**AGNR Strategic Planning and Advisory Meeting**

**Agenda**

**Thursday May 16- 8AM-11AM**Building 60B, AGNR Department

**Attendees:**

Lyn Shirley (Plant Science Instructor, and Field Biologist)

Carlos Ruiz (Horticulture Instructor and Orange County Nursery Manager)

Dolores Gault (Landscape and Irrigation Instructor, Instructional Assistant and Former Rancho Santa Ana Botanical Gardens Manager)

Brian Hammer (Urban Food Instructor and GIS and Mojave Water Agency GIS Analyst)

Ben Lehan (Instructor Sustainable Agriculture, Cal Poly Pomona Instructor and former Cal Dept. of Pest Control

Duane Penfold (Animal Science and Nutrition Instructor and Apple Valley High School AG teacher, FFA Coordinator)

Troy Van Bavel (Lucerne Valley High AG teacher, FFA Coordinator)

Neville Slade (Department Chair, Natural Resources and Animal Science Instructor and Director Resource Conservation District)

Tony Walters (Resource Conservation District and Irrigation Water Manager and former student)

Dayan Anderson (Former Specialty Minerals Manager, Mountain Foundation and former student)

Miranda Buckley (Cal Poly Pomona Plant Sciences student and former VVC student)

Belinda Serrano (Professional Expert, Conservation Technician RCD, and former student)

Dr. Todd Scott (Dean of Health Sciences and Industrial Technology Division)

Michele Thompson (Student, Vice President Environmental Club)

**State of Department and VVC/State CCC Initiatives**

Student Centered Funding Model

Neville discussed the new funding model which is student success driven and allows for funding over and above FTES, to include funding for completion of Associate Transfer Degrees (ADT). Chancellor approved Certificates of Achievement and completion of CTE classes. Duane Penfold discussed the need for stackable certificates in Animal Sciences and Veterinary Science. Neville mentioned that these are already submitted to the Curriculum Committee and include: Equine Science Specialist 13 or 14 units; Veterinary Assistant 17 to 19 units and Animal Science Specialist 22 to 24 units. Neville discussed that labor market data showed a shrinkage in the animal sciences but a significant need for veterinary assistant and technicians. Troy Van Bavel endorsed that there is a large need for animal health and safety training including training for Animal Control Workers. Dolores Gault highlighted the need for a certificate of achievement in Floral Design that would be stackable under our recently approved certificates of achievement in Landscape Horticulture (24 to 27 units) and Plant Science (22 to 25).

Associate Transfer Degrees- Transfer Model Curriculum, General education

Neville stated that we will be launching the AG Sciences, Plant Sciences ADT this school year 2019-2020 and given resources to build and staff labs will fully launch the AG Sciences Animal Sciences ADT in 2020 – 2021, these classes are fully transferable to the Cal States and can be used in the General Education Matrix both at VVC and the CSU’s. AGNR has four General Education Classes:

AGNR 170 Environmental Science and Sustainability – Life Science without Lab

AGNR 123 Plant Science – Life Science without Lab

AGNR 175 Sustainable Agriculture, Environment and Society – Social Science

AGNR 178 Agricultural Economics – Social Science

Lyn mentioned the strong data for soils and plant sciences majors to enter the Natural Resource Management Careers. Particularly with Natural Resource Management Agencies such as Bureau of Land Management, Forest Service and National Park Service. Tony Walters endorsed the need for these professionals to work for the Natural Resource Conservation Service (NRCS) and several local agencies like the Mojave Water Agency and the Air Quality Control District. He stated that these careers often require a four year degree in the Environmental Sciences and that our two new associate transfer degrees are perfectly positioned to do this.

Pathways- Career and Guided

Brian Hammer discussed the need to continue to partner with UCR extension on their Master Gardner and Master Composter classes. Dayan Anderson discussed articulating our AGNR 170L (1 unit) class with the California Naturalist Certificate that will be launched by the Mountain Foundation this summer in Big Bear. Neville discussed the usefulness of beginning strategic planning on career pathways over 10 years ago when a group of VVC instructors from several departments and partners from the community attended a career pathway planning seminar in Palm Springs.

Math and English Changes

Neville highlighted these changes that include doing away with the assessment exams and drastically reducing the lower level remedial classes for English and Math. We are fortunate because the TMC’s require Math 120 but Entry into Chemistry would also require Math…. As a prerequisite

Dual Enrollment- High School articulation

Discussed the success of the current dual enrollment classes, over the past three years at Granite Hills and Academy for Academic Excellence – this is a great outreach and mechanism to recruit students into VVC and our program. Troy Van Bavel expressed an interest in teaching and offering the AGNR 170 Fall, AGNR 175 Spring sequence at Lucerne Valley High School, these classes were offered several years ago as concurrent enrollment and can integrate well into High School AG leadership and agricultural systems classes.

Distance Education

Neville discussed the importance of online and hybrid delivery of classes in the future to ensure implementation of our very diverse programs and the travel distances involved for our students. VVC is moving to a new instructional management system – Canvas and all adjunct should try to get the training and become certified.

Our Planning- PRAISE – Program review process

Neville discussed newly completed 3 year cycle. Program Planning has been driven by:

1. Our long-standing AGNR Advisory Board (includes leaders from K12 Education, Community, Industry and Government Agencies) and our faculty, who are actively engaged in local Natural Resource Management and Conservation Organizations. This focus ensures Community and industry alignment of our course and programs. They have developed a seven (7) year Strategic Plan (began in 2012) that has shaped this program and will inform its future planning.
2. A focus on Career Technical Pathways this began when we (three VVC department chairs) and several community partners attended one of the State of California’s original Pathway workshops in Palm Desert in 2010. Facilitates a focused two year course of study at VVC for our students and seamlessly transfer via an AST degree to a university and/or achieve one or more Chancellor approved CTE Certificates of Acheivement and enter a career in this rapidly expanding field The 2019-2020 school year will see the full launch of our Plant **Science and Sustainable Agriculture CTE Pathway** and 2020-2021 will see full launch of our **Animal Science and Vet Assistant CTE Pathway**
3. Development of two Associate of Science Transfer Degrees (ADT). Our Department Chair served on the State Chancellor’s office FDRG team to design the three AGNR ADT degrees and after 5 years of planning at VVC, two new ADT’s were approved by the Chancelors office- Agriculture Science/Plant Science and Agriculture Science/Animal Science.
4. Developing industry relevant CTE classes and industry recognized certification that prepare students for entry into careers in this sector and facilitate industry required license exams. Examples include: Qualified Water Efficient Landscaper (QWEL-EPA); Irrigation Technician and Auditor (IT-Irrigation Association); Pest control Advisor (PCA-California Pest Control Dept.)
5. Extension of our existing articulation and concurrent enrollment partnership with local Agriculture High Schools (Appple Valley, Serrano and Lucerne Valley) to include Dual Enrollment with several high schools ( piloted with the Academy for Academic Excellence and Granite Hills HS in 2017-2018 and 2018-2019
6. Student and Program Learning Outcomes assessment and student recommendations.
7. Collaborating with other VVC Departments through co-developing classes and including other department's classes as electives in our Certificates, includes: Computer Science (Data Management classses); Construction Technology (Waste Water, Water Distribution classes); Electronics (Systems Control and Data Acquisition- SCADA classes), Political Science (Environmental Policy class).

Key strategic *planning in*itiatives are: Planning and Implementation of Career Technical (CTE) Pathways that allow students to begin in High School, transition to a focused two year course of study at VVC and seamlessly transfer via an AST degree to a university and/or achieve one or more Chancellor approved CTE Certificates and enter a career in this rapidly expanding field (Advisory Board recommendation)

Goal 1: Fully Implement Plant Science and Sustainable Agriculture CTE Pathway in 2019-2020 and 2020-2021 school years

Goal 2: Planning and Development of our Animal Science and Vet Assistant CTE Pathway2 019-2020 and 2020-2021 school years, full implementation in 2012-2022

Goal 3: Redesign and implementation of Geospatial, Watershed Management and Environmental Sciences and Natural Resources program and Certificates of Achievement

Personnel- New IA

Lyn and Neville thanked Dolores (new IA) and Belinda Serrano (Professional Expert) for reinvigorating the horticulture and green house program. Just completed our most successful plant sale/community outreach. Student moral in the department is extremely high with a very vibrant student club now helping with outreach and the plant sales. Neville discussed significant instructional and lab technician needs if we are to launch the “new” Lab Science classes and associated labs and field studies….

Infrastructure Improvements- Greenhouses; Labs- Seed, Ag Sciences and Animal Science; Facilities Refurbish

This year has significant refurbishing of horticulture labs and facilities, (includes conversion of a greenhouse into an AG Science/Soils Lab and a Hydroculture Lab, also have begun construction on the Animal Science Barn that will include an Animal Physiology Wet Lab. Financing was obtained from Bond JJ and Strong Work Force funding (mostly for lab stations, supplies and equipment).

1. **Introduce Agricultural Sciences and Natural Resource Management Pathway Feasibility Study**

(Attachment 2) Brian Hammer reinforced the need for a second full time instructor (Plant Sciences) and better labs and state of the art computers/equipment for the GIS/Geospatial Technologies Program, also the rewriting and chancellor approval of the Geospatial Technology, Watershed Management and Natural Resource Management Certificates of Achievement . He also expressed the need for more outreach. Neville stated that although VVC now employs an outreach coordinator they do not necessarily know our community and the need of the community. Neville and Tony expressed the need for counseling support that was focused on these pathways and our programs. Neville stated that some programs did get counseling support and this was extremely helpful when Melanie Dube Price was able to counsel our students under a CTE Grant several years ago. Belinda mentioned our need to collaborate with RCD and NRCS on specific restoration projects. Students can gain valuable work experience as Earth Team Volunteers and VVC can focus its plant production and student learning around the native plants and restoration techniques needed for projects with BLM, Fish and Wildlife, and others. Tony discussed that students are already assisting RCD in the Los Flores Ranch grazing and management project and that this includes soils, plant science and GIS experience. Carlos highlighted the need for Arboriculture and permaculture classes and certification, and the importance of food safety training for food inspectors and the food processing industry that is a strong component of our local agricultural industry. Tony Walters and Belinda discussed the need for education for an estimated 100+ “micro” farms that are focusing on tree crops –Jujube and pistachio and vegetables, this includes soils, plant and irrigation education and an increase in the workshops that we have collaborated on with MWA and RCD in the past and over the past year.

1. **Animal Science and Veterinary Assistant Pathway Feasibility Study**

(Attachment 3 )

1. **Curriculum Planning**: Review of Certificates; Schedules for 2019-2020; Articulation of Classes

Attachment 1- PRAISE Planning 2019-2022 Cycle

PRAISE 208-2019

**Program Goal 1**: Plant Sciences and Horticulture Program Enhancement Better serve Plant Sciences and Horticulture students by improving support for learning and labs in response to increased industry need

**Action Plan**: Curriculum development (redesign and simplify) CTE Certificates Deactivate-Landscape Irrigation Design; Environmental Horticulture and Restoration Technician- Spr 18 Reduce- Floral Design Technician to less than 12 units (Not requiring Chancellor office approval) Seek Chancellor office approval- Horticulture and Plant Sciences Specialist and Landscape Specialist to over 17 Industry Endorsement- Qualified Water Efficient Landscaper(QWEL)- EPA; CA Dept for Pesticide Reg.; Irrigation Ass. Update and reduce number of classes Deactivate AGNR 176- Advanced Irrigation All classes not updated in two years - 6 classes in 2017\_2018, final 6 in 2018\_2019, Seek VVC- General Education approval for AGNR 131 Soil Science (Spr 18) Laboratory and Technology classes Enhance curriculum for each Lab session in AGNR 122, 123, 140 (Spr 18) 131, 141, 150, 152 (2018-2020) Full lab documentation Lab and/or Technology Skill Project Descriptions Student Lab Report and/or Technology Skill Project Templates Equipment and Supplies Lists Re-Hire Environmental Horticulture Instructional Assistant/Greenhouse Manager Hire Full Time Horticulture/Plant Sciences Instructor Purchase industry appropriate technology/equipment (mechanized propagation, plant labeling equipment) Purchase lab supplies (Augment Instructional Supplies Budget from $3800 to $12000 p/a) Purchase Software licenses for Landscape Design package and Plant Materials and Identification Refurbish and Repair Facilities Roofs on two Greenhouses and Seed Lab Straw-Bale Entrance Fencing for seed production test plots

Goal Status: 1. Proposed Goal in Program Review 04/16/2019 Outcomes Assessment, Other (describe in next field) Justification/Description: PLO and SLO Assessment in 2016-2017 indicates need for improvement in Lab and Technology class in: Curriculum Improvement and reduced reliance on Adjunct Equipment purchase (Perkins)

Bettter Instructional/Lab Supplies (Grant Funded) Facilities Refurbishing and Improvement Type (hold ctrl to select all that apply): Ongoing expense Follow Up on Request: Request not funded, continued request Prioritize Item: High Priority Quantity: one- 10 month Cost: $75,000 1000 - New Faculty Hire - Full Time Horticulture/Plant Sciences Instructor (Active) Justification (hold ctrl and select all that apply): Outcomes Assessment, Safety, Decline/stasis of student success, Other (describe in next field) Justification/Description: This position is scheduled to be "re-located" to another department Nature of maintaining greenhouses and living plant materials for Horticulture Lab classes Infusion of new focus to this position will greatly improve student success Type (hold ctrl to select all that apply): Ongoing expense Follow Up on Request: Request funded, discontinue request Quantity: one Cost: $55,000, 12 month

Employeee 2000 - New Classified Hire - Re-Hire Instructional Assistant and Greenhouse Manager (IA-3) (Active) Justification (hold ctrl and select all that apply): Outcomes Assessment, Safety, Decline/stasis of student enrollment, Decline/stasis of student success, Other (describe in next field) Justification/Description: Need for Subject Matter Experts is justified by: Industry relevance to complete this work that is best done by industry professionals many of them who are our Adjunct already. Note: Partially funded for Spring 2018 by our BLM Grant- Continuation will be requested under SWP grant proposal for 2018\_2019 Type (hold ctrl to select all that apply): One-time Money Follow Up on Request: Request not funded - discontinue request Quantity: Four classes Cost: $64/hour x 48hours x 4= $12,288 5000 - Other Operating Expenses - Subject Matter Experts -48 hours to update curriculum on Lab/Technology Classes (Active)

PLO and SLO Assessment in 2016-2017 indicates need for improvement in Lab and Technology class Quantity: multiple Cost: $12000 4000 - Supplies and Materials - Seed and Horticulture Lab Supplies and Materials (Active) 04/16/2019 Generated by Nuventive Improve Page 2 of 9 Program Annual Planning and Augmentation: HSPSIT - Agriculture and Natural Resources in: Equipment purchase (Perkins) Better/More Supplies Partially Funded ($7000) in 2017-2018 by Rio Tinto and BLM Grants Type (hold ctrl to select all that apply): Ongoing expense Follow Up on Request: Request partially funded, continued request Prioritize Item: High Priority Justification (hold ctrl and select all that apply): Outcomes Assessment, Safety, Decline/stasis of student success, Other (describe in next field)

need for improvement in Lab and Technology class in: Facilities Refurbishing and Improvement- Funded by Bond JJ Funds in 2017\_2018 Type (hold ctrl to select all that apply): One-time Money Follow Up on Request: Request funded, discontinue request Prioritize Item: High Priority Quantity: Roofs on two Greenhouses and Seed Lab Straw-Bale Entrance Fencing for seed production test plots Cost: $45,000 5000 - Other Operating Expenses - Refurbish Facilities (Active) Justification (hold ctrl and select all that apply): Outcomes Assessment, Safety, Decline/stasis of student success Justification/Description: needed to align with industry trends. To be requested under Perkins and SWP funding Type (hold ctrl to select all that apply): One-time Money, Requested in Perkins Follow Up on Request: Request not funded, continued request Prioritize Item: High Priority Quantity: mechanized propagation plant labeling, Cost: $16,000 6000- Equipment - Purchase industry appropriate technology/equipment (Active) Justification/Description: Curriculum and program development- Partially funded under BLM grant in Spring 2018 ($10,000) to requested under SWP proposal for 2017-2018 Type (hold ctrl to select all that apply): One-time Money Follow Up on Request: Request not funded, continued request Prioritize Item: High Priority Quantity: 10 hrs/week x 32 weeks (Spring and Fall semesters) Cost: 10 x 32 x $68/hr= $21,760 5000 - Other Operating Expenses - Department Chair release time (Active) Justification (hold ctrl and select all that apply): Outcomes Assessment, Decline/stasis of student enrollment, Decline/stasis of student success Justification/Description: Exposure of students to Industry standard software Type (hold ctrl to select all that apply): Ongoing expense, Requested in Perkins Follow Up on Request: Request funded but is an ongoing request Quantity: 1 x Landscape Design package 1 x Plant Materials and Identification package Cost: $4000 5000 - Other Operating Expenses - Purchase Software licenses (

Attachment 2

**Agricultural Sciences and Natural Resource Management Pathway**

**Feasibility Study**

May 15, 2019 **Final**

**Plan Narrative**

This Agricultural Sciences and Natural Resource Management Pathway is designed to better serve agriculture and natural resource students by improving support for learning and labs in response to increased industry need that has developed over the past ten years. Growth and program focus is supported by AGNR Advisory recommendations and workforce trends/data. This includes a significant increase in the need for trained individuals in horticulture and the plant sciences.

These workforce trends are driven by:

a) Land use changes particularly fires and drought have dramatically increased the need for trained plant science/horticulture and land-use specialists that have skills in: soils conservation, integrated pest management, water conservation/irrigation, ecological restoration, native plant propagation/maintenance, and seed production.

b) California has continued to increase legislation and demand improved certification of workers in this field specifically; legislation in water supply (Governors 25% reduction mandate) and the 2017 Groundwater Sustainability Act have predicted that landscape and horticulture professionals must have certifications such as; Qualified Water Efficient Landscaper-EPA(QWEL)and Certified Landscape Irrigation Auditor - Irrigation Association(CLIA; Pesticide Applicator and Pest Control Advisor- CA Department of Pest Regulation; California's greenhouse gas legislation "AB 32" has led to significant changes in solid waste management legislation, specifically for vegetative/green waste (50% of the solid waste stream), must now be composted and no longer can be disposed at the solid waste facilities.

c) The legalization of Industrial Hemp and Marijuana in California and a production focus in the local municipalities of Hesperia and Adelanto have greatly increased the need for specialized propagation skills and horticulture/greenhouse management expertise.

In this "climate" of significant change and job growth this plan will address these needs by the following enhancements to curriculum and the program:

1. Refining a two year focused course of study that allows students to take a single class or several classes to achieve 3 stackable Career Technical Certificate of Achievement

* Floral Design- 11or 12 units
* Plant Science and Sustainable Agriculture- 22- 25 units
* Horticulture and Landscaping- 24-27 units.

Students will also be positioned to receive a Associates Degree in Environmental Horticulture and/or take advantage of seamless transfer via the Agriculture and Plant Sciences Associates Transfer Degree (ADT) to a university (several higher level and government jobs require a four-year degree) and enter a career in this rapidly expanding field.

2. Partner with local High Schools to make college classes available to high school students and facilitate their access to a college education and explore career options. AGNR has traditionally responded by offering this access via: Concurrent Enrollment and CTE Articulation Agreements. This plan will facilitate the further introduction of the Career and College Pathway (CCAP)/Dual Enrollment for at least three AGNR classes and up to eight sections into Local High Schools.

3. Teach the key sciences needed to compete in this career field, to include:

a. Plant/Horticulture Sciences

b. Soil Science

c. Water Science

d. Geographic Information Science

e. Environmental Sciences

4. Teach the key work and technology skills needed to compete in this career field, to include:

a. Propagation and Tissue Culture Techniques

b. Seed Collection, Evaluation, and Processing Techniques

c. Irrigation and Landscape Design

d. Integrated Pest Management

e. Plant Materials Usage and Identification

f. Greenhouse and Nursery Management Skills

g. Floral Design

h. Composting and Vermiculture

I. Geographic Information Systems (GIS)

j. Soil and Water Analysis Technologies

5. Linkages to other VVC Departments by co-developing classes and including other Department's classes as electives in our Certificates: Computer Science (Data Management); Political Science (Environmental Policy).

6. Developing industry relevant CTE classes and industry recognized certificates that prepare students for entry into careers in this sector and facilitate industry required license exams. Examples include: Qualified Water Efficient Landscaper (QWEL-EPA); Irrigation Technician and Auditor (Irrigation Association); Pest Control Advisor (PCA)-California Pest Control Dept.

7. Maintain and enhance multiple Community and Industry Partnerships/Relationships (current total of 18) via: AGNR staff serving on the boards of community organizations; volunteering in multiple community outreach events; having professionals teach as adjunct; industry professionals serving on AGNR Advisory Board, offering guest lectures, internships and mentoring our students. Educational relevance is also enhanced by “hands-on” experiential learning through our labs and field study experiences. Examples include: serving on the Alliance for Water and Conservation (AWAC); Irrigation and Water Management Workshops with the Mojave Desert Resource Conservation District (MDRCD), Mojave Water Agency (MWA) and Victor Valley Waste Water Authority (VVWRA) and Work Experience/Internships with local agencies and industry that enhance on the job soft and real-world skills.

**Department Data**

The implementation of this Pathway and these COA’s will continue to improve AGNR Department enrollment. Partial implementation of these classes has begun, resulting in:

**FTES**- 12.2% increase in FTES from 2015-2016 (82.7) to 2016-2017 (94.9) school year and 6% in 2017-2018 (**99 FTES**)

**Enrollment-** growth of 16% in 2016-2017 over 2015-2016 and a further 6% in 2017-2018 **Student Retention** saw a 7.6 % increase in from 2015-2016 (86.9%) to 2016-2017 (93.5%) school year and 1% in 2017-2018 (94.5%)

**These trends are expected increase with the full introduction of this pathway, new labs, technology training and a focused course of study**

**Important Needs** (Source of Funds in Blue)

1. **New Full-Time Agriculture/Plant Sciences Instructor** to implement CTE Pathway in 2019-2020 and continue building curriculum/labs and implement the curriculum**.** Teach science and technical rich classes**. PRAISE**

**Note**: Neville Slade, MSC in Animal Physiology and 25 years’ experience in animal health/veterinary science would then assume development, full implementation and teaching of the Animal Science and Veterinary Assistant Pathway in 2020-2021. Best practice would therefore be to hire a new Plant Science and Sustainable Agriculture instructor first (see attached Plant Sciences and Sustainable Agriculture Career Pathway) to assume his current teaching load in this focus area.

1. **Educational Supplies Augmentation** new continuing budget for this program that does not exist at present- $12,000 **SWF and PRAISE**
2. **Capital Improvement** to build and provide furniture for resource Agriculture Science Lab and AGNR Computer Lab **SWF**
3. **Equipment** to resource Agriculture Science Lab and AGNR Computer Lab **SWF 3PERKINS**
4. **Program Coordinator** to oversee evaluation, strengthening, and revision of the curriculum and direct program development to ensure relevance and alignment from education to employment **PRAISE and SWF**
5. **Faculty Curriculum Stipends** for building, strengthening, and revision of the classes in which Full-time Instructor (Neville Slade) does not have expertise, to include: course outline; unit detail (content and assignments); resources needed; labs and assessments. Lab updates will include -full Lab documentation (Lab and/or Technology Skill Project Descriptions, Student Lab Report and/or Technology Skill Project Templates and Equipment/ Supplies Lists. **SWF 3 and PRAISE**
6. **Laboratory Technician** to resource and assist with Agriculture Science Lab and AGNR Computer Lab **PRAISE**

Note partially paid for needed Supplies and Equipment accomplished with Residual Perkins funds in Spring 2019 ($56,000)- with an additional $94,609.08needed to facilitate the functionality of these labs and lab classes in 2019-2020 school year, see SWF 3 Budget below

**Praise Alignment**

Goal #1- Develop and Implement Plant Sciences and Sustainable Agriculture Career Pathway

Attachment 1

**Labor Market-LMI-Data**

Local Advisory to meets biannually - next meeting May, 2018.

Workforce data for this plan is aggregated from several sources, given that several of the job categories are new and emerging and are captured in various reports.

Includes:

1) LMI Resource Library

2) OneNet

3) Job Scans from Centers for Excellence

Trends for the Agricultural and Natural Resource Careers

It is important to note several trends and special circumstances that underlie this rapidly evolving field of study. The Environmental Sciences (soil science, plant science, animal science, environmental science, geographic information science) prepare students for a very wide range of careers. Some of these careers particularly those in government agencies require a bachelor’s degree for significant advancement, particularly in government Agencies. The nature of the agriculture and natural resources industry in California and the location of Victor Valley College allow students to access jobs in several contiguous counties – Los Angeles, Riverside and Kern Counties. These are particularly important because San Bernardino County provides much of the natural resources to the population centers in these counties and Kern County is one of the most important agricultural counties in the United States. This Plant Sciences pathway with the AST degree option provides one of very few mechanisms for an estimated 40% of High School Graduates to seamlessly transfer to these majors in the Cal State System given that only less than 10% of HS seniors are transfer directly to a University.

Career Categories LMI Data

Nursery and Greenhouse Managers - 11-9013.01

Projected Employment for Farmers, Ranchers, and Other Agricultural Managers, including Nursery and Greenhouse Managers in CALIFORNIA

Median wages (2016) $31.91 hourly, $66,360 annual

Employment (2016) 1,029,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +20% Job Growth

Projected job openings (2016-2026) 84,800

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (27% employed in this sector)

(see all industries)

Farm and Ranch Managers - 11-9013.02

Projected Employment for Farmers, Ranchers, and Other Agricultural Managers, including Farm and Ranch Managers in CALIFORNIA

Median wages (2016) $31.91 hourly, $66,360 annual

Employment (2016) 1,029,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +20% Growth

Projected job openings (2016-2026) 84,800

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (27% employed in this sector)

(see all industries)

Soil and Water Conservationists - 19-1031.01

Projected Employment for Conservation Scientists, including Soil and Water Conservationists in CALIFORNIA

Median wages (2016) $29.72 hourly, $61,810 annual

Employment (2016) 22,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +17% Growth

Projected job openings (2016-2026) 2,000

Top industries (2016) Government (75% employed in this sector)

Other Services (Except Public Administration) (12%)

(see all industries)

Agricultural Engineers - 17-2021.00

Projected Employment for Agricultural Engineers in CALIFORNIA

Median wages (2016) $35.40 hourly, $73,640 annual

Employment (2016) 3,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino No Data Available

Projected job openings (2016-2026) 200

Top industries (2016) Government (23% employed in this sector)

Professional, Scientific, and Technical Services (23%)

Agriculture, Forestry, Fishing, and Hunting (21%)

(see all industries)

Range Managers - 19-1031.02

Projected Employment for Conservation Scientists, including Range Managers in CALIFORNIA

Median wages (2016) $29.72 hourly, $61,810 annual

Employment (2016) 22,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +17% Growth

Projected job openings (2016-2026) 2,000

Top industries (2016) Government (75% employed in this sector)

Other Services (Except Public Administration) (12%)

(see all industries)

Forest and Conservation Technicians - 19-4093.00

Projected Employment for Forest and Conservation Technicians in CALIFORNIA

Median wages (2016) $17.10 hourly, $35,560 annual

Employment (2016) 33,000 employees

Projected growth (2016-2026) Slower than average (2% to 4%)

California/Riverside/San Bernardino +3% Growth

Projected job openings (2016-2026) 4,000

Top industries (2016) Government (92% employed in this sector)

(see all industries)

Farm and Home Management Advisors - 25-9021.00

Projected Employment for Farm and Home Management Advisors in CALIFORNIA

Median wages (2016) $23.79 hourly, $49,490 annual

Employment (2016) 10,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino No Data Available

Projected job openings (2016-2026) 1,000

Top industries (2016) Educational Services (74% employed in this sector)

Government (14%)

(see all industries)

Floral Designers - 27-1023.00

Projected Employment for Floral Designers in CALIFORNIA

Median wages (2016) $12.43 hourly, $25,850 annual

Employment (2016) 55,000 employees

Projected growth (2016-2026) Decline (-2% or lower)

California/Riverside/San Bernardino +12% Growth

Projected job openings (2016-2026) 4,600

Top industries (2016) Retail Trade (72% employed in this sector)

(see all industries)

First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers - 37-1012.00

Projected Employment for First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers in CALIFORNIA

Median wages (2016) $21.99 hourly, $45,740 annual

Employment (2016) 178,000 employees

Projected growth (2016-2026) Faster than average (10% to 14%)

California/Riverside/San Bernardino +10% Growth

Projected job openings (2016-2026) 19,000

Top industries (2016) Administrative and Support Services (35% employed in this sector)

(see all industries)

Pest Control Workers - 37-2021.00

Projected Employment for Pest Control Workers in CALIFORNIA

Median wages (2016) $15.88 hourly, $33,040 annual

Employment (2016) 79,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +4% Growth

Projected job openings (2016-2026) 11,600

Top industries (2016) Administrative and Support Services (89% employed in this sector)

(see all industries)

Landscaping and Grounds-Keeping Workers - 37-3011.00

Projected Employment for Landscaping and Grounds-Keeping Workers in CALIFORNIA

Median wages (2016) $12.65 hourly, $26,320 annual

Employment (2016) 1,198,000 employees

Projected growth (2016-2026) Faster than average (10% to 14%)

California/Riverside/San Bernardino +11% Growth

Projected job openings (2016-2026) 161,100

Top industries (2016) Administrative and Support Services (46% employed in this sector)

(see all industries)

Pesticide Handlers, Sprayers, and Applicators, Vegetation - 37-3012.00

Projected Employment for Pesticide Handlers, Sprayers, and Applicators, Vegetation in CALIFORNIA

Median wages (2016) $16.22 hourly, $33,740 annual

Employment (2016) 38,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +12% Growth

Projected job openings (2016-2026) 4,900

Top industries (2016) Administrative and Support Services (37% employed in this sector)

Agriculture, Forestry, Fishing, and Hunting (19%)

Wholesale Trade (12%)

(see all industries)

Tree Trimmers and Pruners - 37-3013.00

Projected Employment for Tree Trimmers and Pruners in CALIFORNIA

Median wages (2016) $16.84 hourly, $35,030 annual

Employment (2016) 55,000 employees

Projected growth (2016-2026) Faster than average (10% to 14%)

California/Riverside/San Bernardino +9% Growth

Projected job openings (2016-2026) 7,400

Top industries (2016) Administrative and Support Services (64% employed in this sector)

(see all industries)

First-Line Supervisors of Agricultural Crop and Horticultural Workers - 45-1011.07

Projected Employment for First-Line Supervisors of Farming, Fishing, and Forestry Workers, including First-Line Supervisors of Agricultural Crop and Horticultural Workers in CALIFORNIA

Median wages (2016) $21.79 hourly, $45,320 annual

Employment (2016) 49,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +9% Growth

Projected job openings (2016-2026) 6,700

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (70% employed in this sector)

(see all industries)

Agricultural Inspectors - 45-2011.00

Projected Employment for Agricultural Inspectors in CALIFORNIA

Median wages (2016) $20.58 hourly, $42,800 annual

Employment (2016) 16,000 employees

Projected growth (2016-2026) Average (5% to 9%)

California/Riverside/San Bernardino +15% Growth

Projected job openings (2016-2026) 2,200

Top industries (2016) Government (73% employed in this sector)

(see all industries)

Nursery Workers - 45-2092.01

Projected Employment for Farmworkers and Laborers, Crop, Nursery, and Greenhouse, including Nursery Workers in CALIFORNIA

Median wages (2016) $10.58 hourly, $22,000 annual

Employment (2016) 504,000 employees

Projected growth (2016-2026) Little or no change (-1% to 1%)

California/Riverside/San Bernardino +12% Growth

Projected job openings (2016-2026) 76,800

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (88% employed in this sector)

(see all industries)

Farmworkers and Laborers, Crop - 45-2092.02

Projected Employment for Farmworkers and Laborers, Crop, Nursery, and Greenhouse in CALIFORNIA

Median wages (2016) $10.58 hourly, $22,000 annual

Employment (2016) 504,000 employees

Projected growth (2016-2026) Little or no change (-1% to 1%)

California/Riverside/San Bernardino +12% Growth

Projected job openings (2016-2026) 76,800

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (88% employed in this sector)

(see all industries)

Farm-workers, Farm, Ranch,Animals and Aquaculture – 45-2093.00

Projected Employment for Farm-workers, Farm, Ranch, and Aquaculture in CA

Median wages (2016) $11.79 hourly, $24,520 annual

Employment (2016) 268,000 employees

Projected growth (2016-2026) Decline (-2% or lower)

California/Riverside/San Bernardino Growth +4%

Projected job openings (2016-2026) 38,600

Top industries (2016) Agriculture, Forestry, Fishing, and Hunting (92% employed in this sector)

(see all industries)

Forest and Conservation Workers - 45-4011.00

Projected Employment for Forest and Conservation Workers in CALIFORNIA

Median wages (2016) $12.95 hourly, $26,940 annual

Employment (2016) 14,000 employees

Projected growth (2016-2026) Little or no change (-1% to 1%)

California/Riverside/San Bernardino +10% Growth

Projected job openings (2016-2026) 2,200

Top industries (2016) Government (39% employed in this sector)

Agriculture, Forestry, Fishing, and Hunting (35%)

(see all industries)

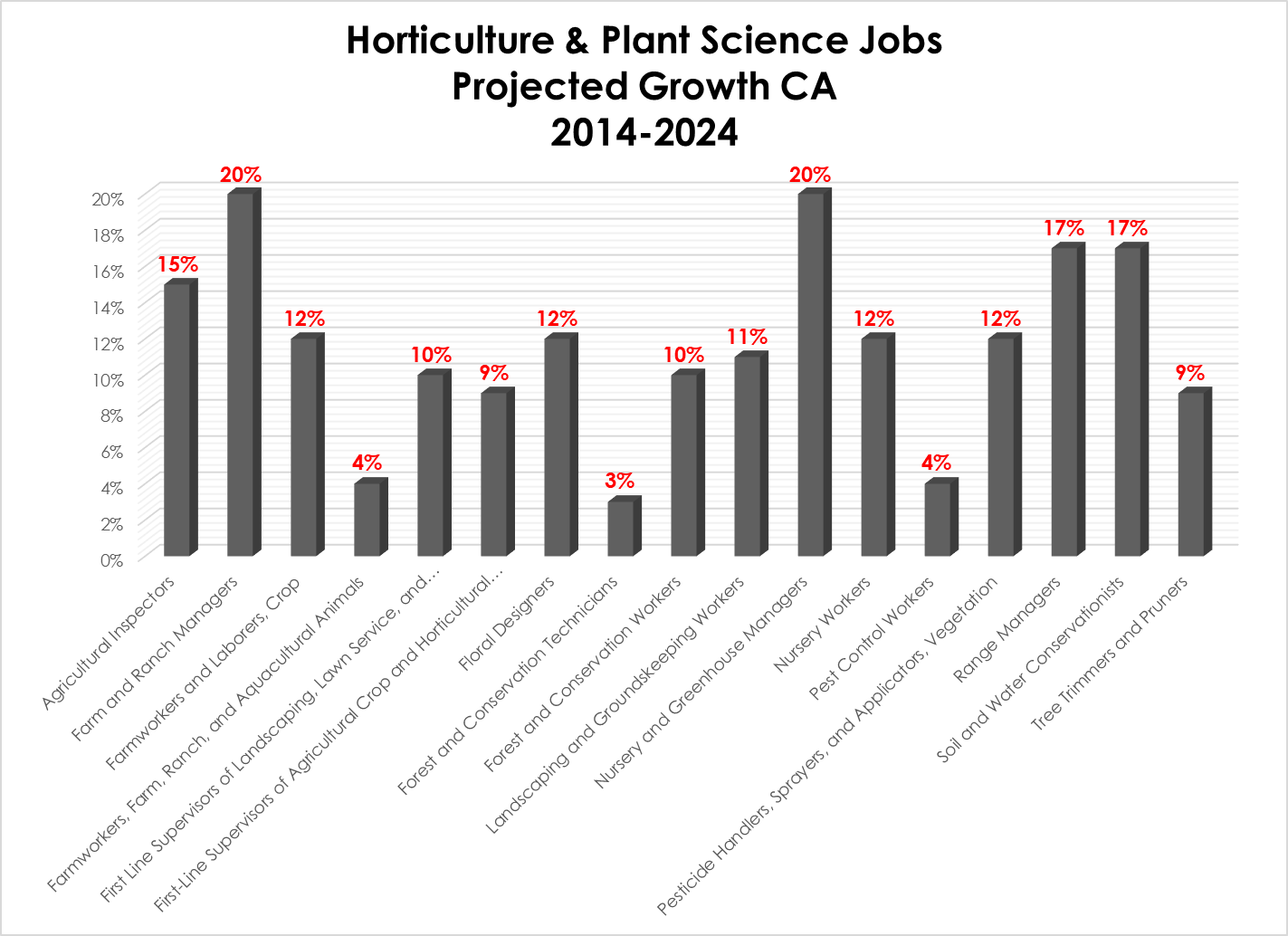
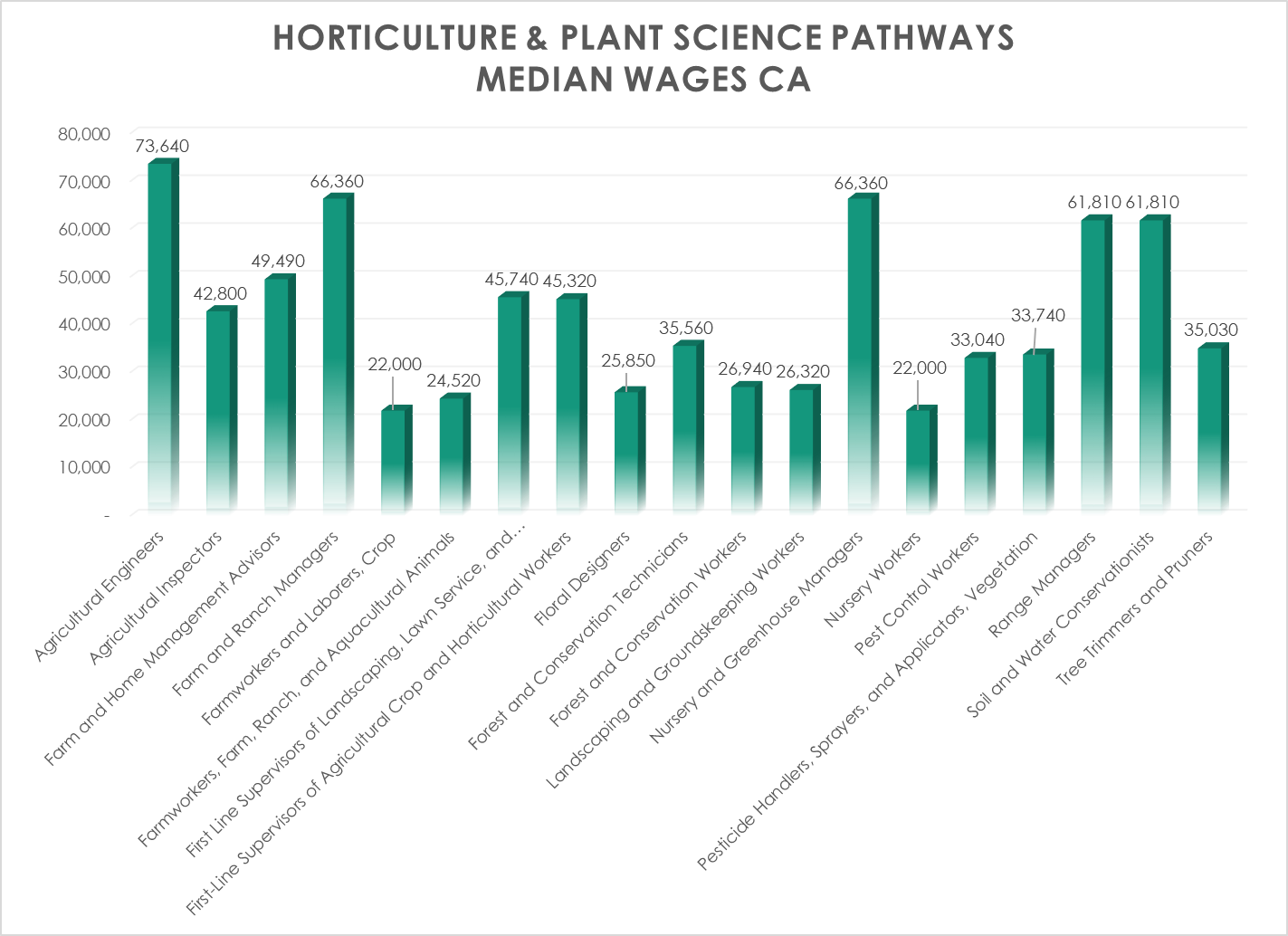
**Employment Trends for the Agricultural Sciences and Natural Resource Management Pathway**

Introduction

It is important to note several trends and special circumstances that underlie this rapidly evolving field of study. The Environmental Sciences (soil science, plant science, animal science, environmental science, geographic information science) prepare students for a very wide range of careers. Many of these careers particularly those in government agencies require a bachelor’s degree for significant advancement\*. The nature of the agriculture and natural resources industry in California and the location of Victor Valley College allow students to access jobs in several contiguous counties – Los Angeles, Riverside and Kern Counties. These are particularly important because San Bernardino County provides much of the natural resources to the population centers in these counties and Kern County is one of the most important agricultural counties in the United States.

\*This ESNR pathway with the AST degree option provides one of very few mechanisms for an estimated 40% of High School Graduates to seamlessly transfer to these majors in the Cal State System given that only less than 10% of HS seniors are transfer directly to a University.



** **

**Nursery and Greenhouse Managers - 11-9013.01**

**Projected Employment for Farmers, Ranchers, and Other Agricultural Managers, including Nursery and Greenhouse Managers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $31.91 hourly, $66,360 annual |
|  | |
| **Employment (2016)** | 1,029,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +20% Job Growth |
| **Projected job openings (2016-2026)** | 84,800 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=11-9013.01&i=11) (27% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/11-9013.01) |

**Farm and Ranch Managers - 11-9013.02**

**Projected Employment for Farmers, Ranchers, and Other Agricultural Managers, including Farm and Ranch Managers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $31.91 hourly, $66,360 annual |
|  | |
| **Employment (2016)** | 1,029,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +20% Growth |
| **Projected job openings (2016-2026)** | 84,800 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=11-9013.02&i=11) (27% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/11-9013.02) |

**Soil and Water Conservationists - 19-1031.01**

**Projected Employment for Conservation Scientists, including Soil and Water Conservationists in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $29.72 hourly, $61,810 annual |
|  | |
| **Employment (2016)** | 22,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +17% Growth |
| **Projected job openings (2016-2026)** | 2,000 |
|  | |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=19-1031.01&i=93) (75% employed in this sector)  [Other Services (Except Public Administration)](https://www.onetonline.org/find/industry?j=19-1031.01&i=81) (12%)  [(see all industries)](https://www.onetonline.org/link/industry/19-1031.01) |

**Agricultural Engineers - 17-2021.00**

**Projected Employment for Agricultural Engineers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $35.40 hourly, $73,640 annual |
|  | |
| **Employment (2016)** | 3,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino No Data Available |
| **Projected job openings (2016-2026)** | 200 |
|  | |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=17-2021.00&i=93) (23% employed in this sector)  [Professional, Scientific, and Technical Services](https://www.onetonline.org/find/industry?j=17-2021.00&i=54) (23%)  [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=17-2021.00&i=11) (21%)  [(see all industries)](https://www.onetonline.org/link/industry/17-2021.00) |

**Range Managers - 19-1031.02**

**Projected Employment for Conservation Scientists, including Range Managers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $29.72 hourly, $61,810 annual |
|  | |
| **Employment (2016)** | 22,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +17% Growth |
| **Projected job openings (2016-2026)** | 2,000 |
|  | |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=19-1031.02&i=93) (75% employed in this sector)  [Other Services (Except Public Administration)](https://www.onetonline.org/find/industry?j=19-1031.02&i=81) (12%)  [(see all industries)](https://www.onetonline.org/link/industry/19-1031.02) |

**Forest and Conservation Technicians - 19-4093.00**

**Projected Employment for Forest and Conservation Technicians in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $17.10 hourly, $35,560 annual |
|  | |
| **Employment (2016)** | 33,000 employees |
| **Projected growth (2016-2026)** | Slower than average (2% to 4%) Slower than average (2% to 4%)  California/Riverside/San Bernardino +3% Growth |
| **Projected job openings (2016-2026)** | 4,000 |
|  | |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=19-4093.00&i=93) (92% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/19-4093.00) |

**Farm and Home Management Advisors - 25-9021.00**

**Projected Employment for Farm and Home Management Advisors in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $23.79 hourly, $49,490 annual |
|  | |
| **Employment (2016)** | 10,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino No Data Available |
| **Projected job openings (2016-2026)** | 1,000 |
|  | |
| **Top industries (2016)** | [Educational Services](https://www.onetonline.org/find/industry?j=25-9021.00&i=61) (74% employed in this sector)  [Government](https://www.onetonline.org/find/industry?j=25-9021.00&i=93) (14%)  [(see all industries)](https://www.onetonline.org/link/industry/25-9021.00) |

**Floral Designers - 27-1023.00**

**Projected Employment for Floral Designers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $12.43 hourly, $25,850 annual |
|  | |
| **Employment (2016)** | 55,000 employees |
| **Projected growth (2016-2026)** | Decline (-2% or lower) Decline (-2% or lower)  California/Riverside/San Bernardino +12% Growth |
| **Projected job openings (2016-2026)** | 4,600 |
|  | |
| **Top industries (2016)** | [Retail Trade](https://www.onetonline.org/find/industry?j=27-1023.00&i=44) (72% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/27-1023.00) |

**First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers - 37-1012.00**

**Projected Employment for First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $21.99 hourly, $45,740 annual |
|  | |
| **Employment (2016)** | 178,000 employees |
| **Projected growth (2016-2026)** | Faster than average (10% to 14%) Faster than average (10% to 14%)  California/Riverside/San Bernardino +10% Growth |
| **Projected job openings (2016-2026)** | 19,000 |
|  | |
| **Top industries (2016)** | [Administrative and Support Services](https://www.onetonline.org/find/industry?j=37-1012.00&i=56) (35% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/37-1012.00) |

**Pest Control Workers - 37-2021.00**

**Projected Employment for Pest Control Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $15.88 hourly, $33,040 annual |
|  | |
| **Employment (2016)** | 79,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +4% Growth |
| **Projected job openings (2016-2026)** | 11,600 |
|  | |
| **Top industries (2016)** | [Administrative and Support Services](https://www.onetonline.org/find/industry?j=37-2021.00&i=56) (89% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/37-2021.00) |

**Landscaping and Groundskeeping Workers - 37-3011.00**

**Projected Employment for Landscaping and Groundskeeping Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $12.65 hourly, $26,320 annual |
|  | |
| **Employment (2016)** | 1,198,000 employees |
| **Projected growth (2016-2026)** | Faster than average (10% to 14%) Faster than average (10% to 14%)  California/Riverside/San Bernardino +11% Growth |
| **Projected job openings (2016-2026)** | 161,100 |
|  | |
| **Top industries (2016)** | [Administrative and Support Services](https://www.onetonline.org/find/industry?j=37-3011.00&i=56) (46% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/37-3011.00) |

**Pesticide Handlers, Sprayers, and Applicators, Vegetation - 37-3012.00**

**Projected Employment for Pesticide Handlers, Sprayers, and Applicators, Vegetation in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $16.22 hourly, $33,740 annual |
|  | |
| **Employment (2016)** | 38,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +12% Growth |
| **Projected job openings (2016-2026)** | 4,900 |
|  | |
| **Top industries (2016)** | [Administrative and Support Services](https://www.onetonline.org/find/industry?j=37-3012.00&i=56) (37% employed in this sector)  [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=37-3012.00&i=11) (19%)  [Wholesale Trade](https://www.onetonline.org/find/industry?j=37-3012.00&i=42) (12%)  [(see all industries)](https://www.onetonline.org/link/industry/37-3012.00) |

**Tree Trimmers and Pruners - 37-3013.00**

**Projected Employment for Tree Trimmers and Pruners in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $16.84 hourly, $35,030 annual |
|  | |
| **Employment (2016)** | 55,000 employees |
| **Projected growth (2016-2026)** | Faster than average (10% to 14%) Faster than average (10% to 14%)  California/Riverside/San Bernardino +9% Growth |
| **Projected job openings (2016-2026)** | 7,400 |
|  | |
| **Top industries (2016)** | [Administrative and Support Services](https://www.onetonline.org/find/industry?j=37-3013.00&i=56) (64% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/37-3013.00) |

**First-Line Supervisors of Agricultural Crop and Horticultural Workers - 45-1011.07**

**Projected Employment for First-Line Supervisors of Farming, Fishing, and Forestry Workers, including First-Line Supervisors of Agricultural Crop and Horticultural Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $21.79 hourly, $45,320 annual |
|  | |
| **Employment (2016)** | 49,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +9% Growth |
| **Projected job openings (2016-2026)** | 6,700 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=45-1011.07&i=11) (70% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/45-1011.07) |

**Agricultural Inspectors - 45-2011.00**

**Projected Employment for Agricultural Inspectors in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $20.58 hourly, $42,800 annual |
|  | |
| **Employment (2016)** | 16,000 employees |
| **Projected growth (2016-2026)** | Average (5% to 9%) Average (5% to 9%)  California/Riverside/San Bernardino +15% Growth |
| **Projected job openings (2016-2026)** | 2,200 |
|  | |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=45-2011.00&i=93) (73% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/45-2011.00) |

**Nursery Workers - 45-2092.01**

**Projected Employment for Farmworkers and Laborers, Crop, Nursery, and Greenhouse, including Nursery Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $10.58 hourly, $22,000 annual |
|  | |
| **Employment (2016)** | 504,000 employees |
| **Projected growth (2016-2026)** | Little or no change (-1% to 1%) Little or no change (-1% to 1%)  California/Riverside/San Bernardino +12% Growth |
| **Projected job openings (2016-2026)** | 76,800 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=45-2092.01&i=11) (88% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/45-2092.01) |

**Farmworkers and Laborers, Crop - 45-2092.02**

**Projected Employment for Farmworkers and Laborers, Crop, Nursery, and Greenhouse in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $10.58 hourly, $22,000 annual |
|  | |
| **Employment (2016)** | 504,000 employees |
| **Projected growth (2016-2026)** | Little or no change (-1% to 1%) Little or no change (-1% to 1%)  California/Riverside/San Bernardino +12% Growth |
| **Projected job openings (2016-2026)** | 76,800 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=45-2092.02&i=11) (88% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/45-2092.02) |

**Farmworkers, Farm, Ranch, and Aquacultural Animals –**

**45-2093.00**

**Projected Employment for Farmworkers, Farm, Ranch, and Aquacultural Animals in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $11.79 hourly, $24,520 annual |
|  | |
| **Employment (2016)** | 268,000 employees |
| **Projected growth (2016-2026)** | Decline (-2% or lower) Decline (-2% or lower)  California/Riverside/San Bernardino Growth +4% |
| **Projected job openings (2016-2026)** | 38,600 |
|  | |
| **Top industries (2016)** | [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=45-2093.00&i=11) (92% employed in this sector)  [(see all industries)](https://www.onetonline.org/link/industry/45-2093.00) |

**Forest and Conservation Workers - 45-4011.00**

**Projected Employment for Forest and Conservation Workers in CALIFORNIA**

|  |  |
| --- | --- |
| **Median wages (2016)** | $12.95 hourly, $26,940 annual |
|  | |
| **Employment (2016)** | 14,000 employees |
| **Projected growth (2016-2026)** | Little or no change (-1% to 1%) Little or no change (-1% to 1%)  California/Riverside/San Bernardino +10% Growth |
| **Projected job openings (2016-2026)** | 2,200 |
| **Top industries (2016)** | [Government](https://www.onetonline.org/find/industry?j=45-4011.00&i=93) (39% employed in this sector)  [Agriculture, Forestry, Fishing, and Hunting](https://www.onetonline.org/find/industry?j=45-4011.00&i=11) (35%)  [(see all industries)](https://www.onetonline.org/link/industry/45-4011.00) |

Attachment 3

**Animal Science and Veterinary Assistant Pathway**

**Feasibility Study**

MAY 15, 2019 **Final**

**Introduction**

Animal production is being asked to be sustainable-more economically, environmentally and socially responsible. In California, rapid housing development and new policies, such as Proposition 2 (the humane treatment of livestock) are encouraging new practices and technologies in all aspects of the industry, from managing animal waste to confined animal housing. This focus on sustainability is intensified by public concerns about genetically modified organisms, industrial scale/factory farming, food safety, antibiotic use and animal cruelty. A new breed of managers and technicians must adapt to these changes and have the skills to apply these technologies.

This curriculum focuses on giving students a basic understanding of animal anatomy and physiology, animal health and issues in animal production that underlie a sustainable food supply. Competencies taught include Animal Science, Animal Nutrition, Animal Health, and Veterinary Science and required Agricultural Sciences including Plant Science and Soil Science.

Focus is on:

1. Development and implementation of industry relevant classes and three new “stackable” Certificates of Achievement (COA) in: Animal Science, Veterinary Assistant and Equine Science. These COA’s were developed under direction of our long-standing AGNR Advisory Board (includes leaders from K12 Education, Community, Industry and Government Agencies) and our faculty, who are actively engaged in local agriculture. (Attachment 1)
2. Teaching the applied agricultural sciences of Animal Science, Soil Science, Plant Science, and Veterinary Science in an experiential environment of labs, field studies and internships. These Ag Sciences develop the basic scientific concepts needed to grow healthy pastures and other animal feed. Also required sciences for an associate transfer degree in Animal Science (to be implemented 2019-2020 school year).
3. Teaching appropriate skills in applied technologies including Endoscopy, Ultrasound, Embryo Transfer, Artificial Insemination, nutritional analysis, weight gain analysis and genetics.
4. Continuing the close relationships and outreach to local high schools, including increasing the number of classes taught on high school campuses as Dual Enrollment (CCAP) or regular VVC classes after hours. Also increase number of fully articulated classes available for cross-credit.
5. Expand the scope of industry professionals including veterinarians serving on AGNR Advisory Board- teaching classes, offering guest lectures, internships and mentoring our students.
6. Implementing a two year focused "Course of Study" under this Pathway that allows students to achieve a Chancellor approved CTE-COA certificate and transfer seamlessly via the new Agricultural Animal Science Associate Transfer Degree (ADT) if need be.
7. Other drivers in this planning include: CTE educational mandates, legislation, community needs, workforce trends, and internal program outcomes assessment and student recommendations.

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The implementation of this Pathway and these COA’s will continue to improve AGNR Department enrollment. Partial implementation of these classes has begun, resulting in: growth of 16% in 2016-2017 over 2015-2016 and 12.2% increase in FTES from 2015-2016 (82.7) to 2016-2017 (94.9) school year. This rate of enrollment increase is predicted to continue under this plan. Student Retention saw a 7.6 % increase in from 2015-2016 (86.9%) to 2016-2017 (93.5%) school year.

**Career Analysis**

Empirical data indicates Career/Job Placement is improving and median wage will do likewise. Local community job needs in this field are showing significant increase as identified by the AGNR Advisory Board and the LMI data (see Attachment 2).

It is important to note several trends and special circumstances that underlie this rapidly evolving field of study. The Agricultural Sciences (soil science, plant science, animal science, environmental science) prepare students for a very wide range of careers. Many of these careers particularly those in government agencies require a bachelors degree for significant advancement\*.

The nature of the agriculture industry in California and the location of Victor Valley College allow students to access jobs in several contiguous counties – Los Angeles, Riverside and Kern Counties. These are particularly important because San Bernardino County provides provides personnel and resources to the population centers in these counties and Kern County is one of the most important agricultural counties in the United States.

\*These COA’s and the Associates Degree Transfer (ADT) degree option provides one of very few mechanisms for an estimated 40% of local High School Graduates to seamlessly transfer to these majors in the Cal State System given that only less than 10% of local HS seniors transfer directly to an University.

It is also important to note that Agriculture is extremely inportant to California with approximately 10.1% percent of the California economy and that animal and crop production are integrally associated and animal agriculture is inextricably linked to Environmental, Social and Ecconomic Sustainability-see exerpts from “California Agricultural Cluster Final Report”- January 31 2019

There are many jobs available that relate to animal and veterinary science and increasingly these jobs require some type of education beyond high school. Jobs may require an associate’s degree, a bachelor’s degree and even a master’s degree.

**Career Opportunities in Animal/Vet Science**

|  |  |  |
| --- | --- | --- |
| **Veterinary Medicine** | **Meat or Dairy Foods** | **Service Organizations** |
| Practice | Product Development | Extension Service |
| Research/Product Development | Quality Control | Natural Resource Cons. Serv. |
| Teaching | Distribution/Marketing | USDA |
| Inspection | **Technology** | Teaching |
| **Livestock Promo/Marketing** | Laboratory Technician | **Management** |
| Breed Organizations | Research Scientist | Farm and Ranch |
| Livestock Publications | Genetics/Animal Breeding | Sales/Marketing |
| Livestock Sales | Reproductive Management | Banks |
| **Sales** | Endocrinology |  |
| Agricultural Sales | Embryo Technology |  |
| Feed | Nutrition |  |
| Pharmaceuticals/Chemicals | Food Science |  |
| Livestock Supplies | Food Processing |  |
|  | Food Safety |  |

**Important Needs**

1. **Program Coordinator** to oversee evaluation, strengthening, and revision of the curriculum and direct program development to ensure relevance and alignment from education to employment. Oversee program implementation and Outreach. SWF
2. **New Full-Time Instructor** to continue building curriculum/labs and implement the curriculum**.** Teach science and technical rich classes. Note: Neville Slade, MSC in Animal Physiology and 25 years’ experience in animal health/veterinary science could assume development, implementation and teaching of these classes. Best practice would therefore be to hire a new Plant Science and Sustainable Agriculture instructor to assume his current teaching load and therefore be able to focus in this area. PRAISE
3. **Faculty Curriculum** Stipends for building, strengthening, and revision of the classes in which Neville Slade does not have expertise, to include: course outline; unit detail (content and assignments); resources needed; labs and assessments. Lab updates will include -full Lab documentation (Lab and/or Technology Skill Project Descriptions, Student Lab Report and/or Technology Skill Project Templates and Equipment/ Supplies Lists. Classes are:

AGNR 101L Livestock Feeding and Nutrition (Duane Penfold); AGNR 102 Equine Science (Melanie Dube Price); AGNR 108 Animal Health and Sanitation; (Dr. Kathy Linde). SWF

1. **Laboratory Technician** to resource and assist with Agricultural Science labs to exclude Horticulture and Plant Science that is responsibility of Instructional Assistant PRAISE and SWF
2. **Educational Supplies Augmentation** new budget for this program that does not exist at present

$ 10,000 PRAISE and SWF

1. **Capital/Equipment** to resource Animal Health Wet Lab and Animal Science/Ag. Science lab ). SWF and POerkins

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Attachment 1: **Certificate of Achievement Narrative**

Program Goals and Objectives

Agriculture and food production have become a major sustainability issue as our society struggles to meet the needs of a world population of over 7 Billion. In the animal industry, the reality of just how to produce enough animal based food products with dwindling natural resources, is exacerbated by the social and ethical issues of factory farming/confined feeding operations, food safety, antibiotic use and animal cruelty. Careers in the public and private entities that are responsible for animal production, animal health, and wildlife management are therefore expanding rapidly as the critical nature of these issues become more apparent. Individuals that are trained in animal sciences will be prepared to take advantage of these exciting career opportunities. Prepares student for employment in the animal science and production industry. Careers include: Agribusiness Managers, Nutritionists, Agriculture and Conservation Extension Officers, Agricultural Food Inspectors

Farm and Ranch Managers, Animal Trainers, Veterinarian Assistants, Pharmaceutical and Feed Representatives, Park and Wildlife Managers, Agriculture and Natural Resource Educators. Animal production is being asked to be sustainable-more economically, environmentally and socially responsible. This focus on sustainability is intensified by public concerns about “factory farming", food safety, antibiotic use and animal cruelty. This curriculum focuses on giving students a basic understanding of animal anatomy and physiology, animal production systems and health issues in animals. Competencies taught include Animal Science, Animal Nutrition, Animal Health, Veterinary Science, Soil Science, Plant Science and sustainable agricultural practices. A new breed of managers and technicians must adapt to these changes and have the skills to apply these new practices and technologies. An Animal Science and Veterinary Assistant Career Technical Pathway has been developed that allows students to begin taking college classes in high school, continue through Victor Valley College and transfer seamlessly to selected California State Universities.

The competencies the students will need to compete in these rapidly expanding career fields are focused on:

* Proficiency in the underlying applied sciences- Animal Science, Animal Nutrition, Veterinary Science, Plant Science and Environmental Science
* Proficiency in the underlying basic sciences-Biology, Physiology, Anatomy, Chemistry
* Proficiency in the underlying social studies- Geography, Economics and Political Science
* Advanced computer (database management) and math (statistics) skills that support the disciplines of agriculture, natural resources and sustainable development. Operation of common word processing, spreadsheet and presentation software.
* Application of advanced technologies and skills in: Veterinary Diagnostic Technologies- X Ray, Ultrasound; Feed Ration Formulation; Reproductive Technologies- Artificial Insemination, Ultrasound and Embryo Transfer; Soil Analysis; Plant Propagation; Field Conservation and Sustainable Agriculture.

Catalog Description and Program Requirements see individual Certificates of Achievement (COAs)

Master Planning: Fits with VVC goal of making all certificates Chancellor approved - COA

1. A “Stackable” Sequence of Certificates of Achievement to include: **Equine Science Specialist, Veterinary Assistant, and Animal Science Specialist.**
2. An Agricultural Animal Science Transfer Model Curriculum (TMC) towards an Associate Transfer degree in **Agricultural Animal Science (ADT) - Approved Feb 2019.** This ADT facilitates a seamless transfer to California State Universities (CSU) to major in:Agriculture, Animal Science, Animal Health, Pre-Veterinary Science, Agricultural Science, Agriculture Education, Agriculture Studies and Natural Resource Management.

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| Enrollment and Completer Projections |

It is expected that Enrollment in the AGNR program will improve by up to 40 students p/a with approximately 20 completing each of the three stackable certificates with total COA of 40 p/a

Place in in AGNR Program at VVC

Two of these certificates already exist at VVC as Certificates of preparation, Veterinary Assistant is being added.

Similar program

None

**Equine Science Specialist COA**

Description:

This certificate focuses on basic husbandry, preventative care and veterinary technology in the Equine. The anatomy and physiology of the horse is studied in comparison to other farm animals to give the student a picture of the need for specialized animal husbandry and veterinary care in the horse. Skills in Radiography, Ultrasound, Endoscopy, Artificial Insemination and Embryo Transfer technology are emphasized. Preparation for careers in Equine production, education, training and health care.

Group I All of the following must be completed 10 Units

AGNR102 Equine Science 4

AGNR105 Equine Health 3

AGNR106 Veterinary Terminology and Technology 3

Group II One of the following must be completed 3 or 4 Units

AGNR100 General Animal Science 3

AGNR101L Livestock Feeding and Nutrition 3

AGNR107 Livestock Selection and Evaluation 3

AGNR175 Sustainable Agriculture, Environment and Society 3

AGNR177 Principles of Wildlife Management 3

AGNR178 Agriculture Economics 3

AGNR108 Animal Health and Sanitation 3

AGNR123 Introduction to Plant Science 3

AGNR131 Introduction to Soil Science 4

AGNR-COOP138 Cooperative Education Agriculture 3

ALDH125 Medical Aspects of Drugs and Alcohol 3

BIOL100 General Biology 4

Program Learning Outcomes:

1. Implement equine husbandry and health care in the horse industry

2. Demonstrate safe restraint and handling of horses, along with appropriate use of equine health care tools and technologies.

**Total Units- 13 0r 14**

**Veterinary Assistant COA**

Description:

Prepares student for employment as a veterinary assistant or animal health care worker. Animal production is being asked to be sustainable-more economically, environmentally and socially responsible. This focus on sustainability is intensified by public concerns about “factory farming", food safety, antibiotic use and animal cruelty. This curriculum focuses on giving students a basic understanding of animal anatomy and physiology, animal production systems and health issues in animals. Competencies taught include Animal Science, Animal Nutrition, Animal Health and Veterinary Science. There is strong demand for Veterinary Assistants that understand basic animal health concepts and can assist Veterinarians in the use of animal health care technology, including: Endoscopy, Tomography (CT Scan), Magnetic Resonance Imaging, Radiography, Fluoroscopy, Ultrasound, Embryo Transfer and Artificial Insemination.

Group I All of the following must be completed 15 Units

AGNR100 General Animal Science 3

AGNR105 Equine Health 3

AGNR106 Veterinary Terminology and Technology 3

AGNR101L Livestock Feeding and Nutrition 3

AGNR108 Animal Health and Sanitation 3

Group II One of the following must be completed 3 or 4 Units

AGNR102 Equine Science 4

AGNR107 Livestock Selection and Evaluation 3

AGNR123 Introduction to Plant Science 3

AGNR131 Introduction to Soil Science 4

AGNR170 Environmental Science and Sustainability 4

AGNR175 Sustainable Agriculture, Environment and Society 3

AGNR177 Principles of Wildlife Management 3

AGNR178 Agriculture Economics 3

CHEM100 Introductory Chemistry 4

MATH120 Introduction to Statistics 4

ALDH125 Medical Aspects of Drugs and Alcohol 3

BIOL100 General Biology 4

AGNR-COOP138 Cooperative Education Agriculture 3

Program Learning Outcomes:

1. Implement animal health care in a Veterinary Practice

2. Demonstrate safe restraint and handling of animals, along with appropriate use of Veterinary tools and technologies

**Total Units- 17 to 19**

**Animal Science Specialist**

Description: Prepares student for employment in the animal science and production industry. Careers include: Agribusiness Managers, Nutritionists, Agriculture and Conservation Extension Officers, Agricultural Food Inspectors, Farm and Ranch Managers, Animal Trainers, Veterinary Assistants, Pharmaceutical and Feed Representatives, Park and Wildlife Managers and Agriculture and Natural Resource Educators. Animal production is being asked to be sustainable-more economically, environmentally and socially responsible. This focus on sustainability is intensified by public concerns about “factory farming", food safety, antibiotic use and animal cruelty. This curriculum focuses on giving students a basic understanding of animal anatomy and physiology, animal production systems and health issues in animals. Competencies taught include Animal Science, Animal Nutrition, Animal Health, Veterinary Science, Soil Science, Plant Science and sustainable agricultural practices. A new breed of managers and technicians must adapt to these changes and have the skills to apply these new practices and technologies.

Group I: All of the following must be completed, 16 Units

AGNR100 General Animal Science 3

AGNR101L Livestock Feeding and Nutrition 3

AGNR102 Equine Science 4

AGNR107 Livestock Selection and Evaluation 3

AGNR108 Animal Health and Sanitation 3

Group II: Two of the following must be completed 6, 7 or 8 Units

AGNR105 Equine Health 3

AGNR123 Introduction to Plant Science 3

AGNR131 Introduction to Soil Science 4

AGNR175 Sustainable Agriculture, Environment and Society 3

AGNR177 Principles of Wildlife Management 3

AGNR178 Agriculture Economics 3

AGNR170 Environmental Science and Sustainability 4

AGNR106 Veterinary Terminology and Technology 3

CHEM100 Introductory Chemistry 4

MATH120 Introduction to Statistics 4

BIOL100 General Biology 4

ALDH125 Medical Aspects of Drugs and Alcohol 3

CIS101 Computer Literacy 4

BADM103 Financial Accounting Fundamentals 3

PHYS100 Introductory Physics 4

AGNR-COOP138 Cooperative Education Agriculture 3

**Total Units- 22 to 24**

Program Learning Outcomes:

1. Implement animal science and best practice in the animal industry.

2. Demonstrate safe restraint and handling of animals, along with appropriate use of animal production and health tools/technologies.

Attachment 2: **Labor Market (LMI) Data**

Introduction

It is important to note several trends and special circumstances that underlie this rapidly evolving field of study. The Agricultural Sciences (soil science, plant science, animal science, environmental science) prepare students for a very wide range of careers. Many of these careers particularly those in government agencies require a bachelors degree for significant advancement\*.

The nature of the agriculture industry in California and the location of Victor Valley College allow students to access jobs in several contiguous counties – Los Angeles, Riverside and Kern Counties. These are particularly important because San Bernardino County provides provides personel and resources to the population centers in these counties and Kern County is one of the most important agricultural counties in the United States.

\*These COA’s and the Associates Degree Transfer (ADT) degree option provides one of very few mechanisms for an estimated 40% of local High School Graduates to seamlessly transfer to these majors in the Cal State System given that only less than 10% of local HS seniors transfer directly to an University.

It is also important to note that Agriculture is extremely inportant to California wit approximately 10.1% percent of the California economy and that animal and crop production are integrally assocated and animal agriculture is inextricably liked to Environmental, Social and Ecconomic Sustainability-see exerpts from “California Agricultural Cluster Final Report”- January 31 2019

***Key findings***

*▪ In 2015, the cluster produced $59.2 billion in farm gate value and supported $395 billion in*

*total economic output. This represents 10.1 percent of the California economy. The industry*

*supported an estimated 1.2 million jobs in 2017, 8.4 percent of the total job base in California,*

*and paid 8.9 percent of the state’s labor and proprietor income.*

*▪ Nuts and fruits have increased harvested acreage by 40 percent since 2000, while field crops*

*have declined by an equal amount. Cash grains had increased by about 20 percent coming out*

*of the recession have declined in acreage between 2010 and 2015. Vegetables have also seen*

*a more modest decline. Livestock and poultry production has increased in value since 2010*

*while dairy products have declined.*

*▪ Among agricultural support businesses, 90 percent have 20 or fewer workers, up from 87*

*percent in 2000. This is the sub-cluster in which much of the technological innovation is*

*occurring in agriculture. These firms provide a number of technical services to growers,*

*including remote sensing, soil analysis, water efficiency products and techniques, fertilizer*

*management, and plant development.*

*▪ From 2017 to 2022, EMSI projects that the state agricultural cluster will add nearly 44,000*

*new jobs, with another 21,000 added between 2022 and 2027. The projections show that*

*while the rate of job growth has been gradually declining since the recovery from the*

*recession, the rates are expected to start to trend upward again as 2027 approaches. New*

*jobs in agriculture will be much more technical than existing jobs, and growth in the industry*

*will be achieved through technological productivity gains rather than through increasing jobs.*

*▪ The number of openings will continue to be substantially higher than the net job growth, with*

*a projected 280,400 open positions between 2017 and 2022. Although Agricultural Support*

*and Distribution are not the largest components of the cluster currently, they are projected to*

*be the largest source of job openings over the next five years. At a more detailed occupational*

*level, farm occupations will provide the largest number of openings, followed by sales and*

*administrative support.*

*REGIONAL HIGHLIGHTS*

*Central California. This region accounts for 57% of farm production in the state, at $33.9 billion in*

*2015. Nearly all types of crops and livestock are produced in this region. Almonds are one of the top*

*crops at $6.3 billion, with dairies producing $5.6 billion, table grapes $2.2 billion, oranges $1.4 billion*

*and tomatoes $1.1 billion. The area’s cluster employment totals 337,000 jobs and is heavily*

*concentrated in many agricultural cluster industries. It is projected to have 60,000 total job openings*

*in the agricultural cluster between 2017 and 2022*

*Inland Empire. This region supports a diverse mix of agricultural production ranging from $328*

*million in dairies products to $144 million in table grapes and a combined $147 million in citrus. This*

*area is a major transportation hub and serves as a distribution center for food products as well as*

*manufacturing of textiles and farm and food processing machinery components. It has a total cluster*

*employment of 86,300 jobs and is projected to have 19,600 openings between 2017 and 2022.*

*Los Angeles and Orange Counties. This region has 250,000 cluster jobs although little agricultural*

*production occurs there. The main concentrations are in textiles and leather manufacturing, with a*

*variety of support industries related to packaging and machinery manufacturing. About 60,800*

*openings are projected between 2017 and 2022.*

***INNOVATION IN RESPONSE TO ENVIRONMENTAL, WORKFORCE AND MARKET PRESSURES***

*California agricultural continues to face increasing challenges that will need to be proactively confronted throughout the 21st century and beyond. Among the most difficult of these challenges are complex issues that are often interrelated.*

***ENVIRONMENTAL*** *Despite being the most productive agricultural region in the world, current and future climate change poses one of the biggest challenges for the future of California agriculture. Climate change occurs in different ways, including: 1. Increased Temperature (Global Warming) 2. Variable Precipitation 3. Decreasing snowpack on the Sierra Nevada due to higher temperatures and less precipitation 4. Extreme Climate events, including prolonged days of higher temperatures 5. Drought 6. Streamflow and Flooding 7. Soil erosion and degradation*

***REGULATORY*** *As a continued national trend setter in environmental and health standards, driven in many cases by consumer demand, California has imposed increasingly stringent burdens upon California agricultural producers. 1. Limits on pesticide and herbicide use 2. Limits on water use brought on by prolonged periods of drought and as outlined by the state mandated Sustainable Groundwater Management Act 3. Limits on sufficient water storage and distribution 4. More stringent food safety standards as mandated by the federal Food Safety Modernization Act, requiring improved growing, harvesting, processing, and distribution standards 5. More stringent water and air quality standards 6. Resulting higher costs on energy, water, and other inputs*

***GLOBAL COMPETITIVENESS, IMMIGRATION, AND TRADE BARRIERS*** *By the year 2050, California’s population could reach nearly 50 million people and world population could reach nearly 9.7 billion in that same period. This growth in population will test California’s limits in agricultural production and challenge its ability to maintain sustainability, best practices, and innovative technology with competing demands on water, air, energy, and land.*

*The following global competitiveness challenges already exist and will only become greater into the future: 1. Labor shortages due to limits on immigration and unwillingness of existing workers to engage in agricultural jobs 2. More burdensome regulations and global food safety and phytosanitary requirements that drive up the cost of production resulting in higher costs to the final consumer 3. Trade wars or disagreements through increased tariffs, non-trade barriers, and/or increased political tensions that limit viable new markets and constrain or contract existing markets 4. Increased import competition, especially in specialty crops, dairy, floriculture, and seeds, as technology advancements and climate change result in increased international productivity and yields*

*The agriculture industry has increasingly turned to technology for solutions to many of these issues, resulting in a wide range of innovations that have profound implications for the future of the agricultural workforce. Some prominent examples include the following: ▪ Sensors to manage soil conditions. ▪ Sensing tools that collect data from satellites, managed aircraft, drones, and ground-based vehicles to monitor tree and vine conditions. ▪ Integrated platform devices that measure stress, pest, and disease indicators in real time. ▪ Multi-patented, easy-to-navigate software for planning, optimizing, and managing agricultural water rights held by irrigation districts, ditch companies, Native American communities, or local agricultural cooperatives. ▪ Imagery systems that provide data fusion and processing methodology combining hyperspectral imaging data with a range of complimentary sources including satellite observations, and terrestrial sensors. ▪ Variable Rate Technology (“VRT”) Applications that provide precision farming tools for data management, precise planting, and harvest timing. ▪ Smart machines give farmers a new way through automation to control weeds eliminating up to 90% of the herbicide volumes sprayed today, while opening the potential to use other herbicides that are not appropriate for broadcast-spraying. ▪ Internet of Things (“IOT”) Field Monitoring Platforms that automatically stream agronomic and machine data from farm equipment via cellular through a simple plug-in device. ▪ Remote weather stations with telematics that alerts growers to real-time frost conditions, reducing risk of crop damage. ▪ Measuring and monitoring applications focused on water quality, meteorology, greenhouse gas fluxes, solar energy, and soil moisture. ▪ Unmanned Aerial Vehicles (“UAV”) for agriculture providing advanced agricultural drone and enterprise cloud-based data solution for precision farming, forestry, surveying, construction, and resource management.*

*Surveys of agricultural employers indicate that the shortage of people with technical skills is the number one workforce issue. Operations, maintenance and soil and water specialties are particularly difficult to recruit. In terms of occupations that matter to the future of the industry, water systems management was listed most often, followed by food safety, computer applications and data management and analysis California agriculture’s continued adoption and adaptation to technological change is driven by not only the innovation and creativity of its farmers, ranchers, food processors, and academic researchers, but also by the necessity to remain globally competitive amidst the growing challenges that they face today and into the future. California’s preeminence as a food and fiber producer can only be maintained with focused efforts on workforce training, especially related to new and evolving technologies. Limited agricultural labor pools will emphasize an increased shift towards mechanization and robotics, requiring appropriate workforce training. Moreover, the increased reliance upon in-field and in-facility sensors, along with more stringent food safety, air and water quality, and pesticide and herbicide use standards will require an ever-evolving workforce training curriculum focused on Agricultural Science, Engineering and Technology (ASET). Workforce training programs should be flexible and adaptive to address the unforeseen needs of practical innovation and invention throughout the 21st Century and beyond.*

California remains the most productive agricultural region in the world. The diversity and productivity of its agricultural base is unmatched as California fields and orchards yield a wide range of fruits, vegetables, grains, floriculture, fibers, beans, seed, dairy, and livestock that feed and clothe millions around the United States, but also across the globe. In 2017, California farms and ranches received over $50 billion in cash receipts for their output of over 400 commodities.1 It is also the leading US state for cash farm receipts, accounting for over 13% of the nation’s total agricultural value.2 California’s agricultural exports also totaled over $20 billion for 2016, far surpassing all other US states in value and variety of products exported.3 Recent drought conditions and labor shortages have affected growth in this industry, but evolving consumer demands for fresh foods featuring convenience packaging, as well as tremendous growth in the farm to fork movements and specialty restaurant trade have stimulated growth in the industry near metropolitan regions of the state.

The agricultural sector comprises an industry cluster that spans a wide range of activities from farm production, technical support services, research, value added food and fiber processing as well as distribution. For purposes of this study, the agricultural industry cluster is defined to have the following four major sub-clusters:

**Production:** The production sub-cluster includes crop and livestock production, and agricultural support services (including labor contractors and management).

**Support**: The support sub-cluster includes agricultural chemicals; plastic, glass, and rubber products; machinery and equipment; wholesalers of equipment; garden supply and equipment retailers; leasing services; professional services; business support and administrative services; and irrigation.

**Processing:** The processing sub-cluster includes food and beverage processing, biological products, and packaging.

**Distribution**: This sub-cluster includes agricultural and food-related wholesale and retail trade, transportation, and warehousing sectors.

**WORKFORCE ISSUES** In terms of workforce issues, a shortage of people with technical skills received the highest number of responses (30%), followed by access to field and harvest crews (25%). Availability of people with adequate soft skills and entry level workers scored equally, and perhaps are related. The cost of labor and the lack of senior personnel received ten percent and seven percent of responses, respectively. This is interesting because the state minimum wage and the “grey tsunami” have both been cited in other studies as major concerns for the agricultural industry. Indeed, two-thirds of those who did say the cost of labor is an issue were growers or ranchers. Table 2: Workforce Issues in the Agricultural Sector WORKFORCE ISSUES RESPONSES\* PERCENT 150 100% Shortage of people with technical skills 45 30% Access to adequate field and harvest crews 37 25% Availability of people who have the necessary soft skills 20 13% Shortage of entry-level positions 20 13% Cost of labor 15 10% Shortage of senior management staff 11 7% Other 2 1%

**OCCUPATIONAL DEMAND** The survey asked about the need for a number of specific occupations. Tables 3 and 4 summarize the occupations for which the companies report shortages of workers. Among skilled occupations, maintenance workers is the most cited occupational group, at 15 percent. This group is cited by a wide range of types of firms, including testing and measurement companies and agricultural supplier and seed companies as well as farms. Equipment operators are listed in 12 percent of the responses, with a high proportion among food processors, suppliers, seed companies and “other” firms, which included irrigation, dairies and beneficial insect producers. Nutrients, soils, and water management received ten percent of the responses, with higher proportions among suppliers, seed companies and others, including agricultural services and dairies. As expected, testing and measurement services firms have higher needs for more technical occupations such as pest management, laboratory/scientific disciplines, soil and water technicians and data processing. Overall, about one third of firms that use more technical occupations such as pest management, laboratory and scientific, soil and water management, food safety and information technology say they have not been able to fill these positions adequately. Food safety technicians are in particularly high demand among food processors, but less so among growers. Fourteen percent of the firms who say they do not have food safety adequately covered are food processors and none of the food processors in the sample say they don’t need food safety personnel in their operations. In contrast, 43 percent of firms who say they don’t need food safety specialists are growers or ranchers.

The survey asked the respondents to choose among a number of occupations in terms of those which matter to the future of the industry. Water systems management was listed most often, followed by food safety, computer applications and data management and analysis (Table 6). Clearly, these results reflect major issues facing the industry today and in the future in terms of water supply and food safety. In addition, it is clear that agriculture, like many industries, is moving toward a much more automated and data driven mode of operation