

The Agricultural and Environmental Plant Science (AEPS) program is proposing a campus specific degree title change to Plant Sciences (PLSC). Please see the attached PDF which contains the following:

1. Proposal for Campus Specific Degree Title Change, pages 1-8
2. Appendix A: Supporting Data, pages 9-16
3. Appendix B: Existing and Proposed Course Requirements Details, pages 17-30



DEGREE MODIFICATION

Degree Title Change

	Existing	Revised
Degree Designation (e.g., BA, MS, etc.)	BS	BS
Campus Specific Degree Title	Agricultural and Environmental Plant Sciences	Plant Sciences
CSU Degree Title	Agronomy, Crop Science	Agronomy, Crop Science
CIP Code	01.1102	same
Start Term	Fall 2022	
College	CAFES	
Department	Horticulture and Crop Science (in the process of being changed to Plant Sciences)	
Contact Name(s) and Email(s)	Scott Steinmaus, PhD, ssteinma@calpoly.edu	
Proposal Date	January 17, 2022	

Upon completion of this form, please submit it for preliminary review by the college and by the Office of Academic Programs and Planning. The proposal can then be submitted to the department, college, and senate curriculum committees before being circulated for approval signatures as indicated at the end of the form.

Proposal elements:

1. *What is the rationale for the proposed modification? (This may address disciplinary convention, recruitment issues, employer concerns/applicable workforce demand issues, or titles used at other CSU campuses or at public or private institutions across the country.)*

Our curriculum is designed to train Plant Scientists who use their education to make informed decisions regarding sustainable farming or horticultural practices that maximize plant production while minimizing economic, environmental and social impacts. They are “service” providers who are managers themselves or provide recommendations to top managers in the areas of plant breeding and physiology, soil and growth media fertility, and pest management. Their job duties require that they balance time outdoors or in controlled plant growth environments as well as indoors in a laboratory or office. The US Bureau of Labor Statistics (USBLS) does not have a single category of occupation that captures exactly the predominant occupations of our graduates. The occupations of our graduates lie between the categories, “Soil and Plant Scientists” and “Farmers, Ranchers and Other Agricultural Managers” (see Appendix A).

As the latest available US Bureau of Labor Statistics (USBLS) indicates for top-employing occupations for workers with an agricultural degree, we should be emphasizing the “science” component of the program as those occupations (e.g. Plant and Soil Sciences) have a projected 7% increase in demand for 2019-2029, and these occupations require a Bachelor’s degree (Table 1). On the other hand, some occupations described as “agriculture” (e.g. certain farm and ranch occupations) have a 6% decrease in demand projected for the same time period and only require a high school diploma (Table 1). Graduates of our program earn a Bachelor’s

degree that prepares them for careers in the plant sciences, not jobs in agricultural labor that only require a high school diploma. Furthermore, during student recruiting sessions with high school students across the state, the single most common question from those students was whether they needed an agricultural background to fit into our program. In a recent survey of first year students in our AEPS 101 Orientation class, nearly 50% of the respondents said they did not come from an agricultural background.

The search term “plant science” has been shown to be a more common search term (keyword) than “agronomy” or “agricultural science” according to a recent assessment performed by Hanover Research Associates (Figure 1). We have seriously considered Hanover’s highest ranked search term “environmental science” with a proposed department and program name such as, “environmental plant science”. This term puts a primary focus on natural ecosystems, and although we do cover some topics in these systems, it is not our primary focus. For example, habitat restoration or wildland conservation is covered as it pertains to the agricultural and natural interface and the quantification of ecosystems services now available to growers (<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/emkts/?cid=nrcseprd1396024>). However, the term, “environmental plant sciences” alone would be confusing at best and misleading at worst, because it does not capture our agricultural and horticultural emphases. The name “Plant Biology” or “Botany” most often refers to programs that are focused on more basic plant research such as molecular biology, anatomy, taxonomy, evolution, and morphology. Even though we also include basic research in our curriculum, the terms “biology” and “botany” are misleading because they do not capture the more “applied” aspects of how we train our students.

The Hanover report confirms, for the most part, the trends indicated by the data from the USBLS. Occupations our graduates obtain are “services-based” in nature and provide expert recommendations to those directly growing food and ornamental plants. For example, our graduates are frequently employed as Pest Control Advisors and Certified Crop Advisors among other “services-based” occupations (Table 2). The occupations specify an educational level that most frequently requires a Bachelor’s degree, as indicated in the parentheses next to each education level (Table 2). The Hanover Report found that many programs that teach a similar curriculum from around the country are named or contain the name, “Plant Sciences”. Our own assessment of all college-level programs in the country that teach a similar curriculum to ours found 56% of programs with the term “Plant Sciences” in their name. Key institutions we consider “peer” institutions whose program names are, or include the name “Plant Sciences” include Cal Poly Pomona, CSU Chico, and CSU Fresno (Table 3). Universities whose programs we might consider “aspirational” with the “Plant Sciences” name include Cornell University, UC Davis, UC Santa Cruz, Purdue University, and many others (data available upon request.)

Table 1. Top-employing occupations for workers with an agricultural degree (Source: US Bureau of Labor Statistics Employment Projections Program and U.S. Census Bureau American Community Survey 2021)



For more information

Click on the occupations below to see the occupational profile in the Occupational Outlook Handbook (OOH).

The U.S. Bureau of Labor Statistics (BLS) projects employment and designates education typical for entry in about 800 detailed occupations. Table 2 shows projections data and typical education for occupations in which people with this degree were employed. It also shows the percentage of bachelor's degree holders in this field who were employed in the occupation and the percentage of workers in the occupation with an advanced degree in any field

**Percent growth,
projected
2019–29**

**Typical entry-level
education**

**Percent degree
holders in this
field, this
occupation, 2018**

**Percent of this
occupation with
an advanced
degree, 2018**



Health specialties teachers, postsecondary	21	Doctoral or professional degree	2	74
Veterinarians	16	Doctoral or professional degree	4	100
Soil and plant scientists	7	Bachelor's degree	2	38
Elementary school teachers, except special education	4	Bachelor's degree	3	50
Farmworkers and laborers, crop, nursery, and greenhouse	4	No formal educational credential	3	1
Sales representatives, wholesale and manufacturing, except technical and scientific products	1	High school diploma or equivalent	3	8
Retail salespersons	-1	No formal educational credential	2	4
Personal service managers, all other; entertainment and recreation managers, except gambling; and managers, all other	-2	Bachelor's degree	4	21
First-line supervisors of retail sales workers	-5	High school diploma or equivalent	2	5
Farmers, ranchers, and other agricultural managers	-6	High school diploma or equivalent	9	4

Note: Occupational profiles may comprise multiple SOC occupations, which may have differing education categories.

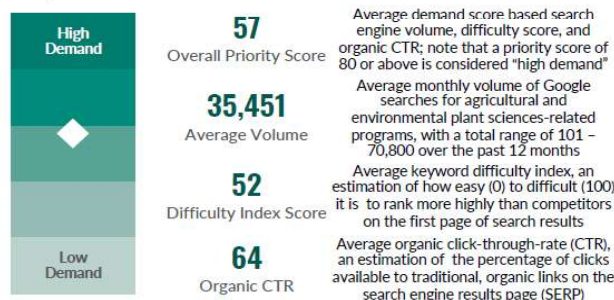
Source: U.S. Bureau of Labor Statistics, Employment Projections program (projected growth, entry-level education) and U.S. Census Bureau, American Community Survey (degree holders, advanced degrees).



Figure 1. Search Engine Key Word Analysis. (Source: Hanover Research. Higher Education Market Analysis, Bachelor's in Agricultural and Environmental Plant Sciences Prepared for California Polytechnic State University_San Luis Obispo. October 2021 page 5)

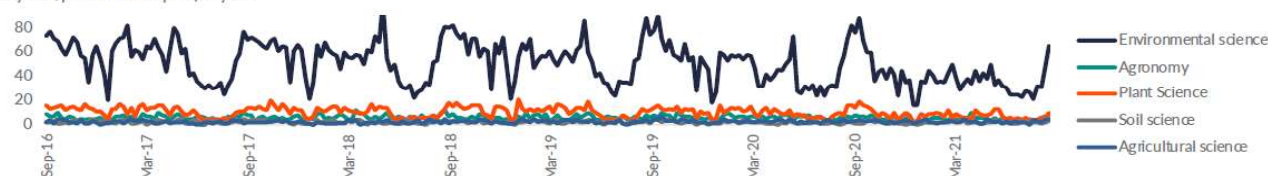
AGRICULTURE; AND ENVIRONMENTAL PLANT SCIENCES-RELATED SEARCH ENGINE ANALYTICS

Agricultural and environmental plant sciences-related priority metrics and Google search trends over the past 12 months



SEARCH INTEREST INDEX OVER TIME

Relative agricultural and environmental plant sciences-related search interest volume by keyword/phrase over the past five years



Note: For this analysis, Hanover retrieved search engine analytics data from [MOZ.com](#), a proprietary search engine optimization (SEO) firm. These data reflect the "actual" average keyword search volume in the United States over the past 12 months as of September 2021. Hanover supplements this data with [Google Trends](#) "Interest over time" metric, whereby "numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term." Note that Google search trends use a "rounded" average, and should be considered with caution.

Table 2. Real-Time Job Postings Intelligence (Source: Hanover Research. Higher Education Market Analysis, Bachelor's in Agricultural and Environmental Plant Sciences Prepared for California Polytechnic State University_San Luis Obispo. October 2021, page 10)

Keyword Job Search	Top 5 Certifications	Top 5 Job Titles	Education Level
Pest Control Advisor (55 postings)	<ul style="list-style-type: none"> Driver's License (8) Certified Arborist (5) Certified Door Consultants (CDC)(2) Certified Pesticide Applicator (1) Certified Professional in Erosion and Sediment Control (CPESC)(1) 	<ul style="list-style-type: none"> Pest Control Advisor (7) Crop Consultant/PCA (2) Integrated Pest Management Coordinator (2) Land Consultant-Property Management (2) Landscape (2) Maintenance Supervisor (2) 	<ul style="list-style-type: none"> High School Diploma/equivalent (3) Associate's degree (2) Bachelor's degree (31) Master's degree (4) Doctoral or professional degree (2) Unspecified/ other (13)
Certified Crop Advisor (17 postings)	<ul style="list-style-type: none"> Certified Crop Advisor (10) Driver's License (3) 	<ul style="list-style-type: none"> Sales Rep (3) Agronomist (2) Field Operations Manager (2) Ag Consultant/Sales (1) Agriculture Consultant (1) 	<ul style="list-style-type: none"> High School Diploma/equivalent (6) Associate's degree (N/A) Bachelor's degree (10) Master's degree (1) Doctoral or professional degree (N/A) Unspecified/ other (N/A)
Plant Protection (88 postings)	<ul style="list-style-type: none"> Driver's license (9) CDL (7) Secret Clearance (4) CPR (2) First Aid Certification (2) 	<ul style="list-style-type: none"> Assistant Branch Operations Manager (9) Branch Operations Lead (7) Facilities Protection Supervisor – level 3 (5) Crop Applicator, Night Crew (4) Warehouse Manager (3) 	<ul style="list-style-type: none"> High School diploma/equivalent (10) Associate's degree (1) Bachelor's degree (15) Master's degree (1) Doctoral or professional degree (1) Unspecified/ other (60)
Farm Management (222 postings)	<ul style="list-style-type: none"> Driver's license (28) First Aid Certification (5) CPR (4) Certified ScrumMaster (CSM)(3) PMI Agile Certified Practitioner (PMI-ACP)(3) 	<ul style="list-style-type: none"> Farm Manager (16) Assistant Farm Manager (8) Environmental Scientist (8) Urban Farmer (5) Ranch Manager (4) 	<ul style="list-style-type: none"> High School diploma/equivalent (44) Associate's degree (4) Bachelor's degree (79) Master's degree (3) Doctoral or professional degree (N/A) Unspecified/ other (92)

Note: For this analysis, Hanover retrieved job postings data for agricultural and environmental plant sciences-related positions in California from [JobsEQ](#), a proprietary database providing real-time job postings aggregated from thousands of websites. All data reflect the 180-day period as of September 2021.

Table 3. Program Benchmarking (Source: Hanover Research. Higher Education Market Analysis, Bachelor's in Agricultural and Environmental Plant Sciences Prepared for California Polytechnic State University_San Luis Obispo. October 2021, page 13)

PROGRAM BENCHMARKING

Benchmarked programs are offered by institutions located in the state with stable or growing program enrollments.

Institution	Program	Target Audience	Employer Demand/Career Opportunities to Rural and Suburban K-12 Students	Notable Features
California State University, Chico	B.S. in Plant and Soil Science	Students interested in careers in the production, protection, and stewardship of plant crops	Not Listed	<ul style="list-style-type: none"> Concentrations in Crops and Horticulture and Land and Soil resource management University Farm provides students with hands-on opportunities Internship and honors research opportunities Crops and horticulture club
California State University, Monterey Bay	B.S. in Agricultural Plant & Soil Sciences	Students interested in agricultural careers	Not Listed	<ul style="list-style-type: none"> Hands-on research and lab opportunities Service Learning course in the surrounding community Internship or independent research
Missouri State University	B.S. in Environmental Plant Science	Students interested in careers in working with plants or further education (e.g., crop consultant, entrepreneur)	Not Listed	<ul style="list-style-type: none"> 3,000 square foot greenhouse provides students with hands-on opportunities Capstone requirement Concentrations in Crop Science, Horticulture, and Plant Breeding and Biotechnology Horticulture minor
New Mexico State University	B.S. in Agriculture-Agronomy	Students interested in agronomy and preparation for graduate school	Not Listed	<ul style="list-style-type: none"> Internship Students may also select an option in crop consulting
Purdue University	B.S., Plant Science	"Students who are interested in the biology of plants: how they grow, develop and evolve; the interactions of plants with other organisms and their role in the environment; how to manage plants that are grown for food, fiber, and fuel."	Not Listed	<ul style="list-style-type: none"> Capstone

Source: Institutional websites (see embedded hyperlinks)

2. Cal Poly degree requirements:

The core course requirements for the Proposed Plant Sciences curriculum and the existing AEPS Program can be found in Table 4. They are identical, as we are not proposing to change any course requirements. Therefore, Support Courses, Advisor-Approved Electives or Concentration courses are not listed here but can be found in Appendix B and at:

<https://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/horticulturecropscience/bsagriculturalandenvironmentalplantsciences/index.html>

Table 4. Comparison of core coursework of the proposed Plant Sciences Program and existing Agricultural and Environmental Plant Science Program (4a). Units associated with support, concentration, and approved/free electives (4b). Units are quarter units.

(a.) Proposed and Existing Core Courses

Proposed Plant Sciences Program			Existing AEPS Program		
Prefix and #	Course Title	Units	Prefix and #	Course Title	Units
PLS 101	Orientation to Horticulture and Crop Science	1	AEPS 101	Orientation to Horticulture and Crop Science	1
PLS 120	Principles of Horticulture and Crop Science	4	AEPS 120	Principles of Horticulture and Crop Science	4
PLS 124	Plant Propagation	4	AEPS 124	Plant Propagation	4
PLS 304	Introduction to Plant Breeding	4	AEPS 304	Introduction to Plant Breeding	4
PLS 313	Agricultural Entomology	4	AEPS 313	Agricultural Entomology	4
PLS 321	Weed Biology and Management	4	AEPS 321	Weed Biology and Management	4
PLS 323	Plant Pathology	4	AEPS 323	Plant Pathology	4
PLS 351	Experimental Technics and Analysis	4	AEPS 351	Experimental Technics and Analysis	4
PLS 410	Crop Physiology	4	AEPS 410	Crop Physiology	4
PLS 461	Senior Project I	2	AEPS 461	Senior Project I	2
PLS 462	Senior Project II	2	AEPS 462	Senior Project II	2
BOT 121	General Botany	4	BOT 121	General Botany	4
SS 120	Introductory Soil Science	4	SS 120	Introductory Soil Science	4

(b.) Summary of Unit breakdown.

Proposed Plant Sciences Program		Existing AEPS Program	
	Units		Units
Total Major Courses	45	Total Major Courses	45
Support Courses	33	Support Courses	33
Concentration Courses	42-43	Concentration Courses	42-43
Approved Elective Courses	16-20	Approved Elective Courses	16-20
Free Elective Courses	3-4	Free Elective Courses	3-4
GE Courses Outside of Major/Support	52	GE Courses Outside of Major/Support	52
Total Units	Total Units	Total Units	180

3. Degree requirements from comparable programs in the CSU or other US institutions:

There are several “peer” programs within the CSU system that align closely with our Program requirements. A comparison of our program and CSU Fresno (<http://fresnostate.edu/catalog/subjects/plant-science/plant-sci.html>) is presented here (Table 5), and Fresno’s associated course descriptions can be found in Appendix C. The program requirements and course descriptions for Cal Poly Pomona (https://catalog.cpp.edu/preview_program.php?catoid=5&poid=1045) and CSU Chico (<https://catalog.csuchico.edu/viewer/21/AGRI/PSSCONEUN.html>) are also very similar to ours and those of CSU Fresno and can also be found in Appendix C.

Table 5. Comparison of major coursework in the proposed California Polytechnic State University, San Luis Obispo (Cal Poly) Plant Sciences (PLS) program and CSU Fresno Plant Science program. CPSU Units are quarter units, CSUF units are semester units.

Proposed Cal Poly Plant Sciences Program			CSU Fresno Plant Science Program		
Prefix and #	Course Title	Units	Prefix and #	Course Title	Units
PLS 120	Principles of Horticulture and Crop Science	4	PLANT 100	Aspects of Crop Productivity	3
PLS 124	Plant Propagation	4	PLANT 107/108	Plant Propagation/Micropropagation	3
PLS 304	Introduction to Plant Breeding	4	PLANT 150	Crop Improvement	3
PLS 321	Weed Biology and Management	4	PLANT 160	Weed Science	3
PLS 323	Plant Pathology	4	PLANT 161	Plant Pathology	3
PLS 313	Agricultural Entomology	4	PLANT 162	Economic Entomology	3
PLS 351	Experimental Techniques and Analysis		PLANT 99	Introduction to Biometrics	3
SS 120	Introductory Soil Science	4	PLANT 172/L	Soils and lab	4
PLS 410	Crop Physiology	4	PLANT 101	Crop Nutrition	3
PLS 461/462	Senior Project	4	PLANT 180/190	Independent Study	3
BRAE 340*	Irrigation Water Management	4	PLANT 71	Agricultural Water	3
AEPS 406, 431, 450**	Advanced Weeds, Entomology, Pathology		PLANT 163	Integrated Pest Management	3

*these courses are listed as required Support Courses

**content included in these classes

Additional courses required at CSU Fresno are very similar if not identical to those required and Cal Poly SLO such as the chemistry, math, and biology (botany) requirements.




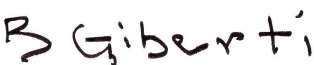
4. How will students currently enrolled in the degree program be accommodated?

Students with the existing degree title (Agricultural and Environmental Plant Sciences) will have the option of graduating with a B.S. in Agricultural and Environmental Plant Sciences or they can choose to graduate with a degree in Plant Sciences. It is our desire that students beginning our plant sciences program in Fall 2022 will have the degree title of Plant Sciences.

5. Summary:

The Horticulture and Crop Sciences Department proposes to change the name of the B.S. in Agricultural and Environmental Plant Sciences (AEPS) to Plant Sciences (PLS) while maintaining the same CIP Code (01.1102). We believe that making this name change will: a) clarify what our students will learn and be able to do as a result of earning this degree, b) better reflect the needs and demand of plant production industries for our graduates, and c) attract more students to our program and to plant (and food) production in general.

We all confirm that the proposed program modification aligns with the mission and strategic plan for the college and university.

 Scott Steinmaus (Apr 11, 2022 18:57 PDT)	04/11/2022
Scott Steinmaus, Department Chair/Head	Date
 Andy Thulin (Apr 12, 2022 12:04 PDT)	04/12/2022
Andy Thulin, Dean	Date
	04/11/2022
Gregory S. Bohr, Chair Academic Senate Curriculum Committee	Date
	04/12/2022
Bruno Giberti, Associate Vice Provost Academic Programs and Planning	Date

This proposal to change the Agricultural and Environmental Plant Sciences degree title to Plant Sciences was approved by the Academic Senate via the consent agenda on _____. The signatures below represent campus support of this proposal.

Thomas D. Gutierrez, Chair, Academic Senate	Date
Cynthia Jackson-Elmoore, Provost and Executive Vice President for Academic Affairs	Date
Jeffrey D. Armstrong, President	Date

APPENDIX A: SUPPORTING DATA

All of the following data for US-BLS can be found at: <https://www.bls.gov/oes/2019/may/oes191013.htm>

Occupational Employment and Wages, May 2020

19-1013 Soil and Plant Scientists

Conduct research in breeding, physiology, production, yield, and management of crops and agricultural plants or trees, shrubs, and nursery stock, their growth in soils, and control of pests; or study the chemical, physical, biological, and mineralogical composition of soils as they relate to plant or crop growth. May classify and map soils and investigate effects of alternative practices on soil and crop productivity.

National estimates for Soil and Plant Scientists:

Employment estimate and mean wage estimates for Soil and Plant Scientists:

Employment (1)	Employment RSE*	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
13,950	4.6 %	\$ 35.12	\$ 73,040	1.5 %

Percentile wage estimates for Soil and Plant Scientists:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	\$ 19.06	\$ 24.72	\$ 31.79	\$ 42.10	\$ 56.46
Annual Wage (2)	\$ 39,650	\$ 51,420	\$ 66,120	\$ 87,560	\$ 117,450

*RES is the Relative Standard Error of the estimate.

Industry profile for Soil and Plant Scientists:

Industries with the highest published employment and wages for Soil and Plant Scientists are provided. For a list of all industries with employment in Soil and Plant Scientists, see the [Create Customized Tables](#) function.

Industries with the highest levels of employment in Soil and Plant Scientists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Management, Scientific, and Technical Consulting Services	2,340	0.15	\$ 31.66	\$ 65,840
Colleges, Universities, and Professional Schools	2,250	0.07	\$ 29.72	\$ 61,810
Scientific Research and Development Services	2,210	0.29	\$ 44.30	\$ 92,150

Merchant Wholesalers, Nondurable Goods (4241, 4247, and 4249 only)	1,340	0.25	\$ 31.21	\$ 64,930
Federal Executive Branch (OEWS Designation)	1,120	0.05	\$ 43.37	\$ 90,200

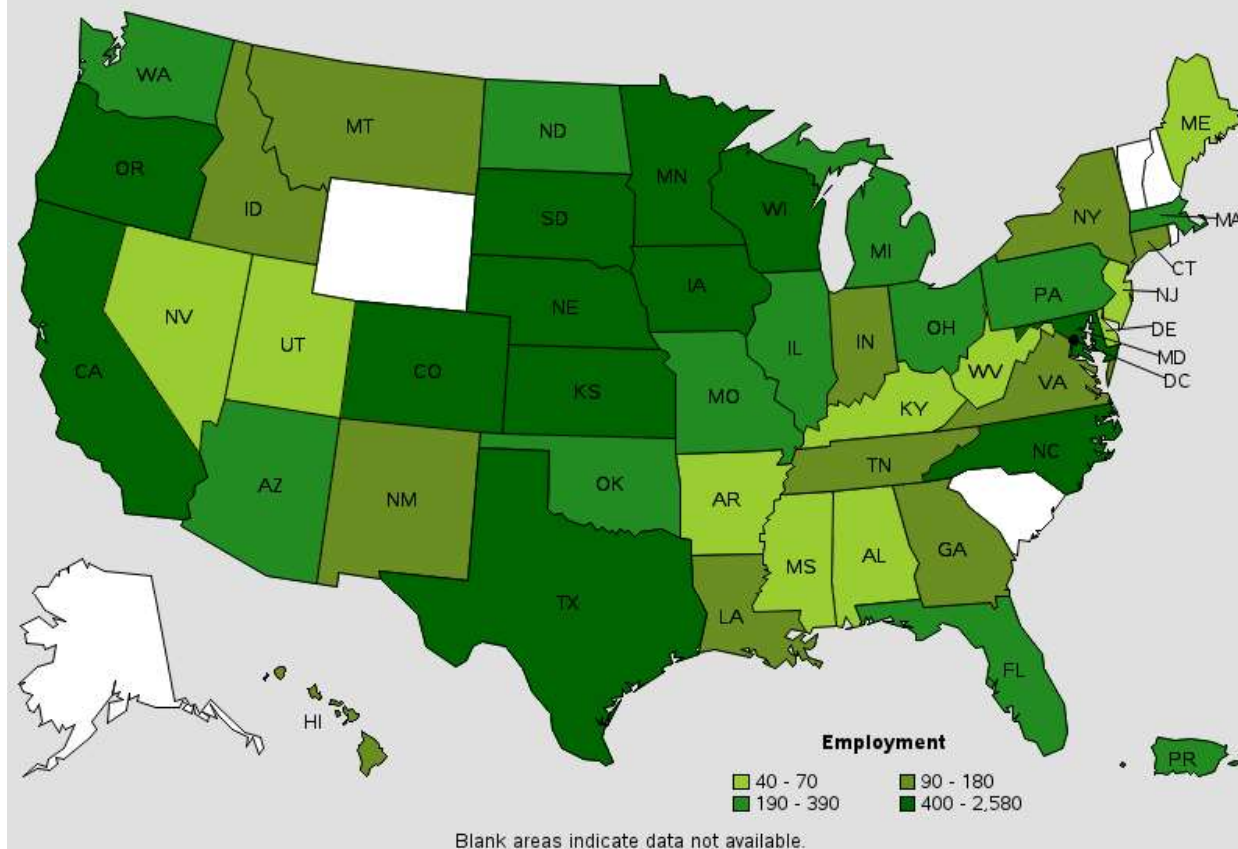
Industries with the highest concentration of employment in Soil and Plant Scientists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Farm Product Raw Material Merchant Wholesalers	480	0.70	\$ 34.63	\$ 72,020
Museums, Historical Sites, and Similar Institutions	430	0.30	\$ 25.57	\$ 53,190
Scientific Research and Development Services	2,210	0.29	\$ 44.30	\$ 92,150
Merchant Wholesalers, Nondurable Goods (4241, 4247, and 4249 only)	1,340	0.25	\$ 31.21	\$ 64,930
Management, Scientific, and Technical Consulting Services	2,340	0.15	\$ 31.66	\$ 65,840

Top paying industries for Soil and Plant Scientists:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Chemical Manufacturing (3251, 3252, 3253, and 3259 only)	80	0.02	\$ 57.47	\$ 119,540
Merchant Wholesalers, Nondurable Goods (4242 and 4246 only)	(8)	(8)	\$ 52.45	\$ 109,100
Management of Companies and Enterprises	180	0.01	\$ 46.57	\$ 96,860
Scientific Research and Development Services	2,210	0.29	\$ 44.30	\$ 92,150
Federal Executive Branch (OEWS Designation)	1,120	0.05	\$ 43.37	\$ 90,200

Employment of soil and plant scientists, by state, May 2019



States with the highest employment level in this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
California	2,580	0.15	1.54	\$38.22	\$79,490
Iowa	900	0.58	6.02	\$32.91	\$68,450
North Carolina	710	0.16	1.65	\$29.13	\$60,590
Minnesota	650	0.23	2.35	\$36.08	\$75,060
South Dakota	580	1.36	14.08	\$28.85	\$60,000

Here is what “Agricultural Managers” do:

. Farmers, Ranchers, and Other Agricultural Managers

Summary

Quick Facts: Farmers, Ranchers, and Other Agricultural Managers	
<u>2020 Median Pay</u>	\$68,090 per year \$32.73 per hour
<u>Typical Entry-Level Education</u>	High school diploma or equivalent
<u>Work Experience in a Related Occupation</u>	5 years or more
<u>On-the-job Training</u>	None
<u>Number of Jobs, 2020</u>	888,300
<u>Job Outlook, 2020-30</u>	-1% (Little or no change)
<u>Employment Change, 2020-30</u>	-5,800

What Farmers, Ranchers, and Other Agricultural Managers Do

Farmers, ranchers, and other agricultural managers run establishments that produce crops, livestock, and dairy products.

Work Environment

Farmers, ranchers, and other agricultural managers typically work outdoors but also may spend time in an office. Their work is often physically demanding.

How to Become a Farmer, Rancher, or Other Agricultural Manager

Farmers, ranchers, and other agricultural managers typically need at least a high school diploma and work experience in a related occupation.

Pay

The median annual wage for farmers, ranchers, and other agricultural managers was \$68,090 in May 2020.

Job Outlook

Employment of farmers, ranchers, and other agricultural managers is projected to show little or no change from 2020 to 2030.

Despite limited employment growth, about 84,800 openings for farmers, ranchers, and other agricultural managers are projected each year, on average, over the decade. Most of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

US-BLS directs any searches for Soil and Plant Science to Agricultural and Food Science

Agricultural and Food Scientists

Summary

Quick Facts: Agricultural and Food Scientists	
<u>2020 Median Pay</u>	\$68,830 per year \$33.09 per hour
<u>Typical Entry-Level Education</u>	Bachelor's degree
<u>Work Experience in a Related Occupation</u>	None
<u>On-the-job Training</u>	None
<u>Number of Jobs, 2020</u>	37,400
<u>Job Outlook, 2020-30</u>	9% (As fast as average)
<u>Employment Change, 2020-30</u>	3,200

What Agricultural and Food Scientists Do

Agricultural and food scientists research ways to improve the efficiency and safety of agricultural establishments and products.

Work Environment

Agricultural and food scientists work in laboratories, in offices, and in the field. Most agricultural and food scientists work full time.

How to Become an Agricultural or Food Scientist

Agricultural and food scientists need at least a bachelor's degree from an accredited postsecondary institution, although many get advanced degrees.

Pay

The median annual wage for agricultural and food scientists was \$68,830 in May 2020.

Job Outlook

Overall employment of agricultural and food scientists is projected to grow 9 percent from 2020 to 2030, about as fast as the average for all occupations.

About 4,400 openings for agricultural and food scientists are projected each year, on average, over the decade. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

Table 1. Agriculture degree, 2018

A glimpse of workers in this degree field.

		Agriculture	All fields
Employment		610,070	55,381,020
Median wage		\$50,000	\$59,000
Percent employed part time		13	15
Percent employed in occupations requiring at least a bachelor's degree		41	59
Percent with an advanced degree		29	37

Source: U.S. Census Bureau, American Community Survey.

Questions you may have

What is being compared?

The table compares people with this degree against people in all fields who have a bachelor's degree.

What is a median wage?

The median is a midpoint: Half of people in this degree field earned more than this amount each year, and half earned less.

What is a bachelor's degree?

A bachelor's degree usually requires at least 4 years of full-time academic study beyond high school.

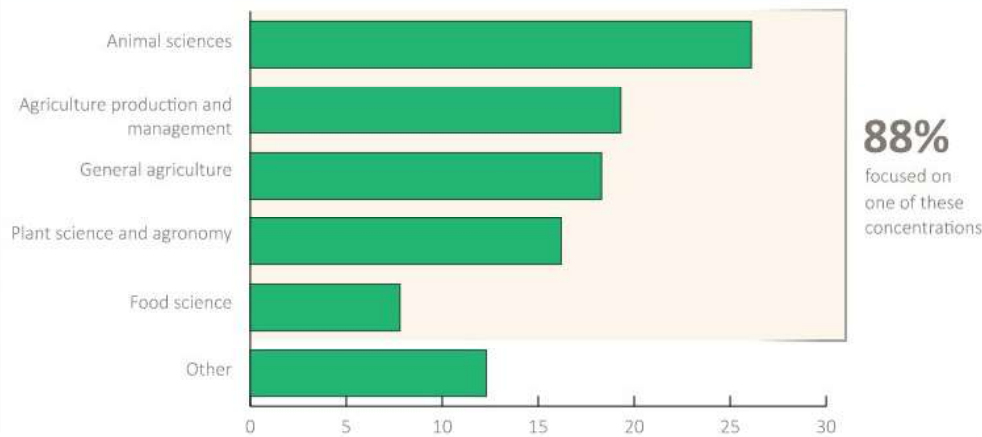
What is an advanced degree?

Advanced degrees include master's, doctoral, or professional degrees and may be in a field other than that of the bachelor's degree. They usually require at least 1 to 3 years of full-time academic study beyond a bachelor's degree.

Types of majors

Within a degree field, students may choose to major in a specific concentration.

Chart 1. Types of agriculture majors, 2018



Note: The sum of percents by major may not total 100 due to rounding.

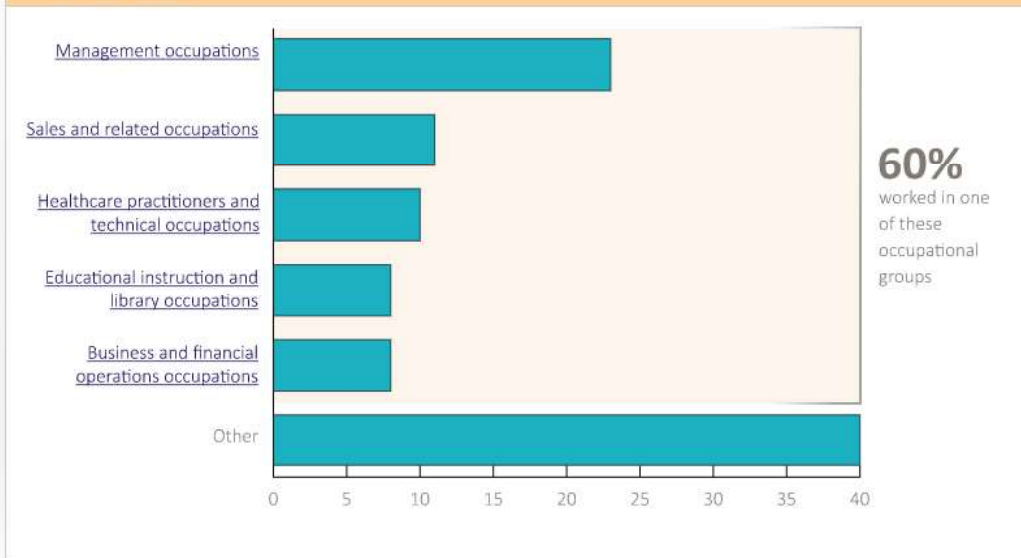
Source: U.S. Census Bureau, American Community Survey.



Occupations, outlook, and more

Occupations are sorted into 23 broad groups based on job duties using the Standard Occupation Classification (SOC) System. For example, various types of managers are grouped together in management occupations. Chart 2 shows the largest shares of this field employed by SOC occupational group.

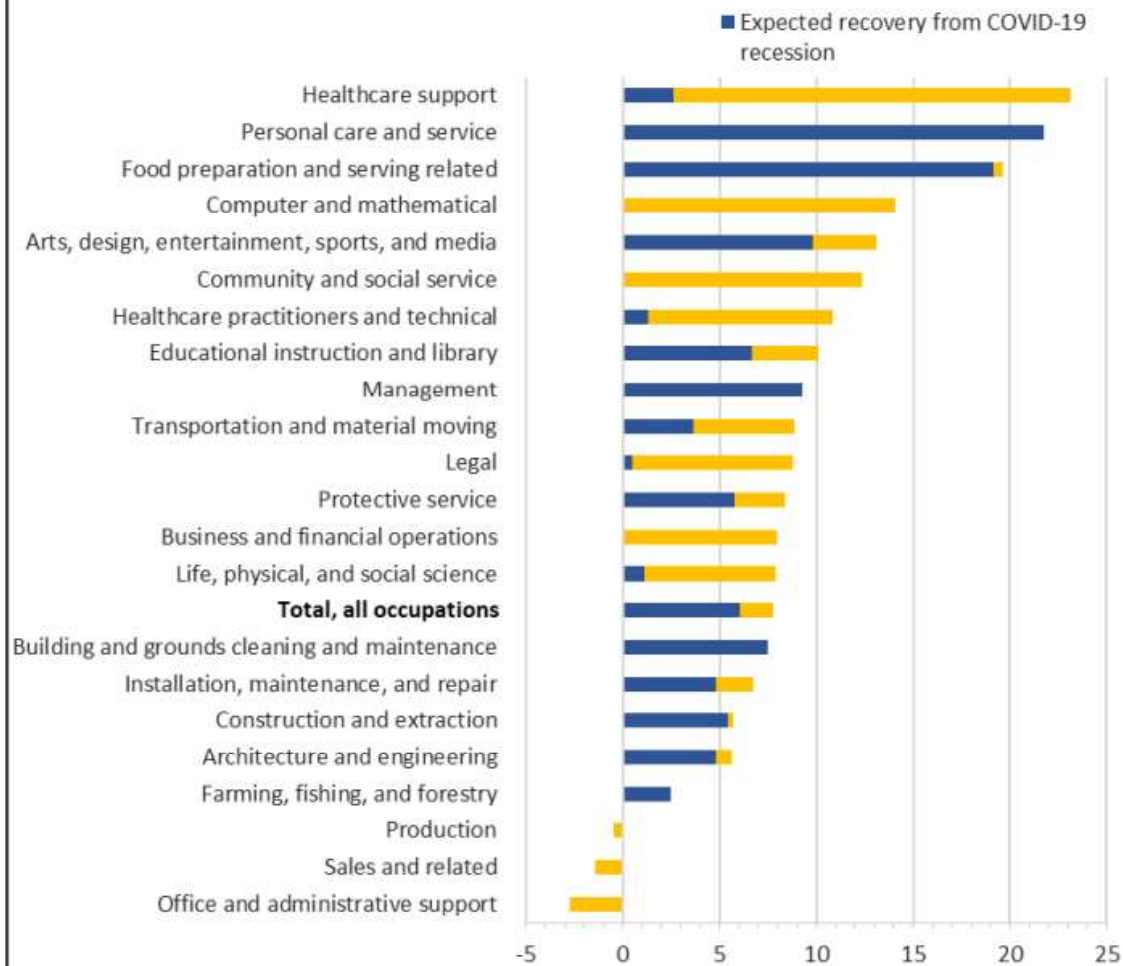
Chart 2. Employment distribution of workers with an agriculture degree, by occupational group, 2018



Note: The sum of percents by major may not total 100 due to rounding.
Source: U.S. Census Bureau, American Community Survey.

<https://www.bls.gov/news.release/pdf/ecopro.pdf>

Chart 1. Projected employment change by occupational group, 2020–2030 (percent)



Note: Expected recovery from COVID-19 recession represents the reversal of declines in employment between 2019 and 2020 for occupational groups that experienced declines during that period.

APPENDIX B: Existing and Proposed Course Requirements details

(<https://aepe.calpoly.edu/aepe/aepe-major>)

MAJOR COURSES		
<u>AEPS 101</u>	Orientation to Horticulture and Crop Science	1
<u>AEPS 120</u>	Principles of Horticulture and Crop Science	4
<u>AEPS 124</u>	Plant Propagation	4
<u>AEPS 304</u>	Introduction to Plant Breeding	4
<u>AEPS 313</u>	Agricultural Entomology	4
<u>AEPS 321</u>	Weed Biology and Management	4
<u>AEPS/BOT 323</u>	Plant Pathology	4
<u>AEPS 351</u>	Experimental Techniques and Analysis	4
<u>AEPS 410</u>	Crop Physiology	4
<u>AEPS 461</u>	Senior Project I	2
<u>AEPS 462</u>	Senior Project II	2
<u>BOT 121</u>	General Botany (B2 & B3) ¹	4
<u>SS 120</u>	Introductory Soil Science	4
Concentration courses (see below)		42-43
SUPPORT COURSES		
<u>AGB 214</u>	Agribusiness Financial Accounting	4
or <u>BUS 212</u>	Financial Accounting for Nonbusiness Majors	
or <u>AGB 212</u>	Agricultural Economics	
<u>BRAE 340</u>	Irrigation Water Management (Upper-Division B) ¹	4
<u>CHEM 127</u>	General Chemistry for Agriculture and Life Science I (B1 & B3) ¹	4
<u>CHEM 128</u>	General Chemistry for Agriculture and Life Science II	4
<u>CHEM 312</u>	Survey of Organic Chemistry	5
<u>MATH 118</u>	Precalculus Algebra (B4) ¹	4
Select from the following:		4
<u>SPAN 101</u>	Elementary Spanish I	

<u>SPAN 102</u>	Elementary Spanish II	
<u>SPAN 103</u>	Elementary Spanish III	
<u>SPAN 111</u>	Elementary Hispanic Language and Culture (USCP)	
<u>SS 221</u>	Soil Health and Plant Nutrition	4
<u>STAT 218</u>	Applied Statistics for the Life Sciences (GE Electives) ¹	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		52
FREE ELECTIVES		
Free Electives		3-4
Total units		180

Concentrations (select one)

- [Environmental Horticultural Science](#)
- [Fruit and Crop Science](#)
- [Plant Protection Science](#)

Environmental Horticulture Concentration Courses:

<u>AEPS 123</u>	Landscape Installation and Maintenance	4
<u>AEPS 127</u>	Horticulture and Landscape Design	4
<u>AEPS 233</u>	Plant Materials I	4
<u>AEPS 234</u>	Plant Materials II	4
<u>AEPS 245</u>	Horticultural Production Techniques	4
<u>AEPS 350</u>	Abiotic Plant Problems	3
<u>AEPS 427</u>	Disease and Pest Control Systems for Ornamental Plants	4
Approved Electives ¹		
Select from the following (at least 8 units must be upper-division):		16
<u>AEPS 126</u>	Landscape Construction	
<u>AEPS 200</u>	Special Problems for Undergraduates ²	
<u>AEPS 212</u>	Environmental Horticulture Enterprise Project I	
or <u>AEPS 312</u>	Environmental Horticulture Enterprise Project II	
<u>AEPS 215</u>	Floral Design I	
<u>AEPS 225</u>	Floral Design II	
<u>AEPS 327</u>	Vertebrate Pest Management	

<u>AEPS 332</u>	Landscape Contracting	
<u>AEPS 333</u>	Greenhouse Vegetable Production	
<u>AEPS 339</u>	Internship in Horticulture and Crop Science ³	
<u>AEPS 340</u>	Principles of Greenhouse Environment	
<u>AEPS 341</u>	Cut Flower Production	
<u>AEPS 342</u>	Potted Plant Production	
<u>AEPS 343</u>	Turfgrass Management	
<u>AEPS 381</u>	Native Plants for California Landscapes	
<u>AEPS 400</u>	Special Problems for Advanced Undergraduates ²	
<u>AEPS 421</u>	Postharvest Technology of Horticultural Crops	
<u>AEPS 424</u>	Nursery Crop Production	
<u>AEPS 425</u>	Arboriculture	
<u>AEPS 428</u>	Advances in Plant Pathology	
<u>AEPS 432</u>	Specialized Operations for Golf Courses and Athletic Fields	
<u>AEPS 437</u>	Park and Public Space Management	
<u>AEPS 441</u>	Biological Control for Pest Management	
<u>BRAE 337</u>	Landscape Irrigation	
<u>BUS 346</u>	Principles of Marketing	
Total units		43

¹ Consultation with advisor is recommended prior to selecting Approved Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 2 units of [AEPS 200](#) and/or a maximum of 2 units of [AEPS 400](#) may count towards Approved Electives.

³ A maximum of 4 units of [AEPS 339](#) may count towards Approved Electives.

Fruit and Crop Science Concentration Courses

<u>AEPS 132</u>	Pomology I	4
<u>AEPS 133</u>	Pomology II	4
<u>AEPS 190</u>	California Vegetable Production	4
<u>AEPS 203</u>	Organic Enterprise Project	2
or <u>AEPS 205</u>	Orchard and Vegetable Enterprise Project	
or <u>AEPS 333</u>	Greenhouse Vegetable Production	

<u>AEPS/BRAE 244</u>	Precision Farming	4
<u>AEPS 421</u>	Postharvest Technology of Horticultural Crops	4
Approved Electives (at least 11 units must be upper-division) ¹		
Select from the following:		20
<u>AEPS 150</u>	Forage Crops	
<u>AEPS 175</u>	Beekeeping	
<u>AEPS 200</u>	Special Problems for Undergraduates ²	
<u>AEPS 240</u>	Commercial Seed Production	
<u>AEPS 327</u>	Vertebrate Pest Management	
<u>AEPS 334</u>	Greenhouse Vegetable Enterprise Project	
<u>AEPS 339</u>	Internship in Horticulture and Crop Science ³	
<u>AEPS 340</u>	Principles of Greenhouse Environment	
<u>AEPS 355</u>	Citrus and Avocado Fruit Production	
<u>AEPS 400</u>	Special Problems for Advanced Undergraduates ²	
<u>AEPS 406</u>	Advanced Weed Management	
<u>AEPS/WVIT 414</u>	Grape Pest Management	
<u>AEPS 420</u>	Organic Crop Production Systems	
<u>AEPS 427</u>	Disease and Pest Control Systems for Ornamental Plants	
<u>AEPS 428</u>	Advances in Plant Pathology	
<u>AEPS 431</u>	Insect Pest Management	
<u>AEPS 441</u>	Biological Control for Pest Management	
<u>AEPS 445</u>	Cropping Systems	
<u>AEPS 450</u>	Current Issues in the Strawberry Industry	
<u>AG/ASCI 360</u>	Holistic Management	
<u>BRAE 405</u>	Chemigation	
<u>BRAE 438</u>	Drip/Micro Irrigation	
<u>BRAE 440</u>	Agricultural Irrigation Systems	
<u>FSN 275</u>	Elements of Food Safety	
<u>SS 321</u>	Soil Morphology	
<u>SS 322</u>	Soil Plant Relationships	
<u>WVIT 233</u>	Basic Viticulture	

<u>WVIT/AEPS 331</u>	Advanced Viticulture - Fall	
<u>WVIT 332</u>	Advanced Viticulture - Winter	
<u>WVIT 333</u>	Advanced Viticulture - Spring	
Total units		42

- ¹ Consultation with advisor is recommended prior to selecting Approved Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ² A maximum of 2 units of AEPS 200 and/or a maximum of 2 units of AEPS 400 may count towards Approved Electives.
- ³ A maximum of 4 units of AEPS 339 may count towards Approved Electives.

Plant Protection Concentration Courses

<u>AEPS 203</u>	Organic Enterprise Project	2
or <u>AEPS 205</u>	Orchard and Vegetable Enterprise Project	
or <u>AEPS 212</u>	Environmental Horticulture Enterprise Project I	
or <u>AEPS 312</u>	Environmental Horticulture Enterprise Project II	
or <u>AEPS 333</u>	Greenhouse Vegetable Production	
<u>AEPS 327</u>	Vertebrate Pest Management	4
<u>AEPS 406</u>	Advanced Weed Management	4
<u>AEPS 427</u>	Disease and Pest Control Systems for Ornamental Plants	4
<u>AEPS 431</u>	Insect Pest Management	4
<u>AEPS 441</u>	Biological Control for Pest Management	4
Approved Electives ¹		
Select from the following:		20
<u>AEPS 132</u>	Pomology I	
<u>AEPS 133</u>	Pomology II	
<u>AEPS 150</u>	Forage Crops	
<u>AEPS 175</u>	Beekeeping	
<u>AEPS 190</u>	California Vegetable Production	
<u>AEPS 200</u>	Special Problems for Undergraduates ²	
<u>AEPS 240</u>	Commercial Seed Production	
<u>AEPS/BRAE 244</u>	Precision Farming	

<u>AEPS 245</u>	Horticultural Production Techniques	
<u>AEPS 334</u>	Greenhouse Vegetable Enterprise Project	
<u>AEPS 339</u>	Internship in Horticulture and Crop Science ³	
<u>AEPS 340</u>	Principles of Greenhouse Environment	
<u>AEPS 341</u>	Cut Flower Production	
<u>AEPS 342</u>	Potted Plant Production	
<u>AEPS 343</u>	Turfgrass Management	
<u>AEPS 355</u>	Citrus and Avocado Fruit Production	
<u>AEPS 400</u>	Special Problems for Advanced Undergraduates ²	
<u>AEPS 420</u>	Organic Crop Production Systems	
<u>AEPS 421</u>	Postharvest Technology of Horticultural Crops	
<u>AEPS 445</u>	Cropping Systems	
<u>AEPS 450</u>	Current Issues in the Strawberry Industry	
<u>CHEM 313</u>	Survey of Biochemistry and Biotechnology	
<u>FSN 275</u>	Elements of Food Safety	
<u>MCRO 221</u>	Microbiology	
<u>WVIT 233</u>	Basic Viticulture	
<u>WVIT/AEPS 331</u>	Advanced Viticulture - Fall	
<u>WVIT 332</u>	Advanced Viticulture - Winter	
<u>WVIT 333</u>	Advanced Viticulture - Spring	
Total units		42

¹ Consultation with advisor is recommended prior to selecting Approved Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 2 units of AEPS 200 and/or a maximum of 2 units of AEPS 400 may count towards Approved Electives.

³ A maximum of 4 units of [AEPS 339](#) may count towards Approved Electives.

APPENDIX C: Program Requirements and Course Descriptions For other CSU Programs:

CSU Fresno

(<http://fresnostate.edu/catalog/subjects/plant-science/plant-sci.html>)

1. Major Requirements (78 units)

Core Courses (38 units)

PLANT 71, 99, 100, 101, 107 or 108, 150, 160, 161, 162, 163, 172, and 172L

Select three (3) units from MEAG

Select one (1) unit from PLANT 180, 190, 194I, or 196 in consultation with a faculty adviser.

Electives (24 units)

Select twenty-four (24) units of electives that best meet your career objectives. A maximum of nine (9) units may be lower division, including any department-approved transfer courses. Note: Electives cannot double count in the required core.

- MEAG 3, 20, or 50
- PLANT 1, 20, 30, 40, 41, or 60
- MEAG 103, 112, 113, 114, or 120
- PLANT 105, 120, 121, 122, 123, 124, 130, 132, 133, 140, 141, 142, 143, 164, 165, 166, 167, 168, 170T, 174, or 175

Of the twenty four (24) units of electives required you may select one (1) to three (3) courses from outside of the major from the courses listed below. Additional prerequisites may be required for some courses. Other electives outside the major not listed below may be considered, but will require prior department chair approval and may have additional prerequisites.

- AGBS 1, 28, 31, 100, 109, 110, 117, 120, 130, 140, 150, 155, 160, 162, 163, or 164
- BIOL 124, 125, 132, 140, 150, 156, or 171
- CHEM 105
- EES 185 or 186
- IT 186
- VIT 1, 101, 102, 103, 105, 106, 160, or 165

Additional Requirements (16 units)*

CHEM 3A (Area B1); BIOL 11(Area B2); MATH 11 (Area B4); CHEM 8 or 3B; CHEM 150

2. General Education requirements (49 units)

3. Other requirements (9 units)

American Government and Institutions (PLSI 2), Multicultural and International (MI), and Upper-division writing. Note: Plant Science majors are exempt from the MI requirement.

4. Sufficient elective units to meet required total units (varies)

5. Total units (120)**

* Ten (10) units of additional requirements (CHEM 3A, BIOL 11, and MATH 11) are also being used to fulfill (10) units of the G.E. requirement.

CSU Fresno Course Descriptions (<https://fresnostate.edu/catalog/courses-by-department/plant-science/index.html>)

- PLANT 20. Introduction to Crop Science. Principles of production for cereal, row, forage and vegetable crops. Culture, insect and disease control, harvesting, storage, and marketing. (Formerly CRSC 1)
- PLANT 30. Introduction to Fruit Science. Origin and distribution of grape and tree fruit crops. Botanical and commercial classification of grapes and tree fruits and their culture in California. (Formerly HORT 1)
- PLANT 40. Introduction to Ornamental Horticulture. Planting and maintenance of the home landscape; selection, planting, fertilization, and pruning of plants; lawn planting and care. (2 lecture, 3 lab hours) (Formerly OH 1) (Course fee, \$10)
- PLANT 41. Floral Design. Principles and rules of design and color using plants as a media; European and Japanese influences; emphasis on American line-mass and contemporary designs. An assortment of arrangements are made in lab. (2 lecture, 3 lab hours) (Course fee, \$50) (Formerly OH 4)
- PLANT 60. Introduction to Plant Health. Origin, history, and evaluation of protective measures (chemical, biological, and cultural) for the management of insects, diseases, weeds, and rodents in the field and around the home. (Formerly PLTH 1)
- PLANT 70. Introduction to Irrigated Soils. Interpretation of physical and chemical properties of biological and mineral matter for the management of soils in irrigated agriculture. Emphasis on soil/plant and plant/water relationships. (Formerly SW 1)
- PLANT 71. Agricultural Water. Water resources and problems in California; water requirements for agricultural and ornamental crops; irrigation scheduling and application methods. (2 lecture, 3 lab hours)
- PLANT 99. Introduction to Biometrics. Introduction to experimental methods and statistical procedures with particular emphasis on applied biological systems. Design of experiments; statistical analysis and interpretation.
- PLANT 100. Aspects of Crop Productivity. Study of the growth, development, and basic physiological processes of cultivated crops. Environmental influences on crop growth and development processes and management techniques to minimize stresses and maximize crop yield and quality.
- PLANT 101. Crop Nutrition. Evaluation of nutrient elements in soils; application of fertilizers and organic waste to meet nutrient requirements; soil and plant tissue analysis and interpretation; fertilizer recommendations for different crops. (2 lecture, 3 lab hours) (Formerly SW 101)
- PLANT 105. Food, Society, and Environment. Linkages among food production systems, human social behavior, and environmental quality. Basic principles of environmental and agricultural sciences as applied to interrelationships among social value systems, agricultural activities and environmental resources. G.E. Integration IB.
- PLANT 107. Plant Propagation. Principles and practices of propagating plants, sexual and asexual. Seeds, cuttings, layering, grafting, budding, and tissue culture. Propagation media and rooting aids. (2 lecture, 3 lab hours; field trips)
- PLANT 108. Micropropagation. Principles of plant propagation by aseptic cell and organ culture as a means of rapid cloning, elimination of systemic plant diseases, production of somatic hybrids, ploidy change, and other genetic variants for use in plant breeding. (2 lecture, 3 lab hours) (Formerly PLANT 102)
- PLANT 110W. Dimensions in Agriculture. Current agricultural problems and developments; nature of agricultural industries in a changing world. Interrelationships among agriculture, government, labor, and the public. Meets the upper-division writing skills requirement for graduation.
- PLANT 120. Row Crops. The culture of beans, cotton, sugar beets, and oil crops; varieties, nutrition, insect, disease, and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours) (Formerly CRSC 101)
- PLANT 121. Cereal and Forage Crops
Prerequisites: BIOL 11, PLANT 20. The culture of barley, corn, sorghum, oats, rice, rye and wheat; varieties, nutrition, insect disease, and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours)
- PLANT 122. Range Ecology and Management. Identification of range and pasture plants; carrying capacity; methods of range and pasture improvement, grazing management, water development, rodents, fertilization, reseeding, brush removal; mountain range resources. (2 lecture, 3 lab hours) (Formerly CRSC 105)
- PLANT 123. Vegetable Production. Cultural practices, harvesting, processing, and marketing of vegetables of economic importance to California and the San Joaquin Valley. (2 lecture, 3 lab hours)

- PLANT 124. Organic Crop Production. Cultural practices, harvesting, processing, and marketing of organically grown crops of economic importance to California and the San Joaquin Valley.
- PLANT 130. Fruit Species of California. Fruit and nut species common to California, their adaptation and uses.
- PLANT 132. Principles of Pomology II. Pruning, fruit and vegetative development, pollination, rootstocks, propagation, and nutrition. Crop fundamentals of spring cultural practices. (2 lecture, 3 lab hours)
- PLANT 133. Citrus and Subtropical Fruits. Geographic distribution, climatic and soil adaptation of subtropical fruit crops. Fruit and vegetative development and cultural practices for globally important fruit crops. Emphasis on citrus and olive (2 lecture, 3 lab hours)
- PLANT 134. Micrometeorology. Micrometeorological influences on local climates including natural ecosystems and varying agricultural canopies. Local climate influences on wildlife, domestic animals, and humans. Manipulation of local climate including frost protection, irrigation and wind sheltering. Microclimates of non-uniform terrain and urban environment.
- PLANT 140. Greenhouse & Nursery Crop Production. Fundamentals of greenhouse and nursery crop production. Emphasis on sustainable and economically viable production and management systems for significant flower, foliage and nursery crops. (3 lecture, 3 lab hours; field trips)
- PLANT 141. Woody Plant Materials. Survey of woody plant materials including identification, growth habits and cultural requirements. Emphasis on plants used in the California landscape. (2 lecture, 3 lab hours; field trips)
- PLANT 142. Herbaceous Plant Materials. Survey of herbaceous plants materials including identification, growth habits and cultural requirements. Emphasis on plants used in California landscapes, botanical gardens and arboreta. (2 lecture, 3 lab hours; 2 Saturday field trips)
- PLANT 143. Turfgrass Production and Management. Production and maintenance of grass for lawns, public parks, public institutions, playgrounds, playing fields, golf courses, bowling greens; identification of turfgrasses and turfgrass seed. (2 lecture, 3 lab hours; field trip)
- PLANT 150. Crop Improvement. Application of genetic, cytological and environmental principles to the improvement of plants; heredity and variation in plants, effects of environmental factors, biotechnology, self- and cross-fertilization, principles and results of selection and hybridization in plant improvement.
- PLANT 160. Weed Science. Vegetation management in California. Identification of common weeds. Fundamentals of preventive, cultural, biological, physical, and chemical weed control methods.
- PLANT 161. Plant Pathology. Study of the causal agents, disease cycles, and control of plant diseases. (2 lecture, 3 lab hours) (Formerly PLTH 106)
- PLANT 162. Economic Entomology. Biology, ecology, management and taxonomy of economically important arthropods, with special emphasis on agricultural ecosystems in California. (2 lecture, 3 lab hours)
- PLANT 163. Integrated Pest Management. Concepts and principles of integrated pest management. Insect and mite pest problems; sampling techniques; biology and ecology of major agricultural crop pests; integration of control measures for the management of economic pests. (2 lecture, 3 lab hours) (Formerly PLTH 108)
- PLANT 164. Plant Nematology. Biology, taxonomy, host-parasite relationships, soil ecology, conventional and innovative controls, plant diagnosis and laboratory techniques with emphasis on plant-parasitic species.
- PLANT 165. Pesticides. Typical uses, modes of action, mechanisms of selectivity, environmental interactions, and user safety of insecticides, herbicides, fungicides, nematocides, rodenticides, and plant growth regulators. Effective and safe use of agriculture chemicals by reading labels and following laws/regulations.
- PLANT 166. Mycology. Growth, physiology, reproduction, taxonomy, ecology, and economic impacts of fungi, slime molds, and oomycota. Role of fungi as symbionts, pathogens, and saprophytes are examined (2 lecture, 3 lab hours)
- PLANT 167. Diagnosis and Control of Plant Diseases. Techniques for diagnosis of specific diseases in California and selection criteria for control strategies. Students will practice diagnostic techniques for selecting preventative, cultural, biological, physical, and chemical disease control strategies for major plant diseases.
- PLANT 168. Biological Control. Study of the action of parasites, predators, and pathogens on the population dynamics of their host/prey organisms; focus on arthropods, with additional emphasis on microorganisms, weeds, nematodes, and vertebrates. (Formerly PLTH 107)
- PLANT 170T. Topics in Plant Science. Selected topics in plant science, agronomy, horticulture, and other associated areas. Topics may require lab hours.
- PLANT 170T. Bee Biology & Apiculture. This course provides an over view of the practice of apiculture (beekeeping), pollinator ecology, and the practical considerations of pollination in agriculture. Students are

provided with a theoretical background on these topics and hands on experience managing honey bee hives. Special emphasis is placed on the practice or rearing honeybee colonies.

PLANT 171. Soils in the Environment. Physical, chemical, and biological properties of soils as the interconnecting link in the biosphere; factors that influence soil formation; role of soil in food and fiber production. Not open to Plant Science and Viticulture & Enology majors. (2 lecture; 3 lab hours).

PLANT 172. Soils. Physical, chemical, and biological properties of soils as a medium for plant growth and as a natural body, factors that influence soil formation; food and fiber production; fertilizer and soil amendment use and environmental impact; soil's role in the biosphere. (Formerly SW 100)

PLANT 172L. Soils Lab. Physical, chemical, and biological analysis. Interpretation of field and laboratory data. (3 lab hours) (Saturday field trip)

PLANT 174. Soil and Water Management. Management of irrigated soils with particular emphasis on crop water requirements, irrigation scheduling, salinity, and other physical and chemical soil problems of field crops, permanent crops and landscapes.

PLANT 175. Irrigation Systems. Principles of planning, installation and evaluation of irrigation systems for field crops, permanent crops and ornamental horticulture. Pressurized systems (sprinkler and drip irrigation) emphasized. (Formerly SW 111)

PLANT 180. Undergraduate Research. Exploratory work on a suitable agricultural problem in plant science. Approved for RP grading.

PLANT 190. Independent Study.

PLANT 194I. Agricultural Internship. Field experience in your career specialty that integrates with classroom instruction. Written reports of knowledge and experience gained are required. CR/NC grading only.

PLANT 196. Crop Projects. Knowledge gained from classroom instruction applied to field conditions. Students will participate in growing and marketing a crop using the University Agricultural Laboratory. Approved for

PLANT 250T. Topics in Plant Science. Advanced studies in a selected area of Plant Science which could include new or emerging issues and technologies. Topics may require lab hours.

PLANT 251. Soil-Plant-Water Relation. Water flow and solute transport through the soil-plant-atmosphere continuum (SPAC). Soil-plant-water relationships affecting water use efficiency, agricultural productivity, and environmental quality. Management of salinity, drainage, and trace elements. Irrigation scheduling and water quality. (2 lecture, 3 lab hours)

PLANT 252. Plant Nutrition. Soil factors influencing nutrient availability, mineral requirements of plants, acquisition and translocation of nutrients and their role in plant metabolism. Soil and tissue analysis for fertility management. (2 lecture, 3 lab hours)

PLANT 255. Advanced Plant Breeding. Principles and techniques of plant improvement, breeding methods, combining ability, sterility systems, quantitative genetic analysis, heritability estimates, experimental designs for plant breeding.

PLANT 257. Physiology of Cultivated Plants. Plant cell structure and function. Response of cultivated plants to the environment. Physiology and hormonal control of flower induction, fruit set, and development. Review of pertinent current publications.

PLANT 261. Advanced Plant Health Management. Comprehensive study of arthropod, disease, and weed problems in California cropping systems. Examination of complex relationships among crop plants and other biological organisms in agro-ecosystems design crop health management programs that are economically viable and ecologically sound.

PLANT 270. Seminar in Plant Science. Reviews of published and/or original research in the broad areas of crop science, soil and water relations, and plant health.

PLANT 290. Independent Study.

PLANT 299. Thesis

PLANT 299C. Thesis Continuation

Cal Poly Pomona Curriculum

(https://catalog.cpp.edu/preview_program.php?catoid=5&poid=1045)

Required Core Courses for Major: 57 units

Required of all students. A 2.0 cumulative GPA is required in core courses in order to receive a degree in the major.

- AG 100 - Orientation to the College of Agriculture (1)
- PLT 131/131L - Landscape Horticulture (3/1)
- PLT 132/132L - Plant Propagation (3/1)
- PLT 133/133L - Agricultural Cropping Systems (3/1)
- PLT 231/231L - Basic Soil Science (3/1)
- PLT 232 - Irrigation and Water Management (4)
- PLT 233/233L - Introduction to Arthropods (3/1)
- PLT 301 - Investigative Techniques in Plant Science (4)
- PLT 302 - Technology Innovations in Plant Science (4)
- PLT 331/331L - Weeds and Weed Control (3/1)
- PLT 332/332L - Soil Fertility and Fertilizers (3/1)
- PLT 333 - Integrated Pest Management (4)
- PLT 401 - Crop Ecology (4)
- PLT 411 - Environmental Toxicology (4)
- PLT 441 - Internship in Plant Science (2-4) or
- PLT 461 - Senior Project (2)
- PLT 463 - Undergraduate Seminar (2)

Required Support Courses: 42 units

- ABM 224 - Accounting for Agribusiness (4)
- AG 101 - Agriculture and the Modern World (4) (D2)
- AG 401 - Ethical Issues in Food, Agricultural, and Apparel Industries (4) (D4)
- BIO 115/115A/115L - Basic Biology (3/1/1) (B2,B3)
- BOT 201/201L - Form and Function in Plants (3/1)
- BOT 428/428L - Plant Physiology (4/1)
- CHM 122 - General Chemistry (3) and
- CHM 122L - General Chemistry Laboratory (1)
- CHM 121 - General Chemistry (3) (B1) and
- CHM 121L - General Chemistry Laboratory (1) (B3)
- PLT 421/421L - Crop Diseases (3/1) or
- PLT 427/427L - Diseases of Ornamentals (3/1)
- STA 120 - Statistics with Applications (4) (B4)

Note(s):

For Plant Science Students - Select a sufficient number of courses so that the total from Directed Support and GE is at least 93 units.

Elective Support Courses: 29 units

Determined in consultation with your advisor (21 units)

Business Courses: *Choose 8 units*

- ABM 328 - Agribusiness Enterprise Management (4)
- ABM 402 - Agribusiness Personnel Management (4)
- EBZ 301 - Introduction to Electronic Business (4)
- EBZ 302 - E-business Technology (4)
- FRL 201 - Legal Environment of Business Transactions (4)
- HRT 320 - Club Operations (4)
- IBM 301 - Principles of Marketing Management (4)
- MHR 301 - Principles of Management (4)
- MHR 313 - First-line Management (4)
- MHR 318 - Organizational Behavior (4)
- MHR 320 - Introduction to Entrepreneurship (4)
- TOM 301 - Operations Management (4)

Unrestricted Electives: 4 units

CSU Chico Curriculum

(<https://catalog.csuchico.edu/viewer/21/AGRI/PSSCNONEUN.html>)

Course Requirements for the Major: 78-85 units

Completion of the following courses, or their approved transfer equivalents, is required of all candidates for this degree. Additional required courses, depending upon the selected option are outlined following the major core program requirements.

Major Core Program: 57-60 units

Lower-Division Core: 33-35 units

6 courses required:

ABUS 101	Introduction to Agricultural Business and Economics
AGET 150	Agricultural Machine Systems
AGRI 180	The University Experience
MATH 105	Introduction to Statistics
PSSC 101	Introduction to Plant Science
PSSC 250	Introduction to Soil Science

1 course selected from:

ANSC 101	Introduction to Animal Science
ANSC 230	Animal Feeds and Nutrition

1 course selected from:

CHEM 107	General Chemistry for Applied Sciences
CHEM 111	General Chemistry I

1 course selected from:

CHEM 108	Organic Chemistry for Applied Sciences
CHEM 112	General Chemistry II

6-8 units selected from:

ABUS 231	Computer Applications in Agriculture
ABUS 261	Farm Accounting
BIOL 161	Principles of Ecological, Evolutionary, and Organismal Biology
BIOL 162	Principles of Cellular and Molecular Biology
BIOL 163	Principles of Physiology and Development
GEOG 101W	Physical Geography (W)
GEOS 265	Soils and Surficial Processes
PHYS 202A	General Physics I
PHYS 204A	Physics for Students of Science and Engineering: Mechanics
PSSC 160	West Coast Crop Production
PSSC 266	California Orchard Production and Management
PSSC 274	Greenhouse Management
RHPM 240	Outdoor Recreation Systems

Upper-Division Core: 24-25 units

3 courses required:

AGRI 331	Agricultural Ecology
AGRI 482W	Agricultural Issues (W)
AGRI 490W	Agricultural Experimental Research (W)

1 course selected from:

PSSC 356	Soil Quality and Health
PSSC 453	Soil Fertility and Plant Nutrition

1 course selected from:

BIOL 369	Advanced Plant Biology
BIOL 414	Plant Physiology
BIOL 448	Plant Diversity and Identification
PSSC 459	Crop Physiology

1 course selected from:

ABUS 321	Agribusiness Management
ABUS 341	Natural Resource Economics
ABUS 464	Farm and Ranch Appraisal

Prerequisites: ABUS 101.

1 course selected from:

AGRI 432	Holistic Management
PSSC 441	Principles of Integrated Pest Management

2 units selected from:

PSSC 309A	Directed Work in Field and Row Crops
PSSC 309B	Directed Work in Vegetable Crops
PSSC 389	Internship in Plant and Soil Science

Major Option Course Requirements: 21-25 units

The following courses, or their approved transfer equivalents, are required dependent upon the option chosen. Students must select one of the following options for completion of the major course requirements. Use the links below to jump to your chosen option.

[The Option in Crops and Horticulture](#)

[The Option in Land and Soil Resource Management](#)

The Option in Crops and Horticulture: 23-25 units

This option prepares students to manage agricultural enterprises for the production of food, feed, fuel, fiber, and ornamental crops. It comprises protection of these crops and resources against pests (insects, diseases, weeds, and vertebrates) and stewardship of their natural resources (soil, water, air, and biota). The option emphasizes sustainable land use and crop production practices. This option equips students with skills to competitively pursue graduate education or other professional opportunities in agricultural consulting, production, conservation, research, and regulation.

2 courses required:

AGRI 305	Agricultural Genetics
PSSC 353	Plant Protection Materials, Methods, and Regulations

Crop Production

2 courses selected from:

AGET 360	Irrigation
PSSC 345	Horticultural Therapy
PSSC 361	Production of Annual Crops
PSSC 363	Forage Crops
PSSC 365	Sustainable Vegetable Crop Production
PSSC 366	Fruit and Nut Production

Agricultural Pests and Management**1 course selected from:**

BIOL 446	Plant Pathology
PSSC 340	Economic Entomology
PSSC 343	Introduction to Weed Science

Crops and Horticulture Electives**8-9 units selected from:**

To fulfill the requirements of this option, select additional upper-division courses from the major core, option, listed courses below, or other courses in consultation with your advisor. Students may elect to take either PSSC 390 or PSSC 392 to satisfy up to 3 units of upper-division electives in this option. Check with your advisor on which one is most appropriate for your career path.

AGRI 301	California Agriculture Seminar
PSSC 305	Introduction to Wines
PSSC 390	Food Forever: Comparisons of Sustainable Food Production Systems

OR (the following course may be substituted for the above)

PSSC 392	World Food and Fiber Systems
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AEPS - Plant Sciences.Name Change for Signatures


Final Audit Report

2022-04-12

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