A JOINT PROPOSAL

TO ESTABLISH A JOINT UNDERGRADUATE DEGREE PROGRAM
IN ENVIRONMENTAL SCIENCES

BETWEEN

UNIVERSITY OF CALIFORNIA, RIVERSIDE

AND

CALIFORNIA STATE UNIVERSITY, FRESNO

Revised May, 2002
University of California, Riverside - California State University, Fresno
Joint Bachelor of Science Degree Program in Environmental Sciences Working Group

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EXECUTIVE SUMMARY

California State University, Fresno (CSUF) is a premier regional university serving the Central Valley of California, and University of California, Riverside (UCR) is a leading campus of the University of California system. While UCR is a distinguished world-class research university with abundant academic resources in many areas, CSUF is best known for providing high quality undergraduate education. President Welty of CSUF and Chancellor Orbach of UCR have decided to join forces in providing the best possible educational opportunities to the students of California by combining the expertise and resources of the two universities.

Based on the current demand for environmental professionals and the future need for environmental education in Central California, a joint bachelor’s degree program in Environmental Sciences between the two universities is proposed. The goal is to educate students in the area of Environmental Sciences with an innovative program that is truly unique. It will be the first undergraduate degree program jointly offered by campuses of the two different public university systems of California, and will lead to a Bachelor of Science degree jointly conferred by both universities. The success of this program will also provide a model for future joint programs in many other academic areas, leading to vast opportunities to cooperate, increase efficiency, and share institutional facilities.

The proposed joint degree curriculum is designed based on the existing Environmental Sciences curriculum of UCR. The joint degree curriculum is interdisciplinary and will be available to students on both campuses. Separate distinct and intellectually equivalent curricula will be established at each campus. This will allow students enrolled in the program to move between campuses fulfilling residency requirements. In addition, students will be free to select courses from either campus that meet their specific areas of interest. At CSUF the curriculum is designed and will be taught by faculties from different academic departments. Most of the courses (more than 80%) in the curriculum are existing courses offered by CSUF. The remaining courses may be offered on CSUF campus by UCR faculty members using distance learning arrangements, by visiting UCR faculty members, by resident UCR staff in the Fresno area, or by new CSUF faculty members specifically recruited for this program.

There are three options within the proposed Joint CSUF-UCR Environmental Sciences Program at CSUF: (1) Earth Science, (2) Life Science, and (3) Behavioral, Policy, and Health Sciences. Under each option, students can further select an area of concentration from a range of available emphases according to their interests and career objectives.

Students admitted into the joint degree program at CSUF must also satisfy admission requirements of both UCR and CSUF, and register concurrently at both universities. They must maintain a specified academic performance standard and are free to enroll in courses at either CSUF or UCR campuses. Students based in Fresno may enroll in UCR courses either through distance learning or in residence at the UCR campus. Similarly, UCR students who want to select any of the courses in the CSUF curriculum are free to enroll in CSUF courses. In order to be qualified for the joint degree, students must also satisfy special residency requirements of both campuses.
The Joint Degree Program in Environmental Sciences will be offered and administered at CSUF by the School of Natural Sciences as an interdepartmental program and at UCR by the Department of Environmental Sciences, and be under the supervision of a Joint Program Governing Board consisting of deans and faculty representatives from the two universities. Two Co-Program Coordinators, one on each campus, will be appointed by the Chancellor/President of the respective campus. They will be responsible for the implementation of the program according to the regulations and policies set forth by the Board and approved by the universities. The Co-Program Coordinators will be tenured faculty members with a field of expertise within or related to the environmental sciences. The Co-Program Coordinator at CSUF will be assisted by an executive secretary of the program office. The program will be reviewed after five years and every five years thereafter, according to the standard procedures and policies of the two universities.

The Joint Environmental Sciences Program has the full support of both universities’ administrations. They are committed to provide the additional resources needed for the start-up of the program including additional faculty, distance learning facilities, instructional laboratories, and administrative costs.

The Joint Environmental Sciences Program will benefit the State of California and its two public university systems in the following ways:

• It will provide the human resources necessary to solve the environmental problems in Central and Southern California.

• It will combine the best of both teaching and research resources, which will be made accessible to students from a region much broader than what any public university in California traditionally serves.

• It will serve as a catalyst for further cooperation and scholarly interaction between the faculties of UCR and CSUF.

• It will provide a model for future collaboration between the UC and CSU systems in other academic areas using new and innovative instructional delivery technology.
I. MISSION STATEMENT

The University of California, Riverside-California State University, Fresno Joint Degree Program in Environmental Sciences offers a high-quality, comprehensive, interdisciplinary undergraduate education in the areas of physical, natural, and socio-behavioral sciences directed towards understanding and solving today's environmental problems. By providing a solid foundation in the sciences, it prepares students for graduate programs and advanced studies, for scientific careers in research and teaching, and for professional careers in law and management. Hence, it cultivates the human resources necessary to combat the critical environmental problems of both regional and global scales.

The Joint Environmental Sciences Program trains students for leadership in environmental issues. By educating the future leaders and representatives of our communities, it helps promote public environmental awareness and shape sound public policies in our state and nation.

The Joint Environmental Sciences Program integrates the diverse expertise from the two university faculties. It combines the best of teaching and research resources and makes them available to students from a region much broader than any public university in California traditionally serves. The program serves as a catalyst for collaboration and scholarly interaction between the two faculties, and at the same time provides a model for future collaboration between the University of California and California State University systems in areas of instruction delivery and joint degree programs.
II. INTRODUCTION

In the spring of 1996, Chancellor Raymond Orbach of the University of California, Riverside (UCR) and President John Welty of California State University, Fresno (CSUF) met and agreed to establish joint educational programs to serve the people of Central California. A joint Environmental Sciences major was selected as a pilot program for this new collaborative effort.

President Welty designated Dr. K. P. Wong, Dean of the School of Natural Sciences, to lead the CSUF effort of developing the proposed program in Environmental Sciences. At the same time, Chancellor Raymond Orbach designated Dr. Michael Clegg, Dean of the College of Natural and Agricultural Sciences, to coordinate this effort at UCR.

Deans Clegg and Wong as well as some of the department chairs at UCR met to discuss a number of principles involved in such a program. Prior to the meeting, Dean Wong had conducted several meetings at CSUF with other school deans (Dean Daniel Bartell, Dean Karl Longley, and Dean Ben Cuellar) as well as interested faculty members with expertise in or related to Environmental Sciences. The purpose was to outline an Environmental Sciences Program with particular emphasis on the inventory of existing courses and available expertise at California State University, Fresno.

Since April 1997, a Joint Degree Program Working Group was formed at CSUF. It includes faculty members from the departments of Biology, Earth and Environmental Sciences, Psychology, and Plant Science, as well as Dean K.P. Wong, and Associate Dean Stanley Ziegler. A corresponding working group was formed at UCR, consisting of faculty members of the existing Environmental Sciences Department. Dr. Walter Farmer of UCR and Dr. John Suen of CSUF were appointed coordinators of the working groups for their respective campus. The two working groups constitute the Joint Degree Program Committee, which met regularly, either in person or via teleconferences to discuss issues related to curriculum, administrative logistics, and needed resources. The Joint Degree Program Committee has the charge of designing a new degree program to be submitted for final approval.

This proposal represents the result of efforts to develop an undergraduate program in Environmental Sciences leading to a BS degree conferred jointly by both universities. The proposed program, to be jointly offered at CSUF and at UCR, is listed in Section III of this proposal. The CSUF component, which will be a new degree program, consists of three separate degree options, and includes courses in the existing UCR program as well as new and existing courses at CSUF. Joint program students must meet admission requirements of both universities, and register in both universities concurrently. Students based in Fresno will be able to take UCR courses either through distance learning or in person during their required residency at the UCR campus. Students enrolled in the existing UCR program in Environmental Sciences can enroll in a range of courses offered by CSUF unavailable from
their home campus. Students enrolled at UCR may select the Joint Degree in Environmental Sciences by completing the required residency at CSUF. The joint degree program is designed to ensure intellectual equivalency between all aspects of the curriculum at the two campuses, thus allowing students to take advantage of course offerings at UCR and CSUF.

The proposed program is truly unique. It will be the first undergraduate degree program jointly offered by campuses of the two public university systems of California. Its success will provide a model for future joint programs in other academic areas, leading to vast opportunities to cooperate, share institutional facilities, and increase efficiency of instructional delivery.
II.A Justification for a Joint Degree Program in Environmental Sciences

California and the rest of the nation are confronted with numerous environmental issues, such as air quality, land utilization, and water resources. To face these issues, it would require an informed public as well as a trained workforce educated with a multi-disciplinary curriculum. Educational programs in environmental science have been successful in bringing together the technical, scientific, and social expertise into an integrated fashion to address these issues.

In particular, Central California has a need for ensuring that adequate training in the area of the environment is available to its workforce. Statistics provided by the National Science Foundation indicate that 51% of CSUF students are minority, 53% are first generation college students, 39% are greater than 25 years of age, and 82% are from the Central Valley. Forty-nine percent of CSUF students come from families with an annual income of less than $30,000; only 28% of UC students come from the same family income level. Presumably, many CSUF students chose to stay in the San Joaquin valley because of financial limitations or familial obligations. The joint degree program will provide many qualified but Central Valley-bound students the opportunity to enroll in courses offered by the UC system, which would not be accessible to them otherwise. At the same time, the program will give UC the opportunity to reach qualified students in the Valley who would not otherwise consider attending UC.

Furthermore, many students who leave the Central Valley to pursue higher education and professional training do not return to serve their home region, because the larger metropolises in California provide a strong attraction to professionals as well as those who are educated and have special skills. However, joint program students who are based in Fresno will more likely stay in the Valley and contribute to the local economic development.

Current choices at CSUF for the student interested in environmental sciences include courses in biology, geology, chemistry, and psychology. Although science departments of CSUF enjoy national reputations, none of the existing programs, either separately or combined, offer a comprehensive program of interdisciplinary courses necessary to provide students with the training required for employment in the fields of environmental sciences or environmental management. Because the existing Environmental Sciences Program of UCR has been well established since the 70’s and is considered to be one of the most outstanding environmental sciences programs of the country, the experience and expertise of the UCR faculty can be utilized to complement the efforts of CSUF faculty. A joint degree program will provide the opportunity to collaborate and share resources.
II.B  The Need for Enhanced Environmental Education in Central California

In Central California, the leading agricultural production region of the world, the need to train environmental scientists is paramount. In the San Joaquin Valley, for example, valuable farmland is now being lost because of the disposal problem with toxic agricultural drainage water. Groundwater resource, the primary source of drinking water for most of the valley, is being threatened by the downward migration of pesticides and nitrates. The San Joaquin Valley is rated as one of the worst regions in the United States for air quality, and Fresno County has had the highest death rate due to respiratory problems. Toxic chemicals have been found beneath city streets, and industrial wastewater is leaking from agricultural processing plants. The urgency to study, control, and correct these serious problems cannot be over-emphasized.

A number of government agencies at the regional (Water Quality and Air Quality Control Boards), state (California EPA, and the Departments of Water Resources, Health, and Food and Agriculture) and national (U.S. Geological Survey, and EPA) levels, as well as private companies, consulting firms and government laboratories (Lawrence Livermore and Lawrence Berkeley), have established their presence in Central California. They have engaged in a range of environmental projects.

Environmental scientists are needed to participate in the design of water treatment plants, study ecosystems, restore wetlands, remediate ground water contamination, analyze trace air and water contaminants, study and prevent adverse health effects, control pesticide contamination, ensure legal compliance, and enforce environmental laws and regulations. The multifaceted nature of the environmental needs of the Central Valley is evident, and the demand for well-trained interdisciplinary environmental professionals can only increase with future population growth in the region.

For leading universities of the region, the responsibility is apparent. We must satisfy the need of our service region by cultivating the necessary human resources locally to combat the serious environmental problems facing Central California. By combining the diverse expertise from both UCR and CSUF faculties, the quality education necessary for training new environmental professionals can be provided. The proposed interdisciplinary program in Environmental Sciences represents a momentous effort in furnishing a much-needed service to the people of Central California.

The existing parallel program in Environmental Sciences at UCR has an approximate enrollment of 120 students. A very conservative estimate for the proposed joint program would be at least half of the UCR current enrollment (i.e. at least 60 students) within three years after its inauguration, and the total enrollment of 120 to 200 students is expected within five years. This estimate is based on the comparison of the current enrollment sizes between CSUF and UCR in science, engineering and agriculture.
II.C Program Goals

The primary goals of establishing a joint degree in Environmental Sciences are to:

• Provide access by students from UCR and CSUF to unique training opportunities available at both campuses in expanded areas of the environmental sciences.

• Provide the state with additional professionals trained in environmental sciences by combining the rich intellectual resources of the two institutions.

• Develop intellectual resources present in Central California, and enable students to engage a profession that will contribute to the improvement of environmental quality and economic growth of the region, and specifically, to provide the Central Valley with the human resources necessary to solve both short and long term environmental problems.

• Provide an alternative educational opportunity for highly qualified students who wish to pursue careers in environmental science, but who are unable or unwilling to leave the Central Valley, and to further prepare them in areas of specialization relative to individual career objectives.

• Establish an effective environmental program that utilizes the technical expertise of both campuses by exploring the potential benefits of high technology education delivery system.

• Provide a catalyst for academic interaction and collaborative projects between faculties of the two universities.

• Provide a model for future joint programs between the two systems of public higher education (UC and CSU) in California.
II.D Benefits Provided by the Program

A collaborative effort of the UC and CSU systems to offer a program in the Environmental Sciences is clearly beneficial to the people of California, in particular, the Central Valley. The long-term economic and social benefits to the State of California are numerous. For examples,

- The joint degree program will develop a pool of professionals with a vested personal interest of the region and thus long term commitment to solving the environmental problems, and therefore it helps to reduce the need for recruitment of environmental professionals from outside the Central Valley for employment in government agencies and private industry.

- This program will attract high quality students who otherwise might leave the Central Valley to pursue their higher education as well as provide an alternative to those students unable to leave the valley.

- This program will increase instructional, research and internship opportunities available to students in the existing UCR degree program. This will attract new students to UCR to participate in educational opportunities not previously available on the UCR campus.

- This program will also alleviate the cost of immediately recruiting new faculty in CSUF. The exploitation of a new high-technology instructional delivery system will maximize resource use. CSUF faculty supporting the program will draw on the expertise of well-established environmental scientists from UCR, reducing the need for immediate hiring at CSUF. Conversely, CSUF faculty will be able to provide reciprocal teaching and expertise to the existing UCR program via distance learning telecommunications systems.

- Although a number of joint graduate degrees are established, this joint degree would be the first undergraduate degree to be offered between the university systems. The program will provide a model for future joint programs among institutes of higher education in California. The experience gained from this program, especially in areas of distance learning and multimedia instruction, will prove to be invaluable when facing the new challenges of the 21st century.

- This program will enhance the UC academic presence in the Central Valley, a region currently underserved by UC programs.
• This program will serve as a catalyst for collaboration and scholarly interaction between UCR and CSUF faculties. Any joint collaborative research efforts initiated as a result of this program will benefit the community in dealing with many of the environmental problems in our service region.

• The program will prepare high quality students for further studies at the MS and PhD levels at UCR. This is especially significant to develop a pool of qualified candidates in the relatively new area of Environmental Sciences.
III. JOINT DEGREE PROGRAM

III.A Program Name and Degree

The name of this proposed joint degree program shall be:

*Joint Bachelor of Science Degree Program in Environmental Sciences between University of California, Riverside and California State University, Fresno.*

This program shall lead to the degree of **Bachelor of Science** jointly conferred by the University of California, Riverside and California State University, Fresno (i.e. both universities’ names will be on the diploma).

III.B Admissions, Fees, and Academic Regulations

Applicants to the joint degree program must be eligible to enroll in both UCR and CSUF. Accordingly, their academic records must satisfy the entrance requirements of both universities before they can be considered for admission to the program. All students in the program must be duly admitted by and concurrently register in both UCR and CSUF.

Students of the joint degree program are free to enroll in courses offered at either campus, either in residence or through distance learning. However, students are subject to the academic regulations of both campuses as well as specific academic performance requirements set by the Environmental Sciences Joint Degree Program Governing Board.

Students are required to pay student fees only to the campus where they are in residence. (See Residency Requirements under Section III.D). The fees for the other campus are automatically waived.

Detailed procedure for admission will be determined by the administrations of the two universities. Criteria for admission will be established by the Environmental Sciences Joint Degree Program Governing Board and reviewed periodically. Under the proposed framework, students can be admitted through three different paths:

1. Admitted as freshmen — High school graduates whose academic achievements satisfy both the UCR and CSUF admissions requirements and meet all the admissions criteria are admitted into the program as freshmen. They are free to transfer between the two campuses, or enroll in courses via distance learning without having to meet any further requirements on the condition that they maintain a prescribed minimum academic standard.

2. Transfer students — Graduates of community colleges and other colleges and universities who are admissible to UCR and CSUF as transfer students under current UC and CSU admission policies, and whose academic records satisfy specific program requirements, may be admitted into the program.
(3) CSUF students — CSUF students who have not been formally admitted into the program as freshmen may be admitted based on their academic performance in their first two academic years in CSUF. Their records must meet the same requirements as those set for transfer students from community colleges and other universities.

To remain in the joint degree program, students must maintain the academic performance standards set by the Joint Degree Program Governing Board. Failure to do so will result in either being put on academic probation or disqualified from the joint degree program.
III.C Student Advising

Students in residence at CSUF are assigned an academic advisor. Initially, three faculty members who are closely involved in the program will be appointed by the Governing Board — one for each degree option. However, for the Behavioral, Policy and Health Sciences option, two additional faculty advisors may be required – one for each area of emphasis. More academic advisors will be added as the program grows. Each advisor should not be responsible for advising more than thirty students.

Students in residence at UCR will be advised according to procedures in effect in the existing Environmental Sciences degree program at UCR. Students in the UCR program are assigned to a program coordinator until they decide on an option at which time they are reassigned to a faculty advisor. Each faculty advisor at UCR is normally responsible for advising from 10 to 16 students.

All students must meet at least once every semester/quarter with their academic advisor to review their past performance and carry out curricular planning according to their interests and career objectives. (A list of possible career objectives for the different curricular options is included in Appendix A). All curricular plans, and any subsequent changes, must be approved in writing by the advisor. However, it is the full responsibility of the students, not of their advisors, to ensure that their curricular plans will meet all the academic requirements for their intended degree objective.
III.D Degree Requirements

(1) Residency Requirements for the Joint Degree

All students of the joint degree program must concurrently enroll in both UCR and CSUF. In order to qualify for the joint degree, at least 24 quarter units must be earned in residence at UCR, and at least 15 semester units at CSUF. Students must be in residence at UCR for at least two academic quarters, and at CSUF for at least one semester. These residency requirements for the joint degree must be satisfied in addition to satisfying the normal residency requirement for the bachelor’s degree at either UCR or CSUF. For the purpose of determining the total residency normally required for the bachelor’s degree at either university, the residence period spent at the other campus of the joint degree program may be counted. A ratio of 2 to 3 will be applied to the conversion from quarter to semester units, and vice versa.
(2) General Education Requirements

Although the General Education programs of the two universities are not exactly identical, both programs are aimed to achieve the same educational goal. Therefore, they should be considered to provide a parallel educational experience with an equivalent intellectual training. For this reason, we propose that students of the joint degree program whose course work satisfies the General Education requirements of either university be considered to have satisfied the GE requirements for the Joint BS degree. In addition, GE courses of the two universities will be articulated between the two faculties so as to facilitate the transfer of students between the two campuses.
The program offers three degree options:

1. Earth Science option,
2. Life Science option,
3. Behavioral, Policy, and Health Sciences option.

(Possible career objectives in relation to the degree options can be found in Appendix A).

1. Core Requirements

1.1 Lower Division Courses (47 semester units)

Biology - 9 units
All options: Bio Sci 1A + 1B.\textsuperscript{§} Introductory Biology (4+5)

Chemistry - 10 units
Earth Sci. and Life Sci. Options:
Chem 1A, 1B. General Chemistry and Qualitative Analysis (5+5)
BP&H Sci. Option:
Chem 3A. Introductory General Chemistry (4)
Chem 8. Elementary Organic Chemistry (3)
Chem 150 General Biochemistry (3)

Earth and Environmental Sciences - 9 units
All options:
UCR ENSC 1. Introduction to Environmental Sciences: Natural Resources (4 qtr) [offered at CSUF via distance learning].
UCR ENSC 2. Introduction to Environmental Sciences: Environmental Quality (4 qtr) [offered at CSUF via distance learning].
Geol 1E.\textsuperscript{§} Physical Geology for Geologists, Engineers and Environmental Scientists (4)

Mathematics - 4 units
Earth Sci. Option:
Math 75. Mathematical Analysis I. (4)
Life and BP&H Sci. Options:
Math 70. Mathematical Analysis for Life Sciences. (4)
or
Math 75. Mathematical Analysis I. (4)
Physics - 8 units
   Earth Sci. Option:
      Phys. 4A+4AL, 4B+4BL. Mechanics and Wave Motion; Electricity, Magnetism, and Heat. (3+1, 3+1)
   Life Sci. and BP&H Sci. Options:
      Phys. 2A + 2B. General Physics (4+4)

Statistics - 4 units
   All options:
      Math 11. Elementary Statistics (4)
      or
      Psych 42. Introductory Statistics (4)

Social Sciences - 3 units
   All options: One of the following
      Econ 40. Principles of Microeconomics (3)
      Anth 2. Introduction to Cultural Anthropology. (3)
      UCR ENSC 174. Law, Institutions, and the Environment. (4 qtr) {UCR residency or via distance learning}

§ Bio Sci 1A and Geol 1E may be substituted with Bio 15 and Geol 15 of the Man/Woman and the Natural Environment special field-based program.

1.2 Upper Division Courses for all options (11 semester units)
   ENSC 100A, 100B. Introduction to Environmental Sciences (4+4)
   (new courses to be developed with inputs from UCR; interdisciplinary, team taught, possible cooperation with UCR faculty)

   Phil 120. Contemporary Conflicts of Morals (3)
   or
   Pl Si 189T. Environmental Politics and Policy (3)
2. Earth Science Option

2.1 Required Courses (14 semester units)

Math 76. Mathematical Analysis II. (4)
Math 77. Mathematical Analysis III. (4)
Chem 8 Elementary Organic Chemistry (3)
Geol 117. Hydrogeology. (3)

2.2 Elective Courses: (25 to 27 semester units)

2.2.1 Three possible emphases for Groups A, B, and C:
   (1) Engineering - Three from A, including UCR ENSC 127; one from B; one from C.
   (2) Geology - One from A; three from B; one from C.
   (3) Soils - UCR ENSC 127 from A; two from B; two from C.

Group A:

UCR ENSC 127. Fate and Transport of Contaminants in Soil (4 qtr) {UCR residency required}
C.E.170. Pollution and Society (3)
C.E. 191T. Water Quality (3)
C.E. 140. Hydrology (3)
H.S. 166T. Waste Management (3)

Group B

Geol 114. Engineering Geology (3)
Geol 124. Geochemistry. (3)
Geol 105. Geomorphology. (3)
Geol 116. Applied Geophysics. (3)
Group C.

UCR ENSC/SWSC 104. Environmental Soil Chemistry (5 qtr units)
{UCR residency required}

UCR ENSC/SWSC 107. Soil Physics (4 qtr units)
{UCR residency required}

2.2.2
Three courses from Groups D and E. At least one from Group D.

Group D.

Chem 108. Introductory Physical Chemistry (4)
Chem 105. Quantitative Analysis Laboratory (4)
Math 81. Applied Analysis. (4)
Psych 144. Research Designs and Experimental Methods. (4)
Psych 145. Computer Applications. (4)

Group E.

Micro 140. Microbiology (4)

UCR ENSC 155. Principles and Application of Bioremediation. (4 qtr units) {UCR residency required}

H.S. 160. Principles of Toxicology (3)
Geog 107. Introduction to Geographic Information System (4)
Geog 108. Spatial Analysis in Geographic Information System (4)
Geog 111. Meteorology (3)
Econ 117. Economics of Ecology (3)
UCR ENSC 172  Principles of Environmental Impact Analysis  
(4 qtr units) {UCR residency required.}

Env. Sci 190. Internship (3-6).

3. Life Science Option

Please Note:  
Emphases under this degree option are directed by faculty advisors.

3.1 Required Courses (16 semester, 12 quarter units)

Ecol. 151. Terrestrial Ecology (4)  
Ecol. 152. Aquatic Ecology (4)  
CHEM 128A, B. Organic Chemistry (3+3)  
UCR. ENSC 172. Principles of Environmental Impact Analysis. (4)*  
UCR. ENSC 174 Law, Institutions, and the Environment (4)*  
UCR. BPSC 122. Restoration Ecology (4 qtr.)*

* to be taken during an in-residence quarter at UCR

3.2 Elective Courses (18-21 semester units)

Choose a minimum of two courses from the following: (7-8)

Bot. 144. Plant Taxonomy (4)  
Ecol. 162. Microbial Ecology (4)  
Ecol. 171. Fisheries Biology and Management (3)  
Ecol. 172. Wildlife Biology and Management (4)  
Zoo. 150. Natural History of Vertebrates (4)  
Zoo. 141. Invertebrate Zoology (4)
Choose a minimum of two courses from the following: (8)

Psych. 143. Intermediate Statistics (4)
Psych. 144. Research Designs and Experimental Methods (4)
Psych. 145. Computer Applications (4)
Geog. 105. Aerial Photography Interpretation (4)
Geog. 106. Advanced Aerial Photo Interpretation and Remote Sensing of Environment (4)
Geog. 107. Introduction to Geographic Information Systems (4)
Geog. 108. Spatial Analysis in Geographic Information Systems (4)

Optional Internship (3-6)

Env. Sci 190. Internship (3-6).

This degree option gives students:
- general background in environmental science found at UCR
- strength in field biology found at CSUF
- strength in environmental reporting and interpretation found at UCR
- the option of developing strength in experimental design and statistical data analysis OR in remote sensing (CSUF)

4. Behavioral, Policy, and Health Sciences option

Prepares individuals for careers in environmental law, environmental policy, environmental health, environmental analysis, urban-planning, and socio-environmental research.

Requirements: A total of at least 31 semester upper division units, including required courses.

4.1 Optional Internship (3-6)

Env. Sci 190. Internship (3-6).

or

Health Science 175 Environmental Internship (3 to 6)

4.2 Environmental Policy Emphasis

4.2.1 Required courses:
1. Philosophy 118 Social and Political Theory (3),
   or Philosophy 127 Philosophy of Law (3)
2. Political Science 189T Environmental Politics and Policy (3)
3. One of the following:
   - 19 -
Economics 161          Population Economics (3)  
Economics 119          Regional Economics (3)  
Economics 174          Government Regulation of 
                        Economic Activity (3)  
(4) Business 158        Environmental Legislation and Control  
                        (3)

4.2.2 Upper Division Elective Courses at CSU Fresno

Philosophy 118          Social and Political Theory (3),  
Philosophy 127          Philosophy of Law (3)  
Philosophy 157          Freedom, Fate and Choice (3)  
Political Science 181   Public Administration  
Political Science 156TT  Topics in Political Behavior (1-4) (Approved topics only)  
Economics 161          Population Economics (3)  
Economics 119          Regional Economics (3)  
Economics 174          Government Regulation of Economic Activity (3)  
CPR 135                Environmental Law (3)  
Geog 135               The Protection of Nature (3)  

4.2.3 Upper Division Elective Courses at UCR

ENSC/ECON 143A          Environmental Economics (4)  
ENSC/ECON 143B          Natural Resource Economics (4)  
ENSC 170                Environmental Management (4)  
ENSC 174                Law, Institutions, Environment (4)  

4.3 Environmental Health Emphasis

4.3.1 Required courses:

Health Science 109      Epidemiology of Disease (3)  
Health Science 147      Evaluation of Occupational Environment (3)  
Health Science 160      Principles of Toxicology (3)  
Health Science 161      Environment and Human Health (3)  
Health Science 162      Environmental Health (3)  
Health Science 167      Public Health Laboratory Techniques (3)  
Health Science 168      Occupational and Industrial Health (3)  

4.3.2 Upper Division Elective courses at CSU Fresno

Health Science 148      Evaluation of Occupational Environment II (3)  
Health Science 151      Health Law and Legislation (3)  

- 20 -
Health Science 165 Directed Groups Study on Environmental Health (3)
Health Science 170 Health Effects of Indoor Pollution (3)
Health Science 182 Computers for Health Professionals (3)
Plant Health 102 Pesticides (32)
Plant Science 105 Food, Society and Environment (3)
Economics 162 Health Economics (3)

4.3.3 Upper Division Elective Courses at UCR

ENSC/ENVE 144 Solid Waste Management (4)
ENSC 155 Principles and Applications of Bioremediation (4)
ENSC 172 Principles of Environmental Impact Analysis (4)
ENSC/SWSC 176 Acquisition and Analysis of Environmental Data (5)

4.4 Socio-behavioral analysis emphasis

4.4.1 Required courses:

Psych 144 Experimental Research Methods (4)
Psych 143 Intermediate Statistics (4)
Psych 145 Computer Analysis (4)
Psych 173 Environmental Psychology

4.4.2 Upper Division Elective Courses at CSUF

Pl Si 156T Topics in Political Behavior (1-4) (Approved topics only)
Bio 151 Terrestrial Ecology (4)
Bio 152 Aquatic Ecology (4)
Geog 105 Aerial Photography Interpretation (4)
Geog 106 Advanced Aerial Photo Interpret. and Remote Sensing (4)
Geog 107 Intro to Geographic Information Systems (4)
Geog 108 Spatial Analysis of Geographic Info Systems (4)
Soc 163 Urban Sociology (3)
Anthro 108 Urban Anthropology (3)
Econ 161 Population Economics (3)

4.4.3 Upper Division Elective Courses at UCR

ENSC/ENVE 144 Solid Waste Management (4)
ENSC/ECON 143A Environmental Economics (4)
ENSC/ECON 143B Natural Resource Economics (4)
ENSC 155 Principles and Applications of Bioremediation (4)
ENSC 170 Workshop in Environmental Management (4)
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 172</td>
<td>Principles of Environmental Impact Analysis</td>
<td>(4)</td>
</tr>
<tr>
<td>ENSC/SWSC 176</td>
<td>Acquisition and Analysis of Environmental Data</td>
<td>(4)</td>
</tr>
</tbody>
</table>
(4) B.S. Program in Environmental Sciences-Major Requirements for UCR Based Students

The following curriculum is the currently approved Environmental Sciences degree program as it appears in the UCR General Catalog. Students based at UCR wishing to enroll in the Joint Degree Program will follow this curriculum. During the required residency on the CSUF campus, students may select CSUF courses as approved by their adviser to satisfy one or more of the required electives associated with the Environmental Sciences degree option.

The major requirements for the Bachelor of Sciences degree are as follows. Students must fulfill the courses listed under the lower-division and upper-division requirements and choose one of the options.

Note: With proper justification and the approval of the advisor, for any of the four options, students may substitute ENSC 197 or ENSC 198-I for one of the upper-division elective courses listed.

1. Lower-division requirements (29 units)

   CHEM 1A-1B-1C  General Chemistry
   ENSC 1  Introduction to Environmental Science: Natural Resources
   ENSC 2  Introduction to Environmental Science: Environmental Quality
   MATH 5  Introduction to College Mathematics
   POSC 10  American Politics

2. Upper-division requirements (15 units)

   ENSC 100  Introduction to Soil Science
   ENSC 100L Land Resources Laboratory
   ENSC 101  Water Resources
   ENSC 102  Introductory Atmospheric Sciences
   ENSC 191  Seminar in Professional Development

**Natural Science Option** (78-89 units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>BIOL 5A</td>
<td>Introduction to Cell and Molecular Biology</td>
</tr>
<tr>
<td>BIOL 5LA</td>
<td>Intro to Cell and Molecular Biology Laboratory</td>
</tr>
<tr>
<td>BIOL 5B</td>
<td>Introduction to Organismal Biology</td>
</tr>
<tr>
<td>CHEM 112A-112B</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>ENSC/ECON 006</td>
<td>Introduction to Environmental Economics</td>
</tr>
<tr>
<td>ENSC/ECON 143A</td>
<td>Environmental Economics</td>
</tr>
<tr>
<td>ENSC 172</td>
<td>Principles of Env. Impact Analysis</td>
</tr>
<tr>
<td>GEO 1</td>
<td>The Earth's Crust and Interior or</td>
</tr>
<tr>
<td>GEO 2</td>
<td>The Earth's Dynamic Surface</td>
</tr>
<tr>
<td>MATH 9A-9B</td>
<td>First Year Calculus</td>
</tr>
</tbody>
</table>
PHYS 2A, 2B, 2C  General Physics
PHYS 2LA, 2LB, 2LC  Physics Lab recommended
STAT100A-100B  Introduction to Statistics or
STAT 120A-120B  Exp. Tech. for Biologists

Elective Courses- Natural Science Option

- at least one course chosen from the group listed below.

  BIOL 5C  Intro. Evol. & Ecology
  CHEM 5  Quantitative Analysis
  CHEM 112C Organic Chem.
  MATH 9C  First Year Calculus

- at least five courses chosen from the group listed below (at least three must be Environmental Sciences or Soil and Water Sciences courses):

  BIOL 117  Intro. Pop. & Community Ecology
  BIOL/MCBL 121A or 121B  Microbiology
  BIOL 160  Animal Behavior
  BIOL 163  Evol. Ecology of Terrestrial Vertebrates
  BPSC/BIOL 130  General Botany
  CHEM 109  Physical Chemistry for Life Sciences
  ENSC 127  Transport Processes
  ENSC 131  Biology of the Soil Environment
  ENSC/ENTX/CHEM 135  Chem./Clean & Polluted Atmosphere
  ENSC/ENTX/CHEM/SWSC 136  Chemistry of Natural Waters
  ENSC/SWSC 140  Limnology
  ENSC 141  Aquatic Microbiology
  ENSC 142  Water Quality
  ENSC/ENVE 144  Solid Waste Management
  ENSC 155  Principles & Applic. of Bioremediation
  ENSC 163  Hydrology
  ENSC 170  Workshop in Env. Management
  ENSC 174  Law, Institutions, and Environment
  ENSC/SWSC 176  Acquisition & Analysis of Env. Data
  ENTX 101  Fundamental Toxicology
  GEO 157  Automated GIS
  GEO 160  Atmospheric Circulation
  GEO 162  Geomorphology
  GEO 167  Conservation and Land Use
  GEO 168A  Biogeography
  GEO 168B  Landscape Ecology
  SWSC/ENSC/BPSC 134  Soil Conditions and Plant Growth
SWSC/ENSC 104  Environmental Soil Chemistry
SWSC/ENSC 107  Soil Physics
SWSC 111  Microbiology and Biochem. of Soils
SWSC/ENSC/GEO 138  Soil Morphology and Classification
SWSC 124  Soils of Wildland Ecosystems

Social Science Option (85-92 units)

BIOL 2  Cellular Basis of Life
BIOL 3  Organisms in Their Environment
ECON 3  Introduction to Microeconomics
ECON 111  Research Methods in Bus. & Econ. or
SOC 110A  Methods of Sociological Inquiry
ENSC 174  Law, Institutions, and the Env.
ENSC/ECON 143A  Environmental Economics
ENSC/ECON 143B  Natural Resource Economics
ENSC/ECON 143C  Ecological Econ. & Env. Valuation
ENSC 170  Workshop in Env. Management
ENSC 172  Principles of Env. Impact Analysis
GEO 1  The Earth's Crust and Interior or
GEO 2  The Earth's Dynamic Surface
MATH 22  Calculus for Business
STAT 100A-100B  Introduction to Statistics or
STAT 120A-120B  Exp. Tech. for Biologists or
SOC-110B (Stat. Analysis) - 110C (Multiv. Analy.)

Elective Courses – Social Science Option

- at least one course chosen from the group listed below.

ENSC/SWSC 140  Limnology
ENSC 141  Aquatic Microbiology
ENSC 142  Water Quality
ENSC/ENVE 144  Solid Waste Management
ENSC 155  Principles & Applic. of Bioremediation
ENSC 163  Hydrology
ENSC/SWSC 176  Acquisition & Analysis of Env. Data
SWSC/BPSC/ENSC 134  Soil Conditions and Plant Growth
SWSC/ENSC 104  Environmental Soil Chemistry
SWSC/ENSC 107  Soil Physics
SWSC 111  Microbiology and Biochem. of Soils
SWSC/ENSC/GEO 138  Soil Morphology and Classification
SWSC 124  Soils of Wildland Ecosystems
- at least six courses from the groups listed below:

1. Economics

   ECON 102A or 102B Microecon. Theory  
   ECON 146 Urban Economic Problems  
   ECON 148 Land & Resource Economics  
   ECON 156 Pop. Dyn. & Econ. Well-being  
   ECON/BSAD 160 Industrial Organization

2. Society and Culture

   ANTH 132 Cultural Ecology  
   ANTH 134 Anthropology of Resource Mgmt.  
   ANTH 135 Nutritional Anthropology  
   ANTH/LNST 186 People & Env. in Latin America  
   PHIL 117 Environmental Ethics  
   SOC 137 Population  
   SOC/URST 143 Urban Sociology  
   SOC/HMDV/URST 182 Urban Problems  
   SOC 184 Environmental Sociology

3. Regulation and Law

   BSAD/POSC 182 Politics and Economic Policy  
   POSC 101 The Legislative Process  
   POSC 166 Jud. Politics and Policy-Making  
   POSC 181 Public Policy  
   POSC 183 Admin. Politics and Theory

4. Management:

   BSAD/STAT 121 Intro. to Management Science  
   BSAD 122 Linear Programming with Appls.  
   GEO 157 Automated Geographic Information Systems  
   GEO 167 Conservation and Land Use  
   GEO 179 Urban Transportation Planning  
   MATH 120 Optimization Techniques

**Soil Science Option** (89-90 units)

   BIOL 5A Intro. to Cell and Molecular Biology
BIOL 5B        Intro. to Organismal Biology
CHEM 112A-112B Organic Chemistry
ENSC/ECON 6   Introduction to Environmental Economics or
ENSC/ECON 143A Environmental Economics
GEO 1        The Earth's Crust and Interior or
GEO 2        The Earth's Dynamic Surface
MATH 9A-9B    First Year Calculus
PHYS 2A-2B-2C General Physics
PHYS 2LA-2LB-2LC Physics Lab recommended
STAT 100A-100B Introduction to Statistics or
STAT 120A-120B Exp. Tech. for Biologists

Elective Courses – Soil Science Option

- at least four courses chosen from the group listed below.

ENSC 127    Transport Processes
ENSC 131    Biology of the Soil Environment
SWSC/ENSC/134   Soil Conditions and Plant Growth
SWSC/ENSC 104 Environmental Soil Chemistry
SWSC/ENSC 107 Soil Physics
SWSC 111    Microbiology and Biochem. of Soils
SWSC/ENSC/GEO 138 Soil Morphology and Classification
SWSC 124 Soils of Wildland Ecosystems

- at least one course chosen from the group listed below.

CHEM 5        Quantitative Analysis
CHEM 112C    Organic Chemistry
MATH 9C      First Year Calculus

- at least two courses chosen from the group listed below.

BPSC 103    Crop Ecology
BPSC/BIOL 130 General Botany
BPSC/BIOL 143 Plant Physiology
BPSC/BIOL 146 Plant Ecology
ENSC/CHEM/ENTX/SWSC 136 Chemistry of Natural Waters
ENSC/SWSC 140 Limnology
ENSC 141    Aquatic Microbiology
ENSC 142    Water Quality
ENSC 155    Principles & Applic. of Bioremediation
ENSC 163    Hydrology
ENSC/SWSC 176 Acquisition & Analysis of Env. Data
GEO 30  Crystallography and Mineralogy  
GEO 157  Automated GIS  
GEO 160  Atmospheric Circulation  
GEO 162  Geomorphology  

**Environmental Toxicology Option** (80-92 units)  

BCH 100  Elementary Biochemistry or  
BCH 110A-110B General Biochemistry  
BCH 110C  General Biochemistry or  
BIOL 107A  Molecular Biology  
BIOL 5A  Intro. to Cell and Molecular Biology  
BIOL 5LA  Intro to Cell and Molecular Biology Laboratory  
BIOL 5B  Introduction to Organismal Biology  
BIOL 102  Introductory Genetics or  
BIOL/MCBL 121A  Microbiology  
CHEM 5  Quantitative Analysis or  
BIOL 5C  Introductory Evolution & Ecology  
CHEM 112A-112B-112C  Organic Chemistry  
ENSC/ECON 6  Introduction to Environmental Economics or  
ENSC/ECON 143A  Environmental Economics  
ENTX 101  Fundamental Toxicology  
ENTX 154  Risk Assessment  
MATH 9A-9B  First Year Calculus  
PHYS 2A, 2B, 2C  General Physics  
PHYS 2LA, 2LB, 2LC  Physics Lab recommended  
STAT 100A-100B  Introduction to Statistics or  
STAT 120A-120B  Exp. Tech. for Biologists  

Elective Courses – Environmental Toxicology Option  

- at least one course chosen from the group listed below.  

ENSC 127  Transport Processes  
ENSC 131  Biology of the Soil Environment  
ENSC 135/CHEM 135/ENTX 135  Chem./Clean & Polluted Atmosphere  
ENSC 136/CHEM 136/ENTX/SWSC 136  Chemistry of Natural Waters  
ENSC/SWSC 140  Limnology  
ENSC 141  Aquatic Microbiology  
ENSC 142  Water Quality  
ENSC/ENVE 144  Solid Waste Management  
ENSC 155  Principles & Applic. of Bioremediation  
ENSC 163  Hydrology  
ENSC/SWSC 176  Acquisition & Analysis of Env. Data
ENTX 150  Cancer Biology
SWSC/ENSC/BPSC 134  Soil Conditions and Plant Growth
SWSC/ENSC 104  Environmental Soil Chemistry
SWSC/ENSC 107  Soil Physics
SWSC 111  Microbiology and Biochem. of Soils
SWSC/GEO/ENSC 138  Soil Morphology and Classification
SWSC 124  Soils of Wildland Ecosystems
III.E Administration of the Program

The Joint Degree Program in Environmental Sciences will be governed by the Environmental Sciences Joint Degree Program Governing Board. The Board will have six members — three representatives from each campus, consisting of the Dean of the School of Natural Sciences of CSUF or designated Associate Dean, the Dean of the College of Natural and Agricultural Sciences of UCR or designated Associate Dean, the two Co-Program Coordinators from each campus, and two additional faculty representatives, one from each campus. The Co-Program Coordinators and the faculty representatives will be appointed by the Chancellor (UCR) and the President (CSUF) of their respective campus. The Board will address planning and policy issues, and consider curriculum recommendations by faculty participating in the program. Any curriculum recommendations coming from the Governing Board will only become effective after approval by each campus following its own procedures.

Initially, the Environmental Sciences Program in CSUF will be placed administratively within the current Department of Earth and Environmental Sciences in order to optimize the use of existing academic resources. In UCR, the program will be administered in conjunction with the existing Environmental Sciences program. The Co-Program Coordinators will be responsible for administering the program and implementing the academic policies set forth by the Governing Board.

At CSUF, participating faculty who teach designated Environmental Science (E.S.) courses will have joint appointments in the Environmental Sciences Program in addition to their existing department affiliations. For each of the three options of the joint degree curriculum, a faculty advisor will be appointed by the Governing Board. Faculty advisors will be responsible for advising students on academic and curricular matters.

At UCR, the participating faculty is primarily based in the Department of Environmental Sciences. The Department of Environmental Sciences will have administrative responsibility for the proposed joint degree Program as well as responsibility for the existing Environmental Sciences program at UCR.

I.F Instructional Delivery

Students enrolled in the joint BS degree program in Environmental Sciences will be required to take a certain number of courses on each of the two campuses. Most of this requirement will be met through a combination of fulfilling the residency requirement and the development and utilization of distance learning/multimedia instructional approaches to shared faculty expertise.

In developing the Joint Degree Program attention was given to ensuring intellectual equivalency between the various program components as they exist on the two campuses. This enables students to take courses at both campuses without experiencing serious deficiencies in background and preparation. Likewise students will be qualified to enroll in
courses through distance learning and have all necessary prerequisites. In particular, the upper division sequence in Environmental Sciences (ENSC 100, 101 and 102 on the Riverside campus and ENV SCI 100A,B) on the Fresno campus were designed so that either sequence would allow students to take the upper division electives having these courses as prerequisites.

Fresno-Based Students

The CSUF curriculum for the joint BS degree in Environmental Sciences requires Fresno-based students to take a minimum number of units from courses offered by the UCR faculty. In addition, they must also satisfy a minimum residency requirement at UCR. More than 80% of the courses in the proposed curriculum are existing courses taught by CSUF faculty. The remaining 20% of the courses will be delivered through one or more of the following means:

(1) By taking advantage of the established distance learning/multimedia instructional facilities, a pilot program based on distance learning and multimedia instruction will be developed. Experience gained from this program will provide the needed experience to fully evaluate their potential benefits and explore other possibilities for inter-campus courses.

(2) The Environmental Sciences areas will be considered for new faculty hires. For example, since a course in Atmospheric Chemistry is needed as a fundamental course in air pollution, the Chemistry Department will include this need in their future faculty recruitment.

(3) Faculty who are interested in the area of Environmental Sciences will be encouraged to update and pursue training in this area through sabbatical or difference-in-pay leaves.

(4) Fresno-based students will be able to take UCR courses during their residency at UCR.

(5) Advanced courses may be taught on CSUF campus by visiting UCR faculty, particularly those who have been involved in the nearby Kearney Agricultural Extension Station as well as those who have been conducting environmental research in the Central Valley area. In addition, a faculty exchange program may be developed.

UCR-Based Students

The UCR curriculum that will be used in the joint degree program is already established and functioning. UCR-based students wishing to enroll in the Joint Program will be taking CSUF courses while fulfilling their required residency on that campus. UCR-based students, including students not enrolled in the joint BS degree program, will also be taking CSUF courses through distance learning in specialized areas of instruction not available on the Riverside campus.
Frequency of Offering

The proposed policy requires that core courses of the curriculum will be offered on an annual basis, and elective courses will be offered at least once every two academic years. Departments contributing to this proposed program will have to be committed to this minimum frequency of offering. Since the majority of the courses are also required by other degree programs, the actual offering frequencies for most of the included courses are expected to be higher due to student demand. This program should not cause any undue burdens on individual academic departments.
III.G  Programmatic Review

To ensure the effectiveness of instruction and academic quality of the program, periodic course evaluations will be held according to the existing practice and established procedures of the two campuses. In addition, faculties and the Program Governing Board will hold annual or semi-annual retreats to review progress, set goals, formulate plans, identify problems, and propose changes to improve the program’s performance.

The first formal evaluation of the program will be carried out internally by the Program Governing Board after the end of the third academic year of the program. A formal external review of the program will be held after the end of the fifth year, and every five years thereafter. The review process will follow all existing practices and established procedures of either universities or a combination of both. Special attention will be focused on recruitment and retention data as well as outcome assessment data, useful in measuring the success of the program and fine-tuning the curriculum.
IV. RELATIONSHIP TO EXISTING PROGRAMS

There are currently no programs offering degrees specifically in Environmental Sciences at CSUF. Because the UCR/CSUF Joint Degree Program in Environmental Science is a precedent-setting undertaking, its relationship to existing and future programs at UC Riverside is somewhat tentative. However, given the fact that each campus possesses unique educational resources that the Joint Program would make available to students in any major on both campuses, it is expected that opportunities will emerge to benefit students in existing programs and to develop new programs not currently available at UCR and CSUF.

IV.A Benefits to Students in Existing Programs:

Environmental science majors at UCR engage in a multi-disciplinary curriculum with substantial flexibility in course selection so that they can focus their education on their particular academic and professional objectives in the environmental sciences. However, courses not available at UCR are required for State certification in at least two professional areas closely related to environmental science: Industrial Hygiene and Environmental Health. Since these programs currently exist at CSU Fresno, the joint program could make the requisite courses available to UCR students. Appropriate courses are listed under the Environmental Health emphasis of the Behavioral, Policy, and Health Sciences option of this proposal.

Some UCR courses provide an educational experience that is so highly specialized that the low student enrollment is not sufficient to justify offering the course on an annual basis. Consequently, students whose matriculation is not synchronized with courses offered on alternate years may not have access to these courses. To the extent that CSUF-based joint degree student enrollment in these courses (via distance learning or in residence) will result in more frequent offerings, UCR student access to these courses will be enhanced.

IV.B Opportunities for New Programs

As illustrated by the widespread appearance of environmental science programs over the past thirty years, both technological advancements and social needs influence the evolution of academic curricula. While today’s global population of about 5.8 billion people prepares to meet the needs of the 9.4 billion people expected in the next fifty years, it has become apparent that the development paradigm of today’s industrialized nations cannot achieve that goal without severely damaging the Earth’s resources upon which we all depend. In recognition of this fact, the World Commission on Environment and Development reported and defined a need for “sustainable development” as “that which meets the needs of the present without compromising the ability of future generations to meet their own needs”. The Environmental Science major at UCR provides students with a strong background in the natural and social sciences necessary to understanding the causes of environmental
degradation, its consequences to humans and the biosphere and the means of evaluating alternative methods of controlling it. Applying this knowledge to the design and implementation of industrial and agricultural systems offers the potential of major contributions to their sustainability. The Joint Program would enable UCR students to gain access to CSUF’s courses in industrial technology and agriculture to provide the context for a programmatic application of environmental management principles to enhancing sustainable development. Students completing such a program would be well prepared to participate in enabling developing countries to leap-frog over the most environmentally destructive development practices as well as promoting the transition of industrial agriculture and manufacturing to sustainable methods in developed regions. Appropriate courses are listed in Section IV.C below.

IV.C Additional CSU Fresno Courses Available for UC Riverside Environmental Sciences Degree Options

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>IT 92</td>
<td>Industrial Safety Management</td>
<td>3</td>
</tr>
<tr>
<td>IT106</td>
<td>Energy Conversion and Utilization</td>
<td>3</td>
</tr>
<tr>
<td>IT107</td>
<td>Facilities Planning</td>
<td>3</td>
</tr>
<tr>
<td>Ag Ec 1</td>
<td>Introductory Agricultural Economics</td>
<td>3</td>
</tr>
<tr>
<td>Ag Ec 2</td>
<td>Agricultural Sector Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Ag Ec 28</td>
<td>Introductory Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>Ag Ec 100</td>
<td>Intermediate Agricultural Economics</td>
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</tr>
<tr>
<td>Ag Ec 110</td>
<td>Farm Management</td>
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<td>Ag Ec 120</td>
<td>Agribusiness Management</td>
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<td>Ag Ec 122</td>
<td>Agricultural Cooperative Management</td>
<td>3</td>
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<td>Ag Ec 124</td>
<td>Food and Fiber Industry Management</td>
<td>3</td>
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<td>PLT H 102</td>
<td>Pesticides</td>
<td>3</td>
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<tr>
<td>PLT H 103</td>
<td>Economic Entomology</td>
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<td>Introduction to Irrigated Soils</td>
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<td>SW 104</td>
<td>Soil and Water Management</td>
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<tr>
<td>SW 111</td>
<td>Irrigation Systems</td>
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</table>
V. RESOURCE REQUIREMENTS

Both CSUF and UCR have strong instructional programs that are well supported by several campus services including extensive library resources, accessible computer services and an active student-learning center. Additional resource needs are indicated below.

Resources Needed for the Program by CSUF

Additional resources needed by CSUF for this program fall into four general areas: (1) personnel; (2) instructional equipment and facilities; (3) operational expenses, and (4) student aids.

Personnel include three additional tenure-track faculty positions in earth, atmospheric, and oceanographic sciences, a half-time faculty program coordinator, and additional faculty release time for program/course development activities for the first few years of the program.

Instructional equipment and facilities consist of a dedicated distance learning lecture theater with the necessary equipment, an instructional laboratory including equipment, such as computer workstations, microscopes and analytical instruments. These facilities will also need maintenance and technician support.

Operational expenses include office expenses, administrative, secretarial, and technician support.

It is expected that when the enrollment reaches the target of 60-120 after the third year, the FTEs of the program will generate sufficient revenue to pay for the operational expenses and personnel costs.

In addition, financial aid must be made available for Fresno-based students through grants and scholarships, because they are required to be in residence for at least two quarters at UC Riverside where fees are higher than at CSUF, and also, students who otherwise would stay with parents in the valley will likely incur additional living expenses such as rent or dormitory fees. Some joint program students may be eligible for existing scholarships and other forms of financial aids. However, based on the projected enrollment, the increased need for student aid cannot be met by current resources. To meet this need, additional funds will be obtained through external grants and scholarships from private foundations and government agencies. This need is not included in our budget request.

Resources Needed for the Program by UCR

The University of California, Riverside currently offers BS and BA degrees in Environmental Sciences. This ongoing program is in a position to provide the resources needed to initiate the Joint Degree Program. In order to maintain the breadth of the program at UCR, there is a need to recruit and hire a person with expertise as a soil landscape scientist. In addition to
teaching a number of existing program courses, this individual would develop new classes in land use and conservation that would incorporate training and application in remote sensing and geographic information systems.

The success of the joint program will require the establishment of a well equipped and continually supported distance learning facility dedicated to the program’s use.

Consideration for financial supplements available to students may be warranted due to the potential requirement to maintain dual residencies and transportation expenses.

**Resources to Be Shared by Both Universities**

It is essential for the success of the program that faculty workload be credited fully to the institution teaching the course. This would include courses taught via distance learning. A major aspect of the success of the Joint Degree Program is that courses will be shared among students at both institutions. This will be accomplished through various instructional approaches including students attending classes during the required residency on each campus as well as attending classes through distance learning while in residence on their primary campus. Students not enrolled in the Joint Degree Program will also be allowed to participate in classes from each campus taught through distance learning.

To develop a truly joint degree program between the two universities, special programs to promote scholarly interaction, research collaboration, and sharing of intellectual resources between the two faculties should also be created. These should include a faculty exchange program, seminar series or special symposiums. Lectures by guest speaker will be broadcast from one campus to the other via distance learning facilities. To establish these inter-campus programs and activities, a special fund is needed. We propose to set up a fund with equal contributions from the respective Chancellor’s Office and President’s Office of the two university systems.
Table Of Possible Career Objectives In Relation To the CSUF Degree Options. Similar Career Opportunities Apply for the UCR Degree Options.

<table>
<thead>
<tr>
<th>Degree options</th>
<th>Earth Science Option</th>
<th>Life Sci Option</th>
<th>Behavioral, Policy and Health Sciences Option</th>
</tr>
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<tbody>
<tr>
<td>Curriculum emphasis</td>
<td>Engineering</td>
<td>Geology</td>
<td>Soils</td>
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<tr>
<td>Env. planner *</td>
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<td>GIS specialist</td>
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<tr>
<td>Env. educator</td>
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<td>X</td>
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<td>Public relations specialist</td>
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<tr>
<td>Regulatory affairs specialist</td>
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<td>X</td>
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<tr>
<td>Engineering geologist *</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hydrogeologist/hydrologist *</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Env engineer *</td>
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<td></td>
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<tr>
<td>Ecologist</td>
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<td></td>
<td></td>
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<tr>
<td>Indust. hygiene consultant</td>
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<td></td>
<td></td>
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<tr>
<td>Toxicologist</td>
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<td></td>
<td></td>
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<tr>
<td>Env. chemist</td>
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<td>X</td>
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<tr>
<td>Env. economist</td>
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<td></td>
<td></td>
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<tr>
<td>Env health specialist §</td>
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<td></td>
</tr>
<tr>
<td>Env scientist</td>
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<td>Env. modeler</td>
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<td>Civil/geotechnical engineer *</td>
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<td>Recycling specialist</td>
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<td>Waste management specialist</td>
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<td>Geophysicist *</td>
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<tr>
<td>Env. impact specialist</td>
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<tr>
<td>Policy analyst</td>
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<td>Scientist/Researcher</td>
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<td>Agronomist</td>
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<tr>
<td>Resource specialist/Planner</td>
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<td>Water conservation/pollution consultant</td>
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<td>Fishery/wildlife manager</td>
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<tr>
<td>Public administrator</td>
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<tr>
<td>Forestry manager</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Endangered species biologist</td>
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</tbody>
</table>

Notes:

* Additional course work, professional education, and/or examinations are required for registered or certified professional status.

§ Proposed curriculum meets the requirements for Registered Environmental Health Specialist in the State of California. Program is expected to be accredited by the California Department of Health Services, and National Environmental Health Science Protection Accreditation Agency.
APPENDIX B

ENVIRONMENTAL SCIENCE FACULTY at CSUF

C. JOHN SUEN
Professor, Department of Earth and Environmental Sciences, B.Sc. McGill (1972), Sc.D. MIT (1978), Registered Geologist (Calif). Professor Suen's teaching interests include environmental geoscience, hydrogeology, groundwater hydrology, geochemistry and computer applications. In addition to classroom activities, Professor Suen is the CSUF coordinator of the UCR-CSUF Joint Degree Program in Environmental Sciences. His research areas cover the modeling of geohydrologic and hydrogeochemical systems as applied to environmental problems, in particular, in areas of nuclear waste disposal, and groundwater contamination. His past research projects include computer model development and testing funded by U.S. Nuclear Regulatory Commission Low-Level Waste program and reactive transport model development for DOE's Savannah River Site, His current interest includes groundwater modeling for sites in the San Joaquin Valley, especially areas related to fractured rocks. Professor Suen was an AWU-DOE Fellow at Lawrence Berkeley National Laboratory (94-95); Assoc. Scientist (87-88), Scientist (88-90), Brookhaven National Laboratory; Adjunct Prof., SUNY at Stony Brook (89-90); Lecturer and Adjunct Prof., California State University, Hayward (85-87). He was a Research Scientist at MIT (79-80), and he also carried out research at UC San Diego as a postdoctoral fellow, and at R&D departments of two major oil companies.

LYNNETTE C. ZELEZNY
Assistant Professor of Psychology, Ph.D., the Claremont Graduate University (1998). She teaches courses in statistics, research methods, honors psychology, environmental psychology, and applied social psychology. In addition, she conducts research related to applied social issues: environment, health, and education. She is the author of Methods in Action, and the editor of Promoting Environmentalism, a special issue of the Journal of Social Issues. Professor Zelezny is a professional member of the American Psychological Association, the American Psychological Society, the Western Psychological Association, the Society for the Psychological Stud of Social Issues, and Sigma Xi., the National Honor society for Scientific Research. Additionally, she serves on the advisory board of the Ronald McNair Scholarship Foundation, and as a member of the Latino Mental Health Task Force in Fresno, CA. She has been recognized by Psi Chi, the National Honor Society in Psychology, for outstanding service and as Psychology Professor of the Year at California State University, Fresno.
SHARON E. BENES  
Assistant Professor, Department of Plant Science, B.S. Botany, University of New Hampshire, Durham, M.S. Plant pathology, North Carolina State University, Raleigh, Ph.D. Plant physiology, University of California, Davis; postdoctoral research, Univ. of California, Davis. Professor Benes teaches (Undergraduate:) Soils, Soils lab, Crop nutrition, (Graduate:) Plant nutrition, Soil & Water Relationships and Seminar in Plant Science. Her research areas include response of plants to soil salinity, irrigation with saline water and effects on soils, management of hypersaline, high boron drainage water in the westside San Joaquin Valley. Field and greenhouse studies. She is also interested in management of nitrogen fertilizers to reduce nitrate leaching and risks of groundwater contamination, crop nutrition and soil amendments. Professor Benes has worked on foliar absorption of sodium and chloride in sprinkler-irrigated corn and barley in Spain (1993-95), and on Melampsora leaf rust in poplar in Italy (1985-86) where she was a Fulbright Scholar.

CHARLES F. KRAUTER  
Professor of Soil and Water, Department of Plant Science, B.S. Soil and Water Science, University of California – Davis (1969); PhD Soil Science, University of California – Davis (1974). Professor Krauter was Associate Professor from 1979 to 1983, Professor from 1983 to present. He regularly teaches Agricultural Water, Water Management, Irrigation Systems, and Plant Water Relations. Has also taught Soils, Crop Nutrition, Soil Management, and Water Quality. His research interests include irrigation management based on plant stress monitoring and remote sensing, deficit irrigations, groundwater contamination from irrigated agriculture practices, and ammonia in the atmosphere from fertilizer applications.

BERT TRIBBEY  
Professor of Biology, B.A. degree in Biology from the University of California, Santa Barbara (1961); Ph.D. from the University of Texas, Austin (1965) in Zoology with a specialization in Aquatic Ecology. He joined the Biology faculty at California State University, Fresno in 1965 (then Fresno State College) and has remained there, moving through the ranks, ever since. He served as department chair from 1972 through 1978. As a 1978-79 recipient of a NSF Science Faculty Fellowship, he spent the 1978-79 academic year as a visiting faculty member at Michigan State University and the summer of 1978 teaching Limnology at the University of Wisconsin, Madison. He has taught well over a dozen different courses at CSUF ranging from introductory biology for nonmajors to specialized graduate courses in Systems Ecology and Advanced Ecology. His areas of specialization are Freshwater Ecology and Fisheries Biology. For the last decade, his research has been directed to practical aspects of reservoir ecology and evaporation ponds. He has worked cooperatively on contract research with the Department of Fish and Game, the Department of Water Resources, and the Kings River Conservation District. He has supervised over thirty successful M.A. thesis projects. He has received three Performance Awards from the Dean of the School of Natural Sciences, and his contributions...
were recognized as a 1998 recipient of a Provost's performance award.

WAYNE N. CLARKE
Professor of Health Science, B.S. Utah State University, M.S. Utah State University, MPH University of Hawaii, Ph.D. Utah State University, Registered Sanitarian/Registered Environmental Health Specialist. Professor Clark is a faculty advisor for the Environmental Health Science/Industrial Hygiene option of the Bachelor of Science degree program in Health Science. He has been a faculty member of the Health Science Department since 1973.

RONALD C. SCHULTZ
Professor of Health Science, B.A. CSU Fresno, M.S. CSU Fresno, Ph.D. Oregon State University, Certified Health Education Specialist (CHES), Registered Sanitarian/Registered Environmental Health Specialist. Professor Schultz is the Coordinator for the Environmental Health Science/Industrial Hygiene option of Bachelor of Science degree program in Health Science. He has been a faculty member since 1972.

Alam Hasson, Ph.D. University of Birmingham (UK), 1998. Assistant Professor. Kinetic and mechanistic investigations of the tropospheric oxidation of organic compounds, the quantification of toxic compounds in ambient aerosols, and studies of dynamic instabilities in tropospheric chemistry models.

Graham Mortyn, Ph.D. Scripps Institute of Oceanography, University of California, San Diego, 2000. Assistant Professor Paleo-climatology and paleo-oceanography. Isotopic studies of deep ocean water/sediments.

Sandra Donohue, Dr.P.A. University of La Verne, Registered Environmental Health Specialist; Certified Hazardous Materials and Waste Manager. Associate Professor and Environmental Health/Industrial Hygiene Program Coordinator. (New member of the Environmental Sciences Curriculum Committee). Environmental/occupational policy and program development, hazardous materials and waste management, and medical entomology/vector control.

Steve Blumenshine, Ph.D. University of Notre Dame, 1997. Assistant Professor. Role of predation and nutrient enrichment on the structure and dynamics of aquatic communities and ecosystems.


Ruth Kern, Ph.D. Duke University, 1996. Assistant Professor. Plant population and community ecology of montane systems.


APPENDIX C

LETTER OF SUPPORT FROM
DR. MICHAEL ORTIZ, PROVOST
CALIFORNIA STATE UNIVERSITY, FRESNO
MEMORANDUM

DATE: September 2, 1999

TO: Dr. Jolayne Service, Dean
    Academic Program Planning
    Office of the Chancellor
    California State University

FROM: J. Michael Ortiz, Ph.D.
      Provost and Vice President for Academic Affairs

RE: Joint Bachelor of Science Degree in Environmental Sciences

As Provost of California State University, Fresno, I fully recognize the academic value and merit to our students and faculty of the proposed UC Riverside – CSU Fresno Joint BS Degree Program in Environnemental Sciences. I have given my strong support for the establishment of this program and will continue to lend my support to this program by providing as much of the necessary academic resources for its implementation as our funding allows.

Should there be any further questions concerning academic resources, please do not hesitate to contact my office.

JMO:kyp

cc: Brandt Keohc
    K.P. Wong
APPENDIX D

LETTERS TO DEAN K. P. WONG (CSUF)
FROM DEAN MICHAEL CLEGG (UCR)
Dean Kin-Ping Wong  
School of Natural Sciences  
2555 East San Ramon Avenue  
Fresno, CA 93740-0090

Dear Dean Wong:

Last month, Chancellor Raymond Orbach of the University of California, Riverside, met with President John Welty of Fresno State University to discuss a number of potential relationships between our institutions. A primary area of interest was the possibility of joint Ph.D. programs in the natural sciences. Currently UCR offers graduate degrees in chemistry, geology, mathematics, physics, soil sciences, and statistics. Already many of our graduate students come to us from Fresno State. It may be desirable, however, to establish a more formal association between UCR and Fresno State. Several of our departments have expressed an interest in developing a closer relationship.

I would be pleased to meet with you to discuss programs of mutual interest. I may be reached at 909-781-3101, or by my e-mail address: cnasdean@ucr.ac1.ucr.edu. I look forward to hearing from you.

Sincerely,

Michael T. Clegg  
Acting Dean

cc: R. Orbach  
(909) 781-5501
November 19, 1996

Dean Kin-Ping Wong
School of Natural Sciences
2555 East San Ramon Avenue
Fresno, CA 93740-0090

Dear Dean Wong:

Thank you for a most informative visit concerning a joint effort between our campuses in environmental sciences. Chancellor Orbach enthusiastically supports such an effort. A group of faculty from our Department of Soil and Environmental Sciences is meeting next week to discuss this further. Following their meeting, I will be in contact with you to arrange the next steps.

In the meantime, will you please send me information concerning your curriculum in environmental biology? I look forward to hearing from you.

Sincerely,

Michael T. Clegg
Acting Dean
APPENDIX E

MEMORANDA TO SCHOOL DEANS AND FACULTY
FROM DEAN K.P. WONG (CSUF)
DATE: September 3, 1996

TO: Dr. Daniel Bartell, Dean, School of Agricultural Sciences & Technology  
    Dr. Karl Longley, Interim Dean, School of Engineering  
    Dr. Ben Cuellar, Dean, School of Health & Human Services  
    Dr. George Hanna, Director, Engineering Research Institute  
    Dr. John Johnston, Associate Professor, Department of Civil and Surveying Engineering and Construction  
    Dr. Bert Tribbey, Professor, Department of Biology  
    Dr. Gary Banuelos, Soil/Plant Scientist, USDA & Adjunct Professor, Department of Biology  
    Dr. Barry Gump, Professor, Department of Chemistry  
    Dr. Kin Ng, Professor, Department of Chemistry  
    Dr. Arthur Barabas, Professor, Department of Geology  
    Dr. John Suen, Professor, Department of Geology  
    Dr. Ronald Schultz, Professor, Department of Health Science  
    Dr. Charles Kranter, Professor, Department of Plant Science & Mechanized Agriculture  
    Dr. Mark Mayse, Professor, Department of Plant Science & Mechanized Agriculture  
    Dr. Kenneth Mosher, Professor, Department of Industrial Technology  
    Dr. Dennis Nef, Chair and Professor, Department of Agricultural Economics  
    Dr. David Zoldoske, Assistant Director, Center for Irrigation Technology

FROM: Kin-Ping Wong, Dean  
School of Natural Sciences

SUBJECT: Collaborative Programs with UC, Riverside, Air/Water Pollution (Environmental Science) - REVISED
President Welty has had a number of discussions with Chancellor Raymond Orbach of the University of California, Riverside concerning possible collaboration between our two institutions in Environmental Science particularly in the area of air and water pollution.

He has asked me to act as a liaison with my counterpart, Dr. Michael Klegg, Dean of Natural and Environmental Science at UC, Riverside. I would like to first meet with you and discuss with you what we would like to do before I meet with Dean Michael Klegg. The following are a few items we would like to include in our discussions:

1. Student demands and job market.
2. Faculty expertise and interests - Agriculture, Engineering, Health, Science and others.
3. Degree level and forms of collaboration - doctoral, masters, undergraduate
4. Resources needed: institution, state, federal, corporal
5. Benefits to students, faculty, and community.
6. Possible participation of other institutions - USDA Water Research Lab Fresno, Kearney Ag Extension of UC, UCSF (Fresno) Medical Program, State Water Resources Lab, EPA, Forest Services, Wildlife and Game, San Joaquin Air Pollution Board, etc.
7. Organization structure - planning committee, etc., and
8. Any other items you would like to bring up.

I have scheduled a meeting on September 6, 1996 at 10:00 a.m. in the Natural Sciences Dean's Conference Room, Science 100. I hope everyone can attend.

KPW

c: President John D. Welty
Provost Alex Gonzales
DATE: November 14, 1996

TO: Dr. Karl Longley, Interim Dean, Engineering
    Dr. Bert Tribbey, Biology
    Dr. John Suen, Geology
    Dr. Wayne Clark, Health Science
    Dr. Charles Kreuter, Plant Science
    Dr. Lynnette Zalesny, Psychology

FROM: K. P. Wong, Dean
       School of Natural Sciences

SUBJECT: UC Riverside/CSUF Environmental Science Program

I would like to invite you to come to a working session to discuss curriculum matters related to the UC Riverside/CSUF Environmental Science Program on Tuesday, November 19 at 9:00 a.m. in the Natural Sciences' Conference Room, Science 100.

Attached is a tentative curriculum proposed by Professor John Suen, which list courses currently offered by CSUF which are equivalent to those being offered by UC Riverside for the Environmental Science majors and their options.

KPW:sm

Attachment

c: President John D. Welty
    Provost Alex Gonzalez
    Dean Daniel Bartell
    Dean Benjamin Cuellar