Focus on the Future

Academic Prioritization Committee Report
July 31, 2009

College of Agricultural and Environmental Sciences
University of California, Davis

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On February 17, 2009, Dean Neal Van Alfen (College of Agricultural and Environmental Sciences, University of California, Davis) charged the Academic Prioritization Committee (APC) to undertake a thorough review of college programs and make transformational recommendations for the future of the college in recognition of an increasingly resource-limited environment. Rather than across-the-board reductions, the committee was asked to make strategic, targeted recommendations and suggestions for strong alternative structures that would provide the greatest opportunities for the excellence of our research, teaching, and outreach programs to be maintained and to continue to thrive.

Academic Prioritization Committee members included:

MRC Greenwood, chair, Department of Nutrition
Christopher Benner, Department of Human and Community Development
Douglas Cook, Department of Plant Pathology
Graham Fogg, Department of Land, Air and Water Resources
Bruce German, Department of Food Science and Technology
Marion Miller, Department of Environmental Toxicology
Elizabeth Mitchum, Department of Plant Sciences
Anita Oberbauer, Department of Animal Science
Jay Rosenheim, Department of Entomology
Mark Schwartz, Department of Environmental Science and Policy
Richard Sexton, Department of Agricultural and Resource Economics

Background

The College of Agricultural and Environmental Sciences (CA&ES) is facing an unprecedented crisis compounded by two decades of steady erosion of state support including disproportionate, targeted cuts to the Agricultural Experiment Station (AES) and Cooperative Extension (CE) budgets in the range of 20–25 percent, both in the early 1990s and early 2000s. Budget reductions in the early 1990s and early 2000s were met primarily by:

1) Reducing core support via the college RAC formula
2) Significant reductions in state-funded staff
3) The transfer of one academic program to another college
4) The loss of approximately 77 AES and CE faculty positions through attrition

The college has three sources of state-supported revenue: AES, CE, and Instruction and Research (I&R). CA&ES once again faces draconian, permanent budget cuts in the range of 20 percent to all three of its state general-funded categories. These reductions translate to approximately $5.7 million, $6.8 million, and $2.0 million, respectively in I&R, AES, and CE for a total reduction of approximately $14 million.

As an example, if the entire $14 million reduction were taken through faculty attrition and associated support, this would translate to a loss of 89–158 faculty FTE and 46–82 staff FTE, depending on the level of faculty exit salary for which we are credited. In 2009–2010, a portion of this budget reduction will be mitigated by federal stimulus funding and the cost savings expected from the recently announced University of California furlough program. However, savings from stimulus funding and furloughs are a temporary measure and will likely not be available in 2010–2011 and beyond. Additional reductions to, and recovery of, state general fund support for the University of California will be directly correlated to the speed at which California recovers from the current economic crisis.

Two decades of state budget cuts have brought CA&ES to the point where retrenchment is not a long-term option. Since approximately 88 percent of the CA&ES state general fund budget is committed to salaries for faculty, staff, and student employees, it is critical that CA&ES immediately begin to implement the difficult, but critical, strategic decisions necessary to align with the state general funds that will be available in the foreseeable future. Difficult choices must be made about what programs will, and will not, be supported in the future.

Much of the narrative and supporting data in this report will reference only I&R and AES because the college has direct oversight of these state-derived funding sources. While the Cooperative Extension budget is administered by the college, the budget authority is maintained at the division of Agricultural and Natural Resources (ANR), and while CA&ES may influence ANR it cannot make final allocations. The committee wants to be clear that the lack of specific reference to CE faculty and CE programs in no way reflects their excellence or value to the college.

I. The Larger Environment in Which the College of Agricultural and Environmental Sciences Exists

Human well-being is a broad issue that includes food quality, food safety, and food security, and their interrelationship with food choices and nutrition as major translational disciplines in the agriculture enterprise. These topics are all tightly linked to human health. Environmental quality and the health of communities are also centrally linked to human well-being. As human population exceeds the capacity of the earth to support its inhabitants to live by western standards, environmental degradation becomes another critical component of human health and well-being.

While much of the world is building its scientific infrastructure around these disciplines, UC Davis is at risk of losing its leadership and expertise through faculty attrition. CA&ES must develop a coherent plan to focus its energies and limited resources on the fields that will drive the future of human well-being.

Human well-being will be one of the most valuable sectors of the global economy in the 21st century. Broadening and personalizing what we consider human health and the maintenance of human well-being will be the most valuable growth dimension in this sector over the next 25 years. Advances in human well-being will require major innovations in basic science and their translation via enabling technologies. The universities that produce this science and technology and train the leaders of tomorrow will dominate the 21st-century academic landscape.

The world relies on the resources of universities for both short-term crisis management and long-term opportunity identification; CA&ES is distinguished in its ability to address both. Our world-renowned expertise in agricultural, environmental, and human sciences and the strength of the interface of these disciplines within the college serve as a foundation to address issues critical to the future of our world.

The breadth, diversity, and interrelationship of CA&ES expertise is an asset in long-term opportunity discovery, but can be considered a perceived liability in times of short-term crisis management. Crisis management decisions affecting the college should not result in complete abandonment of this diversity or result in default decisions in order to meet short-term criteria.

What is the Urgency?

The urgency for education and scholarship on agricultural and environmental sciences has never been greater. The viability and stability of human civilization as we know it is being challenged by the unknown or questionable sustainability of the food supply, natural resources, and environmental quality. As the human population approaches seven billion people, land use decisions regarding how we both feed humanity and maintain livable environments has never been more of a challenge.

The College of Agricultural and Environmental Sciences provides an essential vehicle for addressing these intertwined issues. For decades these issues have been recognized as critically important. Increasingly, we see the need to consider the challenges of food supply and natural resource use alongside the broader issue of environmental quality related to both agricultural and non-agricultural practices. The urgency is both global and great because of:

1. Rapid development and population growth in the world
2. Pressures on the global supply of food and resources
3. Rapid and widespread environmental degradation that threatens human health and well-being
4. Climate change

The following three statements, as well as other powerful statements by leading knowledge centers from the United Nations to the National Research Council of the National Academies, frame the dilemma that the College of Agricultural and Environmental Sciences now faces.

> "Our world is changing at an increasing pace and unleashing a complicated set of problems and opportunities. . . . We are only beginning to understand the meaning of the emerging bio-economy for world food and energy security, and how this development in our agricultural system can be achieved more sustainably, if at all. It is not an exaggeration to observe that world stability depends on reliable supplies and stable prices for food and energy, which are now linked in agriculture, and on the preservation of the natural resource base. . . . Is the next generation of leaders in agriculture prepared to address these critical demands on our agricultural systems? Can we sustain the educational institutions that will prepare the leaders of tomorrow?"
>
> (*from: Transforming Agricultural Education for a Changing World; Board on Agriculture and Natural Resources, NRC, National Academies Press, 2009, http://www.nap.edu/catalog/12602.html*)

"Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history. . . . This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process — in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent."

(from: The Millennium Ecosystem Assessment, 2005, http://www.millenniumassessment.org/en/index/aspx)

The social and behavioral sciences provide an essential but often unappreciated knowledge base for wise choices affecting environmental quality. These sciences can help decision makers of all kinds to understand the environmental consequences of their choices and the human consequences of environmental processes and policies, as well as to organize decision-making processes to be well informed and democratic. . . . Good environmental decision making requires not only good environmental science, but also improved understanding of human-environment interactions and development and implementation of decision-making processes that integrate scientific understanding with deliberative processes to ensure that the science is judged to be decision relevant and credible by the range of parties interested in or affected by the decisions. . .

(*from: Decision-Making for the Environment: Social and Behavioral Science Research Priorities, National Research Council, Committee on the Human Dimensions of Global Change, http://www.nap.edu/catalog.php?record_id=11186*)

The College of Agricultural and Environmental Sciences at UC Davis is the national leader in integrating agriculture, the environment, and the human condition. However, with large budget cuts looming and the larger landscape becoming increasingly global and interactive, a critical realignment of the college's resources is needed. This report will cover the past and pending resource issues and provide numerous databases and other information along with our recommendations for the future. It is important to note that while it is likely that this report, requested by Dean Van Alfen, may be used first to make decisions in a shrinking resource environment, we believe our recommendations will also be useful in an environment of increased resources.

Support for Agricultural and Environmental Research[1]

A substantial body of evidence indicates benefit-cost ratios for U.S. agricultural research and development (R&D) of well more than 10:1 and typically in the 20:1 range, indicating that public investments in agricultural R&D have paid off handsomely and that the U.S. has, on balance, underfunded agricultural research.

Expenditures on agricultural research grew rapidly through most of the 20th century but the growth rate has slowed considerably recently. In 2004, more than $4.3 billion was spent on public agricultural R&D, with $2.2 billion contributed by the federal government and $1.5 billion by state governments. During the 1960s and 1970s, public expenditures grew at an annual rate of 2.91 percent in real time, but the growth rate declined to 0.56 percent in the 1980s and to 1.24 percent from 1990–2004. The balance of funding has also shifted, de-emphasizing on-farm productivity enhancement in favor of investments in post-farm processing, food safety and quality, human health and nutrition, and resource/environmental issues. Meanwhile international competitors such as China, India, and Brazil have higher rates of productivity growth than the U.S. and are ramping up their investments in agricultural research.

Climate change, air quality, water quality and availability, limited natural resources, and the need to protect biodiversity are critical issues facing California, the nation, and the world, and will require significant resources including technological expertise and funding to find solutions to the challenges the world is, and will be, facing for decades to come. The rhetoric is strong for global environmental research; however, the proportion of funding remains low compared to the increasing need.

[1] Portions of this section are adapted from the report "Agricultural Research Policy and the 2007 Farm Bill: Some California Perspectives," by Julian M. Alston and Philip G. Pardey (University of California Agricultural Issues Center, AIC Farm Bill Brief #4, July 2007).

II. The Best Institutions Globally and Nationally

Agricultural Sciences

The academic departments in the CA&ES division of agricultural sciences have enviable reputations with the majority of the programs ranked in the top three in the nation as indexed by the Chronicle of Higher Education. Other predominant national universities offering top programs in the agricultural area are Cornell University, University of Wisconsin, and North Carolina State University (as identified by CA&ES departments).

Within the United States, Sciencewatch.com ranks UC Davis as the #1 high-impact U.S. institution in Agriculture/Agronomy (by number of papers; 2003–2007 data).

Total and federally financed R&D expenditures in the agricultural sciences can also be used to rank the relative success of agricultural activities at UC Davis as compared to other peer institutions. The National Science Foundation's Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and College, FY 2007, ranked UC Davis second overall (behind University of Florida), but well above all other national institutions viewed as having comparable agricultural programs: Cornell University, North Carolina State University, and the University of Wisconsin, Madison. Similar overall rankings were obtained by http://sciencewatch.com.

The top two international institutions identified by CA&ES departments as offering premier programs in the agricultural sciences are INRA (French National Institute for Agricultural Research; the equivalent of the U.S. Department of Agriculture) and Wageningen University (the Netherlands). Although direct comparison with international institutions is difficult, according to Sciencewatch.com, which uses Thomas/Reuters publication data, these three institutions are ranked (by number of citations; 1998–2008 data):

1. INRA
2. Wageningen University
3. University of California, Davis

Environmental Sciences

The academic departments in the CA&ES division of environmental sciences are renowned for both individual disciplinary strengths and collectively for unprecedented breadth, with several programs ranked in the top five nationally. The Chronicle of Higher Education's "Top Research Universities Faculty Scholarly Productivity Index 2007" ranks Soil Science number one; and U.S. News and World Report ranks the Ecology Graduate Group as tied for 3rd–4th place among ecology/evolutionary biology programs nationally. Unfortunately, neither the Chronicle of Higher Education nor other entities provide information on academic ranking for most of the environmental science programs.

The breadth includes not only the environmental resource sciences but also strong programs that interface between the environment, human well-being, and public policy. This breadth is of note because societal concerns about the environment stem mainly from the effects on human and ecosystem health, and the practice of environmental protection and management requires strong connections between science and policy.

The environmental science department chairs listed numerous, disparate top programs at other institutions in their many and various disciplines. The lack of commonality among the top programs listed by the campus environmental sciences programs is because of the more recent and complex evolution of environmental sciences, which can be found in some form at most institutions but typically without a unifying structure like a college or school. This presents both a problem and an opportunity, because any institution that successfully unifies its environmental science units into a stronger, more recognizable whole, experiences greater internal synergies as well as external visibility. Out of the many top programs listed by the department chairs, the following institutions were generally mentioned with some repetition: University of Arizona, Cornell University, Wageningen University, Duke University (Nicholas School for the Environment), University of Wisconsin, UC Santa Barbara (Bren School for the Environment), Yale School of Forestry, Stanford University, University of Washington, Oregon State University, Colorado State University, UC Berkeley, and University of Nevada Reno.

Despite the lack of any kind of systematic rankings for most of the environmental science disciplines, one can get some idea of the relative stature of the environmental sciences of CA&ES through the National Science Foundation's data on R&D expenditures (http://www.nsf.gov/statistics/rdexpenditures/). The 2007 data for the environmental sciences, including atmospheric science, earth science, and oceanography, shows UC Davis ranked at 26.

However, all but a few of the institutions ranked higher than UC Davis have large expenditures for field programs that do not occur at UC Davis, namely, airplanes and equipment for atmospheric science research and ocean-going vessels and equipment for oceanography research. Moreover, most of what NSF would call "earth science" occurs outside CA&ES in the Department of Geology. NSF includes a category representing expenditures in the other areas of environmental sciences, and in that list UC Davis is ranked 5th out of 432, behind Oregon State University (1st), Harvard, the USC system, and Johns Hopkins.

Human Sciences

The college has four departments and one division within the human sciences division, with some of the most productive faculty in the country. According to the Faculty Scholarly Productivity Index published by the Chronicle of Higher Education[2], our faculty rank 2nd in agricultural economics, 4th in human development and family studies, 9th in food science, and 10th in nutritional sciences in the country. ISI Essential Science Indicators has ranked UC Davis' food science and nutrition program as 1st in the nation.

Other rankings of international graduate programs place the Department of Agricultural and Resource Economics as 1st in the master's program and 2nd in the doctoral program. Www.econphd.net ranks the UC Davis ARE program as 2nd in Agricultural Economics and 4th in Resource and Environmental Economics.

The UC Davis Human Development Graduate Group (which includes members of the Department of Human and Community Development) was recently rated by the Chronicle of Higher Education as the third top graduate program in the nation.

As noted in Section V (page 32), metrics for social science units can differ from other CA&ES units, and there are not easily measured quantitative indicators for some human science programs. Despite the lack of quantitative measures for some programs, departments in the college self-identified their strengths and national/international rankings (Appendix G). Many of the departments in the human sciences ranked their own departments among the leading departments in the U.S.

[2] http://chronicle.com/stats/productivity/page.php?year=2007&institution=544&byinst=Go

III. CA&ES and the UC Davis Environment

The College of Agricultural and Environmental Sciences — Research, Education, and Outreach

The leading college of its kind in the nation, the College of Agricultural and Environmental Sciences at UC Davis addresses critical issues related to agriculture, food systems, the environment, and human and social sciences through:

- Cutting-edge research
- Top-ranked undergraduate and graduate education
- Internationally recognized outreach programs

The mission of the College of Agricultural and Environmental Sciences is:

> To develop students into scholars, mentors, and responsible citizens of the state of California, the United States and the world;
> To advance, integrate, evaluate and communicate knowledge of the sciences and technologies of natural resource utilization and conservation, agriculture, food, nutrition, human development, and related environmental, health, safety, and policy concerns;
> To seek out, anticipate and lead in addressing the needs of citizens, communities, and governmental agencies, particularly in California.

Researchers in the college work in an interdisciplinary system to find breakthroughs in basic science that help develop novel solutions to pressing, real-world problems. CA&ES scientists conduct world-class research in a wide array of disciplines across the full continuum from fundamental to applied work.

CA&ES is part of the U.S. land-grant system — a system in which federal legislation provided funds to establish an Agricultural Experiment Station (AES) within each land-grant university with the mission of conducting research of practical concern to U.S. citizens. The Agricultural Experiment Station has evolved from its historic focus on agriculture and mechanical arts, and now includes a broad range of subjects including agriculture, environmental and natural sciences, and human and social sciences. Research and education address emerging and timely topics such as changing environmental and social conditions, urban and consumer interests, and the increasing interdependence of urban, rural, and global communities relative to the quality of life.

The college emphasizes interdisciplinary education and research involving faculty and students from many departments and colleges. This growing culture of partnership has led us to the top ranks of industry- and government-sponsored university research. These partnerships are producing research, teaching, and technological advances and improvements to our quality of life through outreach in business, government, communities, schools, and environmental programs.

CA&ES strives to provide the highest quality educational programs for our undergraduate and graduate students and through our outreach efforts to farmers and environmentalists, families, agribusiness, policymakers, government agencies, and NGOs. CA&ES educates students and citizens about critical issues and methods for solving problems in agriculture, food systems, social sciences, and the environment, thereby improving the quality of life for Californians and enhancing the standard of living around the world. In our classrooms and laboratories and in locations around the world, distinguished faculty teach the latest science and conduct cutting-edge research of global significance to agriculture, to the environment, and to society. Our graduates go on to become top-notch scholars, leaders, and decision-makers throughout the world.

College programs reach beyond campus boundaries via extensive AES and Cooperative Extension outreach efforts. Practical information is delivered to citizens through collaborative efforts with Cooperative Extension offices located in counties throughout California, from centers and institutes on campus, and through hundreds of workshops and conferences held each year on topics of interest to our key stakeholders. Our interactions with 4-H and master gardener programs throughout California teach, train, stimulate, motivate, and educate the next generation of leaders.

CA&ES research, education, and outreach efforts reflect the social, economic, and technological changes and challenges occurring throughout the world. Our research reflects cutting-edge technologies and ideas that provide California much of the intellectual capital to provide a profitable and safe food and fiber system, a diverse, high-quality environment, and a healthy population with viable economic opportunities.

Agricultural Experiment Station Expectations

There are unique performance expectations associated with a faculty appointment in the Agricultural Experiment Station, an academic obligation that research conducted is applicable to and extended to the citizenry of the state of California. On average, faculty in CA&ES have a 50 percent appointment in the AES. Thus, meeting the mission of the AES is a key component of their appointment and performance evaluation, and differs from most other colleges and schools at UC Davis. This obligation should be recognized and understood by the university as a whole to be similar to expectations placed on faculty in the medical school to provide clinical and translational services. Both groups of faculty are held accountable for meeting their respective missions.

Funding for the AES resources must be viewed similarly to support from an extramural granting agency. In the same way that a principal investigator is not expected to use funding from an NIH grant to support undergraduate instruction or institutional infrastructure, neither should AES funds be used to cover programs other than purposes for which these funds are intended.

Key Budget Facts

During 1990–2009, the total filled faculty full-time equivalents (FTE) in CA&ES decreased from 427.6 to 350.9. This attrition occurred during 1990–1996 related to the 1990–1994 budget reductions, and again during 2004–2009 related to the 20 percent AES and 25 percent CE reductions sustained in 2002–2004 (Table 1).

Table 1. CA&ES Historical FTE Data

	Filled FTE (19900 Funds)			
Budget Year	I&R Filled FTE	AES Filled FTE	CE Filled FTE	Total Filled FTE
1990–91	128.73	227.63	71.24	427.60
1991–92	122.36	211.10	70.14	403.60
1992–93	122.62	211.61	76.39	410.62
1993–94	118.62	207.36	79.54	405.52
1994–95	106.90	182.83	79.04	368.77
1995–96	106.58	182.33	77.06	365.97
1996–97	111.79	187.82	77.06	376.67
1997–98	118.29	197.27	76.81	392.37
1998–99	116.35	197.22	76.56	390.13
1999–00	117.80	196.46	75.84	390.10
2000–01	118.55	199.41	74.84	392.80
2001–02	121.08	201.62	75.64	398.34
2002–03	119.56	200.32	77.59	397.47
2003–04	148.48	168.77	82.34	399.59
2004–05	149.98	155.52	75.64	381.14
2005–06	144.85	151.85	72.64	369.34
2006–07	144.73	145.95	70.64	361.32
2007–08	144.22	141.06	67.61	352.89
2008–09	139.77	145.73	65.41	350.91

Additional information on the actual reductions in 2007–2008, 2002–2005, and 1992–1994 (Phase III) can be found in Appendix A.

It is important to note that much of the discussion about funding in campus circles focuses solely on the core support provided by the state general funds. This core funding is very important and supports most base faculty salaries**,** instruction**,** infrastructure for AES facilities and special teaching courses, faculty recruitment and startup, departments' and dean's office administration, and matching funds for graduate student support, equipment, and research proposals.

At present, the state general fund provides about 50 percent of the dollars expended by CA&ES. The remaining 50 percent of CA&ES's funding comes from non-state general funds (Table 2)**.** CA&ES has seven major categories of funding in addition to state general funds. The largest among these is federal contracts and grants (37 percent). State contracts and grants are also a significant source of funding (19 percent), as are private contracts and grants (25 percent), private gifts (5 percent), endowment income (6 percent), and federal formula funds (including Hatch, multistate, animal health, and Smith Lever funds) (5 percent). Approximately 88 percent of CA&ES's state general fund budget is committed to salaries for faculty, staff, and student employees.

Table 2. Major Categories of CA&ES Expenses (I&R + AES + CE)

Category	2005–2006 Expenditures ($)	2006–2007 Expenditures ($)	2007–2008 Expenditures ($)
Federal contracts and grants	33,679,966	33,600,830	34,033,635
State government contracts and grants	14,470,985	15,885,256	17,312,891
Local government contracts and grants	1,560,054	1,666,226	2,315,983
Private contracts and grants	19,547,793	18,440,020	23,189,123
Private gifts	5,064,746	5,630,534	4,738,060
Endowment funds income	5,407,825	5,212,001	5,194,941
Federal formula funds	3,025,550	2,498,102	4,711,267
Total non-state general	**82,756,919**	**82,932,968**	**91,495,899**
State general funds	**86,844,220**	**91,607,923**	**94,173,265**

The increase in federal formula fund expenses in 2007–2008, compared to 2006–2008, was due to two elements:

1. Approximately $500,000 of Smith Lever funds that ANR awarded to various faculty for ANR Core Issue Grants.
2. Approximately $1.8 million of one-time special supplemental Hatch and multistate funds.

Thus, as we move forward in a time of reduced state general funds, it will be critical to optimize the capacity of CA&ES independently and in collaboration with other university units and even extra-university partners to garner resources from sources other than the state of California. Much of our capacity to deliver on all of our missions including instructional capacity will depend upon our ability to align our state general support funds with external opportunities for future success.

Aging Demographics — CA&ES Faculty Age Profile

In a report entitled "An Aging Faculty in the College of Agricultural and Environmental Sciences: Analysis and Recommendations," submitted to Dean Van Alfen in fall 2003, an ad hoc CA&ES Demographic Planning Committee provided information on the age profile of college faculty and offered recommendations to address what the committee saw as a serious age imbalance.[3] We summarize the main findings of that committee and update their report to the present.

Main Findings of the 2003 Demographic Planning Committee

- An ideal age distribution is nearly uniform within the various age cohorts, so that faculty are relatively equally distributed across age ranks from the late 20s to early 30s, when people typically enter the faculty ranks, to normal retirement age.
- CA&ES departed dramatically from this ideal due to lack of faculty in the younger age cohorts. At the time of the report, half of the faculty fell into an 11-year age cohort from 46–56.
- The age structure of faculty within CA&ES departed significantly from the age structure of faculty for the rest of UC Davis, which quite closely approximated the uniform-distribution ideal.
- Although the imbalance permeated across most CA&ES departments, it was more pronounced in some than others. Several departments (environmental design, environmental horticulture, environmental toxicology, nutrition, and textiles and clothing) had no faculty age 45 or younger.

[3] Members of this committee were James Carey, Robert Flocchini, Catherine Morrison Paul, Richard Plant, and Richard J. Sexton (chair).

- Nearly an entire generation of faculty (those 40 and younger) was missing from the college ranks.
- The imbalance seriously threatened the CA&ES worldwide reputation for excellence and its position in the top rank of agricultural and environmental colleges.
- To address the imbalance, the university should accelerate the release of positions to the College of Agricultural and Environmental Sciences and hiring should be concentrated at the assistant and associate professor ranks; recruitment at the rank of professor should be allowed only under extraordinary circumstances.

Update of the Committee's Findings

The report was instrumental in enabling Dean Van Alfen to make a successful case to the UC Davis provost to allow the college to accelerate its rate of hiring by, in essence, borrowing against future retirements. This hiring has eased the age imbalance somewhat, but it still exists and represents a major challenge to the college moving forward.

Whereas in September 2003 only 4.4 percent of college senate faculty were 40 or younger, and 12.2 percent were 45 or younger, the current figures are 13.3 percent 40 or younger, and 17.7 percent 45 or younger. The concentration of faculty that existed then in the 46–56 age range, exists today in the 51–60 range, which encompasses 46.9 percent of college faculty, with the 15-year range from 51–65 encompassing 62.6 percent of college faculty. Adding in the 29 ladder faculty age 66 or older means that 73 percent of the CA&ES faculty could be lost to retirement in the next 10–15 years, assuming normal retirement patterns.

The age imbalance is even more pronounced among CE specialists, where only seven of 69 specialists (10.1 percent) are age 45 or under, and 52 (75.4 percent) are in the 51–65 range. Table 3 provides both the cumulative and marginal distributions of senate faculty by age (as of March 25, 2009), and Table 4 provides the same information for CE specialists.

Extreme age imbalances within several CA&ES departments persist, as indicated in Table 3. The following departments have zero or one senate faculty member age 45 or younger among their ranks (number of faculty 45 or younger relative to total faculty in parentheses): entomology (1/17), environmental design-landscape architecture (1/7), environmental toxicology (1/8), nematology (0/6), nutrition (1/12), viticulture and enology (1/12), and wildlife, fish and conservation biology (0/8). Although these departments represent the most extreme cases of CA&ES age imbalances, only a very few college units (biological and agricultural engineering; food science and technology; and to a lesser extent environmental science and policy; and land, air and water resources, approximate the ideal of a uniform age distribution).

Table 3. Cumulative and marginal distributions of senate faculty by age (as of March 25, 2009)										
Age	**30-35**	**36-40**	**41-45**	**46-50**	**51-55**	**56-60**	**61-65**	**66-70**	**71-78**	**Total**
Department										
Ag. and Resource Economics	4	1	1		8	3	3	2	1	**23**
Animal Science	1	1	1	1	5	12	2	1	2	**26**
Biol. & Ag. Eng.	1	2	2	2	2	5				**14**
Entomology	1			3	4	6	2	1		**17**
Env. Design-Landscape Arch.		1		1	2	1	2			**7**
Env. Sci. & Policy	3	2	1	4	2	5	4		1	**22**
Env. Toxicology	1				4		1	1	1	**8**
Food Sci. and Tech.		1	2	3	1	3	3	1		**14**
HCD - Comm. Dev.	1	1	1			2	3	1		**9**
HCD - Hum. Dev.	2			1	1	2	1	1	2	**10**
LAWR	2	2	3	2	8	4	5	1	1	**28**
Nematology				2	1	1		2		**6**
Nutrition		1			5	1	3	2		**12**
Plant Pathology	1	1		3	1	7	1	1		**15**
Plant Sciences	3	6	1	4	16	10	14	1	3	**58**
Textiles and Clothing					2	2		1		**5**
Viticulture and Enology			1	2	4	4	1			**12**
WFCB				1	2	2	1	2		**8**
TOTAL	**20**	**19**	**13**	**29**	**68**	**70**	**46**	**18**	**11**	**294**

Table 4. Cumulative and marginal distributions of Cooperative Extension faculty by age (as of March 25, 2009)										
Age	**30-35**	**36-40**	**41-45**	**46-50**	**51-55**	**56-60**	**61-65**	**66-70**	**71-75**	**Total**
Department										
Ag. and Resource Economics					1	2	1			**4**
Animal Science		1	1	1	2	1	1	1	1	**9**
Biol. & Ag. Eng.						1				**1**
Entomology					1	2	1			**4**
Env. Design - Landscape Arch.										**0**
Env. Sci. & Policy				1						**1**
Env. Toxicology							1			**1**
Food Sci. and Tech.				2	1	1		1		**5**
HCD - Comm. Dev.					1					**1**
HCD - Hum. Dev.	1						1			**2**
LAWR		1		1	2	3	2			**9**
Nematology						1				**1**
Nutrition					1	1				**2**
Plant Pathology					2	1	1			**4**
Plant Sciences			1	2	7	8	4			**22**
Textiles and Clothing										**0**
Viticulture and Enology		1				1				**2**
WFCB			1							**1**
TOTAL	**1**	**3**	**3**	**7**	**18**	**22**	**12**	**2**	**1**	**69**

The age imbalance of the CA&ES faculty relative to other campus units remains extreme, as Table 5 demonstrates. The percentages of CA&ES faculty in the 31–40 and 41–50 ranges, 9 percent and 16 percent, respectively, are the lowest on campus and are roughly half of the campus-wide average. Not surprisingly, the converse is also true — CA&ES has the highest percentages of faculty in the 51–55, 56–60, and over 65 age brackets, 27 percent, 24 percent, and 9 percent, respectively, and the fourth highest percentage, 14 percent, in the 61–64 age bracket[4].

Table 5. Ladder faculty by age range (Headcount, June 2008 payroll)

	Age							
School, College, Division	**30 or under**	**31–40**	**41–50**	**51–55**	**56–60**	**61–65**	**over 65**	**Total**
College of Ag. and Environ. Sci.	1%	9%	16%	27%	24%	14%	9%	279
College of Biological Sciences	0%	15%	34%	16%	15%	12%	8%	113
College of Engineering	2%	23%	35%	15%	9%	8%	7%	175
Div. of Hum., Arts, and Cult.Studies	1%	24%	21%	17%	18%	15%	5%	192
Div. of Math. and Physical Sciences	3%	25%	33%	16%	9%	9%	6%	155
Division of Social Sciences	1%	29%	30%	11%	12%	12%	5%	207
School of Education	8%	33%	13%	8%	4%	29%	4%	24
Graduate School of Management	4%	38%	29%	8%	8%	13%	0%	24
School of Law	0%	39%	23%	3%	13%	19%	3%	31
School of Medicine	0%	18%	34%	15%	17%	11%	5%	451
School of Veterinary Medicine	1%	16%	32%	18%	21%	8%	4%	154
Total	**1%**	**20%**	**29%**	**17%**	**16%**	**12%**	**6%**	**1,805**
Gen. campus without prof. schools	1%	20%	26%	18%	15%	12%	7%	1,121
Professional schools	4%	37%	22%	6%	9%	20%	3%	79
General campus with prof. schools	2%	21%	26%	17%	15%	13%	7%	1,200
Health Sciences	0%	17%	34%	16%	18%	10%	5%	605

[4] Percentages in Tables 4 and 5 differ slightly because Table 4 represents data as of March 25, 2009, while Table 5 information reflects the June 2008 payroll.

IV. Process and Resources Employed by the Academic Prioritization Committee

It is within this backdrop of the critical role the College of Agricultural and Environmental Sciences plays, the looming budget cuts and demographic challenge, the demand for critical assessment of the current CA&ES structure, and the existing strengths and areas ripe for improvement that the Academic Prioritization Committee (APC) was charged to suggest transformational recommendations. The APC assembled a large quantity of information which was used in the deliberations.

The Academic Prioritization Committee met 15 times as a committee. Several smaller task groups met frequently, extensive e-mail consultation was done, and an extensive web SmartSite was available for the committee's continuous access. The committee reviewed previous academic plans both college-wide and departmental. In addition, it administered both a faculty survey and a list of questions for comment to department chairs. A large number of data sets both internal and external were reviewed and a demographic study was updated.

The task we were given was very difficult as there is no question that CA&ES is an excellent institution as many of the illustrations before have shown. Consequently, it was tempting to recite the many positive things that can be said about our college and to avoid any serious recommendations. But as we hope our colleagues can understand, CA&ES has reached a state where the impact of continuing cuts in state allocations of the magnitude we are facing cannot be accommodated by equal distribution and retrenchment. Similarly, if funding can be secured from additional sources we must be positioned to benefit from opportunities and these recommendations may help to position the CA&ES for growth when possible.

We have tried to provide our best judgment; the committee has, on occasion, struggled with interpretation of the analysis and cautions the reader to be sensitive to differences in disciplines and to encourage additional factors for inclusion in the future (including an extensive analysis across peer institutions). No report can satisfy all departments, units, and individuals, but we hope you can appreciate the challenges and nuances that the committee faced and the hard work this entailed.

It is important to note that although metrics are available to compare the programs both internally and externally, most metrics have significant flaws. Publication numbers are biased toward disciplines that favor short journal articles (sometimes multi-authored) as compared to disciplines requiring books. Extramural expenditures favor those discipline that require large monetary sums to achieve the research as well as reflecting agencies prepared to provide those

larger sums. Postdoctoral scholars are more prevalent in some disciplines than others. Student credit hours reward large class size, but do not speak to the quality of instruction. The number of student majors will favor disciplines that are attractive on the surface to students and not necessarily reflect the societal need for that major.

With these caveats, productivity evaluation, when tempered with common sense, was still deemed useful for examining the strength of the CA&ES components. The following resources were employed by the Academic Prioritization Committee.

A) Academic Prioritization Survey

One of the many resources used by the APC was a faculty survey about academic priorities for the future, what they considered important in evaluating faculty excellence and productivity, and their opinions about key resources they would need to meet those priorities.

To elicit this opinion, the APC developed a survey that was deployed to all research and teaching academics (I&R, AES, and CE faculty; adjuncts, professional researchers, etc.). The survey was administered using Survey Monkey, from April 20 through May 11, 2009, and resulted in a total of 302 responses; there was widespread representation across all departments and divisions of the college. Here we summarize key findings of this survey:

Measuring Current Program Strengths and Impacts

Respondents clearly felt that traditional academic measures of faculty productivity — including journal articles and academic book publications — are valuable ways of measuring the research strength of existing programs. In terms of more qualitative assessments of research strength, effects on human health and quality of life were rated the highest on a list of possible other ways of assessing research strength. In terms of teaching contributions, mentoring graduate students and innovative teaching (including innovative pedagogy and new course development) were seen as most important, while a simple measure of student credit hours taught was rated the lowest among the possible choices.

In terms of service contributions, service to the profession was rated as being more important than service to the college or university. Within the university, however, service on departmental committees and UC Davis campus-wide committees was rated as being more important than membership on college committees. In terms of meeting the outreach mission of the college, the most important factors were seen to be impacts on public policy and developing collaborative research projects with stakeholders.

Stakeholder Identification and Engagement

We asked respondents to rank potential stakeholders for their teaching, research, and outreach activities. Our student body, both undergraduate and graduate, is seen by respondents of the survey as the single-most important category of stakeholder. External stakeholders that were identified as important include agriculture and environmental businesses, government policymakers, and California residents and workers.

We also asked respondents to identify the most important ways of assessing the impact of CA&ES programs on external stakeholders of the college. It was clear that contributions to achieving environmental and agricultural sustainability were considered to be most important by respondents to the survey.

Future priorities

Among the choices given, respondents rated factors related to "relevance to advancing the frontiers of basic scientific knowledge," "availability of research funds," and "public policy relevance," as being more important than the number of students interested in any particular field.

Respondents identified new faculty expertise and capacities as being much more important than equipment or space in being able to meet these future priority needs.

Agricultural Sciences

- Genomics, proteomics, and biotechnology
- Agricultural sustainability (positive and negative interactions with environment, economic viability, green technology, availability of resources including water)
- Agricultural threats (disease, invasive species, pests, etc.)
- Food safety, food choices, and adequacy, global hunger

Environmental Sciences

- Climate change (impacts on agriculture, environment, communities)
- Natural resource management (particularly water and air, environmental literacy, cultural values)
- Urbanization, migration, and land use

Human Sciences

- Sustainability (economics, urbanization, food systems, equity)
- Health and environment, food, behavior, social structures
- Cultural competency, changing demographics

Centers and Institutes

Respondents to the survey are affiliated with a wide array of research centers and institutes, both housed within CA&ES and elsewhere on campus. One thing that is clear from the responses, however, is that the centers and institutes housed within the college primarily serve faculty in the agricultural and human sciences divisions of the college. Centers for the environment appear to be housed more frequently in other colleges of the university, or as separate organized research units (ORUs). These organizations provide opportunities for CA&ES environmental sciences faculty to interact with colleagues across the university — and indeed many faculty within the college are prominent leaders within these institutes. Nonetheless, the importance of environmental concerns and the depth of faculty interests suggest that better overall coordination of the environmental effort is necessary.

College-wide centers and institutes (those receiving some form of support from the college) tend to be oriented to one, or perhaps two, divisions within the college. There are, however, three notable exceptions that have substantial affiliation across college divisions (with at least three survey respondents from each division of the college): The Agricultural Sustainability Institute, International Programs, and the Center for Regional Change. These centers, institutes, and programs are clearly providing a home for interdisciplinary work within their areas of focus.

Details of the respondents' responses to the survey questions are provided in Appendix B.

B) Web of Knowledge ISI Citation Index

Another tool explored by the APC to examine performance of our programs was to develop a citation index of all CA&ES I&R, AES, and CE faculty. This report collected information on total number of publications, total number of citations, and H-index.

The APC recognizes the limitations of this information as it relates to disciplines that publish in journals not tracked by ISI, or in disciplines where books rather than journal articles are considered the primary measure of one's impact, as well as the effect of years in career on

H-index. Furthermore, it should be clearly noted that the H-index is designed to be used to compare productivity *within* disciplines with broadly similar publication patterns. H-index scores vary dramatically across disciplines. Since the value is essentially related only to number of publications and number of citations per publication, it is much higher in fields where publication of many multiple authored short articles is more common than fewer single-authored longer publications.

As with any form of data comparison, there is not a "one-size fits all" model that allows for equal comparison across all disciplines. However this type of data will likely become an accepted standard for future international rankings. Given this potential use, it would be wise for the college to develop and maintain an ongoing system for collecting this type of productivity measure, particularly in areas where it is used nationally and internationally.

A summary of the raw ISI data by department can be found in Appendix C. We would urge the college to ask departments to secure the cooperation of the faculty to insure an accurate index and to develop a factor useful in those disciplines where the ISI data are less useful. Perhaps the NRC report currently being prepared on graduate education will outline new methodology that may be helpful for tracking productivity.

C) Past and Present Academic Plans

The APC spent considerable time reviewing the 1999 and 2007 CA&ES strategic plans, the 2009 ANR strategic vision document (executive summary can be found in Appendix D, E, F; complete reports can be found on the CA&ES and ANR web pages), the responses to the "chairs directed questions" (Appendix G), and current CA&ES departmental academic plans to ascertain not only the strengths and challenges facing each department but also whether there were common themes consistently mentioned as either core areas to maintain or as new directions for the future upon which to build. A detailed discussion of the main themes found in the departmental academic plans and updates indicated a number of commonalities (Table 6). Key themes that resonate include:

1) Agricultural and ecosystem sustainability (climate change, invasive species, life cycle analysis)
2) Water (utilization, quantity, and quality)
3) Biobased materials (including biofuels and green technologies)
4) Human health and well-being and the impact of agriculture and environment (food safety, foods for health, agriculture-urban interface)

5) Science policy
6) Science literacy

Strong support exists for the integration of agricultural, environmental, and human sciences to address the challenges facing California, and the interface between these broad areas of emphasis is an important strength in our college that should be focused to address critical challenges. Another common theme in the past two strategic plans for CA&ES was that the college currently includes valuable core programs and competencies that should be preserved.

Table 6. Comparison of themes: College of Agricultural and Environmental Sciences, UC ANR, CA&ES Departments

CA&ES 1999 Plan	CA&ES 2007 Plan	ANR 2009 Plan	Common Themes Among Departmental Academic Plans

Core programs (85 percent) defined as:
 	
• Agricultural systems
• Environmental sustainability and ecosystem function
• Human health and development
 	
Opportunities for programmatic investment (15 percent):
 	
• Agricultural and environmental genomics
• Water and watersheds
• Agriculture, environment, and human health
• Agricultural and environmental sensing and informatics
• Science, the public and government policy
 	
• Agricultural sustainability was added shortly after report published
	First priority for the next five years: Address the demographic imbalance and to enable departments to meet their most critical needs.
	
	Ten emerging areas in which the college (and campus) exhibit substantial strength, and in which support exists across multiple departments for building on these strengths:
	
	• Agricultural sustainability
	• Biobased materials
	• Biodiversity and ecosystem services
	• Complex microbial ecosystems
	• Environmental and human health
	• Environmental informatics
	• Foods for health, and food safety
	• Global change, water, and watersheds
	• Regional change
	• Science, policy, and public perception
		The following multidisciplinary, integrated initiatives represent the best opportunities for ANR's considerable infrastructure and talent to seek new resources and new ways of partnering within and outside of UC to find solutions for California
		
		• Improve water quality, quantity and security
		• Enhance competitive, sustainable food systems
		• Increase science literacy in natural resources, agriculture and nutrition
		• Enhance sustainable ecosystems
		• Enhance the health of Californians and California's agricultural economy
		• Provide for healthy families and communities
		• Ensure safe and secure food supplies
		• Manage endemic and invasive pests and diseases
		• Improve energy security and green technologies
			• **Agricultural and ecosystem sustainability**
			  ○ Water- quantity, quality
			  ○ Life cycle analysis
			  ○ Biomaterials, including biofuels
			  ○ Science policy
			  ○ Climate change impacts
			  ○ Invasion biology
			  ○ Biodiversity and ecosystem services
			  ○ Urban-rural-wild land interface
			
			• **Healthy Californians**
			  ○ Foods for Health
			  ○ Human health and the environment
			  ○ Food Safety
			
			• **Science literacy**
			
			• **Integrated programs**
			
			• **Core competencies** — Genetics, Ecology, Physiology/Biology

D) Undergraduate Instruction

The most important issues for the college related to undergraduate education are:

1. Strong engagement in undergraduate education by all of departments
2. Continued growth in quality of our admitted students
3. Assurance that our students receive a high-quality educational experience

Many of the programs currently offered in our departments are unique within the University of California system, thus providing a significant competitive advantage to UC Davis as we compete system-wide for the best undergraduate students. A summary of the number of graduating undergraduate majors can be found in Table 7. The relevance of our programs to the most pressing global issues, together with these programs being considered to be the best in the country, place us in a very enviable recruiting position for students. Due to the targets set by campus for CA&ES incoming students, we cannot admit many highly qualified students who apply to majors in our college (which are not available at any other UC campus).

In order for CA&ES to maintain the excellence it currently holds in undergraduate education, the college will have to address the large number of faculty who will be of retirement age in the next 5–15 years, and the impact these retirements will have on the college's ability to deliver a robust, contemporary undergraduate curriculum. As the college looks to the future, consideration should be given to modernizing and enhancing our undergraduate majors to insure they meet the needs and interests of the next generation of students. CA&ES faculty are known for their innovative teaching, and it is noteworthy that a number of revisions to existing majors as well as creation of new majors and programs are already underway, e.g., plant and environmental sciences.

Table 7. Yearly number of graduating students by majors

	Major	Academic Year									
		1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
CA&ES	Ag. Management and Range Resources				2	2	4	2	5	4	19
CA&ES	Ag. Systems and Environment	13	15	16	9	8	2	1			64
CA&ES	Ag. and Managerial Economics	63	46	33	23	10	2	1	1	2	181
CA&ES	Ag. Business Management				1						1
CA&ES	Ag. Econ. and Business Management			1							1
CA&ES	Ag. Science and Management								1		1
CA&ES	Ag. and Environmental Education									3	3
CA&ES	Agricultural Education		1								1
CA&ES	Animal Biology		7	16	15	19	21	20	24	17	139
CA&ES	Animal Science and Management	21	31	20	21	14	24	22	10	9	172
CA&ES	Animal Sciences	73	73	106	99	106	96	91	103	103	850
CA&ES	Applied Behavioral Science	9	5	1	1	1					17
CA&ES	Atmospheric Sciences	4	4	5	7	4	8	5	5	4	46
CA&ES	Avian Sciences	4	6	5	6	4	8	6	6	5	50
CA&ES	Biotechnology	49	61	76	74	60	65	75	58	80	598
CA&ES	Child Development				1						1
CA&ES	Clinical Nutrition	7	21	15	22	20	51	52	48	77	313
CA&ES	Community Nutrition	6	1	1	2	1					11
CA&ES	Comm. and Regional Development	28	29	30	47	36	43	32	61	58	364
CA&ES	Crop Science and Management	4	5	3	3	2		2	2	2	23
CA&ES	Dietetics	33	24	10	4						71
CA&ES	Double major	6	5	9	5	7	1	5	4	3	45
CA&ES	Entomology	5	1	2	2	3	5	4	6	5	33
CA&ES	Environ. Hort. and Urban Forestry	25	17	6	16	16	13	9	9	4	115
CA&ES	Environ. Planning and Management			2						1	3
CA&ES	Environ. Resource Science	35	12	17	24	23	15	13	7	9	155
CA&ES	Environ. Toxicology	12	15	20	15	15	15	19	19	16	146
CA&ES	Environ. Policy Analysis and Planning	12	17	20	14	24	18	22	23	16	166
CA&ES	Environ. Biol. Management	32	23	21	11	23	25	26	17	13	191
CA&ES	Fermentation Science	8	11	8	7	2	3	1		3	43

CA&ES	Fiber and Polymer Science		2	1	1			1	1	1	7
CA&ES	Food Biochemistry	11	9	2	2				1		25
CA&ES	Food Science	43	40	22	22	23	19	24	31	39	263
CA&ES	Home Economics	1				1					2
CA&ES	Human Development	213	194	189	209	238	219	215	201	180	1,858
CA&ES	Hydrologic Science						1				1
CA&ES	Hydrology	2	1	2	5	2	1	2	2	4	21
CA&ES	Individual major	6	3	4	10	5	5	6	3		42
CA&ES	International Ag. Development	4	7	9	10	1	4	9	8	5	57
CA&ES	Landscape Architecture	42	36	28	27	26	24	30	30	43	286
CA&ES	Managerial Economics	262	326	391	372	281	301	273	284	268	2,758
CA&ES	Nutritional Science	47	31	21	23	22	19	18	35	40	256
CA&ES	Plant Sciences				1		1				2
CA&ES	Renewable Natural Resources	1									1
CA&ES	Soil and Water Science	3	3	2	3	2	2		3		18
CA&ES	Textiles and Clothing	13	5	18	26	19	29	26	27	27	190
CA&ES	Viticulture and Enology	20	21	40	31	26	20	27	30	42	257
CA&ES	Wildlife Fish Biology	2	2	1			1				6
CA&ES	Wildlife, Fish and Cons. Biology	40	39	33	38	33	49	31	45	31	339
	TOTAL	**1,159**	**1,149**	**1,206**	**1,211**	**1,079**	**1,114**	**1,070**	**1,110**	**1,114**	**10,212**
CBS	Biochemistry	102	91	22	22	12	8	6	1		264
CBS	Biochemistry-Molecular Biology			35	64	45	88	88	83	64	467
CBS	Biological Sciences	150	115	100	139	129	146	172	146	88	1,185
CBS	Cell Biology	3	6	8	5	9	13	8	4	3	59
CBS	Evolution and Ecology	12	8	15	16	31	18	7	6	3	116
CBS	Evolution, Ecology, and Biodiversity						5	9	12	4	30
CBS	Genetics	44	49	34	52	43	63	36	29	18	368
CBS	Microbiology	39	25	31	18	21	29	22	22	14	221
CBS	Neurobiology, Physiology, and Behavior	43	38	49	54	41	52	64	21	16	378
CBS	Plant Biology	13	14	11	8	9	9	17	6	5	92
	TOTAL	**406**	**346**	**305**	**378**	**340**	**431**	**429**	**329**	**215**	**3,180**
L&S	Design	119	97	99	101	126	101	100	66	24	833
VM	Physiology	2	3	1							6
VM	Vet Med	9	6	12	11	9	6	7	2	8	70
	GRAND TOTAL	**1,695**	**1,601**	**1,623**	**1,701**	**1,554**	**1,652**	**1,606**	**1,508**	**1,361**	**14,301**

E) Graduate Education

It is by the reputation of their graduate programs that many institutions are known. CA&ES is no exception to this case. Graduate programs in CA&ES are both departmentally associated and part of graduate groups. Many of the CA&ES faculty and other research personnel participate in more than one graduate program. Table 8 lists the enrollment (headcount) of graduate students in each of the 17 departments. This set of data is commonly used for resource analysis but may mask many of the issues related to graduate education.

Nearly all of the unit academic plans describe in detail the undergraduate teaching program and plans for changes in majors, etc. However, almost none of the plans addressed the health of graduate education, the need for student support, or plans to change, revise, or revitalize graduate education. The lack of a point person in CA&ES with the responsibility to assess the situation on a regular basis was also noted.

While the intellectual value of graduate groups was positively noted, it is apparent that in some ways the vitality of graduate programs is suffering from a version of the tragedy of the commons. Many believe it is important, and it is everyone's responsibility, but there is not much incentive to take steps to insure future success. In addition, many of our graduate programs have been well rated in the past but the lack of the new NRC report has hampered a more-current assessment. When the report is released, it should provide additional help with metrics that can be used to set priorities.

Table 8. CA&ES Graduate student count by location [Data from Helen Paik, ORMP]					
Department	**Fall 2004**	**Fall 2005**	**Fall 2006**	**Fall 2007**	**Fall 2008**
Ag. & Resource Economics	92	89	87	86	80
Animal Science	115	104	102	71	70
Biological & Ag. Engineering	25	25	21	24	24
Entomology	48	44	56	42	40
Environ. Design - Land. Arch.	29	16	14	20	18
Environ. Science & Policy	75	56	78	80	79
Environ. Toxicology	49	23	20	22	14
Food Science	59	46	42	44	42
HCD - Comm. Development	68	57	49	52	36
HCD - Human Development	42	47	33	37	37
Land, Air and Water Resources	103	93	85	100	95
Nematology	1	15	7	9	8
Nutrition	75	72	71	78	72
Plant Pathology	44	36	41	37	39
Plant Sciences	152	142	137	129	140
Textiles and Clothing	23	24	17	13	12
Viticulture and Enology	50	55	47	44	39
Wildlife, Fish & Cons. Biology	41	56	51	46	50
TOTAL	**1,091**	**1,000**	**958**	**934**	**895**

V. Applying the Metrics — The Foundation for the Future

For purposes of quantifying and examining departmental performance in different areas, a variety of data on faculty and departmental activities were compiled. The data that are most readily compared across departments are those related to teaching, where we looked at student contact hours (SCH) for both undergraduate and graduate education, as well as total number of graduate students and postdoctoral scholars, which relate to both graduate education and research. As a measure of access to external funding, we looked at the direct cost expenditures attributed to each faculty member.

As mentioned elsewhere in the report, the committee struggled to find a consistent measure of scholarly productivity that would be applicable across the diverse departments that constitute our college. The committee was divided on whether to separate out the social sciences, as the metrics that seemed reasonable for most CA&ES units did not consistently work for the social science units. However, even within single disciplines, there is often wide-spread disagreement about the appropriate indicators to measure scholarly quality and productivity. This is evidenced in the National Research Council's efforts to rate Ph.D. programs across the country, which, despite the investment of significant time and resources, has been delayed multiple years precisely because of internal debate about how to interpret quantitative indicators. Trying to develop appropriate metrics that are comparable across the diverse disciplines in CA&ES is an even more substantial challenge.

The number of scholarly (i.e., type 1) publications is one indicator that can be gathered, and is generally agreed upon as being an important metric. Yet even here it is important to acknowledge differences between books, single-authored journal articles, and individual contributions to multiple-authored journal articles, and how these publishing patterns differ substantially across disciplines — particularly between the physical and social sciences.

Gathering such detailed quantitative indicators for all faculty members in CA&ES would require a substantial investment of time in reviewing individual promotion and tenure packages and enumerating numbers of specific types of publications. Given the level of time and resources devoted for this committee's efforts, and the significant demands already placed on departmental administrative staff, the committee made the decision to not request that departments collate this data. We do think it would be in the college's interest to develop a system for regularly collecting and monitoring such data. It is important, however, to not place undue emphasis on simply the number of publications, especially given the university's

guidelines for promotion which are explicit in saying, “Publications in research and other creative accomplishments should be evaluated, not merely enumerated.”[5]

With those caveats, the committee gathered metrics on total number of publications available from the ISI Web of Knowledge. These statistics should be considered as a rough approximation of total publications by each department, as ISI Web of Knowledge does not gather information on book publications, an important outlet for faculty research for a number of departments in the college. Furthermore, for faculty with common names, it can be difficult to distinguish between different authors. The committee made an attempt to capture accurate publication data by also linking names with prior institutions and/or pseudonyms, but the underlying information would benefit from verification by individual faculty members and departments.

As an additional indicator for comparison, the committee considered the collective ISI Web of Knowledge H-Index per department. It is important to keep in mind, however, that H-Index values are higher in fields with many multiple-authored journal articles than in fields where single-authored articles are more common, and that senior faculty have greater opportunities for high H-indices, because the index is a cumulative measure of scholarly citation. Thus, while the H-Index was not intended to compare disparate disciplines, it may be appropriate in cases where departments operate under similar academic tradition.

All of the internal data gathered are expressed on a per-department basis in Table 9 and normalized to full-time equivalents (FTEs) in Table 10. To facilitate examination of departments, a standardized score was calculated for each metric. As such, each metric was reclassified to have a mean of zero and a standard deviation of 1. Thus a score of 1 or -1 is one standard deviation above or below the mean for that variable. The summary of all scores for the seven metrics, ranked from highest to lowest, is shown in Tables 11A-G.

Despite the limitations of the measures the committee used, taken together they include some indication of the primary domains of faculty function (teaching, research, and scholarship) and the scores reveal several well-supported themes. When demographic factors are also considered, it is possible to draw a more informed view of the state of the CA&ES departments.

[5] http://www.ucop.edu/acadadv/acadpers/apm-210.pdf (p.6).

Teaching

Undergraduate and graduate students were identified in the faculty survey as the most important stakeholders of the college. Given the importance of the education function of the university in determining funding from the state of California, it is important to examine departmental contributions to teaching when evaluating the future priorities of the college.

Five departments conduct 54 percent of the teaching in our college. However, these same five departments also contain 48 percent of the college's Instruction and Research FTE. We conclude that a more relevant measure of teaching is *teaching load*. Of the five departments mentioned above that conduct 54 percent of the college's teaching, one is below the mean for teaching load and only two of these departments have teaching loads that rank among the top five. Here we have defined "teaching load" as student credit hours (SCH) per I&R FTE.

When teaching load is compared across all departments, considerable variation is evident. The three-quarter average teaching load for CA&ES is 379 SCH/actual instructional FTE (actual instructional FTE includes instructors who are on the payroll and available to teach, such as I&R faculty, temporary lecturers, and "associate in" graduate students; but excludes faculty on sabbatical and unpaid emeriti).

This three-quarter average translates to a CA&ES annual average teaching load of 1,137 SCH/actual instructional FTE. The actual values among CA&ES departments range from 111 to 709 SCH/actual instructional FTE (three-quarter average), or 333 to 2,127 SCH/actual instructional FTE (annual total).

In particular, two departments have teaching loads that are roughly 50 percent of the mean, while four departments have teaching rates that are 150 percent of the mean.

External Funds

Approximately half of the total expenditures in CA&ES come from external funding sources, and given current trends in the state, this is the only portion of the college budget that is likely to see significant increase in the near future. While external funds cannot be used to hire core faculty, they can be used to help support the critical research functions of the college and indirectly support teaching. Several departments on an FTE basis are highly successful in obtaining extramural funds; other departments bring in significantly less than college averages.

While the amount of funds available or required to conduct quality research varies substantially across disciplines, it is clear that faculty in departments with low levels of external funding should be encouraged to increase these amounts, and that expanding access to external funding should be emphasized across the college.

Demographics

Over 50 percent of the college's FTEs are invested in five of our 17 departments. Consistent with their large size, over 50 percent of the faculty in excess of 60 years of age reside within these five departments. It is reasonable to expect that larger departments have more depth and resilience, and they may not merit the highest priority for reinvestment in the immediate future. However, even large departments may not be able to meet the critical missions of the college without reinvestment in core programs.

Moreover, many departments consist of multiple, disparate programs that could be destroyed if the departments are cut purely on the basis of overall size without regard for the programs within. The five departments with the greatest immediate demographic risk (as measured by the percent of faculty over age 60) are all relatively small units. The committee determined two options for these small units — develop a plan to focus hiring efforts in these units, or, alternatively, one or more of these units should be reorganized.

While size alone should not be the sole consideration in determining college priorities, it is an important metric to consider, and in an environment of constrained resources, small departments are much more vulnerable to loss of key faculty. Thus, the college should evaluate the priority of these small units. Units whose separate identity is judged as critical to the mission of the college should be targeted for increased investment, while departments whose separate identity is not critical to the mission of the college should be targeted for merger or other reorganizational steps.

Perhaps the most sobering message in this analysis is a theme that has long been recognized, namely that all of the college's departments are at serious risk from high rates of retirement which will occur in a 5–15 year time frame. During this time, the college may lose up to 75 percent of its total faculty. Combined with the current fiscal crisis and the resulting immediate reductions to faculty numbers, it is increasingly important to establish targets for the number of faculty in each unit.

Units whose separate identity is critical to the mission of the college should receive extra consideration for reinvestment. Although most academic units are likely to decrease in size, the larger departments should plan for somewhat lower priority for immediate reinvestment. The committee also recommends that the college reorganize departments when small size precludes efficient administration, or in cases where a particular discipline is of lower priority in the overall college mission.

Table 9. Primary data for departments

Department	IR + AES FTE[1]	2007–08 Actual Instructional FTE[2]	Grad std #[3]	Postdocs #[4]	Direct costs in M$[5]	UG SCH[2]	GRD SCH[2]	UG + GRD SCH	Total pubs / faculty[6]	H-index / faculty[6]
Ag. & Res. Econ.	23	17	80	2	2.1	6,927	904	7,831	33	8
Animal Science	26	16	70	12	4.1	5,532	848	6,380	65	14
Biol. & Ag. Eng.[7]	11	3	24	10	3.7	330	25	354	44	9
Entomology	17	5	40	16	6.9	2,696	434	3,129	102	18
Env. Des.-Land. Arch.	7	8	18	1	0.23	1,707	244	1,951	9	2
Env. Sci. & Policy	22	13	79	11	5	1,556	1,059	2,615	51	17
Env. Toxicology	8	4	14	14	6.3	851	342	1,193	139	23
Food Sci. & Tech.	14	7	42	0	2.3	4,169	426	4,595	70	16
HCD-Comm. Dev.	9	7	36	0	0.22	2,016	331	2,347	30	9
HCD-Human Dev.	10	8	37	2	1.6	5,321	445	5,766		
LAWR	28	12	95	21	8.1	1,980	998	2,978	66	15
Nematology	6	2	8	5	0.67	560	47	607	76	18
Nutrition	12	9	72	14	8.2	3,944	900	4,844	195	24
Plant Pathology	15	5	39	27	8	1,526	420	1,946	71	18
Plant Sciences	58	23	140	49	21.1	5,159	1,433	6,592	52	17
Textiles & Clothing	5	4	12	2	0.5	955	154	1,109	77	13
Viticulture & Enol.	12	5	39	11	2.8	2,001	426	2,427	57	16
WFCB	8	5	50	5	1.5	995	397	1,392	48	14
Std Dev					4.8	1,932.2	372.6	2,178.8	42.2	5.2
Mean					4.6	2,679.0	544.9	3,223.8	69.6	14.8
Median					3.3	1,990.7	426.3	2,521.1	65	16

[1]From "Faculty Demographics/Summary Mar 2009." Slide 1: CA&ES Faculty Demographics I&R/AES Faculty Age on 3/25/09. [2]From "Instructional Workload Distribution, Student Credit Hours (SCH) by Pay Department, 2007–2008 Three Quarter Average, CA&ES" run date 6/18/2008. [3]From "CA&ES Grad Student Count by Location" fall 2008. [4]From "CA&ES Postdoc Count by Department Appointment Snapshot on 3/25/2009." [5]From DaFIS. [6]Data compiled by APC from ISI Web of Knowledge. [7]Data for the Dept. of Biol. and Ag. Engineering is for the portion of the department reported under CA&ES; does not include productivity data that is reported under the College of Engineering.

Table 10. Departmental data normalized on a per FTE basis[1,2]

Department	Division	grd st / IR+AES FTE	PD / IR+AES FTE	grd st + PD / IR+AES FTE	Direct costs M$ / IR + AES FTE	2007–08 UG SCH / Actual Instructional FTE	2007–08 GRD SCH / Actual instructional FTE	2007–08 Total SCH / Actual Instructional FTE	Total pubs / faculty	H-index / faculty
Ag. & Res. Econ.	H	3.48	0.09	3.57	0.09	403.0	52.6	455.5	33.0	7.6
Animal Science	A	3.33	0.57	3.90	0.20	349.2	53.5	402.7	65.1	13.8
Biol. & Ag. Eng.[3]	A	2.18	0.91	3.09	0.34	104.0	7.7	111.9	44.0	9.1
Entomology	A	2.35	0.94	3.29	0.41	519.4	83.5	603.5	101.7	18.1
Env. Des.-Land Arch.	E	2.57	0.14	2.71	0.03	223.1	31.9	254.9	8.6	2.4
Env. Sci. & Policy	E	3.59	0.50	4.09	0.23	122.5	83.4	205.8	50.7	17.4
Env. Toxicology	E	1.75	1.75	3.50	0.79	216.4	87.1	303.5	139.3	22.9
Food Sci. & Tech.	H	3.00	0.00	3.00	0.16	558.0	57.1	615.0	69.8	16.5
HCD-Comm. Dev.	H	4.00	0.00	4.00	0.02	293.9	48.2	342.1	29.7	9.0
HCD-Human Dev.	H	3.70	0.20	3.90	0.16	654.5	54.7	709.1		
LAWR	E	3.39	0.75	4.14	0.29	168.5	84.9	253.4	66.4	14.7
Nematology	A	1.33	0.83	2.17	0.11	237.4	19.8	257.2	76.0	18.1
Nutrition	H	6.00	1.17	7.17	0.68	457.1	104.2	561.3	194.8	23.9
Plant Pathology	A	2.60	1.80	4.40	0.53	282.6	77.8	360.4	71.1	17.7
Plant Sciences	A	2.41	0.84	3.26	0.36	225.7	61.7	287.4	51.7	16.9
Textiles & Clothing	H	2.40	0.40	2.80	0.10	266.8	43.1	309.9	77.0	13.4
Viticulture & Enol.	A	3.25	0.92	4.17	0.23	425.7	90.7	516.1	56.6	15.6
WFCB	E	6.25	0.63	6.88	0.19	195.9	78.2	274.2	48.2	13.7
	Std Dev	1.3	0.51	1.28	0.21	151.0	25.4	158.5	42.2	5.2
	Mean	3.1	0.67	3.85	0.27	316.9	62.2	379.1	69.6	14.8
	Median	2.8	0.67	3.73	0.21	274.7	59.4	326.0	65	16

[1]Aggregate I&R + AES FTE values were obtained from "Faculty Demographics/Summary Mar 2009" 3/25/09. The number for Biol. and Ag. Eng. was adjusted to convert headcount to FTE. [2]Actual instructional FTE values were obtained from "Instructional Workload Distribution, Student Credit Hours (SCH) by Pay Department, 2007–2008 Three Quarter Average, Agriculture Environmental Science" run date 6/18/2008. [3] Data for the Dept. of Biol. and Ag. Engineering is for the portion of the department reported under CA&ES; does not include productivity data that is reported under the College of Engineering.

Table 11A			Table 11B			Table 11C		
Dept.	Div	**Grad student / IR+AES FTE**	Dept.	Div	**Postdocs / IR+AES FTE**	Dept.	Div	**Direct costs M$ / IR+AES FTE**
WFCB	E	2.42	Plant Path	A	2.22	Env Toxicol	E	2.46
Nutrition	H	2.23	Env Toxicol	E	2.12	Nutrition	H	1.97
HCD-CommD	H	0.69	Nutrition	H	0.97	Plant Path	A	1.25
HCD-HumanD	H	0.46	Entomology	A	0.53	Entomology	A	0.65
Env Sci & Pol	E	0.38	Vit & Enology	A	0.48	Plant Sci	A	0.45
Ag&Res Econ	H	0.29	Biol&Ag Eng[1]	A	0.47	Biol&Ag Eng[1]	A	0.33
LAWR	E	0.23	Plant Sci	A	0.34	LAWR	E	0.09
Animal Sci	A	0.18	Nematology	A	0.32	Vit & Enology	A	-0.17
Vit & Enology	A	0.12	LAWR	E	0.16	Env Sci & Pol	E	-0.20
Food Sci Tech	H	-0.08	WFCB	E	-0.09	Animal Sci	A	-0.36
Plant Path	A	-0.38	Animal Sci	A	-0.19	WFCB	E	-0.39
ED-Land Arch	E	-0.41	Env Sci & Pol	E	-0.33	Food Sci Tech	H	-0.50
Plant Sci	A	-0.53	Text Clothing	H	-0.53	HCD-HumanD	H	-0.52
Text Clothing	H	-0.54	HCD-HumanD	H	-0.92	Nematology	A	-0.75
Entomology	A	-0.57	ED-LandArch	E	-1.03	Text Clothing	H	-0.81
Biol&Ag Eng[1]	A	-0.71	Ag&Res Econ	H	-1.14	Ag&Res Econ	H	-0.85
Env Toxicol	E	-1.04	Food Sci Tech	H	-1.31	ED-LandArch	E	-1.13
Nematology	A	-1.36	HCD-CommD	H	-1.31	HCD-CommD	H	-1.17

Table 11E			Table 11F			Table 11G		
Dept.	Div	**Graduate SCH / Actual instr. FTE**	Dept.	Div	**Total SCH / Actual instr. FTE**	Dept.	Div	**Total pubs / faculty**
Nutrition	H	1.65	HCD-HumanD	H	2.08	Nutrition	H	2.97
Vit & Enology	A	1.12	Food Sci Tech	H	1.49	Env Toxicol	E	1.65
Env Toxicol	E	0.98	Entomology	A	1.42	Entomology	A	0.76
LAWR	E	0.89	Nutrition	H	1.15	Text Clothing	H	0.18
Entomology	A	0.84	Vit & Enology	A	0.86	Nematology	A	0.15
Env Sci & Pol	E	0.83	Ag&Res Econ	H	0.48	Plant Path	A	0.04
WFCB	E	0.63	Animal Sci	A	0.15	Food Sci Tech	H	0.00
Plant Path	A	0.61	Plant Path	A	-0.12	LAWR	E	-0.08
Plant Sci	A	-0.02	HCD-CommD	H	-0.23	Animal Sci	A	-0.11
Food Sci Tech	H	-0.20	Text Clothing	H	-0.44	Vit & Enology	A	-0.31
HCD-HumanD	H	-0.29	Env Toxicol	E	-0.48	Plant Sci	A	-0.42
Animal Sci	A	-0.34	Plant Sci	A	-0.58	Env Sci & Pol	E	-0.45
Ag&Res Econ	H	-0.38	WFCB	E	-0.66	WFCB	E	-0.51
HCD-CommD	H	-0.55	Nematology	A	-0.77	Biol&Ag Eng[1]	A	-0.61
Text Clothing	H	-0.75	ED-Land Arch	E	-0.78	Ag&Res Econ	H	-0.87
ED-Land Arch	E	-1.19	LAWR	E	-0.79	HCD-CommD	H	-0.94
Nematology	A	-1.67	Env Sci & Pol	E	-1.09	ED-Land Arch	E	-1.45
Biol&Ag Eng[1]	A	-2.14	Biol&Ag Eng[1]	A	-1.69	HCD-HumanD	H	-1.65

Calculation of relative scores: All values for each metric were adjusted to have a mean of zero and a standard deviation of 1, based on data presented in Table 10. In the Tables 11A–11G, a score of -1 reflects a value that is one standard deviation unit below the mean for that metric. The general calculation for all values in Table 11 has the form of [(observed-mean)/std dev]. [1] Data for the Dept. of Biol. and Ag. Engineering is for the portion of the department reported under CA&ES; does not include data that is reported under the College of Engineering.

VI. The Committee's Recommendations
(Challenges, Opportunities, and Recommendations)

Future Investments

By any measure, departmental research, teaching, and outreach programs, and the expertise and national/international reputation of the CA&ES faculty are excellent; however, in an era of declining resources, difficult choices must be made as to which units can maintain their excellence without a significant influx of new resources.

The demographic crisis facing CA&ES adds an extra dimension to the difficult challenges the college needs to immediately address. In the next decade approximately 50 percent of CA&ES faculty will retire; this is a unique crisis when compared with other colleges on campus. In order to maintain the excellence of CA&ES undergraduate, graduate, research, and outreach programs it is critical that renewal of faculty occur even during this financial crisis. CA&ES must reinvest in both existing units or in some cases create new units where excellent programs can continue to thrive.

The recommendations found in this section were exceptionally challenging and painful to the committee, but are based on careful examination of the productivity data compiled, discussion of alignment to the mission of the college, current and future demographic concerns, and committee judgment relative to the minimal size of a viable department. The Academic Prioritization Committee recommendations will likely be controversial; however, the fiscal crisis the college is facing, and likely will continue to face in the foreseeable future, requires that bold, new structures be developed that will provide faculty the greatest opportunity for success.

The recommendations take into account the intersection between core departmental programs and multidisciplinary themes that will be critical in meeting the future challenges facing our society.

Recommendations:

- Eight departments are considered "stable":

  - Agricultural and Resource Economics
  - Animal Science
  - Biological and Agricultural Engineering
  - Entomology
  - Environmental Science and Policy
  - Land, Air and Water Resources
  - Plant Pathology
  - Plant Sciences

  These departments align well with the college's mission, and have pending but not immediate demographic risk — although the wrong combination of faculty attrition could devastate individual programs.

  It is recommended that these departments evaluate their academic plans with an eye toward narrowing their scope relative to their research, teaching, and outreach missions given the limited number of FTE that will be available for reinvestment. Given the current budgetary situation, these departments should not be considered the highest priority for immediate reinvestment.

- Seven departments are considered "of concern":

  - Environmental Toxicology
  - Food Science and Technology
  - Human and Community Development - Community Development
  - Human and Community Development - Human Development
  - Nutrition
  - Viticulture and Enology
  - Wildlife, Fish and Conservation Biology

  It is recommended that the dean pay particular attention to these units relative to future reinvestment. The committee's concerns vary by department so individual recommendations are listed.

  - The Department of Environmental Toxicology is a relatively small department with high demographic risk. It has valuable core programs and aligns well with the mission, but may not be sustainable as a stand-alone department. It is

recommended that opportunities to strengthen by association and consolidation with others units be explored.

- The Department of Food Science and Technology has medium demographic risk, but future investment in food safety is critical to its continued alignment with the mission. Possible amalgamation with other units should be considered.

- The Department of Human and Community Development, Community Development, is a relatively small department with high demographic risk. It aligns well with the mission. HCD-CD and HCD-HD could be a strong unit but synergies haven't developed. Given the lack of resources to invest, it may be difficult to maintain as an independent unit; however, there is a potential strong link with the Department of Landscape Architecture and regional planning. It is recommended that opportunities to strengthen by association and consolidation with other units be explored.

- The Department of Human and Community Development, Human Development, is a relatively small department with high demographic risk. As currently constituted it does not align entirely well with the mission. HCD-CD and HCD-HD could be a strong unit but synergies haven't developed. Given the lack of resources to invest, it may be difficult to maintain as an independent unit. It is recommended that opportunities to strengthen by association and consolidation with other units be explored.

- The Department of Nutrition has high demographic risk. It has valuable core programs and aligns well with the mission. It is recommended that opportunities to strengthen by association and consolidation with other units be explored.

- The Department of Viticulture and Enology is a relatively small department and has moderately low demographic risk. It aligns well with the mission. Possible amalgamation with others units should be considered.

- The Department of Wildlife, Fish and Conservation Biology is a relatively small department and has high demographic risk. It has valuable core programs and aligns well with the mission, but may not be sustainable as a stand-alone department. It is recommended that opportunities to strengthen by association and consolidation with others units be explored.

- The remaining three departments are recommended for redistribution:

    - Environmental Design - Landscape Architecture
    - Nematology
    - Textiles and Clothing

    All have medium to high demographic risk and are so small they cannot continue unless substantial resources are invested, which is unlikely given the current fiscal climate. It is recommended that faculty be incorporated into other units where their expertise can be well utilized.

In addition, the committee recommends the following steps be instituted:

- Review the value of maintaining resources to support small or declining agricultural industries in California.
- Continue developing central management of CA&ES field facilities to further eliminate redundancies and create systems for more-efficient utilization of resources.

Agricultural Experiment Station

The consistent pattern of declining state resources supporting higher education and the disproportionate budget reductions assessed to the AES and CE programs over the past two decades, with no recovery during better economic times, leaves no alternative other than to fundamentally change the future direction of CA&ES. It seems likely that any future growth in state support will be directly linked to I&R programs; however, we cannot abandon the equally important responsibility to our stakeholders that rely on our AES and CE programs. Some of the missions of AES and CE may find willing foundation support but the current trajectory suggests continual dilution of resources. Our recommendation is that the mission of the AES be refocused and accountability be strengthened.

Recommendations:

- AES funding, like any other source of funding requires strong accountability; thus, those holding AES appointments must be informed of and be required to meet expectations.
- Continued appointment in AES requires demonstrated accountability to the college mission.

- Narrow or refocus the mission of the Agricultural Experiment Station so that fewer faculty hold AES appointments. Faculty positions with no clear responsibility to the AES should be hired at nine-month I&R appointments.
- Provide faculty with the option to relinquish AES appointments and put salary on grants.
- AES retirement FTE — resources should go into a pool to be allocated to new FTE and their programs.

Undergraduate Curricula

By any measure of productivity the college has a robust undergraduate program. There are approximately 4,800 students in 29 undergraduate majors. Most degree programs are directly aligned with a department; however, there are a number that are interdepartmental. The APC discussed the challenges related to maintaining an excellent undergraduate program with the pending surge of faculty retirements and the paucity of resources that will be available to departments to replace expertise needed to adequately deliver the courses required for the extensive array of majors currently available.

The APC also noted a fair amount of redundancy of course offerings within several majors that could likely be addressed in ways that would maximize expertise found in departments others than the home department. The time is right to thoroughly evaluate our undergraduate programs.

Recommendations:

- Work with the college executive committee to conduct a thorough review and make recommendations to redefine the existing undergraduate education programs within the College of Agricultural and Environmental Sciences.
- Explore development of division-wide lower division, core curricula that could be taught by faculty in multiple departments.
- The college should facilitate the consolidation of some majors and align them with the common themes identified in recent academic planning activities.
- Develop a system to equitably distribute resources for teaching college-wide core courses to remove disincentives to collaborate on interdepartmental undergraduate curricula.
- The need for temporary lecturers should be balanced with the expectation that new/existing faculty be assigned responsibility for required, core courses.

- To economize on increasingly scarce I&R FTE, explore use of area-wide resources, i.e., opportunities to share courses and instruction with the California State University system.

Graduate Education

While clear from the faculty survey that undergraduate students are important, graduate education is critical for training the innovators and leaders of the future. Much of the graduate work in CA&ES is done in graduate groups and these organizational structures may benefit from administrative evaluation. Increasingly, graduate groups may suffer from the "tragedy of the commons." Because they draw on faculty from multiple departments they have the advantage of offering students the cross-disciplinary and interdisciplinary work necessary to solve complex problems; however, because the faculty are derived from multiple departments, both the teaching and support resources are unstable and are likely to become more so as experienced faculty and administrators retire. Furthermore, in many cases the reputation for excellence that the college currently has, and strives to maintain, will be a direct derivative of our graduate programs and the associated success of graduate students and the research that they do.

Recommendations:

- A point person for insuring the success of graduate education in CA&ES should be designated and an annual "state of graduate education" should be submitted to the dean.
- Since graduate groups do not control teaching assistant allocations, examine the constraints and develop guidelines for more predictable access to teaching assistant positions to enable guaranteed support packages for students in graduate groups.
- Departments should be required to include in their academic plans a thorough assessment of the overall health of and future goals for their graduate instruction programs.
- To insure graduate education is appreciated at the campus level, CA&ES should support the inclusion of the Dean of Graduate Studies as a member of the Council of Vice Chancellors.

Future Structure

While it would be wonderful to think that state resources will be restored or increased in the future, it is more likely that the twenty-year trend of declining state support for higher education as a whole, and AES and CE in particular, will continue. More than 50 percent of CA&ES funding is from non-state funds; options for increasing revenues must be actively explored.

With the continuing decline in state support, CA&ES faculty will need to increase their level of entrepreneurship via external support (extramural grants, strategic relationships with businesses and others, and/or philanthropic opportunities). Research being conducted in CA&ES is increasingly across multidisciplinary, multi-college, and multi-university lines. This activity needs to be encouraged; however, the college does not have effective mechanisms in place for evaluating, consolidating, and appropriately organizing multidisciplinary efforts, especially large ones.

Recommendations:

- Faculty should be encouraged to actively increase revenue in the future through grants and philanthropy.
- Sophisticated support units must be developed to provide the services necessary to help garner increased extramural resources, as well as provide the level of oversight and management required for high-value, multidisciplinary research programs.
- There must be more-efficient alignment of faculty and staff expertise to support multidisciplinary curricula, research, and outreach endeavors.
- Human and financial resources need to be realigned via new organizational structures to optimize opportunities for faculty, staff, and students to succeed in a resource-scarce environment.
- Organize larger department structures to provide depth and resiliency.
- Evaluate new models for doing the work of the college that do not require the commitment of permanent funding. There are several types of faculty and professional staff that contribute to departmental productivity — particularly research.
- Organize the college in such a way that faculty can garner significantly more extramural funds and deliver teaching programs that meet the challenges of the future.
- Examine alignment of departments within the CA&ES Dean's Office structure to create stronger affinity groups.

Role of Centers and Institutes

CA&ES centers and institutes vary considerably as to their primary purpose and stated goals. Unfortunately, time did not allow the committee to conduct a thorough review of all college and departmental centers.

Recommendations:

- A thorough analysis of each center and institute should be conducted to evaluate whether they continue to be a good use of college and department resources.
- While the majority of college-supported centers and institutes were formed primarily to support and increase outreach activity to external stakeholders, consideration should be given to expanding their scope to also be a conduit/convener for multidisciplinary grants.
- Departmental centers are often manifestations of faculty members acquiring outside resources. This is a valuable addition to existing resources; nonetheless, there needs to be a better understanding of how departmental centers are resourced.
- Explore whether opportunities exist to provide services to a group of centers and/or provide some support or transition during possible dissolution once external support is gone or competitive grants are undergoing extended review.

Administrative Efficiency

As noted in earlier sections our college alignment may not be optimized to insure success in the future. Both too many and some outdated small units exist and they may be too aligned with funding sources that are diminishing and not optimized to provide the support needed by faulty and others to maximize our success in acquiring new and sustainable sources of support.

Recognizing the financial crisis is likely to occur for 3+ years the college must pull back and reorganize staff support. It is likely minimal dollars would be saved; however, units must be created that will provide maximum support to the critical demands that accompany increased extramural funding and associated accountability.

While not a direct charge to this committee, we recommend that committee(s) be charged to:

Recommendations:

- Review current and develop new models for administrative support.
- Identify burdensome policies that are within the control of CA&ES and recommend solutions.
- Provide examples of burdensome policies outside the control of CA&ES.
- Suggest acceptable alternatives to the risk-averse policies that are currently being mandated and which create excessive burdens on both staff and faculty.
- Conduct a thorough review of department, college, and campus activities and identify redundant processes.
- Identify methods to streamline the faculty merit and promotion process.
- Investigate alternative methods to better align university resources to support the needs of faculty research endeavors.

APPENDICES

Appendix A

Actual Reductions in 2007–2008, 2002–2005, and 1992–1994 (Phase III)

History of Significant 19900 Budget Reductions

• 2007–2008
  • $1.72 million permanent reduction
  • Holding open 5.0 I&R faculty FTE totaling $311K
  • Reduced department/center support $816K
  • Reduced dean's office support $595K

• 2002–2005
  • $10.9 million permanent reduction
  • Eliminated faculty FTE (50.0 AES FTE and 15.7 CE FTE) totaling $3.9 million
  • Reduced department support $3.0 million
  • Reduced dean's office support $0.1 million
  • Received $3.9 million assistance from campus and ANR (upgrade funds associated with eliminated faculty FTE)

• 1992–1994 (Phase III)
  • $3.6 million permanent reduction
  • Eliminated faculty FTE (10.75 I&R FTE and 27.65 AES FTE) totaling $1.7 million
  • Reduced department support $1.7 million
  • Reduced dean's office support $0.2 million

Appendix B

Academic Prioritization Survey
Detailed Report

Background

One of the tools used by the APC was to solicit faculty opinions about academic priorities for the future, their opinions about key resources they would need to meet those priorities, and to assess current program strengths and impacts. To solicit this opinion, the APC developed a survey that was deployed to all research and teaching academics (I&R, AES, and CE faculty; adjuncts, professional researchers, etc.). The survey was administered using Survey Monkey, from April 20 through May 11, 2009, with an initial e-mail notification followed by two e-mail reminders to ensure a maximum response rate.

Respondents

A total of 302 completed at least some of the survey, with 272 completing the entire survey. As shown in Table 12, there were 146 responses from the agricultural sciences division, 60 from environmental sciences, and 96 from human sciences. People responding to the survey included some emeriti, as well as adjunct faculty and professional researchers (see Table 12 for a breakdown of this response by division), making it somewhat difficult to calculate response rates.

If we use the number of I&R/AES faculty in each department as a baseline, the lowest response rate was 68 percent (15 out of 22 in the Department of Environmental Science and Policy) and the highest rate was 217 percent in the Department of Nutrition (26 responses, out of 12 I&R/AES appointments in the department, with responses including 7 professional researchers, 2 project scientists, and 3 lecturers). Overall, half of the departments in the college had at least as many responses as I&R/AES faculty.

Table 12. In what department are you located?

Overall	Response Count	Total Faculty**	Response Rate
Agricultural Sciences	**146**	**148**	**99%**
Plant Sciences	65	58	112%
Animal Science	27	26	104%
Entomology	13	17	76%
Biological and Agricultural Engineering	12	14	86%
Plant Pathology	12	15	80%
Viticulture and Enology	11	12	92%
Nematology	6	6	100%
Environmental Sciences	**60**	**73**	**82%**
Land, Air and Water Resources	22	28	79%
Environmental Science and Policy	15	22	68%
Wildlife, Fish and Conservation Biology	10	8	125%
Environmental Toxicology	7	8	88%
Environmental Design-Landscape Arch	6	7	86%
Human Sciences	**96**	**73**	**132%**
Nutrition	26	12	217%
Agricultural and Resource Economics	23	23	100%
Food Science	21	14	150%
Human and Community Development	20	19	105%
Textiles and Clothing	6	5	120%
Overal Total	**302**	**294**	**103%**

**only I&R/AES. Need CE also.

Table 13. What type of appointment do you have?

	Overall	Agricultural Sciences	Environmental Sciences	Human Sciences
Combination I&R/AES appointment	63%	63%	78%	54%
Cooperative Extension	14%	17%	10%	12%
Just I&R appointment	3%	1%	3%	5%
Joint CE/AES appointment	6%	11%	0%	2%
Joint I&R/CE/AES appointment	2%	3%	3%	1%
Adjunct faculty	1%	1%	2%	2%
Professional researcher	3%	1%	0%	8%
Emeritus	7%	4%	3%	15%

Thus, the responses represent the opinions of a strong majority of research and teaching faculty in the college. A total of 78 percent of respondents had the equivalent of a full professor rank (see Table 14).

Table 14. What is your current appointment rank?

	Overall	Agricultural Sciences	Environmental Sciences	Human Sciences
Assistant (or equivalent)	12%	11%	10%	14%
Associate (or equivalent)	10%	8%	12%	12%
Full (or equivalent)	78%	81%	78%	73%

A total of 25.3 percent of respondents were over the age of 61 (see Table 15).

Table 15. What is your age?

Age	Overall	Agricultural Sciences	Environmental Sciences	Human Sciences
30-35	7%	5%	10%	9%
36-40	6%	6%	8%	5%
41-45	5%	4%	7%	7%
46-50	9%	12%	8%	4%
51-55	23%	22%	27%	23%
56-60	24%	29%	17%	22%
61-65	14%	17%	12%	10%
66-70	7%	3%	8%	13%
71-80	4%	2%	2%	8%

Centers and Institutes

A series of questions attempted to identify the center, institutes, graduate groups, and research support institutes most utilized by faculty in the college. Table 16 shows the centers and institutes that are housed within the college and with which respondents are affiliated. It is clear from this that the centers and institutes housed within the college are substantially less oriented towards respondents in the environmental sciences division than the other two divisions of the college. Most centers and institutes in the college are oriented towards only one or two of the college's divisions. There are three, however, that have substantial affiliation across the college's divisions (at least three survey respondents in each division of the college):

- The Agricultural Sustainability Institute
- International Programs
- Center for Regional Change

Table 16. What CA&ES centers and institutes are you affiliated with? (check all that apply)

		Response Count		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Agricultural Sustainability Institute	32	14	7	11
Robert Mondavi Institute for Wine and Food Science	31	15	1	15
Foods for Health Institute	24	9	0	15
Seed Biotechnology Center	22	20	0	2
International Programs	21	10	4	7
Center for Regional Change	18	3	7	8
California Institute of Food and Agricultural Research	11	4	0	7
Western Institute for Food Safety and Security	11	6	0	5
California Crop Improvement Association	10	10	0	0
California Center for Urban Horticulture	9	8	1	0
UC Davis Arboretum	7	3	4	0
Foundation Plant Services	6	6	0	0
Gifford Center for Human Population Issues	6	0	0	6
Foundation Seed Service	5	5	0	0
4-H Center for Youth Development	5	0	0	5
Center for Vector-Borne Disease Research	3	2	1	0
Center for Produce Safety	3	1	0	2
Other (please specify)	34	17	5	12

Table 17. What CA&ES research support facilities do you utilize?

		Response Count		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Greenhouses	70	63	6	1
Genomics Facility	48	40	3	5
Plant Transformation Center	21	20	0	1
Agricultural and Environmental Informatics Facility	15	6	8	1
Long-Term Research on Agricultural Systems	15	6	6	3
Center for Aquatic Biology and Aquaculture	11	7	4	0
Contained Research Facility	10	8	1	1
Other (please specify)	57	32	9	16

A substantial number of respondents in the college are affiliated with centers and institutes elsewhere on campus (see Table 18). It is clear, however, that respondents in the environmental sciences were much more likely than the other two divisions in the college to identify other university centers they were affiliated with. This reflects the fact that there are fewer centers and institutes housed specifically in the college focused on environmental issues.

Table 18. What other university centers and research institutes on campus are you affiliated with?

	Response Count			
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
John Muir Institute of the Environment	55	8	36	11
UC Davis Natural Reserve System	27	9	18	0
Institute of Transportation Studies	12	2	7	3
Center for Watershed Sciences	10	0	9	1
Tahoe Environmental Research Center	8	1	7	0
Sustainable Transportation Center	8	1	4	2
Center for Health and the Environment	5	3	2	0
Environmental Justice Project	5	1	2	2
Road Ecology Center	3	1	2	0
Energy Efficiency Center	3	1	1	1
Public Service Research Program	2	0	0	2
Center for Affordable Technology for Small Water Systems	0	0	0	0
Other (please specify)	42	23	9	12

Future Priorities

One question in the survey asked respondents to rate a number of factors that might be considered important in determining research, teaching, and outreach priorities of the college in the next ten year. Respondents were asked to rate each factor on a scale of 1 (not at all important) to 5 (very important). Results are shown in Table 19.

Table 19. How important do you consider each of the following for determining research, teaching, and outreach priorities of the CA&ES in the next ten years?

	Rating Average			
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Relevance to advancing the frontiers of basic scientific knowledge	4.36	4.33	4.40	4.39
Amount of research funds available	4.01	4.05	3.88	4.03
Public policy relevance	3.96	3.83	4.12	4.09
Stakeholder identified priorities	3.73	3.96	3.53	3.51
Total number of incoming graduate students	3.61	3.52	3.59	3.80
Total number of undergraduate majors	3.38	3.30	3.21	3.63

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

There is broad agreement across the college that the most important factor is “relevance to advancing the frontiers of basic scientific knowledge,” reflecting the core research functions of the college. This received an average score of 4.36 across the college. Other factors that were seen as quite important included “amount of research funds available” and “public policy relevance.” Notice that “stakeholder identified priorities” seemed to be most important to respondents in the agricultural sciences division, who rated it an average of 3.96, while the other two divisions rated this factor 3.5. Also, respondents in the human sciences division appeared to place a higher value on the total number of undergraduate majors as a factor, rating it on average 3.63, compared to 3.30 in agricultural sciences, and 3.21 in environmental sciences.

The survey also asked respondents to provide more in-depth details on what they consider the two most critical areas within their field that should be researched, extended to non-academics, and taught to students over the next ten years. This question elicited a wealth of interesting ideas, but there were a number of themes that emerged in multiple responses, as follows:

Agricultural Sciences

- Genomics, proteomics, and biotechnology
- Agricultural sustainability (energy, green technology, etc. — water, water, water)
- Agricultural threats (diseases, invasive species, pests, etc.)
- Food safety and adequacy (global hunger)

Environmental Sciences

- Climate change
- Natural resource management (water, air particularly, environmental literacy, cultural values)
- Urbanization, migration, land use

Human Sciences

- Sustainability (economics, urbanization, food systems, equity)
- Health and environment, food, behavior, social structures
- Cultural competency, changing demographics

Measuring Current Program Strengths and Impacts

The survey also asked a series of questions designed to determine what respondents felt were the best ways of measuring the strength and impacts of our current programs. In relation to research excellence, it is clear across the entire college that the number of journal articles was seen as the best indicator (see Table 20). Book publications are perhaps somewhat more important broadly within human sciences and environmental sciences than in agricultural sciences, and the human sciences fields seem to pay more attention to the impact factor of the journal than do fields in the college's other divisions. Nonetheless, there is a remarkable level of agreement across the college.

Table 20. How important do you consider each of the following indicators for assessing RESEARCH excellence in your field?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Lead-authored journal articles	4.14	4.12	4.02	4.26
Co-authored (but not lead-authored) journal articles	3.99	3.93	4.00	4.06
External research grants	3.78	3.80	3.71	3.80
Number of citations of publications	3.47	3.26	3.58	3.71
Book publications from academic presses	3.44	3.30	3.68	3.49
Impact factor of journal	3.34	3.11	3.20	3.77
Single-authored journal articles	3.29	2.96	3.42	3.69
Book chapters	3.14	3.00	3.34	3.25
Policy briefs and short research reports	2.79	2.72	2.78	2.92
Book publications from non-academic presses	2.46	2.42	2.61	2.43
Non-peer-reviewed publications	2.34	2.43	2.29	2.25

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

It is perhaps important to note that there was some concern expressed about measuring research excellence through simply quantitative metrics. As one respondent put it:

> *"Research excellence is best judged by content and by substantive contributions to the real world, not by any of the standards listed in this question."*

Assessing this more substantive evaluation of research excellence is best conducted through more in-depth analysis than is possible in a survey. We did, however, try to assess more qualitative aspects of determining current program research impacts. Interestingly, effects on human health (4.00) and effects on quality of life (3.95) were rated the highest across the college (see Table 21).

Table 21. How important do you consider each of the following more qualitative ways of assessing RESEARCH excellence in your field?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Effects on human health	4.00	3.97	3.79	4.19
Effects on quality of life	3.95	3.91	3.89	4.07
Effects on resource sustainability	3.87	4.02	4.07	3.52
Effects on ecosystem function	3.87	3.94	4.23	3.52
Effects on public policy	3.71	3.58	3.89	3.82
Economics effects	3.67	3.73	3.27	3.85

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

In terms of measuring teaching contributions, it is clear that respondents consider the mentoring of graduate students to be the most important across the college, with an average rating of 4.26. Innovative pedagogy (3.61) and new course development (3.45) were also seen as quite important or very important by a large number of respondents. Total number of student credit hours was rated the lowest among the options presented (see Table 22).

Table 22. How important do you consider each of the following for assessing TEACHING contributions in your field?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Mentoring of graduate students	4.26	4.16	4.33	4.37
Innovative pedagogy	3.61	3.54	3.85	3.58
Teaching evaluation from graduate students	3.45	3.47	3.42	3.44
New course development	3.45	3.39	3.71	3.37
Teaching evaluation from undergraduate students	3.30	3.29	3.38	3.24
Textbook or other educational material publication	3.18	3.22	3.24	3.11
Total student credit hours (SCH) taught	3.06	3.08	2.78	3.23

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

In terms of measuring service excellence (see Table 23), respondents generally rated service to the public or to their field higher than service to the university. For example, membership on committees serving government or the public (3.92), and editorship of academic journals (3.86) were rated the highest overall, while membership on committee serving the department (3.34), UC Davis (3.33), the college (3.26), and UC system-wide (3.19) were rated the lowest in terms of assessing service contributions. There were only minor differences between the divisions of the colleges in response to this question.

Table 23. How important do you consider each of the following for assessing SERVICE contributions in your field?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Membership on committees serving government or the public (e.g., NSF, EPA, NRC, etc.)	3.92	3.84	4.07	3.94
Editorship of academic journals	3.86	3.79	3.91	3.93
Administrative service (e.g., department/program chair)	3.83	3.76	4.04	3.82
Leadership in professional associations	3.79	3.67	3.86	3.93
Review of journal submissions	3.58	3.62	3.55	3.54
Membership on departmental committees	3.34	3.31	3.32	3.42
Membership on UC Davis campus-wide committees	3.33	3.21	3.36	3.48
Membership on college committees	3.26	3.18	3.25	3.40
Membership on UC system-wide committees	3.19	3.13	3.25	3.24

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

In terms of assessing contributions to the specific outreach mission associated with AES and CE, respondents to the survey rated impacts on public policy (3.95) and developing collaborative research projects with stakeholders (3.87) as the most important (see Table 24).

There are some interesting differences between divisions in the college. Respondents in the environmental sciences division, particularly, highly valued impacts on public policy, rating it 4.30 on average, compared to 3.95 in human sciences and 3.80 in agricultural sciences. Respondents in agricultural sciences seemed to place a relatively higher value on presentations to small community/stakeholder groups, rating it 3.73, compared to 3.45 in environmental sciences and 3.33 in human sciences.

Table 24. One important feature of our college is our specific outreach mission associated with AES and CE. How important do you consider each of the following for assessing OUTREACH contributions in your field to help meet this mission?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Impacts on public policy	3.95	3.80	4.30	3.95
Developing collaborative research projects with stakeholders	3.87	3.97	3.91	3.71
Presentations to public conferences	3.77	3.78	3.74	3.77
Presentations to small community/stakeholder groups	3.54	3.73	3.45	3.33
Testifying to state and federal legislatures	3.49	3.36	3.65	3.60
Developing web or print materials	3.46	3.53	3.55	3.30
Interaction with media (e.g., writing op-eds, talking with reporters)	3.39	3.29	3.55	3.44
Active participation in ANR workgroups	2.85	2.97	2.56	2.87
Participation in K-12 outreach	2.80	2.72	2.91	2.88

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

Stakeholder Identification and Engagement

We asked respondents to rank stakeholders for their teaching, research, and outreach activities by assigning a number to each of nine different categories of stakeholders, with the total of all numbers equaling 100. Clearly our student body is seen by survey respondents as the most important category of stakeholder (see Table 25). On average, graduate students were allocated 23.95 points, and undergraduate students 22.68 points, with few differences across the divisions of the college.

On average, the category of agricultural and environmental businesses received the third highest total (19.41), but this was primarily because it was seen as the most important category of stakeholders by respondents in the agricultural sciences division, who gave this category an average of 25.63, compared to only 9.47 by respondents in environmental sciences, and 14.73 by respondents in human sciences.

Table 25. Who do you consider to be the most important stakeholders for your teaching, research, and outreach activities? Please assign a number to each of the following categories of stakeholders based on their importance to you. The total must equal 100.

		Response Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Graduate students	23.95	23.29	24.94	24.28
Undergraduate students	22.68	21.45	23.35	24.08
Agricultural and environmental businesses	19.41	25.63	9.47	14.73
Government policymakers	11.94	9.39	13.88	14.00
Other California residents and workers	10.60	10.54	9.35	11.58
Central Valley residents and workers	8.78	9.55	8.19	7.96
Nonprofit organizations	8.37	7.64	9.35	8.58
Government administrators	7.68	6.83	9.02	7.48
Other businesses	6.16	5.51	3.29	9.08

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

We also asked respondents to identify the most important ways of assessing impact on external stakeholders of the college (assessing teaching effectiveness for our student body was covered in a previous question.) Here, it was clear that contributions to both environmental (4.23) and agricultural (4.15) sustainability were considered most important by respondents, on average, across the college (see Table 26).

Interestingly, there is some variation between divisions within the college. Within human sciences, for example, contributions to quality of life and new knowledge/sectors of technology were the two highest-rated categories, while in agricultural sciences, contributions to the economic viability of agriculture in California was the highest-rated category.

Table 26. How important are each of the following in assessing the impact of the CA&ES teaching, research, and outreach activities on these stakeholders over the next 10 years?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
Environmental sustainability	4.23	4.31	4.55	3.92
Agricultural sustainability	4.15	4.34	4.09	3.94
Economic viability of agriculture in California	4.09	4.39	3.46	4.08
New knowledge/sectors of technology	4.07	4.19	3.75	4.09
Quality of life	4.01	3.92	3.98	4.20
New policies/laws	3.53	3.35	3.67	3.74
Human resource development	3.51	3.48	3.36	3.71
New jobs and/or businesses	3.49	3.57	3.11	3.61

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

Identifying Future Resource Needs

The survey also asked respondents to identify the future resource needs that would be required to meet the priority research, teaching, and outreach goals they had previously identified in the survey. By a large margin, respondents across the college identified faculty capacities and expertise as being much more important than new equipment or space, rating it an average of 4.45, compared to 3.41 for new equipment and 2.91 for new space (see Table 27). There appear to be slight differences across the college, with agricultural sciences placing a slightly higher emphasis on new equipment than the other two divisions, but faculty capacities and expertise is still clearly considered to be the most important factor across the college.

Table 27. How important are each of the following to enable your department/program to effectively address the priority areas you identified in the previous section?

		Rating Average		
Answer Options	**Overall**	**Agricultural Sciences**	**Environmental Sciences**	**Human Sciences**
New faculty capacities and expertise	4.45	4.33	4.55	4.57
New equipment	3.41	3.60	3.11	3.29
New space on campus	2.91	2.94	3.00	2.80

(1 = not at all important, 2 = slightly important, 3 = moderately important, 4 = quite important, 5 = very important)

Appendix C

ISI Citation Index Summary by Department

Table 28. Summary Sheet				
Department	**Total Publications/ Faculty**	**Total Citations/ Faculty**	**Mean Citations/ Paper/Faculty**	**H-Index/ Faculty**
Ag. & Res. Economics	32.96	331.82	14.45	7.61
Animal Science	65.14	818.60	12.28	13.77
Biol. & Ag. Engineering	43.33	398.53	13.72	9.00
Entomology	101.65	1,827.80	15.49	18.10
Environ. Design - Land. Arch.	8.57	30.00	2.89	2.43
Environ. Sci. & Policy	50.73	1,528.41	24.48	17.41
Environ. Toxicology	139.33	2,589.67	13.75	22.89
Food Science & Tech.	69.81	1,145.00	13.87	16.48
Human & Comm. Dev.	29.74	672.65	19.40	9.04
Land, Air & Water Res.	65.18	1,126.47	15.18	14.50
Nematology	76.00	1,443.86	16.71	18.14
Nutrition	193.94	3,130.71	17.98	23.59
Plant Pathology	67.32	1,705.53	19.96	16.95
Plant Sciences	50.16	1,205.48	19.30	16.52
Textiles & Clothing	77.00	677.00	7.39	13.40
Viticulture & Enology	56.62	1,093.54	16.07	15.62
Wildlife, Fish & Cons. Biol.	48.20	1,070.10	19.24	13.70
	Missing data for approximately six people			

Appendix D

1999 CA&ES Strategic Plan
Executive Summary

The College of Agricultural and Environmental Sciences (CA&ES) of UC Davis consists of approximately 400 faculty members located in 22 departments. Between 1991 and 1998, the college reduced the size of its faculty by about 7 percent in response to budget cuts while increasing the number of majors 16 percent and student credit hours by 29 percent. During this period the college improved its already excellent record of extramural grant support and it remains internationally recognized for the excellence of its programs, generally being ranked as the best in the world in food and agricultural sciences and among the best in environmental sciences. Maintaining such high levels of distinction during a period of increasing workload and decreasing resources has been a challenge for our faculty. Similar problems are shared widely on the UC Davis campus and, as with other colleges, we expect to participate in accommodating the increasing numbers of students that must be absorbed in the coming decade. To improve the quality of our programs while absorbing new students will require the college to carefully plan and judiciously invest its resources.

The academic plan presented here was developed by a faculty committee charged with identifying initiatives to guide the college in building programs of high quality. Many of the difficult decisions regarding resource allocation could not be handled through the faculty committee process that was used to develop this academic plan and thus the plan does not fully address these issues. The college is not likely to have sufficient resources in the near to intermediate future to carry out all of the areas of investment identified in the academic plan. Thus, additional prioritizing is required. The college also needs to address how to redirect resources among existing programs to better achieve our goals. Throughout our planning it has been the expectation that a follow-on process will be initiated to make these difficult decisions. This Executive Summary serves to abstract and annotate the attached academic plan as interpreted by the college's leadership team and to identify priority areas for immediate investment.

The plan that is presented stresses that the core programs within our college must be maintained since they form the foundation upon which our initiatives will develop. These foundation programs are identified as:

1. Agricultural systems
2. Environmental sustainability and ecosystem function
3. Human health and development

The committee recommends that 85 percent of the faculty resources that become available through vacancies over the next five years be used to sustain these foundation programs. This reinvestment of approximately 85 percent of our FTE resources into the core programs of the college is not meant to imply that positions will be refilled as currently described. We will make significant changes in our core programs during this planning window to reflect changes in research, educational and outreach extension needs. We specifically intend to advance the environmental sciences programs of our college, in conjunction with those of the campus in general, so that they will be indisputably the premier programs in the country. This must be done with the recognition that for our food, nutrition, and agricultural sciences programs to retrain their top rankings, they cannot remain static, but must also continue to improve in quality.

The college faces a challenge regarding its business, social science, and design programs. We must jointly plan with other parts of the campus to assure that our programs complement and support the overall campus vision in these areas. These programs are struggling from the large number of students in their majors and courses and feel that the college has not sufficiently invested resources in them. A priority for our college will be to develop a plan for managing the educational needs of students in these programs while focusing on improving the quality of associated research areas. Our plans must be coordinated with those of similar programs on campus, just as the planning and implementation of our environmental and agricultural science programs are being coordinated with the other life and physical science programs on campus.

The opportunities for programmatic investment identified in the academic plan provide a blueprint for the development of programs that span our traditional disciplinary areas within the college. These five programs are:

1. Agricultural and environmental genomics
2. Water and watersheds
3. Agriculture, the environment, and human health
4. Agricultural and environmental sensing and informatics
5. Science, the public, and governmental policy

Most of these programs are broad, with multiple areas identified under each that could benefit from investment of new and redirected FTEs. This blueprint for future development will guide our investment of the 15 percent of retirement FTEs and requests for new growth. The college does not have adequate resources available to simultaneously begin development of each of the five initiatives identified in our academic plan. The plan will need to be implemented in stages and details of the implementation will need to be provided beyond that provided in the

academic plan which primarily discusses planning assumptions and principles. The following is an outline of our plan for the immediate implementation of some of the initiatives of the academic plan developed by the faculty committee.

Priorities among the Five Initiatives Identified in the Attached Academic Plan

Environment and Water

We place our highest priority on the strengthening of our environmental sciences core programs and the development of the initiative on water and watersheds identified in the academic plan. We will encourage and support an enhanced role for the John Muir Institute of the Environment as the focus for coordination of all campus environmental science research, graduate education, and outreach programs. To strengthen our core programs in the environmental sciences, we will encourage a restructuring of the college's dispersed programs related to environmental effects on plants. We will encourage the formation of a college-based center for plant/environment interaction research and education that will include faculty of the Divisions of Environmental Sciences and Agricultural Sciences as well as scientists of the USDA Forest Service. Close associations with the Section of Evolution and Ecology in DBS will be encouraged. To lead our Division of Environmental Sciences a new associate dean is being sought through a national search. We will commit 2–3 positions to help this associate dean to build or strengthen an area of this division.

The water and watersheds initiative of the college will be developed through an interface with the campus-wide Integrated Watershed Science Initiative. The implementation of our college initiative is described in the academic plan and, as noted, relies heavily upon a coordinated campus program. There is considerable campus strength in this area and significant problems within the state, nation and world that justify research investment and strengthening of teaching programs. We strongly support a campus-wide coordination of programs through the committee of department chairs with water programs. We consider further development of this area through cluster hires to be a high priority.

One aspect of the water initiative that needs further clarification and planning prior to investment of resources is that involving policy and economics. As noted in the academic plan, two of the three priority water positions are policy related. The college initiative identified as Science, the Public and Government Policy is also heavily directed toward environmental science policy issues. There are additional economic and policy programs within the environmental science and policy and agricultural and resource economics departments.

The academic plan does not indicate how these programs are interrelated and coordinated. The strength of our environmental policy and resource economic programs provides the impetus for the college to carefully evaluate our existing expertise in these areas prior to proceeding with their further development to assure coordination of our existing programs with the proposed new investments in policy/economic oriented positions.

Agricultural and Environmental Genomics

Our second priority will be to build on our current strength in agricultural genetics through the college agricultural genomics initiative. The rapidly increasing availability of gene sequences and genomic organizational information is revolutionizing the life sciences and agricultural research. We must aggressively build on our current strengths in this area to assure the long-term quality of our life sciences-related agricultural research programs. Our scientists have been successful in capturing significant amounts of NSF and USDA funding for plant genomics research. The investment of a few more positions in this area will assure our national pre-eminence in plant genomics research. Two previously authorized positions in plant genomics have been released for a cluster hire to add to our strength. As with the water positions, we will seek to build programs by clustering our areas of strength. This search is being coordinated with simultaneous searches for a director of the new campus genomics initiative and associated leadership positions. We also consider the building of strength in animal genomics to be a priority. We do not currently have the depth of strength in animal genomics within the college as we do in plant genomics, so it will take longer and require a greater investment to meet our goal of building a dominant program in animal genomics.

The methods for developing, understanding, and using sequence data are not unique to any taxonomic groups of organisms, so organization of the genomics efforts of the CA&ES will be across disciplines. We will initiate the organization of a center for agricultural genomics research that will be the focus of our investments in infrastructure to support the genomics efforts within the college. These investments will be coordinated with those made for the campus genomics initiative to assure that there is no unnecessary duplication.

Areas of opportunity listed under the Agriculture, Environment and Human Health initiative of the college address issues that complement our priority areas. One of these is the interface between diet and human health. There are opportunities to combine our strengths in plant and animal genomics with those of human health and nutrition. This research area will be encouraged as an interface between these two strengths of the college. Another important issue addressed by this initiative is food safety. We will take advantage of information that is coming from studies of microbial genomics to develop better strategies for ensuring the safety

of our food supply. We will participate with the School of Veterinary Medicine in their initiative on food safety. Together with this group, DBS, and the Medical School there are unrealized opportunities to build significant strength in food safety and other areas of microbiology and food science. Food safety is an area of significant concern to our college and we will enhance our abilities to address this important food issue.

The initiative entitled Agricultural and Environmental Sensing and Informatics in the academic plan has components that need to be developed to strengthen the environmental sciences and genomics programs within the college. The parts of this initiative that support strengthening of these programs will be a priority for investment of FTEs as they complement strategies to build our strength in these areas.

Building these two initiatives and parts of the other three will impact our teaching programs in innovative ways. As we implement these initiatives, we will search for ways to redirect some of our students and to assist in enrollment management in some areas.

Conclusions

Although our academic plan identifies five initiatives that need to be pursued for the long-term health of our college, we recognize that our resources are insufficient to initiate all simultaneously. Consequently, we have identified two initiatives for immediate investment of our resources along with portions of other initiatives that can be built in association with these two primary initiatives. We also have outlined our strategy for developing cross-disciplinary approaches within our college for the development of infrastructure supporting priority areas. We will develop a unified plan to strengthen the area of policy/economics in the college and we will identify how our plan meshes with comparable campus programs. We have identified a strategy to strengthen our core programs in the environmental sciences division to facilitate the potential of our campus being recognized as having the strongest environmental sciences program in the country. Finally, we have identified the business/economics, social sciences, and design portions of our college as needing additional planning. Such planning should coordinate with similar programs of other colleges and schools and identify programs that have potential for significant improvements in quality with additional investment.

Measurement of the success of our proposed initiatives will be through monitoring departmental and program rankings. A large proportion of our departments are already ranked among the best in the country. Those programs that are not formally ranked have few enough peers that informal assessments provide credible information regarding their relative ranking. Formal analyses such as those conducted by the ISI and Ecological Society of America that rank

our agricultural and ecology programs (campus-wide) as the best in the country will naturally be followed with interest.

Agricultural Experiment Station and Cooperative Extension Funds

The bulk of the resources available to the CA&ES are to support the specific research and outreach objectives of the Agricultural Experiment Station (AES) and Cooperative Extension (CE). In the past these resources have been so heavily invested in faculty positions that too few resources are available to maintain and build the necessary infrastructure for modern research and outreach. The greatest limitation to the success of our core programs and the initiatives that have been proposed is the quality and quantity of our research and extension facilities. Our college was the first on campus and a large number of our facilities remain essentially unchanged from when they were originally built. We cannot retain our position as the premier college of our disciplines in the country without significant investment in our infrastructure during the next decade. In our planning we anticipate that the AES and CE funds available to us will not keep up with inflation and certainly will not grow in proportion to the I&R resources coming to campus and our college. This combination of lack of growth of AES and CE funds coupled with our need to extract flexible funds from FTEs for investment in campus infrastructure and initiatives will place a significant strain on our college in the next decade. We anticipate that an excess of I&R investment over our rate of AES fund withdrawal from faculty positions will be needed to meet the needs of the anticipated increasing number of students in our college. The concomitant benefit to the campus will be an increase in flexible resources that can be invested into infrastructure and programs of our college and other parts of campus that support the AES and CE missions.

Facilities

Once the academic plan is submitted, the college will initiate a planning process for future facility needs that will have as a priority the co-location of similar programs. This co-location is important to reduce the costs of investment in the expensive and short-lived equipment necessary to conduct modern research. The current dispersal of similar programs is requiring our investment in islands of similar facilities. The majority of our laboratory facilities are cramped and in old buildings. Our scientists are among the most productive on campus, but their productivity is being hampered by the condition of their facilities and their inadequate space. We will use the priorities listed in the academic plan to guide the prioritization of our investments in, and requests for, new facilities. A particular need of our college is the renewal of many of our animal and plant production research and teaching facilities. These facilities are

key to the excellence of our agricultural programs yet they lag significantly in quality behind those of other major universities in the country. If we are to maintain our position as the premier agricultural college, we must address these problems soon. We will make major efforts to solve many of our facility problems through partnerships, internal resources, and development campaigns, but we also will need significant help from campus resources to address our facility needs.

Appendix E

2007 CA&ES Strategic Plan
Executive Summary

The College of Agricultural and Environmental Sciences (CA&ES) at the University of California, Davis (UC Davis), is one of the nation's premier institutions for agricultural, environmental, and human sciences. As part of the system of land-grant universities, our college partners with the residents and communities of California to address both global and regional issues, and to provide research-based solutions to problems.

Its expertise has evolved from the largely agricultural focus of the nineteenth century to encompass today's much wider range of concerns and issues, such as natural resource use and environmental protection, food safety and nutrition, human health and well-being, globalization of trade and information, changing demographics and consumer demands, the information explosion, and global climate change.

California is a nationally and globally significant hotspot of biological and environmental diversity, with an agricultural system among the most diverse and valuable in the world. Its climate, geography, and vibrant economy continually draw new residents, setting the stage for challenges over uses of land, water, and other natural resources.

A key strength of our college is its ability to synergize across the broad excellence of disciplines in the agricultural, environmental, and human sciences. This integration is critical to finding sustainable solutions to increasingly complex societal problems. While maintaining the strength of our 17 traditional academic departments, the college is also developing many new centers, institutes, and initiatives to form a continuum from basic to applied research, and using the research to provide real-world solutions for external stakeholders. This approach will help guide and maintain the college's excellence into the future.

Priority Areas

Agricultural Sciences

- We continue to lead California, the nation, and the world in the development of sustainable and safe food and agriculture systems. These systems must be considered in their totality, including inputs and outputs, and benefits and detriments to society as a whole.

- Important areas in which the college contributes include:
    - Production of affordable, safe, and healthy foods
    - Traditional and novel approaches to crop and livestock production and improvement
    - Efficient use and stewardship of natural resources, including water, soil, and air
    - Environmentally sound and cost-effective pest management
    - Economic viability and sustainability
    - Addressing emerging issues, such as the development of biofuels and other biobased materials, heritage species, increased globalization, climate change effects on agriculture, and biotechnology for crop and animal production

Environmental Sciences

- Our outstanding strength in this area extends far beyond the environmental aspects of agriculture, comprising world-class expertise in
    - Global climate change and its impacts
    - Organismal biology and diversity
    - Water and watershed science
    - Ecosystem function, ecology, and natural resource management
    - Invasive species biology and control
    - Informatics tools for environmental analysis
    - Wildfire science

Human Sciences

- We continue to ensure that human health and nutrition, economic and community development, and public and private decision-making about resource use are recognized for their fundamental roles in enabling the translation of scientific knowledge into socially desirable solutions.
- We continue to weave agricultural, environmental, and human sciences research into effective decision-making by policymakers, stakeholder groups, and the public.

Future Research Areas

Ten emerging areas in which the college (and campus) exhibit significant strength (*listed alphabetically, not by priority*):

1. **Agricultural sustainability**: Interdisciplinary research and outreach programs that integrate economic profitability, environmental health, and social and economic justice in agricultural and food systems for California and the world.

2. **Biobased materials**: Research to help the transition from petroleum-based energy and products to renewable resources, such as plants, in order to provide fibers, plastics, films, food additives, oils, and fuels.

3. **Biodiversity and ecosystem services**: Maintain expertise in biological diversity and conservation, environmental informatics, and the functioning of natural ecosystems (animal, plant, and microbial).

4. **Complex microbial ecosystems**: Foster an understanding of the function of and interconnections between microbial species in agricultural and other ecosystem, in order to promote agricultural sustainability and to understand global warming.

5. **Environmental and human health**: Maintain strength in the study of environmental-based health problems such as global change, infectious diseases, groundwater contamination, and trace-metal poisoning.

6. **Environmental informatics**: Develop improved systems to manage, model, and distribute large data sets relevant to solving problems in the agricultural and environmental sciences, including geographic information systems and remote sensing technology.

7. **Foods for health, and food safety**: Enhance the campus-wide strength in developing a comprehensive program considering all aspects of food, from production to consumption, and the health of the individual.

8. **Global change, water, and watersheds**: Science-based solutions are being developed to support sustainable watersheds as California's urban population grows and global climate change impacts water management programs.

9. **Regional change**: Changes in the Central Valley of California are impacting economic, agricultural, environmental, social, and political climates. Expertise on regional change is being centralized to assist constituents of regional organizations.

10. **Science, policy, and public perception**: There is an increasing need to understand the process by which scientific information is transmitted from the university to effective decision-making and planning by policymakers, stakeholder groups, and the public.

Specific Planning Recommendations for 2007–2012

(These recommendations were developed by the college's Academic and Strategic Planning Committee in early 2007.)

I. Departmental Needs

Our college has done extremely well in the campus initiative competitions, thereby benefiting from a large number of new positions in emerging areas of scholarship. However, the initiatives have comprised almost all new FTE at a time of diminished resources for the college's applied research and extension functions, and of ever-growing concern about the college's aging demography. Departments face critical challenges to their abilities to meet core, discipline-specific needs for teaching, research, and outreach to key stakeholder groups.

The college's first priorities for the next five years, with respect to FTE allocation, should be to address the demographic imbalance and to enable departments to meet their most critical needs.

II. Future Research Areas

Ten emerging areas in which the college (and campus) exhibit substantial strength, and in which support exists across multiple departments for building on these strengths:

1. Agricultural sustainability
2. Biobased materials
3. Biodiversity and ecosystem services
4. Complex microbial ecosystems
5. Environmental and human health
6. Environmental informatics
7. Foods for health, and food safety
8. Global change, water, and watersheds
9. Regional change
10. Science, policy, and public perception

Brief descriptions of each subject are given in the previous section. Goals in these areas range from modest to multiple new FTE appointments. The college must continue to transcend traditional disciplinary boundaries in addressing key future challenges and opportunities, and continue to position itself for excellence in the future. These ten academic themes are areas of college-wide significance that should receive high priority for future development as resources allow.

III. Undergraduate Education

Strong enrollments are key to the college's continued vitality. If CA&ES were successful in returning to 25 percent of the total campus enrollment, the target enrollment would be just over 7,300 undergraduates.

A comprehensive review of CA&ES majors and curricula is recommended to ensure that our academic programs are relevant and attractive. At the same time, lower-division portal curricula should be developed to help guide students into our majors, along with an outreach and marketing plan for students and stakeholders.

IV. Graduate Education

The academic strength of the college relies strongly on excellence in graduate education, and the college will be well served by maintaining the number and quality of its graduate students over the next five years.

Important strategies to achieve this goal include graduate tuition relief, more teaching assistantships, better rewards to faculty for excellence in graduate instruction, experimenting with new types of programs (e.g., professional master's degrees), and reviewing the effectiveness of our existing programs. The highest priority should go to graduate student tuition relief.

V. Staff Issues

Our college depends on the excellence and dedication of its nonacademic staff to fulfill its teaching, research, and outreach missions. We currently face issues of understaffing, increasing workloads, inadequate compensation, and the impending retirement of a generation of key senior staff.

To maintain the productivity of faculty and the continued functionality of academic units, the college must address staff concerns such as compensation, efficient systems to manage the increasing workload, and opportunities for staff development.

VI. Cooperative Extension

Cooperative Extension (CE) specialists and advisors are central to fulfilling the applied mission of the college, yet the CE program faces the dual challenge of growing to meet society's changing needs while coping with the 30 percent cut in state resources since 2002.

The college should support the programmatic planning of Cooperative Extension to provide for its future and to broaden the CE expertise base. The college should also find ways to strengthen the continuity between Cooperative Extension and I&R across research, teaching, and outreach programs. The college should also pursue development of off-campus certified education programs to meet stakeholder needs for qualified professionals.

VII. Agricultural Experiment Station

Agricultural Experiment Station (AES) resources are crucial to our land-grant mission of applied research and outreach. Because of recent cuts, there is a trend towards new faculty positions that are 100 percent I&R, which could decouple AES resource allocations.

The college, departments, and faculty should work together to create a more-integrated college-wide outreach plan and to refine the Agricultural Experiment Station proposal and performance evaluation process, so that the allocation of AES FTE reflects the quantity and quality of outreach.

It is also important to continue to review the Resource Allocation Committee formula and Special Facilities allocations for priority setting within the college.

VIII. International Focus

The ongoing internationalization of the college's mission is an important component of the college. An international focus is consistent with the plan of UC Davis and beneficial to California stakeholders. The college administration should take a global perspective in faculty and graduate student recruitment in order to continue to attract the best scholars in the world.

There may be opportunities to attract high-quality, large-scale international programs to UC Davis, and our college should actively support efforts to pursue them. The college should embrace Education Abroad programs, international experiences for graduate students, new internationally focused courses and teaching programs, and other ways to enhance our international focus.

Appendix F

2009 UC ANR Strategic Vision
Executive Summary

The University of California and its Division of Agriculture and Natural Resources (UC ANR) represent a partnership of four-world-renowned science and education communities on three UC campuses, a UC presence in all California counties, an unmatched system of research locations and expertise, recognized leadership in special program areas, and an internationally recognized community of Cooperative Extension professionals.

UC ANR professionals have a unique, proven, respected ability to bring together the resources needed to solve tough problems. UC ANR people, programs, and science-based solutions bridge conflicting interests by bringing new knowledge, targeted research, and local education to complex problems.

California of 2025 will face many complex challenges related to increases in global and domestic populations and changes in climate and land use patterns. To thrive and prosper, Californians must have solutions to a wide range of existing and new challenges.

- Increasing global and domestic populations will need sustainable, safe food.
- Competition for water and land resources among urban, environmental, and agricultural uses will intensify.
- The resilience of natural, managed, and human communities is threatened by climate changes and population growth.
- Natural ecosystems will be increasingly stressed, reducing biodiversity and the capacity to provide essential ecosystem services.
- The mixture of regional crops and animal products grown in California will change.
- The capacity to use nutrition to positively impact human health will be a reality.
- California's youth will need new and enhanced opportunities for engagement.
- California will face less-secure and more-costly energy supplies.

California must address the challenges to the state to ensure a high quality of life, a healthy environment, and economic success for future generations. UC ANR's Strategic Vision is the first step in a strategic planning process to address the challenges we face and provide the scientific and technological breakthroughs California needs to compete in a global economy, ensure a safe, nutritious food supply, conserve natural resources, and keep Californians healthy. The following multidiscipline, integrated initiatives represent the best opportunities for ANR's

considerable infrastructure and talent to seek new resources and new ways of partnering with and outside UC to find solutions for California.

- Improve water quality, quantity, and security
- Enhance competitive, sustainable food systems
- Increase science literacy in natural resources, agriculture, and nutrition
- Enhance sustainable natural ecosystems
- Enhance the health of Californians and California's agricultural economy
- Provide for healthy families and communities
- Ensure safe and secure food supplies
- Manage endemic and invasive pests and diseases
- Improve energy security and green technologies

California is the most innovative, diversified, and efficient agricultural producer in the world. Our natural resources are unparalleled, with ancient redwoods, prime productive forestlands, and vast expanses of beautiful grasslands, deserts, and coastline. The state is home to a greater diversity of species than any state in the nation.

UC ANR is at the heart of California's unique position as a world leader in agriculture and natural resources research and innovation because of UC's unparalleled scientific capacity. Given the future demands on resources, who other than ANR is better suited to meet the needs of a growing state, or for that matter, a growing world?

Appendix G

Response to Chairs-Directed Questions

(listed alphabetically by department)

These six questions were posed to each of the 17 academic departments during the Academic Prioritization Committee's review process:

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

6. Who do you consider to be the top national and international programs in your area(s)?

Department of Agricultural and Resource Economics

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

The primary stakeholders for the Department of Agricultural and Resource Economic's (ARE) outreach and research activity are the natural resource and agricultural industries in California. Since much of ARE research is policy orientated, state and federal officials responsible for policy analysis and programs rely significantly on our research and outreach.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

The impact of research and outreach activities on stakeholders can be measured in terms of the frequency and the effectiveness of contact by ARE faculty and staff with the stakeholders. The most prominent example of demand for our outreach is the production budgets that stimulated 600,000 downloads last year. Also there are many examples in which state and federal policy can be shown to have been influenced by research from the college and/or the Department of Agricultural and Resource Economics.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

In our opinion, the CA&ES themes in the coming decade should be water, food safety, and the interface between environmental impacts and agricultural production.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

Important factors in order of importance are:

- Critical scientific research questions
- Policy relevance
- Stakeholder identified priorities
- Research funds

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

The role of economics in adapting agricultural and environmental use of California's resources to climate change, growing population, and shifts in the California economy.

6. Who do you consider to be the top national and international programs in your area(s)?

Top national and international programs in the ARE field are: UC Davis, UC Berkeley, University of Maryland, Cornell University, and Iowa State University. A recent summary of the national and international standing of the ARE program written for a review of our graduate programs is as follows:

Recent rankings place the UC Davis Agricultural and Resource Economics (ARE) Ph.D. program at number two in the world and our M.S. program at number one. In 2004, the website www.econphd.net ranked Ph.D. programs in Resource and Agricultural Economics based on research output of the faculty. This ranking uses the Journal of Economic Literature classification system to define the subdiscipline of Resource and Agricultural Economics. It places our program at number two, just behind the University of Maryland and just ahead of UC Berkeley. Www.econphd.net also provides separate rankings for Agricultural Economics and for Resource and Environmental Economics. It ranks the UC Davis ARE program number two in Agricultural Economics behind Iowa State and number four in Resource and Environmental Economics behind UC Berkeley, University of Maryland, and Harvard University.

In 2004, Gregory Perry of Oregon State University produced a ranking of graduate programs in Agricultural Economics (see http://arec.oregonstate.edu/Ranking2004.pdf). Perry surveyed 100 referees for the American Journal of Agricultural Economics, which is the premier journal in our field. Based on their responses, he ranked the UC Davis ARE program second behind UC Berkeley. The program also received a number two ranking in earlier versions of Perry's survey in 1993 and 1999.

The 2004 Perry survey places our M.S. program at number one. This result shows an improvement from 1993 when we ranked third, and from 1999 when we ranked second. Many of our competitors offer multi-year thesis-based master's programs, whereas our program is a one-year program that focuses on quantitative rigor rather than independent research. Our consistently high ranking shows that our program fills an important niche in the profession.

The success of our students in winning awards also illustrates the high quality of our Ph.D. program. The American Agricultural Economics Association awards an annual prize for the best Ph.D. dissertation. Since 1970, our students have won 14 of these awards, more than any other program. Since 2000, our Ph.D. graduates have won 4 best dissertation awards, also more than any other program.

Department of Animal Science

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

- Academic, government, and nonprofit research institutes, organizations, foundations, and professional scholarly societies who utilize and build on our research data and interpretations
- Animal agricultural industries and commercial operations (livestock and poultry) including large and small scale operations and specialized "niche" businesses
- Policymakers and legislators (and their staffers)
- Regulatory agencies and boards (e.g., the Environmental Protection Agency [EPA], and water and air quality boards)
- Large- and small-animal health-care providers (we educate many students who either go on to be veterinarians or work with veterinarians or zoos or in other capacities with animals)
- Nongovernmental organizations
- Environmental groups
- K-12 students and their teachers, 4-H youth groups, FFA, etc.
- Community colleges (students and their instructors)
- The citizens of California (anyone who eats or votes or gets sick or maintains their health. For example, if you are vaccinated you benefit from basic research related to chicken cells in vitro or commercial egg operations that provide eggs for human vaccine growth. The birds that produce the embryos for cell culture or the eggs for virus growth live in housing operations that may well be out of compliance with Proposition 2 — so you benefit from research on poultry related to virology, molecular biology, cell biology, animal welfare and behavior, management / husbandry / care of poultry, etc. We in the Department of Animal Science provide both the "why" and "how" animals operate to serve societal needs).

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

- Peer-reviewed publications
- General-audience publications
- Student success (activities, awards, employment)
- Awards to faculty
- Impact statements, comments from stakeholders

- Research funding (*including* commodity, gifts and donations, extramural, etc. All dollars which fund faculty programs should count!)
- Media coverage of advancements and activities (including interviews)
- Increased enrollment and competitive scores of our undergraduate and graduate students
- Numbers of visiting scientists, scholars, and postdoctoral research scholars
- Number of outreach events held annually that capture children, adults, industries, and interested citizens (*all* should be important to CA&ES — not only commercial stakeholders and businesses)

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

- Continued: Human-urban-agricultural interfaces and management
- Environmental issues
- Conservation issues
- Food issues (from source to plate)
- Continuing education of our stakeholders as adults (lifelong education in various forms for our citizens)
- Role for agriculture and the environmental sciences in terms of human health (high quality, safe food supply *with* added value, anti-aging properties, etc.)

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

- Cutting-edge disciplinary experimental research which addresses critical issues in the agricultural and environmental sciences; however, discovery driven science must also be emphasized.
- Student education that is high quality, experiential, creative, flexible, and exciting, wherein students are immersed in an area of expertise but *are* involved in research (listed above) and outreach (see below).
- The above two areas should be intimately connected (students with research) so students can understand the value of research to their education and society and they can learn the importance of outreach as the service arm of the institution.
- Outreach that is flexible and relevant to the topics of the day and continues to respond and evolve as our society and industries change. Outreach is our service arm to society

in addition to our research and education. It is the bridge of our engagement with society.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

The *many* roles of animals in our world and the contributions of human involvement with animals to the successes and advances in our society (the food supply, consistent source of nutrient protein, human health and welfare and well-being, and environmental stewardship including managing, maintaining, and restoring). Animals are an integral part of the landscape and many environments, and thus play an enormous positive role, yet we are mostly faced with managing for the negatives — a situation that must change.

6. Who do you consider to be the top national and international programs in your area(s)?

National: University of Wisconsin, Michigan State University, University of Illinois, Cornell University (note: we rank 2 or 3 by most measures, and have the largest animal science undergraduate major population in the U.S., currently at more than 700 students).

International: INRA (France), Wageningen University (Netherlands).

Department of Biological and Agricultural Engineering

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

The general public of California, farmers and producers, food processors, regulatory agencies, biotechnology industries, agricultural industries (equipment, machinery, tools, electronic systems), commodity groups, and the general public of the U.S. and the world.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

Depending on the subject area, the impact of our activities will range from moderate for long-range projects to high for short-range high-impact projects. Typical long-range projects involve precision agriculture, aquaculture, mechanization, water management, bioenergy development, bioprocessing, etc. Typical short-range high-impact projects involve energy efficiency, commodity group problems, precision spraying, biotechnology product production, ergonomic interventions in the agricultural workplace, etc.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

(not in order of priority)

- Resource management and conservation (water, land, air)
- Mechanization and automation of agricultural operations to reduce labor and improve safety
- Precision agriculture
- Sustainable production of plants and animals
- Bioenergy development
- Energy efficiency in agriculture, food storage, and food processing
- Industrial biotechnology
- Food safety and traceability

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

Research and Outreach

- Critical scientific questions and engineering problems
- Resource scarcity and conservation
- Stakeholder priorities

Teaching

- Student interest
- Policy relevance
- Availability of employment

Student interest will not likely be high at the undergraduate level, but this should not dictate the direction of our creative efforts. Likewise, the availability of large (federal) funds should not unduly determine what we work on, or we will end up with a whole pile of academic research that the stakeholders find only marginally useful.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

- Resource management and conservation (water, land, air)
- Mechanization and automation of agricultural operations to reduce labor and improve safety
- Sustainable production of plants and animals
- Bioenergy development
- Energy efficiency in agriculture, food storage, and food processing
- Industrial biotechnology

6. Who do you consider to be the top national and international programs in your area(s)?

- Cornell University
- Purdue University
- Iowa State University
- Wageningen University, Netherlands
- Katholieke Universiteit Leuven, Belgium

Department of Entomology

Response not submitted

Department of Environmental Design – Landscape Architecture

Response not submitted

Department of Environmental Science and Policy

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Other researchers, graduate students, environmental stakeholders, agricultural and urban stakeholders, government policymakers, nonprofit organizations, decision-makers in industry, California and U.S. audiences, and international audiences.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

- Quality and quantity of publications
- Postgraduate student placement
- Presentations at conferences
- Interaction with media
- Impacts on policy, such as testifying to state and federal legislators, use of university-developed data, analyses, and recommendations in actual policy formulation, participation by faculty (and others) on blue ribbon panels, advisory and review bodies and recovery teams
- Outreach materials such as general audience reports and extension materials

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

We refer the committee to the CA&ES Strategic Plan which represents a consensus of the college on the most important themes and areas over the coming decade. However, we would add that themes which integrate agricultural, environmental, and social sciences should be given priority, e.g., climate change.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

- Critical research questions
- Environmental change issues
- Stakeholder-identified priorities

- Availability of research funding, especially for graduate students and postdoctoral research scholars
- Teaching priorities should not be determined solely by maximization of student throughput or student credit hours

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

- Basic environmental sciences and policy
- Environmental change and impact assessment
- Conservation
- Bioinformatics
- Land use and transportation
- Water and watershed ecosystem science
- Regional change and planning
- Assessment of technology choices and environmental impacts
- Lifecycle analysis

6. Who do you consider to be the top national and international programs in your area(s)?

- Department of Environmental Science and Policy (UC Davis)
- Bren School for the Environment (UC Santa Barbara)
- Nicholas School for the Environment (Duke University)
- University of Michigan School of Natural Resources
- Yale School of Forestry
- Stanford Environmental Program

Department of Environmental Toxicology

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Over the past 40 years our department has focused its efforts on deriving a better understanding of the fate, toxic mechanisms, and detrimental impacts of hazardous materials and agrochemicals in the environment as well as on human and animal health — with an emphasis on determining the methods and conditions for their safe and effective use.

Because we are so diverse in our approach, our department (including the IR-4 Program) continues to serve a wide variety of stakeholders representing all three branches of the college; many also contribute significant extramural support toward departmental research and outreach activities.

- **Commodity Organizations**

  California Almond Board
  California Peach Board
  California Prune Board
  California Rice Commission
  California Rice Research Board
  Pacific Coast Federation of Fisherman's Associations

- **Federal Agencies**

  Army Corps of Engineers (COE)
  U.S. Department of Agriculture (USDA)
  U.S. Department of Defense (DOD)
  U.S. Department of Energy (DOE)
  Environmental Protection Agency (EPA)
  U.S. Fish and Wildlife Service (USFWS)
  U.S. Food and Drug Administration (FDA)
  U.S. Geological Survey (USGS)
  National Academy of Sciences
  National Institutes of Environmental Health Sciences (NIEHS)
  National Institutes of Health (NIH)
  National Oceanic and Atmospheric Administration (NOAA)
  National Science Foundation (NSF)

- **State Agencies**

  California Environmental Protection Agency (CalEPA)
  - Air Resources Board
  - Department of Pesticide Regulation
  - Department of Toxic Substances Control
  - Office of Environmental Health Hazard Assessment
  - Regional Water Quality Control Boards
  - State Water Resources Control Board

  California Sea Grant College Program
  Department of Fish and Game (DFG)
  Department of Food and Agriculture (CDFA)
  Office of Spill Prevention and Response (OSPR)

- **Industry**

  Pharmaceutical Companies — AstraZeneca, GlaxoSmithKline, Iconix, Novartis (U.S. and Austria), and Pfizer
  Petroleum Companies — Chevron Research and Technology and Exxon-Mobil
  Chemical and Pesticide Companies — Dow Agri Sciences, DuPont, FMC, Mitsui (Japan), Monsanto, Mycogen, Olympic, Syngenta, and Valent
  Agricultural and Environmental Consulting Firms — Blankinship and Associates
  Biotechnology Companies — Genentech, Xenobiotic Detection Systems
  Analytical Chemical Analysis Companies — Hiyoshi (Japan)
  Food Products Companies — Pur Roast Coffee

- **Nonprofit Organizations**

  American Heart Association
  American Lung Association
  Susan G. Komen for the Cure (breast cancer research)

- **Commodity Organizations Served by the Departmental IR-4 Program**

  California Almonds
  Washington Apricots
  California Artichoke Research Council
  California Asparagus Commission
  California Specialty Crops Council
  California Avocado Commission
  California Dry Bean Industry
  California Carrot Research Program
  California Celery Research
  California, Washington Cherries
  California Citrus Nursery Research
  California Citrus Research Program
  California Date Commission
  California Fig Advisory Board
  California Cut Flower Commission

California Garlic and Onion Research Program
California Desert Grapes
Oregon, Washington Hazelnuts
California Kiwifruit Commission
California Lettuce Research Program
California Melon Research Program
California Nectarines
Walla Walla Onions
Idaho, Eastern Oregon Onions
California Olives
Hawaii Papaya
California Cling Peaches
California Peaches
California Pepper Commission
California Pistachio Research Program
California Plum Marketing Order
California Prunes
Washington, Oregon Fresh Prunes
Washington, Oregon Pears
California Potato Research Program
Idaho, Eastern Oregon Potatoes
Oregon, California Potatoes
Colorado Potatoes
Washington Potatoes
California Raisins
California Rice Commission
California Wild Rice Program
California Strawberry Commission
California Table Grape Commission
California Tomato Commission
California Processing Tomato Advisory Board
California Treefruit Marketing Order
California Walnut Commission
Oregon Grass Seed Commission
Washington Hops Commission
U.S. Dry Bean and Lentil Council
Far West Spearmint Oil
Mint Industry Research Council
Western Growers Association
National Potato Council
California Citrus Quality Council
Society of American Florists
American Nursery and Landscape Association
California Grain and Feed Association
Monterey Mushroom
Eurofresh
Driscolls
Grimmway
Paramount Farms
Idaho Barley Commission

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

The impact would be predominantly on stakeholder use of new information developed and communicated by the college to enhance agricultural productivity, environmental quality, and both human and animal health. Examples might include the adoption of new field and fertilizer management practices, use of more-productive crop strains, adoption of safer yet more-effective pesticides, development of more-protective chemical criteria for water, air, and foods, improved assessment of the risk of toxic chemicals, etc.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

The nation and the world both face numerous challenges — many of which are integrally connected to a rapidly increasing human population. Therefore, emerging technologies designed to address issues such as climate change, rising energy demand, and the need for increased, but environmentally sound, agricultural productivity will require comprehensive life-cycle analysis to determine their impacts on environmental quality, human and animal health, and food safety. For instance, new energy sources (e.g., biofuels) currently under development may ultimately present larger problems than those currently in use.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

The factors listed above are integrally linked. Through past and current CA&ES research and outreach activities, one key goal has been to communicate with our stakeholders on what the current critical scientific questions are. In doing so, the hope is that they will then identify such questions as top priorities and make available the research funding necessary for us to adequately address them. As research usually produces more questions than answers, the results would facilitate our development of new critical questions, which we would again convey to the stakeholders, and so on.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

The impacts of new and emerging technologies on environmental quality, human and animal health, and food safety (see #3 above).

6. Who do you consider to be the top national and international programs in your area(s)?

Originally organized in 1962 as an Organized Research Unit within the College of Agricultural and Environmental Sciences, our department is the oldest and best known of its type in the world. Although no formal program rankings in environmental toxicology are currently available, we are considered by many to be at the forefront of the field. The excellence of our program is clearly demonstrated by our consistently high level of extramural research

support (the highest per FTE on campus) and the numerous graduates who contribute to the field at both the national and international levels.

Few other major universities have departments in environmental toxicology, and to our knowledge only UC Davis offers a B.S. in environmental toxicology. Only a few universities have emphases within other programs (all at the graduate level), including the University of Arizona, Clemson University, Cornell University, Duke University, Michigan State University, Oregon State University, Texas Tech University, and the University of Wisconsin.

Within the UC system there are programs which specialize in limited areas within environmental toxicology at the Berkeley, Irvine, Los Angeles, Riverside, and Santa Cruz campuses. However, UC Davis is considered to have the only “complete” program in the UC system — it possesses significant breadth *and* strength in all areas of toxicology and offers both undergraduate and graduate degrees.

Department of Food Science and Technology

Response not submitted

Department of Human and Community Development - Community Development

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Our unit has identified three main stakeholders:

- First, scholars and intellectuals in the social sciences concerned with issues related to urban and rural community development, globalization, migration, social change; technological innovation and society; environmental justice; and the relationship between community processes and food and agricultural systems.
- Second, policymakers at the local, regional, national, and international levels.
- Third, community leaders and organizations and for-profit firms concerned with issues such as quality of life, economic vitality, governance, planning, and social inequality.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

- On scholars and intellectuals: citations of our faculty members' research work in specialized publications (i.e., journals, books); invitations to speak at local, regional, national, and international conferences; membership in editorial boards of specialized publications; and as reviewers of articles and book manuscripts for publication and of research proposals for funding organizations.
- On policymakers: invitations to testify as expert witnesses in legislative processes; contracts to work as consultants and to conduct policy-related research for public agencies and policy-oriented nongovernmental organizations.
- On community leaders and organizations and for-profit firms: invitations to speak at community organizations; contracts to work as consultants and to conduct research for community-based, nongovernmental, and for-profit organizations; interviews and coverage in mass media outlets.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

Contributing knowledge and methods to address issues related to:

- Achieving sustainable, collective livelihoods
- Contributing to the transformation of industrial, commodity-based agriculture
- Understanding sociocultural diversity of society in a globalized world

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

CA&ES research, teaching, and outreach priorities should be determined in an open and flexible process that responds to the changing social, political, environmental, cultural, scientific, and technological challenges of California, the United States, and the world. The college should pursue its land-grant mission to serve the people of California by encouraging multi- and inter-disciplinary research addressing not only basic research questions, but also responding to and developing theoretical explanations for real issues and problems. In this process, CA&ES should seek to strike a balance between the different factors affecting stakeholders interested in food, agricultural, and natural resource systems.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

- The complexity of social inequalities across gender, ethnoracial, generational, and class differences at various geospatial scales — local, regional, national, and transnational, with special emphasis on:
    - Urban and regional governance and citizens' participation
    - The socio-political dimensions of sustainability and the transformation of food and agricultural systems
    - The dynamic interrelationships between human well-being and environmental systems
    - Multi-scalar dimensions of community change
    - The impacts of technological change on society, agriculture, and the university

6. Who do you consider to be the top national and international programs in your area(s)?

1. Department of Sociology at Cornell University
2. Rural Sociology at the University of Wisconsin, Madison
3. Mansholt Graduate School of Social Sciences (MG3S) at the Wageningen University, Netherlands.

Department of Human and Community Development - Human Development

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

The mission of the Division of Human Development and Family Studies, Department of Human and Community Development, is to pursue research, teaching, and outreach that promote the capacity of individuals to adapt successfully to life's challenges by minimizing risks and maximizing resilience — the ability to cope with adversity and change — throughout the lifespan.

Our research and outreach programs support the development of healthy, educated, engaged, and resilient people. Thus, we consider the most important stakeholders to be the children, youth, adults, and families residing in California (most broadly speaking). More specifically, we reach these groups by extending science-based strategies and information to social and human service agencies in ways in which they can support individuals in making educated choices toward adopting and sustaining healthy lifestyles.

Some examples of agencies we have specifically partnered with are: Head Start and Early Head Start, Yolo County schools and education systems, 4-H and other youth programs, programs and services for the aging such as the Yolo Adult Day Health Center and statewide Agencies on Aging.

The research we conduct informs and significantly impacts programs and practices of these agencies through a variety of forums, such as trainings, presentations, as well as the publication of our research in a variety of outlets that serve researchers and professionals in the field.

For instance, the HDFS Early Childhood Laboratory (ECL) provides a conduit through which our research on early child development and family well-being reaches programmers and policymakers throughout the state. From lessons learned through demonstrations in the laboratory, the staff and associated department researchers inform relevant stakeholders in early educational systems. The ECL staff has served as subcontracted researchers, writers, trainers, and field consultants for the California Department of Education (Child Development Division) on significant projects that impact early learning environments such as the 2008 California Preschool Learning Foundations and its accompanying 2009 Preschool Curriculum Framework.

The ECL staff regularly present trainings to inform early childhood practice, and serve as a regional "best practices" training site for the California State Preschool System's "California Preschool Instructional Network" (CPIN). They also serve as curriculum developers and instructors for UC Davis Extension's Center for Excellence in Child Development. In addition to the direct impact on professionals in the early childhood field, the ECL also works closely with the California Legislature on the implementation of a statewide comprehensive Quality Rating and Improvement System (a newly passed measure authored by Darryl Steinberg).

In addition to our direct work with agencies and the legislature, we also reach our stakeholders through our popular undergraduate internship program. Each year, human development majors hold positions in agencies representing our stakeholders such as Head Start and preschool programs, K-12 classrooms in the Davis, Woodland, and Sacramento school systems, foster care, and child and family service agencies, social work agencies, senior centers, and retirement communities.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

At the broadest level, the impact of our research and outreach activities over the next ten years can be measured through the number of citations our work receives in the field, and the number of invited presentations our researchers give to professional, government, and service agencies. These provide a sign of whether there is recognition of awareness of the research being conducted, and whether the work is considered to be important and influential.

On a more specific level, we can measure our impact by our participation and inclusion on statewide and regional advisory boards, legislative groups, and programming committees that serve our stakeholder groups. For instance, as stated above, members of our department have been asked to serve on the legislative committee to develop an implementation plan for the statewide Quality Rating and Improvement System. We have also had two of our faculty members contacted to serve as consultants for the developers of Sesame Street as they design a series of programs aimed at addressing the impacts of economic stress on young children.

Our faculty are also contacted to serve as advisors on boards that oversee statewide programming of social service agencies, for instance to oversee training requirements for California Family and Child Service workers. By serving on such boards and agencies our

department has a significant impact on the legislation, policies, and programs that affect our stakeholder groups.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

The CA&ES themes that we feel will be the most important to address in the coming decade are the human science related themes that address the ability of Californians to make informed choices and adapt to challenges, and the ability of support agencies to adequately promote health for all citizens.

The rapidly changing demographics of the state of California present unique and quickly changing challenges to our college as it serves to promote the health and resiliency of Californians. Some of these changes include 20 percent of the U.S. population will be aged 65 or older in less than 30 years from now. As a result of these and other demographic changes, there will be new needs in support and service systems.

Thus, the themes that inform the healthy development of individuals are critical, as they can absorb the impact of significant changes to their environments. For instance, when considering the changing needs in the environment and agriculture, understanding the impact these changes have on people, and how individuals perceive the implications of such changes to their lives, is critical to keep the people of California involved and invested in supporting clean, healthy, and sustainable places to live, work, and grow.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

We consider the most important factors in determining CA&ES priorities for the next ten years to be the immediate and long-term needs of the citizenry so that we are adequately preparing our students to serve California in the future. We believe the changing demographics of our state are resulting in significant shortages and needs in human science related fields, both in terms of educated and engaged workers, as well as an understanding for how people adapt to changes in their environments. Thus, the factors we believe are most important are first the needs of Californians, the critical research questions based on these needs, and interests of students as they relate to these needs, and finally the relevance of the work to inform policy and critical areas of programming across the state.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

We believe the most important area to research, extend, and teach to students over the next ten years are those that address healthy development and lifestyles. Related to this are those that address resiliency factors of diverse populations, individual and environmental factors that support or facilitate the adoption of healthy and sustainable lifestyles.

6. Who do you consider to be the top national and international programs in your area(s)?

It is worth noting that the UC Davis Human Development Graduate Group (which includes all members of our department, but also extends beyond the department itself) has recently been rated by the Chronicle of Higher Education as the third top graduate program in the nation. As far as human development related programs and departments in the country, we consider Pennsylvania State University, Cornell University, and University of Maryland to be the three top programs.

Department of Land, Air and Water Resources

In responding to the committee's questions, LAWR faculty agreed to assume a holistic approach. Departmental comments were provided to assist the Academic Prioritization Committee in assessing college-wide priorities for research, teaching, and outreach. In addition, the departmental response follows LAWR's strategic planning towards improving the integration of academic teaching and research across disciplines and departmental boundaries.

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

As we generally view the people of the state of California as our most important stakeholders, faculty of the Department of Land, Air and Water Resources emphasize the need to **increase the diversity of its stakeholders**. This includes international collaborations with academic institutions and organizations such as FAO and CGIAR (Consultive Group of International Agricultural Research) to **address global issues of high societal relevance** (water-food systems — climate-energy-human health).

Such diversity of stakeholders is represented by (nonprioritized):

- Urban populations
- K–12 education
- County, state, and federal agencies
- Resource groups, environmental NGOs
- Policymakers
- Scientific organizations, institutes, and communities across the globe
- Agriculture industries (e.g., growers)
- Natural resource industries

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

When considering this question, LAWR responded by focusing on **linking research with outreach**. Moreover, by including the science community as a stakeholder, faculty measured impact by way of research quality.

- Recognition of research and outreach activities by stakeholders
- Development of solutions: reports, recommendations, and best management practices (BMPs)

- Development of research information centers (RICs) or similar outreach programs
- Increase in student enrollment
- Awards
- Number of organized conferences and workshops
- External grant support
- Endowments and gifts
- Fellows, NRC committee, and NAS memberships
- Journal publications, citations, and patents
- Placement of graduates in regulatory agencies
- Technology transfer indicators
- Adoption and activities (traffic) of web-based communication and education tools: web portals, wikis
- Distribution and use of conventional outreach, such as brochures, leaflets, short courses, book chapters
- Effects of research and outreach on public policy. Difficult to measure, but some are obvious: Delta Report, drought leaflets, PIER reports for California Energy Commission, etc.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

The faculty response follows LAWR's strategic planning towards improving the integration of academic teaching and research, **across disciplines and departmental boundaries**. Moreover, many of the high-priority research themes in CA&ES have global relevance.

- Sustainable food and animal systems for food, feed, fuel, and fiber production
  Sustainable water management and protection (irrigation strategies, salinization)
  Climate impacts on water resources, energy, and agriculture
- Alternative energy strategies; biofuels, no-till, fertilizer management
- Integration of science with policy across environmental sciences
- Integration of natural with agricultural ecosystems
- Invasive biology (plants, pathogens, animals)
- Comparative analysis of Mediterranean climatic regions
- Human health and the environment
- Remediation of natural resources, to mitigate quality degradation (water quality, air quality, ecosystem restoration, soil contamination)

- Human adaptation to environmental changes through resource management and policy
- Biodiversity and ecosystem services
- Earth system science

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

Research Priorities (in no order of priority):

- Funding opportunities
- Research capacity and quality of current programs
- Stakeholder interests (state, national, global)
- Societal needs
- Implementation of integrative and interdisciplinary science programs
- Mission-oriented
- Integration of research with public policy programs

Teaching Priorities (in no order of priority):

- Maintain core teaching curricula in relevant disciplinary majors (environmental sciences)
- Respond to student interests
- Reaching out to under-represented groups, and responding to demographic changes in the workforce
- Course portfolios that encourage every student to learn about the environment (e.g., through GE requirements and environmental literacy)
- Development of interdisciplinary and experiential undergraduate and graduate programs
- Catering to societal relevance and needs across the professions
- Development of courses with high student enrollment
- Supporting majors across college and campus

Outreach Priorities (in no order of priority):

- Societal relevance
- Target activities that affect policy
- Reaching out to under-represented sections of the population
- Stakeholder-identified priorities

- Target and educate the population on agriculture and the environment
- Outreach that empowers teaching (student numbers) and research (funding)
- Strategies that encourage development and use of innovative methods (internet, wikis), to allow for quick response to community needs (e.g., drought, climate change)
- Potential to educate California voters on timely issues

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

Faculty considered both broad and disciplinary focus areas, with a general emphasis on "natural resource management"

Broad

- Anthropogenic impacts on the environment
- Integrating science with policy
- Climate change science and impacts
- Sustainable agriculture
- Sustainable water management
- Urban-rural-wildland interface
- Natural resource conservation
- Watershed management and modeling
- Biodiversity, resilience, and land use change
- Earth system science

Disciplinary

- Biogeochemical cycling of the biosphere (carbon, nitrogen)
- Prediction of climate change impacts on water resources
- Water quality and supplies
- Integrated analysis of below-ground processes of water flow, contaminants, plant nutrients, and biogeochemical cycling
- Environmental sensors and networking
- Evaluation and implementation of best management practices to protect soil, water, and air
- Greenhouse gas emission understanding and mitigation
- Mass transport in multi-scale and multi-media hydrologic systems
- Uncertainty analysis of decision-making
- Integrated hydrologic system modeling of California's water

- Adaptations to climate change
- Linking soil and plant biodiversity to environmental quality

6. Who do you consider to be the top national and international programs in your area(s)?

We distinguish between the broad area environmental sciences (LAWR) and the specific disciplines (core academic programs).

Broad:

- Environmental sciences at Wageningen Agricultural University (http://www.mes.wur.nl/UK/Profile/)
- Environmental science, policy, and management (UC Berkeley, http://espm.berkeley.edu/)
- Environmental sciences (UC Riverside: http://www.envisci.ucr.edu/)
- Environmental Sciences (University of Virginia: http://www.evsc.virginia.edu/)
- Dept. of Soil, Water, and Environmental Science (University of Arizona, http://ag.arizona.edu/swes/)
- Dept. of Environmental Sciences (Rutgers University, http://envsci.rutgers.edu/)
- Nicholas School of the Environment (Duke University, http://www.nicholas.duke.edu/)
- Brent School of Environmental Science (UC Santa Barbara http://www.esm.ucsb.edu/)
- Carnegie Institution for Science, Department of Global Ecology (http://globalecology.stanford.edu/DGE/CIWDGE/CIWDGE.HTML)
- Center for the Environment, (Harvard University, http://environment.harvard.edu/about/index.htm)

Disciplinary:

Hydrology

- University of Arizona (http://www.hwr.arizona.edu/)
- New Mexico Tech (http://www.ees.nmt.edu/Hydro/)
- University of Reno, Nevada (http://www.hydro.unr.edu/home/)
- Cornell University, Water programs in civil engineering (http://www.cee.cornell.edu/)

Soils

- University of Wisconsin (http://www.soils.wisc.edu/soils/index.php)
- North Carolina State University (http://www.soil.ncsu.edu/)
- University of Florida (http://soils.ifas.ufl.edu/department/index.htm)
- Texas A&M (http://soilcrop.tamu.edu/)
- University of Arizona (http://ag.arizona.edu/swes/instruction/index.htm)
- Cornell University (http://css.cals.cornell.edu/cals/css/about/index.cfm)

Atmospheric Science

- University of Washington (http://www.atmos.washington.edu/)
- Colorado State University (http://www.atmos.colostate.edu/)
- UCLA (http://www.atmos.ucla.edu/)
- Pennsylvania State University (http://www.met.psu.edu/)
- Princeton (http://www.princeton.edu/aos/about_us/)
- University of Wisconsin (http://www.aos.wisc.edu/)
- University of Oklahoma (http://weather.ou.edu/)
- Florida State University (http://www.met.fsu.edu/)
- University of California, Berkeley (http://www.atmos.berkeley.edu/about.html)

Ecology

- Stanford University
- Princeton University
- Cornell University
- UC Berkeley
- University of Minnesota
- University of Chicago

Department of Nematology

These responses were developed from discussions at the nematology faculty meeting (April 28, 2009).

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Some nematodes are very serious pathogens of plants or animals worldwide. In California, plant-parasitic nematodes cause approximately one billion dollars in crop yield losses each year. Our stakeholders in California are primarily those individuals who attempt to mitigate crop losses due to nematodes.

Our research and outreach activities benefit industry (e.g., nursery and seed companies), state agencies (e.g., California Department of Food and Agriculture), EPA (due to issues involving fumigants and other materials now regulated due to VOC emissions), UC IPM, APHIS, USDA — and those working more directly with farmers, including farm advisors.

However, our research and outreach have impacts on improving plant production worldwide, and this benefits the citizens of our state because the resources of Californians come from every part of the globe.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

Worldwide impacts would be hard to assess, but impacts on California stakeholders can be readily measured. For example, registrations of new active ingredients against nematodes (nematicides) in California (B. Westerdahl in our department has registered four such compounds in the last 10 years) reveals that research and testing can lead to the availability of new materials for clientele.

It is also possible to follow changes in pesticide use in California, and these statistics can show how new materials are being used and adopted by stakeholders. Similarly, changing practices developed at UC Davis (often described in special publications or manuals) for improving production (and mitigating losses due to nematodes) can be monitored by farm advisors or survey methods. Web resources that we currently serve can be tracked for usage.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

- Water use and availability
- Invasive species and emerging diseases
- Agricultural sustainability
- Climate change
- Clean air
- Biodiversity
- Local food production
- Human health
- Environmental genomics

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

There is general consensus among our faculty that the proper mix of fundamental and applied research is necessary to fit the requirements of CA&ES for serving clientele and educating the next generation of Californians. For the foreseeable future, the needs of agricultural and environmental stakeholders will require research and outreach in most, if not all, of the areas currently provided by CA&ES departments. It is hard to understand how we would retain relevance to these groups without active research supporting their needs. These applied activities and outreach require a strong basic (fundamental) program in the sciences.

The college needs to be able to offer cohesive and integrated teaching and research programs. We cannot hire new faculty based on the availability of new research funding areas and expect that such hires will fill critical teaching roles in existing programs. The college cannot continue to increase undergraduate enrollment and simultaneously decrease FTE without a strategy for prioritizing teaching programs, eliminating some majors, and reallocating faculty teaching to other areas.

Although there has never been an undergraduate major in nematology at UC Davis, our faculty has already been proactive in this area. We took responsibility for the animal biology major, providing it with an administrative home, a new master advisor (Dr. Ed Lewis), and have been providing substantial teaching for the core courses in the major (Drs. Ed Lewis, Ed Caswell-Chen, and Howard Ferris). The animal biology major has grown to more than 400 students.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

- Alternative methods of nematode control
- Soil quality and biology
- Host plant resistance
- Extending the *C. elegans* paradigm to nematode parasites
- Systems biology
- Long-term impacts of cultural and cropping systems
- Rapid diagnostic methods for pathogens

Students need to develop an understanding of how science works. This is more important for developing a scientifically literate public than any collection of science facts (including those about nematodes) that they might learn (and forget) as undergraduates. This requires substantial changes in how we teach most laboratory courses — and requires an emphasis on introducing undergraduates to the ways that research is actually conducted, interpreted, and communicated.

6. Who do you consider to be the top national and international programs in your area(s)?

Nationally — UC Davis (number one, naturally), UC Riverside, University of Florida, and North Carolina State University.

Internationally there are strong programs in Belgium (Ghent), Netherlands (Wageningen University) and France (INRA).

Department of Nutrition

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

All consumers. One of the great challenges to the health and quality of life in our society are chronic and degenerative diseases such as obesity, cardiovascular disease, and diabetes. Programs which help people make better food choices can play a major role in preventing degenerative disease, improving the quality of life, and reducing health care costs. Within this broad group of stakeholders are policymakers, health care professionals, and disadvantaged high-risk groups.

In addition to programs that lead to better **food choices**, are research, education, and outreach programs that lead to **better food**. We have the ability to identify food components that can benefit health, prevent chronic and degenerative diseases, and we are able to determine their mode of action. We can also transfer beneficial food components from one commodity to another, thereby adding value to California commodities. Added value will enhance the competitiveness of California commodities in national and international markets and increase the economic viability of California agriculture, an important sector of the California economy. Since California provides over 60 percent of the nation's fresh fruits, vegetables, and nuts, any nutritive value we can add will benefit all consumers.

The very successful Program in International and Community Nutrition (PICN) works toward improving nutrition of low-income populations in the U.S. and abroad, and is a recent recipient of a $16 million Gates Foundation grant that will benefit mothers and children in developing nations. PICN activities provide valuable policy information to national and international organizations such as the World Health Organization.

Complementing the above international programs, faculty in the department are actively engaged in research aimed at optimizing pregnancy outcome and early childhood development in California's citizens. An important component of this work is the identification of nutrient-toxicant interactions that can affect our citizens. Finally, an important group of stakeholders are our undergraduate and graduate students who are given a research-based education; it is they who will become future leaders and professionals in all fields of nutrition and dietetics.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

A valuable indicator of the impact of the Department of Nutrition's research and outreach programs on our stakeholders would be a decrease or attenuation of the rise in obesity and chronic and degenerative diseases as well as an improvement in the quality of their lives. Health care costs should be reduced and the quality of food choice decisions improved, particularly among disadvantaged high-risk groups, based upon evaluation research conducted by Cooperative Extension specialists and advisors.

Other metrics could include an evaluation of the impact of research and outreach programs upon decisions made by policy makers at the state, national, and international level; the ranking of the Graduate Program in Nutritional Biology; the success of the Foods for Health Institute; and continued student interest in our undergraduate and graduate programs. The number of students in the nutrition biology and clinical nutrition majors has doubled in the past six years.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

Research and outreach activities in the plant and animal sciences will be important to incorporate food components found to have health benefits into crops and breeds which can be produced successfully on a commercial basis. Food science and technology is an important partner in the development of quality food for consumers, as is environmental toxicology in terms of food safety. It is essential that we maintain the viability of the California food production system which provides a major component of the fruits, vegetables, nuts, and dairy products for U.S. citizens as well as providing food security and safety.

Research and outreach are needed in water conservation, the reduction of environmental impacts of current agricultural production systems, and the development of sustainable agricultural systems including the reduction of energy utilization.

Human and community development will continue to be an important area as programs are developed to improve nutrition among disadvantaged high-risk groups and in the study of the role of nutrition in early childhood development. Combined scientific and behavioral approaches have been shown to be more efficacious than either alone. Finally, economics

play a key role in determining the cost/benefit ratio of our programs as well as their economic feasibility.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

We must hire and retain high-quality faculty and CE specialists who can do research and outreach that address critical scientific research questions in nutrition; who have the ability to conduct fundamental mission-oriented research and establish a continuum between basic and translational research; and be committed to teaching undergraduates and graduate students.

Research and outreach programs must have relevance to stakeholder priorities and contribute to the development of science-based policies. Our undergraduate and graduate programs have to be relevant to students and prepare them for successful careers in academia, professional fields, and industry.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

First: identification of food components that enhance health and prevent disease, and the determination of their mode of action and human metabolism, and elucidation of requirements or desirable intake levels.

Second: development of diets which provide optimum nutrition based on individual genetic makeup and developmental stage.

Third: development of outreach programs which have a real impact upon food choice leading to reduction of obesity and chronic disease.

Fourth: contribution to the development of policies which are science-based and will provide incentives to use diets which will lead to a reduction of obesity and chronic disease.

Fifth: development of programs and policies which provide diets that promote health and mental development — with special emphasis on mothers and infants — that are both efficacious and sustainable in developed as well as developing nations.

6. Who do you consider to be the top national and international programs in your area(s)?

The UC Davis Department of Nutrition has the most comprehensive nutrition program within the UC system and is unique in the nation because of the extent of the multidisciplinary programs and collaboration with other schools, colleges, and organizations. Collaborators include the schools of Medicine and Veterinary Medicine, the colleges of Letters and Science and Biological Science, the USDA Western Human Nutrition Research Center, foundations, commodity groups, and industry.

Top programs, in addition to UC Davis, include University of North Carolina, Chapel Hill; Cornell University; Purdue University; University of Illinois; University of Wisconsin; and the Pennsylvania State University. In international nutrition, top programs, in addition to UC Davis, are Johns Hopkins and Cornell University.

Department of Plant Pathology

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

We recognize all citizens of the state of California as our stakeholders and strive to maintain programs in research and outreach that will be broadly beneficial to the state and all who reside here. Of course our direct contacts are with only a subset of the citizenry, but these still include a wide array of groups and individuals in both the public and private sectors.

Important among these would be UC Cooperative Extension advisors located in most California counties. Many members of our faculty also interact with personnel representing various federal, state, and local entities. This includes the California departments of Transportation, Food and Agriculture, Parks and Recreation, Forestry and Fire Protection, Boating and Waterways, and Pesticide Regulation. Federal agencies include the U.S. Department of Agriculture, the U.S. Forest Service, National Parks, and the U.S. Geological Survey.

At the local level we work with and provide information to county agricultural commissioners, city foresters, and others with responsibilities for management of public lands. In the private sector our clientele includes growers, pest control advisors, chemical, biotechnology, and seed companies, as well as forestry concerns and environmental groups. Many of our stakeholders provide financial support for our research and are listed below. This list is limited to groups sponsoring current projects in our department.

American Vineyard Foundation
California Almond Board
California Citrus Board
California Cling Peach
California Crop Improvement Association
California Cut Flower Commission
California Fig Institute
California Fresh Carrot Board
California Garlic and Onion Board
California Grape Commission
California Lettuce Board
California Melon Research Board
California Olive Growers
California Pear Advisory Board
California Pistachio Growers
California Cotton Growers
California Potato Board
California Rice Research Board
California Strawberry Commission
California Table Grape Commission
California Tomato Commission
California Tomato Research Institute
California Tree Fruit Growers
California Department of Food and Agriculture

Chevron Technology Venture
Chippewa Valley Bean Co., Inc.
Cotton, Inc.
California Dept. of Health and Human Services
California Dept. of Forestry
U.S. Dept. of Energy
U.S. Environmental Protection Agency
U.S. Department of Agriculture
Florida citrus growers
Genentech Foundation
Gordon and Betty Moore Foundation
Grape Rootstock Foundation
Howard Hughes Medical Institute
International Rice Research Institute
International Maize and Wheat Center
Limagrain
Monsanto / Seminis
National Science Foundation
Paramount Farming Company
Pistachio (paramount) 07-002776
Pioneer Hybrid
Sweet Potato growers
USDA Forest Service
W.K. Kellogg Foundation
William H. Haman Agricultural Research Foundation

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

If stakeholder groups that currently sponsor research and outreach activities undertaken by our faculty continue to do so over the next ten years, we would take that as a tangible indication that they feel our efforts have had a positive impact on issues of concern to them. Similarly, if graduates of our program are trained to address problems our stakeholders consider to be important, we would regard that as a beneficial impact.

More quantitative measures of impact might be gained from an evaluation of specific programs. For example, long-running efforts to address disease problems affecting a particular crop could be evaluated based on the magnitude by which yield losses have been reduced. Collecting the required data and properly interpreting the findings would not be a trivial matter, and likely would be feasible for only a small number of programs.

Another possibility would be to quantify pesticide usage to manage problems for which we are developing non-pesticidal alternatives. A decline in pesticide use would imply success of our efforts, though cause and effect might be difficult to establish with certainty.

Finally, we could conduct surveys of appropriate groups to assess their perception of how well our programs are serving their needs. This would be practicable for certain well-defined groups such as UC Cooperative Extension advisors, but more difficult and costly for most other stakeholders. Technology can help provide assessment tools for our education

and outreach programs, particularly those delivered in the form of online modules or web-seminars.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

California's growing population will be a major contributor to the challenges faced by the state over the next several decades. Major themes that would follow from this premise include land use patterns and resource allocation. Expanding urban and commercial centers will require land and water, which will have to be diverted from other uses, particularly agriculture. Similarly, there will be pressure to convert wildlands to agricultural or other uses.

Trade and travel will provide ever increasing opportunities for introduction of invasive pests: plants, animals, and microbes. Climate change and the associated expectations will be overlaid on nearly every other issue. CA&ES themes should be aligned with these problems and structured to help maintain the integrity of our remaining wildlands, and to foster the productivity, sustainability, and competitiveness of California agriculture.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

From a pragmatic perspective student interest and availability of research funds must be accorded a high priority. We have no teaching programs without students and very little research without extramural grants. In general there will be at least some correspondence between critical research questions and funding, so this is not an entirely separate issue.

Stakeholder priorities are important and to the extent that they are associated with resources that expand our capacity for research and outreach, they will continue to guide our activities. Taxpayers in the state of California are among our stakeholders and consequently research in the public interest should be an important part of our mission, and central to what differentiates us from other university programs. Maintaining a culture that embraces this priority is among the major challenges facing our college.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

Our priorities derive principally from the need to maximize the output of the state's agricultural enterprise, while minimizing its environmental impact. To this end our research efforts should fully exploit opportunities to better understand the genetic and biochemical basis for susceptibility and resistance, and to characterize the biotic and abiotic factors that limit or promote the success of plant pathogens. Thus we need to retain and renew our capacity to study the biology of major pathogen groups and their plant hosts.

We should also expand on our efforts to manipulate plants in ways that will reduce their susceptibility to plant pathogens and predisposing environmental stresses. Another important area concerns invasive pathogens, which constitute a major threat to both native and managed ecosystems.

In our graduate program, we need to provide our students with broad exposure to the biology of plant pathogens so they are prepared to assimilate and effectively utilize the steady stream of new information that will be generated over the course of their careers. We must also impress upon them the importance of seeing their work in the context of broader societal issues and the benefits of interacting with colleagues in different disciplines. At the undergraduate level, we should emphasize scientific literacy. This is a key objective of the Science and Society Program, to which our faculty members are major contributors.

For our non-academic clientele, we should strive to help them understand the benefits of research and to feel comfortable assessing the relative risks and benefits of new technologies. There is a critical need for us to promote a better understanding of science and to discourage adoption of dogmatic, anti-intellectual perspectives.

6. Who do you consider to be the top national and international programs in your area(s)?

By most measures, ours would be at or near the top of a national or international ranking of plant pathology programs. In a 2007 survey, UC Davis ranked second but the program ranked first was actually a plant sciences program that included a small contingent of plant pathology faculty.

Among the other highly ranked programs, we generally regard Cornell University and the University of Wisconsin as our principal competitors for graduate students. Very

respectable programs are also found at North Carolina State University, Texas A&M University, Kansas State University, and Ohio State University, among others.

A number of institutions in other countries have plant pathology programs and many members of our faculty have collaborative relationships with scientists at these institutions. Although we attract many applicants from other countries, we see little evidence of traffic in the other direction so we do not see ourselves in direct competition with graduate programs in other countries.

Department of Plant Sciences

Following are ranked lists of responses from the Department of Plant Sciences (May 2009). Responses have been grouped together as much as possible without losing the essence of the response. Given the large size and diversity of our department, the responses are diverse.

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Agricultural industry

a. Agronomic crop growers (9)
b. Tree and other fruit crop growers (9)
c. Future growers of biofuels
d. Food producers (4)
e. Nurseries (3)
f. Vegetable crop growers and industry (4)
g. Produce handlers (3)
h. Beer industry
i. Greenhouse growers

General public (4)

a. Food consumers (3)
b. Rangeland owners and managers (3)
c. Undergraduate and graduate students (2)
d. Urban and suburban landowners and managers

Researchers, Private Industries, and Agencies

a. State and federal government agencies (5)
b. UC Cooperative Extension advisors (4)
c. Service companies — fertilizers, PCAs, service industries (2)
d. NGOs such as resource conservation districts, Audubon, TNC, etc. (2)
e. California, national, and international clientele — all are important
f. Scientific colleagues
g. Restoration practitioners
h. Breeders
i. Biotechnology companies
j. Seed companies

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

1. Adoption of tools, changes, cultivars, policies, and practices resulting from research and outreach in commercial practice in California and the world (14)
2. Continued research support (8)
3. New or improved crops or cultivars that grow with less water, are more sustainable, and still of high value (biofuels as one example) or have enhanced quality (7)
4. Demand for information from clientele (written or verbal) (6)
5. Economic impact of research and outreach on industry (2)
6. Impact on policy development (3)
7. Satisfaction of the general public in the quality of agricultural products available to them (3)
8. Attendance at field days and research conferences (2)
9. Number of publications and citations (2)
10. Improved nutritional quality with lower costs for food
11. How well ideas are accepted by students
12. Sustainability of farms (2)
13. Invitations to speak at scientific and grower conferences and by farm advisors
14. Methods to assess impact on stakeholders, mine data on tree sales and fertilizer to determine impact of research on nutrition, rootstock and tree density research; interview small groups of stakeholders
15. Invitation to participate on external committees
16. Patents and royalties
17. Training of students hired by stakeholders

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

1. Agricultural productivity and economic viability — sustainability (15)
    a. Climate change and its impact on agriculture and the environment (10)
    b. Breeding of new varieties (9)
    c. Invasive species (4)
    d. Crop pests and diseases (4)
    e. Assisting agriculture to produce high-quality food (3)
    f. Soil health and nutrition (2)
    g. Develop and sustain markets for California commodities (2)

2. Resources limited by growing population. This includes food, fuel, land, and water (12)
    a. Natural resources conservation (6)
    b. Environmental policy (2)
    c. Energy conservation

3. Food safety — especially fresh produce (8)
4. Urban agriculture issues and the urban/agriculture interface (2)
5. Intersection of agriculture and environmental issues
6. Regulatory issues
7. Public outreach
8. International outreach

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

1. Stakeholder-identified priorities and goals (20)
    i. Vision of needs in the future (2)
    ii. Grower-related research priorities (2)
    iii. Consumer-related research priorities (2)
2. Availability of research funds and faculty (especially from stakeholders for applied research (19)
    i. Maintenance of core UC Davis strengths in agriculture, environment, and plant sciences
3. Critical scientific research questions (14)
4. Policy relevance (public need) (8)
    i. Sustainability of food production (3)
    ii. Natural resource issues
    iii. Land use issues
    iv. Issues on the horizon not yet recognized by most people (3)
5. Student interest (7)
    i. Job opportunities for graduates
6. Reduce internal regulations (2)
7. Support of field facilities

*Respondents indicated different priorities for their AES/CE and I&R appointments.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

1. Crop improvement using genomics/proteomics tools recently developed (10)
2. Sustainable agriculture, environment, and natural resources (5)
    a. Water conservation techniques
        i. Education of the public on conservation
        ii. Strategies for agriculture to maintain productivity and economic viability with less water (3)
    b. Low-input crops to save energy and environment as related to global warming
    c. Nutrient management to reduce environmental impact and costs to growers (5)
    d. Managing invasive weeds (2)
    e. Integrated problem solving, considering environmental, economic, and social aspects of problems being studied — how best to utilize the information we develop/gather
    f. Energy conservation
3. Improvements in postharvest management of crops, including energy usage, to maintain fresh produce quality for small and large scale handlers (5)
    a. Understanding the bases of senescence and ripening
4. Emphasize the intersection of applied science and human nutrition (2)
    a. Importance of fresh, high-quality produce on human health and nutrition
    b. Importance of bioavailability of nutrients from plant foods vs. supplements
5. Food safety (2)
6. Physiological genetics, responses of plants to environment, climate change (2)
7. Plant metabolism and regulatory networks
8. Integrated crop physiology, understanding how the plants and cropping systems work — central to being an applied plant sciences department, need to understand the limitations of the environment the plants grow in, as well
    a. Use of models to predict plant yield
9. Objective, science-based news reporting
    a. Statistics
    b. Education of public and other UC faculty about farming and where food comes from
10. Strong foundation for students, thinking and communication skills
11. Biomaterials, including biofuels
12. Functional foods to enhance nutrition and health
13. Environmental monitoring
14. Climate change

15. Ecosystem services for livestock production
16. Seed production technology
17. Cost effectiveness of restoration
18. Managing the agriculture/environmental/urban interface

6. Who do you consider to be the top national and international programs in your area(s)?

1. Cornell University (15)
2. UC Davis (14)
3. University of Wisconsin (5)
4. University of Florida (5)
5. North Carolina State University (5)
6. Michigan State University (4)
7. University of Illinois (3)
8. University of Georgia (3)
9. UC Berkeley — Plant Pathology (2)
10. Iowa State University (2)
11. Wageningen University and Institutes (3)
12. Max Plank Institutes — Germany (2)
13. French INRA institutions (2)
14. CSIRO Australia (2)

Division of Textiles and Clothing

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

Our research and outreach activities center around issues related to fibrous materials and biobased products for human well-being, health and protection, and environmental sustainability. The stakeholders for our research and outreach activities therefore include a broad spectrum of users, producers, professionals, regulators, and groups. Specifically, our stakeholders are users of fibers and fibrous materials and products, including:

- The public (consumer) and occupational personnel (i.e., agricultural workers, firefighters, healthcare providers, manufacturing and industrial workers, military, etc)
- Producers along the supply chain of raw materials (fibers, polymers, chemicals, dyes, etc)
- Peers at UC Davis (biological and agricultural engineering, food science and technology, environmental toxicology, plant sciences, public health, entomology, medicine, etc.), in California, across the U.S., and internationally
- Federal (CDC, DHS, DOC, DOD, DOE, EPA, OSHA, USDA), state, and local governmental agencies and nonprofit organizations associated with human health, safety, raw materials and chemicals, and the environment

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

- Leading research and education programs in areas of sustainable food and fibers, renewable materials and chemicals, and alternative (esp. bio-) energy and fuels for improving quality of life and the environment
- Research findings in high-impact journals
- Research and dissemination of knowledge that contribute toward building a sustainable biobased economy
- Extramural grants for disciplinary as well as interdisciplinary research and education
- Numbers of graduates from our programs in public and private sectors in California, the U.S., and around the globe
- Graduates as leaders in the production, research and development, and government in the U.S. and internationally
- Dissemination of research impact to diverse media and interest groups

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

Strengthening biological, physical, and social sciences disciplines and building integrated programs will place CA&ES in the forefront of academic leadership to address societal relevant issues:

- Human health, safety, and protection
- Green materials, chemicals, and processing (less water, less energy, less toxic substances, less waste)
- Environmental health (clean water, clean air, ecosystem)
- Competitive and healthy biobased economy for California and the U.S.
- Understanding cultural diversity and human behavior for effective outreach to, and impact on, all sectors and areas in the world

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

- Addressing critical scientific questions
- Contemporary curricula with disciplinary depth and integrated themes in areas of societal relevance
- Quality students and numbers
- Available research funding
- Up-to-date research facility and infrastructure

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

- Human health, safety, and protection
- Green materials and chemistry for environmental sustainability

6. Who do you consider to be the top national and international programs in your area(s)?

Nationally and internationally, we are at the forefront in our areas and are among the top, along with Cornell University.

Updates since the 2008 Academic Plan:

We hosted a seminar series on "Sustainable Materials for Human and Environmental Health" funded by the Programmatic Initiative Program of the College of Agricultural and Environmental Sciences. The speakers included John Warner, Institute of Green Chemistry; Jack Zhou, a research fellow at Ethicon, Johnson & Johnson Company; Barry J. Beaty, director, Infectious Disease Supercluster at the Colorado State University.

Our faculty led the submission of an IGERT preproposal on Green Textile Materials for Human and Environmental Health in March 2009 (Principal Investigator: G. Sun; co-PIs: Y.-L. Hsieh, B. Hammock, J. Schoenug, F.-T. Liu). The twenty participating members are faculty affiliated with departments in Biological Sciences, Engineering, Medicine, and Public Health on campus and at UC San Francisco as well as several international collaborators in Canada, China, and Switzerland.

We are close to signing an international exchange program with Donghua University in China. The first group of students will be incoming seniors in textile engineering from Donghua for a one-year study program at UC Davis through the Global Studies Program in fall 2009. In 2010, the program will include students from materials science and chemistry at Donghua. We have been in discussion with other universities for potential exchange programs over the past year.

Since January 1, 2009, we have administratively clustered with the Department of Environmental Toxicology by partial sharing five staff members: the department manager, HR manager, contract and grant manager, and IT (from 0.35 to 0.6 FTE each), along with the administrative assistant and academic adviser that have been with us.

In terms of curricula, we are evaluating the social science cluster and the sustainable contents in all course offerings. We re-instated two courses, FPS 110 and CNS 100 in areas of bioplastics and consumer science, respectively, in summer session 2008 and will do the same this year.

Department of Viticulture and Enology

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

First adopters of new technology.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

If California and U.S. wine producers increase their market share of the U.S. wine market.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

Sustainable production and control of quality in production.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

Research funding determines whether anything can be done. This should presumably be aligned with stakeholder priorities if they are helping provide the support.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

Key areas of technology include functional genomics on the plants, pests, and microbes involved in wine processing. Adaption of new analytical technology, including new and micro-sized sensors. Mechanization and automation.

6. Who do you consider to be the top national and international programs in your area(s)?

National: Cornell University and Washington State University. There are also other schools producing B.S. graduates, and Cal Poly, San Luis Obispo, has a new program with many graduates.

International: Our real competition are Université Bordeaux, University of Adelaide, and Stellenbosch University. There is also a research institute in Australia that is a strong research competitor.

Department of Wildlife, Fish and Conservation Biology

The Department of Wildlife, Fish and Conservation Biology (WFCB) had its monthly faculty meeting on April 24, 2009, and we discussed both the objectives of, and the questions provided by, the Academic Prioritization Committee.

1. Who do you consider to be the most important stakeholders for your research and outreach activities?

a) As with all programs in the University of California, the people of California are our constituents and stakeholders. We recognize that such a statement is broad, and so the following is designed to hone in on the subset of Californians for whom our research and outreach impacts. However, we stress that our efforts have direct or indirect benefits to all Californians via increased understanding of the natural world in which they live, of the ecological processes that shape natural systems, the management needs of people in positions to oversee these resources, and better understanding of human-wildlife interactions and how to ameliorate these.
b) WFCB stakeholders include all who value wildlife, natural resources, hunting, birding, camping, biodiversity, ecological, outdoor recreation, and environmental sustainability.
c) The department serves these stakeholders by working with numerous agencies, nongovernmental organizations (NGOs), and private groups to help them achieve objectives related to wildlife and fish ecology, biology, conservation, and management. The California Department of Fish and Game (CDFG) recently noted that WFCB is the research arm of CDFG. Some of the groups with which WFCB faculty have worked in recent years include:
    i) Local and regional agencies: Solano Land Trust, Suisun Marsh Resource Conservation District, Yolo County Resource Conservation District, Solano Water Agency, Yolo Flood Control Agency, etc.
    ii) State agencies, including the California Dept. of Water Resources, California Dept. of Fish and Game, California State Parks
    iii) Federal agencies, including the U.S. Forest Service, U.S. Geological Survey, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, U.S. Environmental Protection Agency
    iv) Native American tribes, including Yurok and Miwok
    v) Nonprofit and nongovernmental organizations (NGOs) with concerns and interests in the conservation of California's wildlife, fish, and natural resources, including Audubon California, Cache Creek Conservancy, California Indian Basketweavers Association, California Native Plant Society, California Trout, California Waterfowl

Association, California Wilderness Coalition, Center for Land-Based Learning, Ducks Unlimited, National Parks Foundation, Mono Lake Committee, Pheasants Forever, Point Reyes Bird Observatory, Putah Creek Council, Save the Redwoods League, Sierra Nevada Alliance, The Nature Conservancy, Trout Unlimited, Tuleyome, Yolo Basin Foundation.

d) Closely associated with the preceding point, the Department of Wildlife, Fish and Conservation Biology is a principle conduit for agency biologists, training many biologists who have become workers and leaders for both state and federal agencies, as well as environmental consulting firms, NGOs, etc.

e) California agricultural interests have long relied on expertise provided by WFCB. Some recent examples include:

   i) Dan Anderson has the strongest and longest data set available on the population ecology of Brown Pelicans, allowing him unprecedented insight to factors influencing annual population trends. He has parallel data sets on grebes in Eagle Lake and Clear Lake, and has participated in extensive research on the ecotoxicological consequences of mercury pollution in Clear Lake and elsewhere.

   ii) Loo Botsford has been a science adviser in the decision-making process to implement marine protected areas under California's 1999 Marine Life Protection Act, and he participated in a National Marine Fisheries Service committee to explain the recent decline in the fall-run chinook salmon in the Sacramento River.

   iii) Joe Cech has worked extensively with water interests in California by pursuing research and extensive outreach on applied physiology and functional ecology of native fishes including green and white sturgeon and several salmonids. His work has led to improvements in fish screening to minimize incidental take of threatened species.

   iv) Chris Dewees made important advancements in our understanding of how to regulate commercial fishing activities so that marine populations remain viable.

   v) John Eadie has worked extensively with the California Rice Commission and the USA Rice Federation to help integrate agricultural and natural diversity (especially waterfowl).

   vi) Debbie Elliott-Fisk is a recognized authority on the geography of soil types and their influence on the terroir of California wines, as well as on the establishment of American Viticultural Areas. She also has worked closely with the National Park Service, U.S. Forest Service, and U.S. Fish and Wildlife Service to inventory biotic resources, ecological conditions, and suggest restoration actions on national park, national wildlife refuge, and national wildlife refuge lands and waters.

   vii) Doug Kelt has worked with the Metropolitan Water District to monitor populations of endangered small mammals in areas impacted by reservoir development. More

recently he has worked with U.S. Fish and Wildlife personnel to develop and coordinate a monitoring plan for the endangered Stephens' kangaroo rat on the Marine Corp base Camp Pendleton. Currently he is involved in research (in collaboration with Dirk Van Vuren) to assess and model responses by small mammals to different forest treatments in an effort to allow sustainable logging practices to continue in California.

viii) Peter Moyle has worked closely with water and environmental interests to solve problems in the San Francisco Bay/Delta (e.g., PPIC reports) and to find better ways to get water delivered to agriculture while protecting endangered species.

ix) Dirk Van Vuren frequently responds to questions concerning vertebrate pests and human-wildlife conflicts. Recently he has been recruited by the Sacramento Area Flood Control Agency to help assess the role of burrowing small mammals on the integrity of levees on the Sacramento River.

x) WFCB faculty also work with ranchers and other agriculture interests to help them facilitate wildlife and fish populations without undermining agricultural productivity. A key example is Lisa Thompson's efforts to improve fish habitat in many California streams and to reduce conflicts of grazing interest and wildlife habitat. She also is involved in applied research to restore natural breeding populations of Eagle Lake trout, a species found only in Eagle Lake but largely maintained by hatchery populations.

f) It is worth highlighting the role that WFCB faculty have had in understanding the biology and management needs of threatened and endangered species, and in reducing conflicts with agricultural interests. Peter Moyle has literally written the book on California fishes, and is *the* go-to person on threats to this economically important group. This has led to his being recruited by California Fish and Game to draft the state listing of Fish Species of Special Concern, which he currently is revising. He also has worked with recovery teams for several fish species.

Dr. Botsford was a member of the Endangered Species Act Recovery Team for the first Pacific salmon listed under the endangered species act. Additionally, Joe Cech has pursued extensive (and renowned) research on the functional and physiological ecology of multiple sturgeon, salmonid, and other fish species in ecological peril in California.

John Eadie has worked with various waterfowl in California but also in Alaska (Steller's Eider) and Hawaii (Hawaiian Duck, with museum curator Andrew Engilis, Jr.). Doug Kelt has worked with the endangered Stephens' kangaroo rat in southern California, and his students also have studied "SKR" as well as other threatened or endangered species such as the Riparian Brush Rabbit and Fisher. Dirk Van Vuren has several decades' of

experience on the Santa Catalina Islands, where he and his students have studied the endangered Island Spotted Skunk and Island Fox.

2. How would you measure the impact of CA&ES research and outreach activities on these stakeholders over the next ten years?

a) Service on committees developing conservation plans, reviewing or developing policy, evaluating programs, proposed policies, etc.
b) Service as scientific experts in federal decision-making processes.
c) Development of new policies and practices as a result of CA&ES efforts. Examples include policies in forest or riparian management, development of national or international guidelines for species or habitat management, etc.

3. Independent of your department, what CA&ES themes or areas will be the most important over the coming decade?

a) Environmental protection and agricultural sustainability in the face of climate change, population growth, and continued habitat fragmentation and loss
b) Impacts of climate change on natural resources
c) Retention of biological diversity through conservation and restoration of species, habitats, and ecosystems
d) Managing "renewable" resources to ensure they also are sustainable
e) Managing and resolving conflicts with endangered species
f) Water availability
g) Air quality
h) Energy reliability
i) Urban expansion and loss of farmlands
j) Addressing changing recreational (quality of life) needs for a growing population, and ameliorating the impacts of these activates on wildlife, fish, and their habitats. Ecotourism and recreational demands on wildlife and their habitats bring substantial economic development to California and should be fostered in an ecologically friendly manner.

4. What are the factors that you consider the most important in determining CA&ES research, teaching, and outreach priorities in the next ten years (e.g., student interest, policy relevance, availability of research funds, stakeholder identified priorities, critical scientific research questions)?

a. As the College of Agricultural and Environmental Sciences is the applied arm of UC Davis, factors that should determine our research should be those that help ensure a healthy environment, maintain sustainable and healthy agriculture, and ensure good air and water quality. Hence, the college should be helping to define the "critical scientific research questions" that are appropriate, the policies that are relevant both in the immediate and the long-term temporal windows. CA&ES should provide feedback that guides the availability of research funds, not following these funds as if they are the best judge of quality research, teaching, or outreach.
b. CA&ES teaching should strive to prepare today's students to understand the breadth of ecological, sociological, and perhaps political issues that will be integral to solving future concerns such as climate change, biodiversity loss, ecological and agricultural sustainability, and urban expansion at the cost of agricultural and natural lands.
c. CA&ES outreach should aim to help educate our stakeholders — the California public — on the issues outlined above. We are uniquely positioned to extend this information (although more CE specialists would greatly improve our reach!) to a public that requires this information while making decisions in their daily lives.
d. Although stakeholder-driven needs should be considered when assessing CA&ES priorities, we argue that they should be considered in an advisory capacity only. Many stakeholder groups will emphasize relatively short-term needs; it is the responsibility of CA&ES to integrate these needs with long-term objectives to ensure healthy, productive, and sustainable use of natural and agricultural resources throughout the state.

5. What do you consider to be the most important areas within your field that should be researched, extended to non-academics, and taught to students over the next ten years?

Research:

1) Better understanding of ecosystem interactions aimed at better understanding responses to extrinsic influences (e.g., species loss, climate change, habitat degradation)
2) Biodiversity and ecosystem management
3) Understanding impacts of anthropogenic influences on the environment, including the influence of different policies on exploitive industries (e.g., fisheries, forestry)

4) We need more mechanistic and predictive models and abilities to predict consequences of these changes and to inform the state and stakeholders. In essence, more than just a better understanding, we need to improve our ability to anticipate and predict the outcomes of alternative scenarios.

Extension:

1) Environmental sustainability, including fisheries management and policy implementation
2) Endangered species conservation and ecology (in an urban and agricultural landscape)
3) Wetland ecology, conservation, and restoration, emphasizing streams, lakes, rivers, and estuaries, and freshwater, riparian, estuarine, and coastal ecosystems

Teaching:

1) Principles of ecology, biology, conservation, and natural history
2) Understanding of the impacts of extrinsic forces (e.g., pollution, climate change, El Niño cycles, etc.) on natural systems and how to reduce these
3) We need to ensure we will have the continued ability (10–20 years out) to teach (and pursue research) in both basic and applied sciences. Within WFCB, this includes fish ecology and conservation, avian ecology and conservation, environmental and ecological toxicology, quantitative conservation ecology and population dynamics of California vertebrates, conservation genetics, physiological responses of organisms of environmental influences and stressors.
4) An NRC report and a recent report from the National Marine Fisheries Service both identified a critical shortage of Ph.D. and M.S. graduates in quantitative population dynamics and estimation.

6. Who do you consider to be the top national and international programs in your area(s)?

The top programs in ecology and conservation of wildlife and fish species are surprisingly few. In California, Humboldt State University (HSU) has strong undergraduate programs in fisheries and wildlife but they emphasize more traditional sport fish and game species than in WFCB. Other UC programs are broader in focus and as such may not target similar stakeholders; these include UC Riverside's Center for Conservation Biology, which has a "conservation track" within the biological sciences major, and UC Berkeley's major in "conservation and resource studies." At UC Davis, the Department of Environmental Science and Policy offers a more general curriculum in environmental science and policy, and includes conservation only as an option with the environmental biology and management major.

WFCB is one of only four academic programs in California and one of only two within the University of California that are associated with the National Association of University Fisheries and Wildlife Programs (http://www.naufwp.iastate.edu); these programs include WFCB, UC Berkeley–ESPM, and HSU (both fisheries and wildlife).

In western North America several institutions provide strong training in wildlife or fish biology and management. These include:

- University of Arizona (B.S. in natural resources)
- Colorado State University (B.S. in fish, wildlife, and conservation biology)
- Oregon State University (B.S. in fisheries and wildlife)
- University of Idaho (B.S. in fishery resources, B.S. in wildlife resources)
- University of Nevada, Reno (B.S. in wildlife ecology and conservation)
- University of Washington (B.S. in aquatic and fishery sciences)
- Washington State University (B.S. in wildlife ecology, B.S. in wetland/aquatic resources)
- University of British Columbia (B.S. in biology)

Elsewhere in North America, these institutions stand out as having high-caliber programs:

- University of Montana (B.S. in wildlife biology)
- University of Wisconsin (B.S. in wildlife ecology)
- Virginia Tech (B.S. in fisheries science, B.S. in wildlife science)
- University of Florida (B.S. in wildlife ecology and conservation)
- University of Georgia (B.S. in fisheries and aquaculture, B.S. in wildlife)