced primary treatment system (flocculation/aeration/clarification) treating domestic wastewater.

GRADUATE THESIS AND PROJECT ADVISING & SUPERVISION

Master's Theses and Projects Advising

"The study of land tenure system in India in contrast with the United States." Kulwinder Sharma, Thesis, Spring 2011 (Thesis Committee)

"Investigation of swelling soil associated with mineralized groundwater near Bakersfield, CA" Bruce Myers, Project, Spring 2010 (Project Advisor)

"Optimization of infiltration rates at Leaky Acres, Fresno, CA" Bret Swain, Project, Summer 2008 (Project Advisor)

"Geosmin Production in the Clovis Water Supply and Possible Control Measures (Project completed in Fall 2007)" Gretchen Weston, Project for Fall 2007 (Advisor)

"A toolbox of computation methods for the problem of double proportion corner restoration in the United States Public Land system." Martin Paquette, Thesis, May 2007 (Thesis Committee member)

"Taste and odor control in City of Clovis water supply" An-Chi Yang, Project, Fall 2005 (Project Advisor)

"Fate of wastewater nitrates and total dissolved solids with variable land application rates." Jojo Butlig, Thesis, Spring 2003 (Thesis Committee Chair)

"Salt accumulation in a sub-basin of the Tulare Lake Basin." Jarma Bennett, Thesis in progress.

"An economic analysis of detention basin practicability for treatment of highway runoff in California." Fernando Morales, Project, Summer 2003 (Project Advisor)

"Temporal and vertical spatial profiling of land treatment units using suction lysimeters." Jon Risinger, Project, Fall 2002 (Project Advisor)

"Develop a nitrogen budget model for Fresno state dairy manure waste stream." Renald Harris, Project, Fall 2002 (Project Advisor)

"Salinity control at Exeter, California" Christie Sandoval," Project, Fall 2002 (Project Advisor)

Supervision of Graduate Assistant Instructor

Supervised graduate student Jon Risinger as he taught CE 129 Civil Engineering Hydraulics and CE 142L Environmental Quality Laboratory during the Fall 2002 semester.

WORKSHOPS, MENTORING, TECHNICAL ADVISING & TUTORING SERVICE

Senior Project Advising: Serve as faculty technical advisor to students in the Civil Engineering program who are designing components of civil engineering projects in their Senior Project course. Activities include weekly one-on-one technical advising and periodic evaluation of group presentations and design reports. The time commitment is approximately 30 hours/ semester (2000 - present).

Led a Civil Engineering workshop on Environmental Engineering for the U.C. Davis Summer Residency Program (1995).

Mentored U.C. Berkeley Civil Engineering students Jason Chen (1992) and Rebecca Kassawara (1993) for the U.C. Berkeley Engineering Alumni Society Mentoring Program.

Tutored Yuba Community College students in the subjects of math and physics (1982-83).

COMMITTEES & SERVICE AT CSU FRESNO

Program:

Faculty Advisor for Tau Beta Pi National Engineering Honor Society (Fall 2006 - present)

Faculty Advisor for the Student Chapter of the American Society of Civil Engineering (Fall 2001-Fall 2006)

Department:

Graduate Program Coordinator & Assessor --Master of Science in Civil Engineering (Fall 2009 – present)

Graduate Committee (member, 9/00 to present)

College:

Academic Affairs Committee (AY 2000-01 through spring 2005)

Faculty Grievance Committee (member, Fall 2007 to present)

Research Committee (AY 2000-01 through present; **Chair** Fall 2005 - present)

Sabbatical Leave Faculty committee –Dr. Kriehn's proposal (Fall 2009)

Faculty Consultative Body (**Chair**, Fall 2009 to present)

University:

Academic Senate (member, 2/05 to 8/05; Substituted for Dr. Larralde for his sabbatical)

Graduate Curriculum Subcommittee (member, 9/17/02 to 2/07)

Western Athletic Conference Academic Alliance Conference organizing board (one of two liaison from CSU Fresno, Spring 2005)

Ad-Hoc Committee on UC Riverside-CSU Fresno Joint Degree Program in Environmental Science (member, 1/03 to present)

Ad-Hoc Committee on Interdisciplinary Technology Programs (Secretary, 4/02 to 9/02)

Faculty Search Committees:

Civil Engineering:

Lecturer position in Civil Engineering (2004-05)

Tenure-track position in Civil Engineering (2005-06)

Tenure-track position in Civil Engineering (2006-07)

Tenured program coordinator position in Construction Management (2006-07)

Tenure-track position in Construction Management (2006-07)

Tenure-track position in Civil Engineering (2007-08)

Tenure-track position in Civil Engineering (2009-10)

Geomatics Engineering:

Tenure-track position in Geomatics Engineering (2005-06)

Construction Management:

Tenured program coordinator position in Construction Management (2005-06)

Tenure-track position in Construction Management (2005-06)

Tenure-Track Faculty Mentoring & Retention, Tenure, & Promotion (RTP) Committees:

Civil Engineering:

Assist. Prof. of Civil Engineering Ching Chiaw Choo (**Chair,** Ment. & RTP Review, Fall 2007 – present)

Assist. Prof. of Civil Engineering Thomas Attard (**Chair,** RTP Review, Fall 2008)

Assist. Prof. of Civil Engineering Lubo Liu (**Chair,** Ment. & RTP Review, Fall 2008 - present)

Assist. Prof. of Civil Engineering Ming Xiao (**Chair,** RTP Review, Fall 2009)

Assist. Prof. of Civil Engineering Fairiborz Tehrani (member, RTP Review, Fall 2009)

Geomatics Engineering:

Assist. Prof. of Geomatics Engr. Clement A. Ogaja (**Chair,** Ment.& RTP Review, Fall 2007 – present)

Mechanical Engineering:

Assist. Prof. Maria Sanchez of Mechanical Engineering (member, RTP Review, Fall 2005 - present)

Assist. Prof. Rahul Rai of Mechanical Engineering (member, RTP Review, Fall 2008 - present)

Assist. Prof. Gemunu Happawana of Mechanical Engineering (member, RTP Review, Fall 2008 - present)

Assist. Prof. Ira Sorensen of Mechanical Engineering (member, RTP Review, Fall 2008 - present)

Electrical and Computer Engineering:

Assist. Prof. Gregory Kriehn of Electrical Engineering (member, RTP Review, Fall 2004 - Fall 2008)

Assoc. Prof. Reza Raeisi of Electrical Engineering (member, RTP Review, Fall 2007 - Fall 2008)

Assist. Prof. Chulho Won of Electrical Engineering (member, RTP Review, Fall 2007 - Fall 2008)

Assist. Prof. Young Wook Kim of Electrical Engineering (member, RTP Review, Fall 2008)

Construction Management:

Assist. Prof. of Construct. Management Jason Charalambides (**Chair,** RTP Review, Fall 2008)

Assist. Prof. of Construct. Management Vivien Luo (**Chair,** Ment. & RTP Review, Fall 2008 - present)

Assist. Prof. of Construct. Management Brad Hyatt (**Chair,** Ment. & RTP Review, Fall 2009 – Spring 2009)

Assist. Prof. of Construct. Management Lloyd Crask (**Chair,** Ment. & RTP Review, Fall 2009–Spring 2009)

HONORS AND AWARDS

Certificate of Recognition awarded by the Provost and Dean of the College of Engineering at the CSU Fresno Faculty Convocation, August 21, 2006.

Letter of Appreciation for laying the groundwork for a new student club at the new U.C. Merced campus. Letter from Carol Tomlinson-Keasey, Chancellor, and Jane Lawrence, Vice-Chancellor, U.C. Merced, October 14, 2005.

Plaque of Appreciation for "hard work and dedication to the Fresno Branch of ASCE." Presented by the American Society of Civil Engineers, Fresno Branch, September 23, 2004.

Plaque of Appreciation for "moral integrity and responsibility to ASCE club students." Presented by the Student Chapter of the American Society of Civil Engineers, November 13, 2003.

Certificate of Recognition for "outstanding service as Director and Member of the Fresno Branch." Presented by the American Society of Civil Engineers, Fresno Branch, September 22, 2003.

Plaque of Appreciation for "dedication and leadership skills regarding student affairs." Presented by the Student Chapter of the American Society of Civil Engineers, November 22, 2002.

Recipient of the GAANN Fellowship, U.C. Davis, 1992, 93, 96, & 98.

Recipient of the University Fellowship, U.C. Davis, 1995.

Guest Speaker, Yuba City High School physics classes, 1995.

Guest Speaker, Yuba Community College engineering classes (twice in the late 1980's).

Student Guest Speaker, U.C. Berkeley College of Engineering Community College Day, 85-86.

Recipient of the Femineers Scholarship, U.C. Berkeley, Spring 1986.

Recipient of the Eugene Sembler Memorial Award, U.C. Berkeley, Spring 1985.

Chi Epsilon (Civil Engineering Honor Society), 1985.

Tau Beta Pi (National Engineering Honor Society), 1985.

Second Place, Yuba Community College Mousetrap Powered Car Contest, 1984.

PROFESSIONAL SERVICE

Journal Articles Reviewed

"The Effect of Feeding Patterns on the Performance of Activated Sludge Systems" for Editor Dr. Say Leong Ong for *Water Environment Research* (October 10, 2010).

"Evaluation of On-site Wastewater Disposal Systems in Mississippi Coastal Areas" for Editor Dr. Rao Surampalli for *Environmental Engineering Science* (July 10, 2010).

"Effect of CO_2 on Oxidation of 1,2-Dichloroethane by Xanthobacter autotrophicus GJ10" for Editor Dawn Densmore for *Environmental Engineering Science* (revised manuscript, June 2009).

"Effect of CO_2 on Oxidation of 1,2-Dichloroethane by Xanthobacter autotrophicus GJ10" for Editor Dawn Densmore for *Environmental Engineering Science* (first manuscript, Feb. 2009).

"Periodic Operation of Biofilters: Simulation and Experimental Results" for Editor Prof. Dr. Želimir Kurtanjek for the *Chemical and Biochemical Engineering Quarterly* (April/May 2007).

"Long-term performance of peat biofilters treating ethyl acetate, toluene, and its mixture in air" for Editor Prof. James D. Bryers for *Biotechnology & Bioengineering* (June/July 2006).

"Removal of p-xylene from an air stream in a hybrid biofilter" for Editor Merv Fingas for the *Journal of Hazardous Materials* (September 2005).

"Recent developments in biological waste gas purification in Europe" for Editor Dan Chang for the *Chemical Engineering Journal* (December 2004).

Reviewed article on biofiltration for Editor Robert G. Arnold of the *Journal of Environmental Engineering* (May 1996).

California State Agricultural Initiative (Spring 2008) on a subject related to the production of biofuel from wastewater (exact title not given to remain anonymous) (No fee)

California State Agricultural Initiative (Spring 2005) on a subject related to microbial detoxification of hazardous materials (title not given to remain anonymous) (No fee)

California State Agricultural Initiative (Spring 2005) on a subject related to measuring particulate air pollution from dairies (title not given to remain anonymous) (No fee)

San Diego State University Foundation, California Energy Commission, Energy Innovations Small Grant Program (6/26/03) "Hydrogen from cheese whey for direct fuel cell use for distributed energy." (second review) ($100)

California State Agricultural Initiative (Spring 2003) on a subject related to wastewater application to land (title not given to remain anonymous) (No fee)

San Diego State University Foundation, California Energy Commission, Energy Innovations Small Grant Program (11/19/02) "Hydrogen from cheese whey for direct fuel cell use for distributed energy." (second review) ($100)

Press Releases and Media Interviews

Press releases about the ENGR 11 program were provided to the Fresno Bee and published on 11/7/05, 6/1/05, 5/6/05, 4/24/04, 3/4/04, 3/4/04, 12/25/03, 11/23/03, 4/4/06, and 5/28/06.

Spoke with Fresno Bee reporter Jim Steinberg about the large demand for civil engineering graduates at Quad Knopf and other engineering firms. The story appeared in the Fresno Bee on June 10, 2005.

Press releases about the ENGR 11 program were provided to home school associations and published on May 2004 and October 2003.

Organized a meeting with engineering faculty and Fresno Bee reporter Jim Steinberg to discuss the need for more engineering graduates on 5/15/03 and the story appeared in the Fresno Bee on 6/1/03.

Other Professional Service

Director of student club activities for the American Society of Civil Engineers local professional branch and as ASCE student club faculty advisor. Programs include annual joint dinners, annual regional competition with other universities for concrete canoe and bridge competition, community service projects such as Engineers at the Mall, etc... (Fall 2001 to Fall 2006)

Coordinator of the ENGR 11 Engineering Applications course that introduces high school juniors and seniors to various areas of engineering and related disciplines (sixteen lectures and hands-on laboratory projects per semester led by college faculty and their assistants). (Spring 2003 to Fall 2006)

Engineer in Training Workshop, 4-hour lecture on chemistry, once or twice per year.

Xiaoming Yang, Ph.D.
Senior Analyst, Geospatial Information Center
California State University, Fresno
Geospatial Information Center
5200 N Barton Ave M/S 34 Phone: 559-278-8457
Fresno, California 93740 Email: xmyang@csufresno.edu

(1) Education

Ph.D. Geographic Information System and Forest Resource Management; State University
of New York, College of Environmental Science and Forestry, Syracuse, NY 1990 – 1994
MS Quantitative and statistical methods for forest resource management; State University of New York, College of Environmental Science and Forestry; Syracuse, NY 1986 – 1989
BS Forestry; Beijing Forestry University, Beijing, China 1978 – 1982

(2) Professional Experience

Senior Analyst Geospatial Information Center, California State University Fresno. April 2010 – present

- Supervises spatial analysis, photogrammetry and remote sensing projects; Data manager for spatial and non-spatial data for a NSF grant; development of two online GIS certificate classes; GIS web application development for the SJ river restoration project; GIS data development and analysis for The San Joaquin Valley Water Plan project.

Senior Analyst Interdisciplinary Spatial Information Systems Center, California State University Fresno. Feb. 2001 – March 2010

- Supervises 100+ spatial analysis, photogrammetry and remote sensing projects; manages The City of Reedley parcel digitization project, The San Joaquin Valley Crop, Water and Land Use Mapping Project and has a significant role in the Remote Sensing for Vineyard Management Project; participate in The San Joaquin Valley Water Plan project and the San Joaquin River Restoration project as leading GIS person, assist GIS training classes for an ESRI certified trainer.

Chief Analyst Resource Studies Center, Saint Mary's University of Minn., Winona, MN July '97 – Dec '00

- Supervised GIS analysts and GIS technicians; designed spatial databases for natural resource & land use management and planning; designed, implemented and managed GIS and digital photogrammetry projects, GIS data automation, and performed geostatistical analysis; designed, programmed, and implemented decision support models for urban development, environmental impact analysis, and hazardous sites

19 monitoring; established QA/QC standards of GIS/digital photogrammetrical projects; taught graduate classes in remote sensing and GIS.

Technical Manager GIS/RS Center, Wilkes University, Wilkes-Barre, PA July '94 – July '97

- Coordinating all research projects involving GIS, remote sensing (RS), global positioning systems (GPS), and photogrammetry technologies; providing technical advice and training; designed and managed a GIS database for environmental monitoring; conducting research on GPS accuracy, water quality, watershed analysis, and economic development; applications; Conducting satellite imagery and aerial photo analysis and classification.

Senior Research Assistant State University of New York College of Environmental
Science and Forestry, Syracuse, NY; June '93 – July '94

- Conducted spatial analysis on urban forest meteorology and meteorological morphology analysis on urban vegetation distribution; designed spatial database for research projects; geo-statistical analysis

Teaching / Research Assistant State University of New York College of Environmental Science and Forestry, Syracuse, NY; Sep '87 – May '93

- Integrated GIS, decision support system, and expert system technologies into a spatial decision support system (SDSS) for timber and wildlife management; Acquired and engineered an wildlife knowledge base for New York state; Designed and developed a wildlife expert system;

Special Training in remote sensing, GIS, and statistical software

Selected Projects and Grants:

- San Joaquin Valley Crop, Water, and Land Use Mapping Project, 2001-2002; funded
- by CSU Agricultural Research Initiative; $149,837, 100%
- Remote Sensing for Vineyard Management, 2001; funded by CSU Agricultural
- Research Initiative; $6,000, 10%
- Geo-spatial Technology Applications for Sun-Maid Growers of California, 2003; Sun-
- Maid, $50,000, 50%
- CIT Salinity, Selenium, and Drainage Mapping, 2004; funded by Center for
- Irrigation Technology; $10,000, 15%
- Streets and Roads Mapping of Fresno and Kings Counties, 2005-2006; Funded by
- California Department of Forestry; $45,000, 60%

Publications and Reports:

- **The San Joaquin Valley Crop, Water, and Land Use Mapping Project,** August
- 2002
- Annual Report: **Remote Sensing for Vineyard Management,** September, 2001

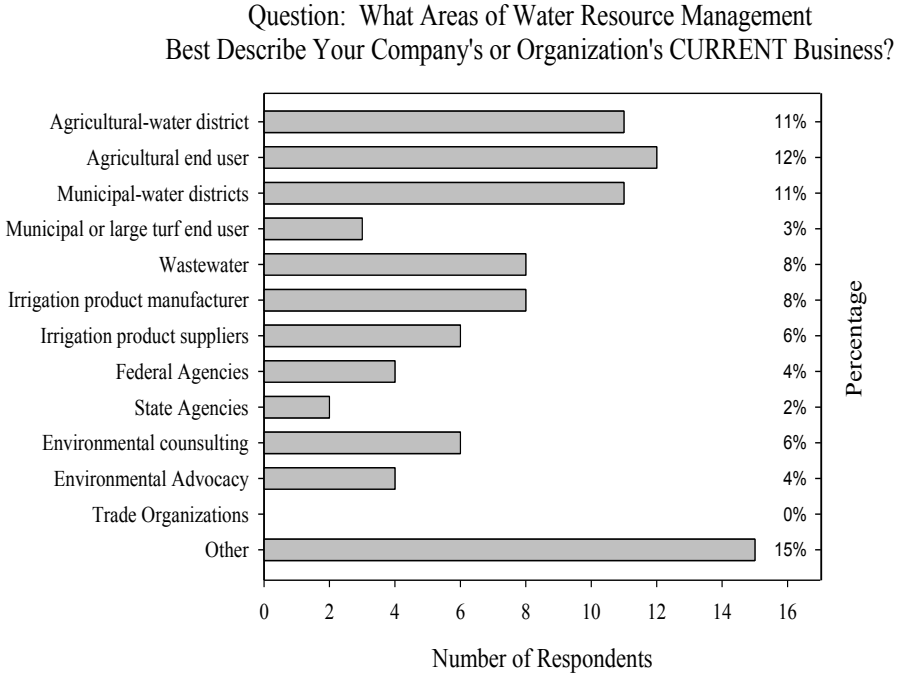
Appendix C: Needs Assessment

Needs Assessment

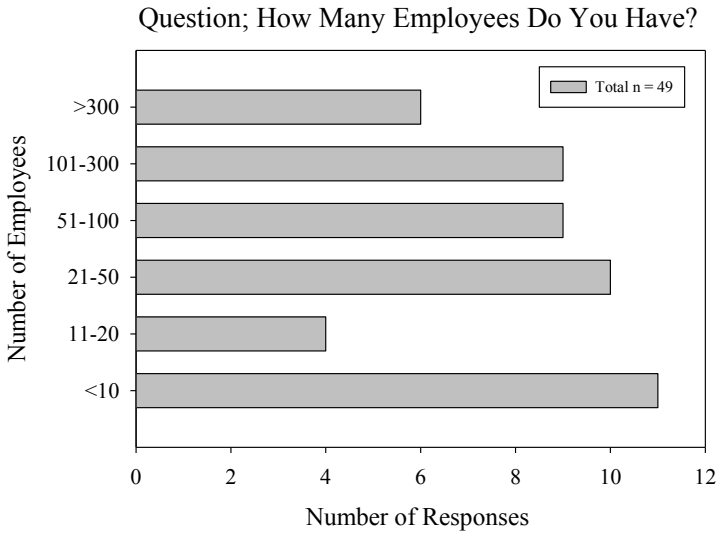
2009/2010 Survey

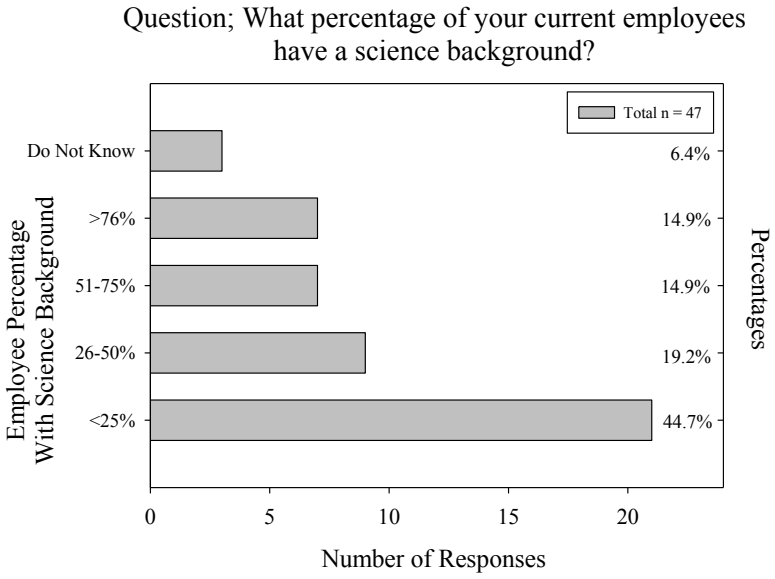
A survey was conducted in 2009/2010 to determine if regional and statewide employers saw a need for employees trained in GIS and Water Resource Management. Additionally the survey asked about the training desired for new employees, internship opportunities, and job prospects for graduates. The survey was sent out to 154 stakeholders representing industry, business, or agencies. The survey addressed the desirability of Water Resource Management training at the graduate level for current and future employees. Ninety–one (91) responded and they strongly supported implementation of GIS coursework. When asked if they would need to hire someone with a GIS background in the next ten years, 69% responded that they would. The results of the survey were used in the development of the Professional Science Master's in Water Management as well as Advanced Certificate in GIS.

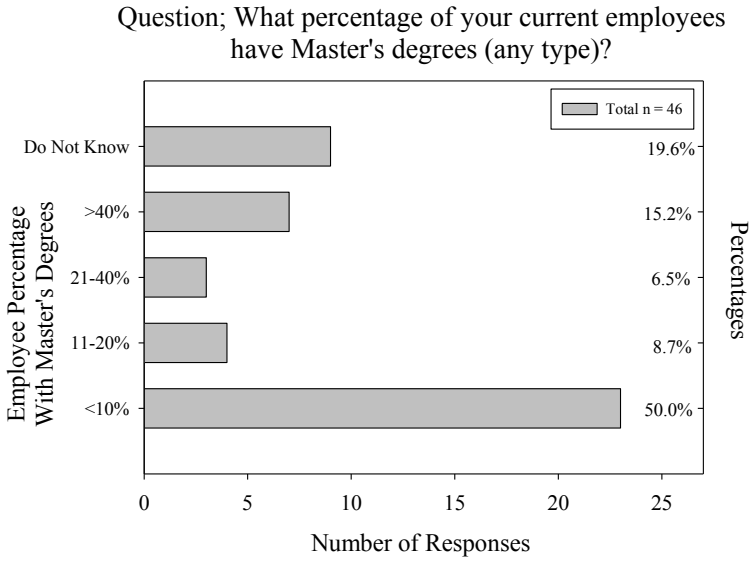
The respondents were divided into twelve categories plus "other". The largest group (27 respondents) identified themselves in the "other" category. Many viewed their area as changing in the near future, indicating the dynamic nature of the industry and the need for graduate level expertise to meet these challenges.

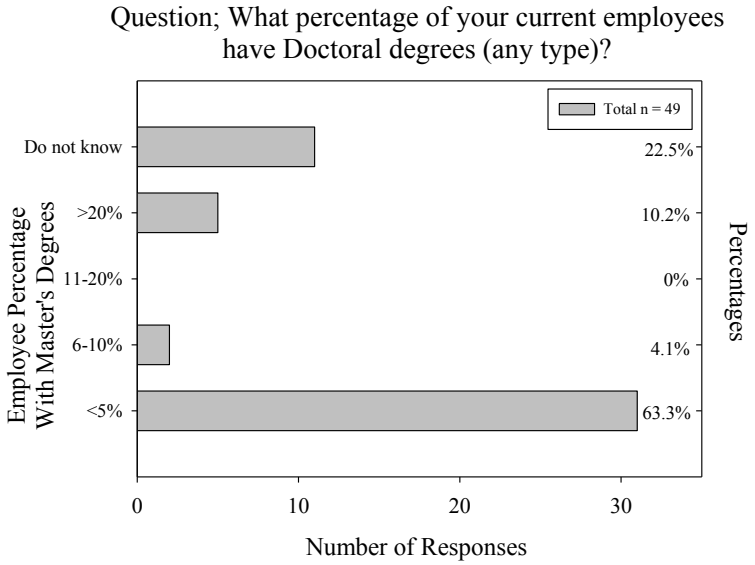


The initial questions were used to characterize the respondents in terms of the number of employees and their education level. The responses show that the majority of businesses range from 20 to 300 employees, and that within these businesses employees with higher education are not uncommon but do not make up the majority of the workers.

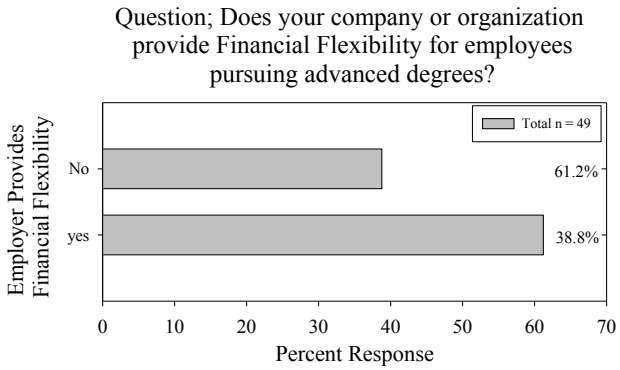


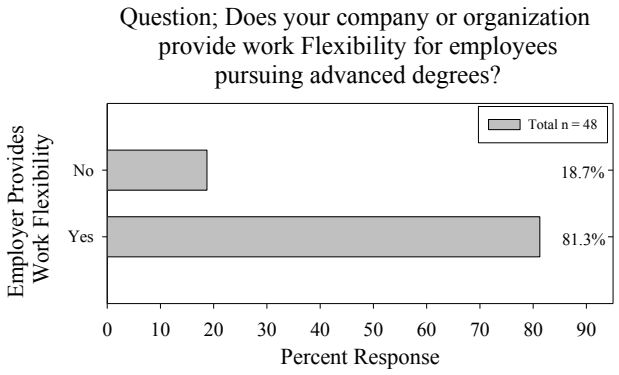


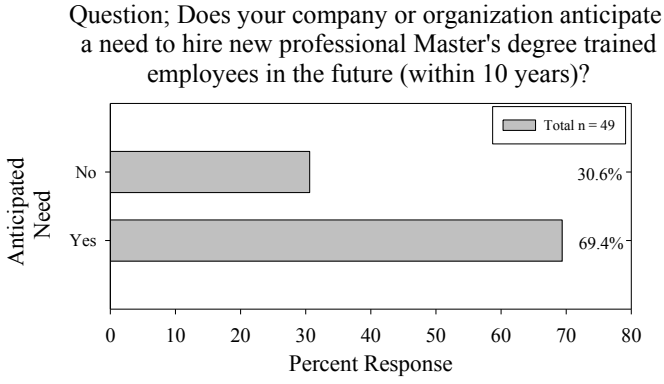

Question; What percentage of your current employees have Master's degrees (any type)?
Total n = 46
Do Not Know
>40%
21-40%
11-20%
<10%
19.6%
15.2%
6.5%
8.7%
50.0%
Employee Percentage With Master's Degrees
Percentages
0
5
10
15
20
25
Number of Responses


Question; What percentage of your current employees have Doctoral degrees (any type)?
Total n = 49
Do not know
>20%
11-20%
6-10%
<5%
22.5%
10.2%
0%
4.1%
63.3%
Employee Percentage With Master's Degrees
Percentages
0
10
20
30
Number of Responses

The desire for a Professional Master's degree in Water resource management was established by asking the respondents if there is flexibility for employees to return to school for advanced degrees and the level of support that these programs would have in the work place. In addition, the last question shows that the companies that were queried expect to hire employees with Master degree training in the future, showing a market for the skills to be learned in the PSM in Water Resource Management.







Fall 2010 Survey

Fong Strategy conducted additional market research in Fall 2010 to assess the demand for an Advanced Certificate in GIS. Eleven in-depth interviews with GIS professionals, planners, water resource professionals and others were conducted, and 77 Fresno State GIS knowledgeable graduates were sent an online survey (19% response rate). The key findings indicated demand for the proposed certificate with the expected growth rate for professions utilizing GIS about 19% during the next decade. Across the country, fifteen campuses offer a graduate certificate in GIS but none have a hydrology emphasis and only a few are fully online. Clearly there is a niche and growth opportunities.

Appendix D: Graduate Writing Rubric

Scoring Rubric—Graduate Writing Requirement

Scoring Level	Style and Format	Mechanics	Content and Organization
5= Exemplary	In addition to meeting the requirement for a "4," the paper consistently models the language and conventions used in the scholarly/ professional literature appropriate to the student's discipline. The manuscript would meet the guidelines for submission for publication in a peer reviewed journal in the student's field of study.	In addition to meeting the requirements for a "4," the paper is essentially error free in terms of mechanics. Writing flows smoothly from one idea to another. Transitions effectively establish a sound scholarly argument and aid the reader in following the writer's logic.	In addition to meeting the requirements for a "4," excels in the organization and representation of ideas related to the topic. Raises important issues or ideas, which may not have been represented in the literature cited. Would serve as a good basis for further research on the topic.
4=Accomplished	While there may be minor errors, conventions for style and format are used consistently throughout the paper. Demonstrates thoroughness and competence in documenting sources; the reader would have little difficulty referring back to cited sources. Style and format contribute to the comprehensibility of the paper. Suitably models the discipline's overall documentation style.	While there may be minor errors, the paper follows normal conventions of spelling and grammar throughout. Errors do not significantly interfere with topic comprehensibility. Transitions and organizational structures such as subheadings are effectively used which help the reader move from one point to another.	Follows all requirements for the paper. Topic is carefully focused. Clearly outlines the major points related to the topic; ideas are logically arranged to present a sound scholarly argument. Summarizes relevant literature. General ideas are expanded upon in a creative and innovative manner thereby extending the significance of the work presented beyond a re-statement of known ideas.
3=Satisfactory	The style and format are broadly followed, but inconsistencies are apparent. There is selection of less suitable sources (non-peer reviewed literature, web information). The style may be difficult to follow so as to detract from the comprehensibility of the manuscript.	Grammatical conventions are generally used, but inconsistency and/or errors in their use result in weak, but still apparent, connections between topics in the formulation of the argument. There is poor or improper use of headings and related features to keep the reader on track within the topic. Effective vocabulary is used.	Ideas presented closely follow conventional concepts with little expansion and development of new directions. Ideas and concepts are generally satisfactorily presented although lapses in logic and organization are apparent. The reader is suitably introduced to the topic being presented such that the relationship to the student's area of study is obvious.
2=Developing	While some of the discipline's conventions are followed, others are not. Paper lacks consistency of style and/or format. It may be unclear which references are direct quotes and which are paraphrased. Based on the information provided, the reader would have some difficulty referring back to cited sources. Significant revisions would contribute to the comprehensibility of the paper.	Frequent errors in spelling, grammar (such as subject/verb agreements and tense), sentence structure and/or other writing conventions make reading difficult and interfere with comprehensibility. There is some confusion in the proper use of vocabulary and terms. Writing does not flow smoothly from point to point. Appropriate transitions are lacking.	The paper is logically and thematically coherent, but is lacking in substantial ways. The content may be poorly focused or the scholarly argument weak or poorly conceived. Major ideas related to the content may be ignored or inadequately explored. Overall, the content and organization needs significant revision to represent a critical analysis of the topic.
1=Beginning	The stylistic conventions of the discipline are not followed. Fails to demonstrate thoroughness and competence in documentation. Inappropriate style and format make reading and comprehensibility problematic.	Paper contains numerous errors in spelling, grammar, and/or sentence structure, which make following the logic of the paper extremely difficult.	Analysis of existing scholarly / professional literature on the topic is inadequate. Content is poorly focused and lacks organization. The reader is left with little information about or little understanding of the paper's topic.