CSU San Marcos Degree Program Proposal

Bachelor of Science in Wildfire Science and the Urban Interface
California State University San Marcos

1. Program Type

Self-Support

Full Online

New Program

2 Year BS (as part of a 2+2 program)

2. Program Identification

a. Campus

California State University San Marcos

b. Full and exact degree designation and title

Bachelor of Science in Wildfire Science and the Urban Interface

c. Date the Board of Trustees approved adding this program projection to the campus Academic Plan.

Spring 2015

d. Term and academic year of intended implementation.

Spring 2018

e. Total number of units required for graduation. This will include all requirements (and campus-specific graduation requirements), not just major requirements.

120

f. Name of the department(s), division, or other unit of the campus that would offer the proposed degree major program. Please identify the unit that will have primary responsibility.

The program will be housed under the College of Science and Mathematics, and will be managed by the Department of Biological Sciences. The program will be financially supported and implemented through Extended Learning as a self-support degree.

g. Name, title, and rank of the individual(s) primarily responsible for drafting the proposed degree major program.

Dr. Tracey K. Brown, Professor, Biological Sciences, CSU San Marcos
Dr. Matt Rahn, Research Faculty, Director, Environmental Leadership Institute and Wildfire Programs, CSU San Marcos, Extended Learning Program

In consultation with: CAL FIRE, CAL FIRE Local 2881, San Diego County Fire, Los Angeles County Fire, U.S. Forest Service, National Institute of Standards and Technology, International Association of Fire Fighters, Temecula Fire Department, and San Diego State University, Homeland Security Program

h. Statement from the appropriate campus administrative authority that the addition of this program supports the campus mission and will not impede the successful operation and growth of existing academic programs.

Institutional Mission:

- The proposed program will benefit the Department of Biology and the College of Science and Math, and support their respective missions with regard to enhancing the strong linkages between students and the communities they serve
- The proposed program is aligned with the core mission, pushing the boundaries of knowledge and discovery, providing rigorous and relevant educational programs that reflect a balance of theoretical and applied learning, and ensure students are prepared to be at the forefront of solving many of the critical challenges facing our communities
- The proposed program will prepare the student in an important field, providing "skills, competencies and experiences needed in a global society experiencing accelerated technological, social and environmental change"
- The proposed program is aligned with the University Vision in that it is a "specialized program responsive to state and region needs"
- Given the specific nature of this program and community served, there are no perceived conflicts with existing programs or their future growth

Moreover, the B.S. in Wildfire Science and the Urban Interface will meet numerous objectives from the Commission on the Extended University:

- The proposed program will meet the economic and workforce needs for San Diego County, the state of California and the Nation by addressing the increasing regional/state/national needs for advanced education in wildfire and urban interface issues
- The proposed program will prepare program participants for advanced careers in the field and help advance that industry
- The proposed program increases access to educational opportunities by serving broader constituencies and creating new educational pathways for the fire service industry
- The proposed program will provide personal and lifelong learning opportunities to professionals in the region. The California State University system has always been a strong and essential foundation to the training of the local skilled workforce.

i. Any other campus approval documents that may apply (e.g. curriculum committee approvals).[1] The campus may submit a copy of the WASC Sub-Change proposal in lieu of this CSU proposal format. If campuses choose to submit the WASC Substantive Change Proposal, they will also be required to submit a program assessment plan using the format found in the CSU program proposal template.

The appropriate forms for meeting WASC requirements when submitting the final P-form to the Chancellor's office are being developed by EL with the assistance of Regina Eisenbach.

[1] Proposers do not need to supply this item. As the proposal goes through the approval process, memos from curriculum committees are obtained. These will be collected and added to the proposal by Academic Programs as a response for this item.

j. Please specify whether this proposed program is subject to WASC Substantive Change review.[2]

Yes – new online program

k. Optional: Proposed Classification of Instructional Programs (CIP) Code and CSU Degree Program Code

Recommended CIP Code: 43.0203 (Fire Science/Fire-fighting) or 43.0299 (Fire Protection, Other)

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[2] Generally this refers to a degree offered at a new level (e.g., a doctorate). To be certain that a WASC Substantive Change review is not necessary, contact the Associate Vice President Academic Programs.

3. Program Overview and Rationale

a. Provide a rationale, including a brief description of the program, its purpose and strengths, fit with institutional mission, and a justification for offering the program at this time. A comprehensive rationale also explains the relationship between the program philosophy, design, target population, and any distinctive pedagogical methods.

Rationale

The purpose of the Bachelor of Science in Wildfire Science and the Urban Interface is to train a new generation of expertly skilled firefighters and scientists to meet the evolving and increasing demands of the firefighting industry, with an emphasis on wildland and wildland urban interface (WUI) fires.

Since 1970, the US has witnessed an increase from three million to an overwhelming eight million acres burned each year, with further increases projected.[3] Across the country, local fire departments are now responding to over 330,000 wildfires each year with over 900 incidents occurring each day.[4] Most of these wildfires are not simply isolated events that occur in rural, unpopulated ecosystems. Rather, these incidents frequently threaten homes, businesses, and lives, with the annual costs of these fires now exceeding $14 billion.[5] Indeed, over 40% of our homes are located in the WUI, where 46 million homes in 70,000 communities are now located in high-risk areas (California has approximately 5.1 million homes in the WUI – more than any other state).[6,7]As a result, the term 'wildland fire' has become a misnomer, where "traditional" wildland firefighting now focuses on community defense.

A WUI incident today represents a dynamic, complex environment where wildland, structure, and vehicle fires merge; we do not clearly understand the risks this synthesis creates nor have we trained and educated our first responders adequately. Furthermore, as our population grows, decisions made in developing and managing our communities, and the concomitant growth into the WUI, will exacerbate our vulnerability and risks. Unfortunately, most higher education programs, specifically at the Bachelor Degree level, do not adequately address this paradigm shift nor do they provide the level of education and understanding required by modern wildland/WUI firefighters.

The most prominent wildland fire agencies including CAL FIRE, the U.S. Forest Service, CAL FIRE Local 2881, CAL OES, the National Institute of Standards and Technology, and the International Association of Fire Fighters all agree that wildland firefighting is decades behind structure and high-rise firefighting. This was highlighted during the 2014 Wildfire Symposium held in Sacramento, California, echoed by expert representatives from academia, local, state, and federal agencies. The degree proposed herein is aimed at resolving this deficiency by focusing on the following:

- Providing a scientific and technical foundation emphasizing ecology, chemistry, physics, geography, land use, policy, and natural/cultural resource management
- Providing a focus on fire ecology, risk, and post-fire recovery related to ecosystem management and land use
- Providing advanced education on technologies, tactics, and strategies for wildland and WUI firefighting
- Improving understanding of issues and risks related to firefighter health and safety
- Improving understanding of land use and development in fire prone areas
- Providing a capstone opportunity that reinforces important skills, allowing students to demonstrate a meaningful and applied understanding (while also contributing to the advancement of the field)

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[3] U.S. Communities Dealing with WUI Fire Fact Sheet (ICC) 1.1.2011; Headwater Economics, www.headwaterseconomics.org

[4] Karter, M. and G. Stein. 2013. U.S. Fire Department Profile 2012. National Fire Protection Association, Fire Analysis and Research Division.

[5] Hamins, A., Averill, J., Bryner, N., Gann, R., Butry, D., Amon, F., Gilman, J., Maranghides, A., Madrzykowski, D., Manzello, S. and Mell, W. 2012. Reducing the Risk of Fire in Buildings and Communities: A Strategic Roadmap to Guide and Prioritize Research. NIST Special Publication 1130. National Institute of Standards and Technology. Gaithersburg, MD.

[6] Radeloff, V., R. Hammer, S. Stewart, J. Fried, S. Holcomb, and J. McKeefry. 2005. The Wildland-Urban Interface in the United States. Ecological Applications, 15(3) 799-805.

[7] Communities Dealing with Wildland/Urban Interface Fire; WUI Fact Sheet, ICC and NARCD Councils, updated March 18, 2013.

With Southern California as the backdrop, representing one of the most high-risk regions in the world, this program will fulfill a significant need in public safety education by providing an educational focus on wildfires and the wildland urban interface, fulfilling a primary need of the industry. CSUSM can offer a progressive, career-oriented undergraduate degree where students can work with faculty and conduct applied research. The program would ensure that students are prepared to compete in the modern fire service industry, serving as leaders and instruments of change. This program is intended to respond to a critical state and national need by providing advanced education for the next generation of fire service professionals and decision-makers, the Bachelor of Science in Wildfire Science and the Urban Interface (herein referred to as the **Bachelor of Wildfire Science)**.

The fully online approach for this program is something that was specifically discussed with representatives from the fire industry, and endorsed as an appropriate and desired method of education. An online offering will have many safeguards in place to ensure academic credibility and honesty, providing a valid assessment of student progress and success. There are basically two types of assessment methods used in the courses: exam based, and written assessment based. For exam based courses, there are online exam control procedures that manage examinations by both discouraging and detecting cheating by students. Protocols that will be provided across all online courses include the following:

- Offering online exams at a set time (and only once), and ensure that the exam is only accessible for a controlled period of time sufficient for exam completion
- The sequence of exam questions can be randomized for each student along with the answer choices (for a multiple choice exam)
- Exam questions can be derived from a larger "test bank" that can consist of (for example) 100 questions, with only 50 given to an individual test taker.
- Exam questions can be presented only one at a time and then "hidden" once the question is completed
- Online exams can be designed to take only a limited time for completion. This prompts students to be adequately prepared for the exam in order to compete it in a timely manner. The time spent trying to "find" the answer rather than knowing the answer provides an appropriate check to the use of external materials.
- A properly designed exam question can also limit the use/reliance of course materials (recognizing that they have access to books and other resources). While they may spend time verifying a challenging definition or difficult, they do not have time to learn the theory or to learn how to solve complex problems.
- Instructors can also require students to use a "respondus lockdown browser" to access an online exam, where students are "locked" into an exam, and are unable to "cut and paste" or access other programs or resources.
- Instructors can change exam questions year-to-year in order to avoid students from developing test banks or other resources.
- Finally, there are other options that include video monitoring of the student during the exam, biometrics to confirm student identity, or requiring the student (with the assistance of Extended Learning) to identify a local proctoring entity that will monitor students during an exam.

We anticipate that most students in this program will be fully-employed, located throughout the state and nation, and need a flexible program when responding to large fire events or other significant incidents. Furthermore, students enrolled in this degree will have already matriculated through programs that provide training and hands-on experience through an Associate Degree and Fire Academy. For example, The CAL FIRE Academy is a nationally recognized training facility that provides a virtually unparalleled spectrum of courses and experience in fire protection, fire prevention, law enforcement, administration, resource management, and fire crew management. As firefighting professionals, individuals who attend academies are uniquely qualified students

that are able carry out their mission through the skillful combination of educational theory and practical application. Similar academies exist for federal firefighters. Therefore, the goal of the Bachelor of Science in Wildfire and the Urban Interface is to augment existing education and training programs to train a new generation of expertly skilled firefighters and scientists that are able to respond to the new demands of the firefighting industry, with an emphasis on wildland and wildland urban interface fires. No such program currently exists, and no program at the local, state, or national level has been developed in such close collaboration with a highly diverse and qualified team of advisors from all levels of the firefighting industry.

CSUSM Institutional Mission

Founded in service, California State University San Marcos continues to be a leader in addressing complex community problems and regional need. The mission of CSUSM includes aligning education with regional needs, intellectual enrichment, and the civic, economic, and cultural life of our region and state. Furthermore, the mission of the College of Science and Mathematics fosters interdisciplinary instruction and collaborative research, innovation, and creative endeavors that provide students with the foundational knowledge and skills needed to meet technological challenges in a rapidly evolving world. The proposed degree uniquely meets this growing local, regional, and national demand.

This proposed degree continues the CSUSM legacy in an area that is fundamentally consequential to California and the nation by building on a strong tradition of innovative programs. We can continue this custom with the development of a degree that meets the demand for a program focused on wildland and WUI fires in the context of science, land use, public safety, policy, administration, and advanced wildland firefighter education.

Our region is one of the highest fire-risk regions in the United States and the world, and while wildfire is a natural part of ecosystem functioning, human caused fires far outpace natural events, and rapid development is increasing the wildland urban interface. These factors make it an ideal location for a Wildfire Science degree. We will be creating new opportunities to educate the next generation of wildland and urban interface firefighters that will have a deeper understanding of the field, going beyond traditional firefighter education and training programs. This can create an unparalleled synergistic relationship between agencies, and research and education that can simultaneously advance the firefighting industry and provide professional advancement. The importance of this effort cannot be overstated. Historically, most research and education fire programs were focused on either rural/remote ecosystems (especially forests) or in the urban areas. This has resulted in a serious deficiency in the current understanding of wildfire practices, land use decisions, policy and regulatory development, community protection, firefighter health and safety, and technology. This program can significantly benefit our region by becoming a hub for advancing the wildfire industry, becoming a program that is responsive to state and regional needs.

We have implemented a collaborative approach to wildland fire education that formed a partnership between a diverse group of agencies and organizations, with this program ultimately emerging as a leader in this field. While the program is primarily focused on a science foundation, it is necessarily interdisciplinary. Therefore, the program not only benefits the College of Science and Math, but can also benefit the College of Humanities, Arts, Behavioral, and Social Sciences. Students will be at the forefront of this field, solving many of the critical challenges facing this rapidly evolving industry.

b. Provide the proposed catalog description, including program description, degree requirements, and admission requirements.

WILDFIRE SCIENCE AND THE URBAN INTERFACE

Office:
Extended Learning

Telephone:
760-750-8730

Program Director:
Matt Rahn, Ph.D., J.D.

Faculty:
Tracey K. Brown, Ph.D.
William Kristan III, Ph.D.
George Vourlitis, Ph.D.
Matt Rahn, Ph.D., J.D.
Nelson Bryner, M.S.

Program Offered:

- Bachelor of Science in Wildfire Science and the Urban Interface

California State University San Marcos offers a Bachelor of Science degree, through Extended Learning, in Wildfire Science and the Urban Interface (referred to as Wildfire Science) that provides foundational and advanced coursework necessary for a career in the fire industry, with a specific emphasis on wildland fires and the wildland urban interface. This degree fulfills a significant societal need by providing a focus on wildfires and the wildland urban interface, designed to increase the scientific foundations and improve access and understanding in a critically important area of public safety.

This is a progressive, career-oriented degree, training a new generation of expertly skilled firefighters, technical experts, decision-makers, and scientists ready to meet the evolving and increasing demands of the industry. Offered completely online, the program is designed for working professionals, individuals seeking career advancement, and those pursuing future employment in the fire industry.

Program Student Learning Outcomes
Students who graduate with a Bachelor of Science in Wildfire Science and the Urban Interface will be able to:

1) Identify issues and risks related to firefighter health and safety with an emphasis on the wildland and wildland urban interface environments
2) Identify and apply appropriate practices, tools, tactics, and strategies to avoid, minimize, and mitigate the risks of fires in the wildland and wildland urban interface
3) Apply scientific methods and statistical/mathematical concepts in order to demonstrate problem-solving and leadership skills within their field of study
4) Communicate in both oral and written form wildfire and urban interface perspectives, concepts, and theories related to societal problems, threats, risks, and safety impacts

Career and Educational Opportunities

A degree in Wildfire Science prepares students for public safety careers in the rapidly growing field of wildfires and the wildland urban interface. The program provides advanced education and training for traditional firefighters, company officers, administrators, fire investigators, and fire inspectors. The degree also supports careers in land use planning, natural resource management, emergency management, homeland security, and forensics. Students interested in these careers should consult with advisors as they plan their studies and select their coursework. The degree has both the breadth and depth of an interdisciplinary field, with Wildfire Science also being an appropriate degree for students wanting to apply for graduate programs in natural resource management, forestry, fire science, environmental science, and similar fields of study.

Preparation

It is expected that students enrolled in this program will have completed an Associate Degree in a related field (e.g. fire science, fire administration, forestry, natural resource management, environmental sciences, etc.) and have taken basic lower division course work in mathematics and natural sciences. The earned Associate Degree is anticipated to provide the first two years of a 2+2 program, with the Wildfire Science Bachelor of Science offered through CSUSM regarded as the second two years of the program.

Students anticipating employment as a firefighter are expected to have completed the materials, preparation, and appropriate training at an appropriate fire academy. Some academies may have additional requirements such as passing a physical abilities test. For specific requirements and further information, contact the fire academy you wish to attend and evaluate the entry requirements for any specific agency you are interested in working with.

Transfer students entering the program are expected to have completed the equivalent of lower-division requirements during their first two years, including the lower-division general education requirements and the U.S. History, Constitution and American Ideals requirement. Students must also satisfy the Language Other Than English Requirement before graduating from CSUSM. Coursework that fulfills the major requirements for some Associate Degrees may not satisfy all transfer requirements necessary to enroll in the Wildfire Science major at CSUSM. Prospective transfer students are advised to access www.assist.org, review the CSUSM catalog and transfer requirements, and meet with an advisor to expedite their transfer plan.

Special Conditions for the Bachelor of Science in Wildfire Science and the Urban Interface

All courses counted toward the major must be completed with a grade of C (2.0) or better. A minimum of 24 units of the major must be completed through CSUSM.

BACHELOR OF SCIENCE IN WILDFIRE SCIENCE AND THE URBAN INTERFACE
(60 Units)

Preparation for the Major (12 Units)

FIRE 101: Wildland Urban Interface	3
FIRE 105: Fire Science	3
FIRE 210: Emerging Technologies and Topics	3
BIOL 216: Biostatistics for Health Sciences	3

Upper-Division General Education (9 Units)

BIOL 338: Human Impact on the Environment[1] or BIOL 339: Cons. Biology[1]	3
PHIL 340: Ethics and the Environment[2]	3
Upper Division GE – DD	3

Required Major Courses (21 Units)

BIOL 391: Fire Ecology	3
CHEM 311: Chemicals and the Environment	3
FIRE 351: Wildfire Law and Economics	3
FIRE 352: Emergency Management, Operations, and Administration	3
FIRE 353: Firefighter Health and Safety	3
FIRE 489: Research Methods and Design	3
FIRE 499: Independent Study[3]	3

Upper-Division Electives (18 Units)

Select 18 units from the following courses in consultation with adviso4[*]

BIOL 338: Human Impact on the Environment[5]	3
BIOL 339: Conservation Biology[5]	3
BIOL 392: Natural Resource Management	3
FIRE 354: Firefighter Stress, Behavioral, and Mental Health	3
FIRE 355: Land Use Planning and Community Resiliency	3
FIRE 399: Special Topics	3
FIRE 402: Fire Behavior, Fuels, and Resource Management	3
KINE 306: Exercise Fitness and Health	3
KINE 316: Stress Management	3
KINE 336: Nutrition for Health and Exercise Performance	3

[1] If taken after students have completed (or transferred) 60 units, this course will satisfy Upper Division General Education requirements in areas BB

[2] If taken after students have completed (or transferred) 60 units, this course will satisfy Upper Division General Education requirements in areas CC

[3] In consultation with a faculty mentor, students will identify a topic for library or applied research on wildfires and/or the wildland urban interface (WUI). OPTION A: Literature Review: In-depth reading and researching of the literature on current issues in wildland fire/WUI. Student must produce a paper with supporting citations that summarizes the current state of knowledge on the topic. OPTION B: Original research project in the developed in collaboration with a faculty member. Student will produce a paper or poster with supporting citations and critical analysis of topic area. Enrollment restricted to students who have obtained consent of director.
Prerequisite: FIRE 489.

[4] Other courses may be approved with the consent of the Program Director.

[5] These courses only count toward Upper-Division Electives if they are <u>not</u> taken to satisfy "Upper-Division General Education" requirements.

4. Curriculum *(These requirements conform to the revised 2013 WASC Handbook of Accreditation)*

a. These program proposal elements are required:

- Institutional learning outcomes (ILOs) [7]
- Program learning outcomes (PLOs) [7]
- Student learning outcomes (SLOs) [7]
  (WASC 2013 CFR: 1.1, 1.2, 2.3)

Institutional Learning Outcomes

On the CSU San Marcos campus, Institutional Learning Outcomes are referred to as Undergraduate Learning Outcomes (ULOs). All program and course learning outcomes align with these ULOs, and reflect this alignment on the comprehensive assessment plan.

Students graduating with a Bachelor's degree from CSU San Marcos will be creative, empathetic, and engaged life-long learners who are:

ULO 1: Knowledgeable in their field of study. Students will be able to:

- Articulate, integrate, and apply theories and methods of a field of study to create professional, scholarly, and/or artistic work

ULO 2: Comprehensive and critical thinkers. Students will be able to:

- Identify key concepts and develop a foundation for future inquiry
- Analyze complex problems and develop solutions by applying quantitative and qualitative reasoning, integrating knowledge and skills from a variety of disciplines
- Construct well-reasoned arguments based on evidence

ULO 3: Globally and culturally intelligent. Students will be able to:

- Apply multiple perspectives to address local, regional, global, and cultural issues.
- Demonstrate an intermediate proficiency in a language other than English

ULO 4: Skilled communicators. Students will be able to:

- Communicate clearly and effectively in both written and oral forms
- Tailor communication to audience and context

Program Goals

The program would ensure that students are prepared to compete in the modern fire service industry, serving as leaders and instruments of change. This program is intended to respond to a critical state and national need by providing advanced education for the next generation of fire service professionals and decision-makers working in the wildland and wildland urban interface. The degree program in Wildfire Science will use Program Goals that are overarching statements, aligned with the mission of CSU San Marcos while reflecting the needs of constituents. These Program Goals focus on the following areas:

- Research strategies, independent analysis, critical thinking, problem solving, and collaborative communication techniques
- Interdisciplinary knowledge, theories, and research to apply to environmental, economic, and societal issues
- Developing summative skills and knowledge that foster competitive entry into a professional field, public service, and graduate school
- Administration, leadership, and management techniques and theories

Program Student Learning Outcomes

Using the Program Goals as guides, the degree's Program Student Learning Outcomes (PSLOs) are measureable statements that further develop the focus areas of the program. The PSLOs are as follows:

Students who graduate with a Bachelor of Science in Wildfire Science and the Urban Interface will be able to:

1) Identify issues and risks related to firefighter health and safety with an emphasis on the wildland and wildland urban interface environments
2) Identify and apply appropriate practices, tools, tactics, and strategies to avoid, minimize, and mitigate the risks of fires in the wildland and wildland urban interface
3) Apply scientific methods and statistical/mathematical concepts in order to demonstrate problem-solving and leadership skills within their field of study
4) Communicate in both oral and written form wildfire and urban interface perspectives, concepts, and theories related to societal problems, threats, risks, and safety impacts

b. These program proposal elements are required:

- Comprehensive assessment plan addressing all assessment elements;
- Matrix showing where student learning outcomes are introduced (I), developed (D), and mastered (M)

Include plans for assessing institutional, program, and student learning outcomes. Key to program planning is creating a comprehensive assessment plan addressing multiple elements, including strategies and tools to assess student learning outcomes, (directly related to overall institutional and program learning outcomes). Constructing an assessment matrix, showing the relationship between all assessment elements, is an efficient and clear method of displaying all assessment plan components.

Creating a curriculum map matrix, identifying the student learning outcomes, the courses where they are found, and where content is "Introduced," "Developed," and "Mastered" insures that all student learning outcomes are directly related to overall program goals and represented across the curriculum at the appropriate times. Assessment of outcomes is expected to be carried out systematically according to an established schedule.

The assessment plan and curriculum matrix are provided in Appendix 1 and 2. Outcomes will be introduced and reinforced across courses in different contexts, and applied at an advanced level in the upper division courses and research experience. Each semester, several program student learning outcomes are included in the student's courses as part of either a required or elective course. Those PSLOs are then evaluated ever-other fall or spring semester (as described in the Comprehensive Assessment Plan, Appendix 1), with all PSLOs evaluated every two years. The Program Director will help support the faculty and instructors on the design and implementation of assessment practices (e.g. assignments, tests, quizzes, projects, etc.) to ensure that the program is appropriately assessing specific knowledge deemed essential to meeting the institutional, programmatic, and student learning outcomes. Coursework will also contain regular and rigorous application and assessment of oral and written communication skills, through required essays, presentations, analytical papers, and/or computer simulated tasks or analyses. Assessment methods across the curricula will ensure that students can progressively apply institutional, programmatic, and individual student learning outcomes, integrating experiences and information from courses to real-world situations.

Reporting of assessment data will be provided in the form of student grades and passage rates, with the 70% level being a minimum qualification rate in any given class to demonstrate appropriate skills and understanding. In addition to the traditional assessment methods, a required culminating research experience is designed to provide a summative evaluation of a student's experience and education at CSUSM. This research experience not only assesses previous learning in the major, but also provides a forum that allows the program to assess the student's overall learning experience. The capstone course (FIRE 499) provides an opportunity for students nearing the end of their degree to demonstrate that they have achieved the goals for learning established by the

University and program. The goal of this course, and indeed all requisite courses, is to be student-centered and student-directed, requiring the command, analysis, and synthesis of theoretical and applied knowledge and skills to the wildland fire industry.

For a program of this nature, the best measure of program success can be obtained from the agencies and organizations that hire our graduates. We will therefore also work with local, state, and federal agencies to institutionalize a formal inquiry and survey of students they hire, to assess outcomes. Hiring managers will be surveyed through a standardized set of questions related to the specific learning outcomes identified through this program. This routine inquiry will serve two purposes: 1) it will allow us to assess student success post-graduation and track employment success, and 2) it will allow us to have a continuing dialogue with the industry to ensure that this program maintains the highest standards, meeting the expectations and needs of a rapidly evolving field. Diligent tracking and monitoring of program graduates through time will also enable us to assess career success, progress, issues, and needs related to continuing education and training. This assessment too has been integrated into the Comprehensive Assessment Plan.

c. Indicate total number of units required for graduation.

120 Units

d. Include a justification for any baccalaureate program that requires more than 120-semester units or 180-quarter units. Programs proposed at more than 120 semester units will have to provide either a Title 5 justification for the higher units or a campus-approved request for an exception to the Title 5 unit limit for this kind of baccalaureate program.

NOT APPLICABLE

e. If any formal options, concentrations, or special emphases are planned under the proposed major, identify and explain fully and list the required courses. Optional: You may propose a CSU degree program code and CIP code for each concentration that you would like to report separately from the major program

NOT APPLICABLE

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f. List all requirements for graduation, including electives, for the proposed degree program, specifying course catalog numbers, course titles, total units required for completion of the degree, major requirements, electives, and prerequisites or co-requisites (ensuring there are no "hidden prerequisites that would drive the total units required to graduate beyond the total reported in 4c above). Include proposed catalog descriptions of all new courses. (WASC 2013 CFR: 2.1, 2.2)

Required - Preparation for the Major (12 Units)		**UNITS**
FIRE 101	Wildland Urban Interface	3
FIRE 105	Fire Science	3
FIRE 210	Emerging Technologies and Topics	3
BIOL 216	Biostatistics for Health Sciences	3
Upper-Division General Education (9 Units)		
Choose from one of the following:		
BIOL 338	Human Impact on the Environment	
or		3
BIOL 339	Conservation Biology	
PHIL 340	Ethics and the Environment	3[1]
Upper-Division General Education – DD		3[1]
Required Major Courses (21 Units)		
BIOL 391	Fire Ecology	3
CHEM 311	Chemicals and the Environment	3
FIRE 351	Wildfire Law and Economics	3
FIRE 352	Emergency Management, Operations, and Administration	3
FIRE 353	Firefighter Health and Safety	3
FIRE 489	Research Methods and Design	3[2]
FIRE 499	Independent Study	3[3]
Upper-Division Electives (18 Units selected from below)[4]		
BIOL 338	Human Impact on the Environment	3[5]
BIOL 339	Conservation Biology	3[5]
BIOL 392	Natural Resource Management	3
FIRE 354	Firefighter Stress, Behavioral, and Mental Health	3
FIRE 355	Land Use Planning and Community Resiliency	3
FIRE 399	Special Topics	3
FIRE 402	Fire Behavior, Fuels, and Resource Management	3
KINE 306	Exercise Fitness and Health	3
KINE 316	Stress Management	3
KINE 336	Nutrition for Health and Exercise Performance	3

[1] If taken after students have completed (or transferred) 60 units, these courses will satisfy requirements in Upper-Division General Education requirements in areas BB, CC and DD.
[2] Prerequisite: BIOL 216
[3] Prerequisite: FIRE 489
[4] Selected in consultation with advisor
[5] These courses will only count toward Upper-Division Electives if they are not taken to satisfy the "Upper-Division General Education" requirement.

Students are also expected to have completed the American Institutions requirements and the general education Language Other Than English Requirement prior to graduating from CSUSM.

g. List of any new courses that are: (1) needed to initiate the program and (2) needed during the first two years after implementation. Only include proposed catalog descriptions for new courses.

NEW COURSES NEEDED:

Program Initiation

BIOL 391
Fire Ecology
Interdisciplinary review and study of wildfires as a natural and man-made biophysical and ecological process. Covers the costs and benefits of wildfires and prescribed burns as a tool for land management, and the implications for endangered species, habitat, soils, air quality, and watersheds. Includes fire history, and fire in the context of global environmental change. Focuses on current issues in fire ecology in the Western U.S. and globally, including readings and discussions of recent scientific literature. *Prerequisites: Biol 210, 211 or enrollment in the Bachelor of Science in Wildfire Science and the Urban Interface program.*

BIOL 392
Natural Resource Management
Review of the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects quality of life, ecosystems, and long-term sustainability. Covers how management decisions influence ecosystem health, with a specific emphasis on the impacts related to invasive species, disease, insects, climate change and wildfires. Covers timely and topical relevant readings from the primary literature, especially those dealing with the current state of our knowledge of natural resource management, ecology, and public policy. *Prerequisites: Biol 210, 211 or enrollment in the Bachelor of Science in Wildfire Science and the Urban Interface program.*

FIRE 101
Wildland Urban Interface
Overview of the wildland urban interface (WUI), which is a complex mix of native and ornamental vegetation, agriculture, industrial, commercial, and residential areas. Explores the challenges WUI firefighters face where vegetation, vehicles, structures, and infrastructure are at risk. Improves understanding of the WUI, including response strategies, interface awareness, size-up, initial attack, incident action planning, structure triage, structure protection tactics, and health/safety. Covers issues related to land-use planning and design, policy-making, and protection of natural areas.

FIRE 105
Fire Science
Covers fire conditions, tactics, and strategies to mitigate fire and fire behaviors, emphasizing wildland and urban interface fires. Discusses fire chemistry including oxidizers, chemical process of combustion, and properties of solid, liquid, and gas fuels. Reviews basic fire chemistry for hazardous materials, identification, reactivity, and health/safety implications. Explores issues related to pyrolysis, the properties of the states of matter, sources of energy for fires, and the properties of heat and temperature.

FIRE 210
Emerging Technologies and Topics
Covers advanced study and review of current and emerging topics and technologies on wildland and urban interface fires through readings, case studies, and presentations. Evaluates advances technology described by subject matter experts who will explain the technology and familiarize students with the tools to analyze and understand the legal, ethical, and operational requirements for new technologies. Evaluates and reviews the

cost benefit analysis and a rigorous, scientific processes for testing, adoption, evaluation, and integration of new technologies, products, and procedures into the fire services.

FIRE 351
Wildfire Law and Economics
Discussion of major concepts in environmental laws, regulations, and policies related to land management, forestry, and urban growth. Reviews the evolution of natural resource and land use policy, with emphasis on the local, state, and federal government, and considers the role of science, law, and economics. Introduces analytical techniques and tools to evaluate liability, risk, and the social, economic, and environmental consequences of wildfires. Examines the roles of judicial oversight, administrative procedures, politics, key organizations, agencies, and stakeholders. *Prerequisite: FIRE 101*.

FIRE 352
Emergency Management, Operations, and Administration
Introduces and discusses emergency management techniques, organizational and professional communication, and strategies for problem solving within fire science. Introduces and explains academic foundations on leadership and administration within the fire service, with an emphasis on multi-professional approaches, cooperation, and coordination. Addresses human resource, labor relations, and legal frameworks to applied fire service settings as well as a study of employee safety, risks and healthy/safe work environments.

FIRE 353
Firefighter Health and Safety
Introduces the health and safety implications of firefighting, including hazard identification, situational awareness, and risk assessment. Reviews and examines technical and scientific procedures for evaluating new techniques, protocols, and technologies. Includes a comprehensive review of resources and information, organizations, regulatory, and legal frameworks, including NFPA, NIOSH, CDC, OSHA, NIST, and the IAFF. Covers occupational exposures and limits, injuries, fatalities, health consequences and how tactics, strategies, resources, staffing, personal protective equipment, and situational awareness influence incident outcomes.

FIRE 354
Firefighter Stress, Behavioral, and Mental Health
Covers industry culture, myths, beliefs, behavioral health, strategies for addressing occupational health and wellness, support services, and behavioral health assistance for first responders. Examines and evaluates the sources of occupational stress and the regularity of incidents that expose first responders to often shocking, dangerous and stressful situations and potentially traumatic events (PTE). Covers suicide prevention and awareness, warning signs and symptoms, communication, emotional and physical behaviors, stress, anxiety, post-traumatic stress, addiction, depression, anger, and separation/retirement.

First Two Years After Implementation

FIRE 355
Land Use Planning and Community Resiliency
Covers how to plan and design strong, fire resilient communities. Topics include land use planning, resource management, homeland security, natural disasters, and wildfires. Examines and evaluates how communities address vulnerability, risk, resiliency, and sustainability using case studies to highlight best practices for planning, preparedness, evacuation, management, design, materials, model codes and ordinances. Discussion of tools available for assessing risk, physical, social, and economic vulnerabilities, and how resilient community planning addresses people, buildings, businesses, infrastructure, cultural and natural resources.

FIRE 399
Special Topics
Covers theoretical and applied content pertaining to special topics in Wildfire Science and the Wildland Urban Interface. Students should check the Class Schedule for a listing of actual topics. Course may be repeated for credit as topics change. *Enrollment restricted to students who have completed all lower-division preparation for the major coursework.*

FIRE 402
Fire Behavior, Fuels, and Resource Management
Covers the use of GIS and analytical tools to understand and evaluate fire behavior prediction systems, with attention to assumptions, limitations, uncertainty, sensitivity, and probability. Explains and demonstrates how fuels, land use, and environmental conditions influence combustion and behavior by using fire models, with discussion on how resource deployment and land management influences outcomes of an incident. Examines and evaluates the tools and approaches for inventory and management of fuels for wildland fires over large, diverse areas in forests, woodlands, shrubland, and grasslands. *Prerequisite: FIRE 101*.

FIRE 489
Research Methods and Design
Provides a foundation in scientific research, research design, effective communication practices, and interview skills. Integrates interdisciplinary approaches to research in the wildfire and wildland urban interface, emphasizing fundamental principles and practices of scientific method, research ethics and responsible conduct, and the organization of scientific inquiry in institutions of higher learning. Covers readings from the original literature and writing on selected current subjects. *Prerequisite: BIOL 216 or equivalent or consent of instructor*.

FIRE 499
Independent Study
In consultation with a faculty mentor, students identify a topic for library or laboratory research on wildfires and/or the urban interface. Literature Review: In-depth reading and researching of the literature on current issues. Student must produce a paper with supporting citations that summarizes the current state of knowledge on the topic. Original research project in the laboratory or field, developed in collaboration with a faculty member. Student will produce a paper or poster with supporting citations and critical analysis. *Prerequisite: FIRE 489, and requires students to obtain consent of program director*.

h. Attach a proposed course-offering plan for the first three years of program implementation, indicating, where possible, likely faculty teaching assignments. (WASC 2013 CFR: 2.1, 2.2)

	Course	Potential Instructor
FALL 1		
FIRE 101	Wildland Urban Interface	M. Rahn
FIRE 105	Fire Science	TBD
FIRE 210	Emerging Technologies and Topics	M. Rahn / NIST / CAL FIRE
BIOL 216	Biostatistics for Health Sciences	W. Kristan / M. Rahn
SPRING 1		
BIOL 391	Fire Ecology	TBD
FIRE 353	Firefighter Health and Safety	M. Rahn / NIST / IAFF
FIRE 352	Emergency Management, Operations, and Administration	CAL FIRE
UD Electives	Variable depending on department offerings	Various
SUMMER 1		
BIOL 338	Human Impact on the Environment	T. Brown
BIOL 339	Conservation Biology	W. Kristan
CHEM 311	Chemicals and the Environment	K. Ng (or other Chem Faculty)
PHIL 340	Ethics and the Environment	J. Mayock (or other Phil Faculty)
FIRE 351	Wildfire Law and Economics	M. Rahn
FALL 2		
FIRE 101	Wildland Urban Interface	M. Rahn
FIRE 105	Fire Science	TBD
FIRE 210	Emerging Technologies and Topics	M. Rahn / NIST / CAL FIRE
BIOL 216	Biostatistics for Health Sciences	W. Kristan / M. Rahn
FIRE 352	Emergency Management, Operations, and Administration	CAL FIRE
FIRE 489	Research Methods and Design	M. Rahn
UDGE-DD	Variable depending on department offerings	Various
UD Electives	Variable depending on department offerings	Various
SPRING 2		
BIOL 391	Fire Ecology	TBD
BIOL 392	Natural Resource Management	TBD
FIRE 353	Firefighter Health and Safety	M. Rahn / NIST / IAFF
FIRE 354	Firefighter Stress, Behavioral, and Mental Health	IAFF
FIRE 352	Emergency Management, Operations, and Administration	CAL FIRE
FIRE 402	Fire Behavior, Fuels, and Resource Management	CAL FIRE / NIST
FIRE 499	Independent Study	M. Rahn
UD Electives	Variable depending on department offerings	Various
SUMMER 2		
BIOL 338	Human Impact on the Environment	T. Brown
BIOL 339	Conservation Biology	W. Kristan
CHEM 311	Chemicals and the Environment	K. Ng (or other Chem Faculty)
PHIL 340	Ethics and the Environment	J. Mayock (or other Phil Faculty)
FIRE 351	Wildfire Law and Economics	M. Rahn
FALL 3		
FIRE 101	Wildland Urban Interface	M. Rahn
FIRE 105	Fire Science	TBD
FIRE 210	Emerging Technologies and Topics	M. Rahn / NIST / CAL FIRE
BIOL 216	Biostatistics for Health Sciences	W. Kristan / M. Rahn
FIRE 352	Emergency Management, Operations, and Administration	CAL FIRE
FIRE 489	Research Methods and Design	M. Rahn
UDGE-DD	Variable depending on department offerings	Various
UD Electives	Variable depending on department offerings	Various
SPRING 3		
BIOL 391	Fire Ecology	TBD
BIOL 392	Natural Resource Management	TBD
FIRE 353	Firefighter Health and Safety	M. Rahn / NIST / IAFF
FIRE 354	Firefighter Stress, Behavioral, and Mental Health	IAFF
FIRE 352	Emergency Management, Operations, and Administration	CAL FIRE
FIRE 402	Fire Behavior, Fuels, and Resource Management	CAL FIRE / NIST
FIRE 499	Independent Study	M. Rahn

UD Electives	Variable depending on department offerings	Various
SUMMER 3		
BIOL 338	Human Impact on the Environment	T. Brown
BIOL 339	Conservation Biology	W. Kristan
CHEM 311	Chemicals and the Environment	K. Ng (or other Chem Faculty)
PHIL 340	Ethics and the Environment	J. Mayock (or other Phil Faculty)
FIRE 351	Wildfire Law and Economics	M. Rahn

There are sufficient regional agency experts and agency partners with the requisite degrees, experience, and knowledge to serve as adjunct instructors for the program to support degree-specific courses. Experts from CAL FIRE, the National Institute of Standards and Technology (NIST), and the International Association of Fire Fighters (IAFF) are partners in the development of this program and have significant experience in the wildfire and wildland urban interface arena, with many of these experts living locally. In order to fulfill the degree requirements, we have an identified need for expert instructors in the areas listed above.

i. N/A This is not a graduate program
j. N/A This is not a graduate program
k. N/A This is not a graduate program
l. N/A This is not a graduate program

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m. For undergraduate programs, specify planned provisions for articulation of the proposed major with community college programs.

We accept transfer students from the community colleges. Local programs offered in the general area of "Fire Science" from Mount San Jacinto Community College, Palomar College, Miramar College, and others provide an education pathway that matches well with this proposed program. Any transfer student will be required to complete all CSUSM Lower-Division General Education requirements prior to enrolling in the Wildfire Science program. This includes lower-division requirements and units in the following areas:

- Area A Basic Skills (9 units)
  - A1: Oral Communication
  - A2: Written Communication
  - A3: Critical Thinking

- Area B Mathematics and Natural Sciences (12 units)
  - B1: Physical Science
  - B2: Life Science
  - B3: Laboratory
  - B4: Mathematics/Quantitative Reasoning

- Area C: Arts and Humanities (9 units)
  - C1: Arts
  - C2: Humanities
  - C3" Arts and/or Humanities

Students are also expected to have completed the American Institutions requirements and the general education Language Other Than English Requirement prior to graduating from CSUSM.

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n. Describe advising "roadmaps" that have been developed for the major.

Fall Semester 1			
Course	Full Semester	8-Week Course	Units
FIRE 101		YES	3
FIRE 105		YES	3
FIRE 210		YES	3
BIOL 216	YES		3
Total Units:			**12**

Fall Semester 2			
Course	Full Semester	8-Week Course	Units
UDGE DD	YES		3
Upper Division Elective		YES	3
Upper Division Elective		OPTIONAL	3
FIRE 489		YES	3
Total Units:			**12**

Spring Semester 1			
Course	Full Semester	8-Week Course	Units
BIOL 391	YES		3
FIRE 353		YES	3
FIRE 352		YES	3
Upper Division Elective		YES	3
Total Units:			**12**

Spring Semester 2			
Course	Full Semester	8-Week Course	Units
Upper Division Elective		OPTIONAL	3
Upper Division Elective		OPTIONAL	3
Upper Division Elective		OPTIONAL	3
FIRE 499		YES	3
Total Units:			**12**

Summer Session 1			
Course		8-Week Course	Units
BIOL 338 or 339 (UDGE-BB)		YES	3
CHEM 311		YES	3
PHIL 340 (UDGE-CC)		YES	3
FIRE 351		YES	3
Total Units:			**12**

GRAND TOTAL:			**60**

**NOTE: The advising roadmap is created for the "+2" portion of the 2+2 degree program. It is assumed that students transferring into the program will have completed the requisite 60 units of their undergraduate degree or have obtained an Associate Degree from a Community College.

Recognizing that students enrolled in this program may be working professionals, who could be deployed to fire incidents or other disasters for extended periods of time, we will ensure that courses will appropriately managed to mitigate issues that could arise that could keep a student from the "classroom" for an extended period of time, ensuring that these unforeseen events do not negatively impact degree progress. While we cannot anticipate incidents or impacts to student success, we will work with instructors to ensure that courses are offered during the semesters as needed by the students with an emphasis on ensuring timely offerings and graduation. We will also address individual hardships on a case-by-case basis, as not all students in a given class or semester may be affected by a dramatic fire season or other incident. Time extensions, altered exam dates, or other mechanisms will be employed as needed to ensure long-term student success.

o. Describe how accreditation requirements will be met, if applicable, and anticipated date of accreditation request (including the WASC Substantive Change process). (WASC 2013 CFR: 1.8)

As a distance learning program, we are seeking expedited review and approval through WASC as previously determined by the Commission for a "Substantive Change Application: Expedited Review."

5. Societal and Public Need for the Proposed Degree Major Program

a. List of other California State University campuses currently offering or projecting the proposed degree major program; list of neighboring institutions, public and private, currently offering the proposed degree major program.

The following Universities with the California State University system provide programs related to fire and/or wildfire. None, however, offer a specific degree in "Wildfire Science" or the "Wildland Urban Interface." These areas are most commonly provided as a single course or concentration rather than a stand-alone degree of that focus and title.

- **California State University Los Angeles**: Fire Protection Administration and Technology B.S.
  - Focus on fire administration and structure/urban fire

- **Cal Poly San Luis Obispo**: Forestry and Natural Resources B.S.
  - Concentration in Wildland Fire and Fuels Management (with forestry focus)
  - Focus on Forestry and Natural Resource Management. The concentration in wildland fires and fuels management is largely focused on forest management.

- **Humboldt State University**: Forestry B.S. with an option in Wildland Fire Management
  - Focus on forestry and forest management. The option in Wildland Fire Management is focused mainly on traditional forest fires and forests rather than wildland and WUI fires.

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b. Describe Differences between the proposed program and programs listed in Section 5a above.

Those programs offered within the CSU lack a particular and substantial foundation of the degree on wildland and the wildland urban interface. Existing CSU programs are generally focused on forestry/forest management, structure/urban firefighting, and administration. Despite our prominence as one of the highest-risk wildland fire regions in the United States, no existing program on wildland fires or the wildland urban interface is offered in California. Furthermore, no national program of this type has been developed, nor have any similar programs been developed with such broad coordination and cooperation with local, state, and federal agencies. Below is a matrix that addresses the similarities and differences between the CSU programs that are somewhat similar to the proposed B.S. in Wildfire Science.

Cal State San Marcos	**Cal Poly San Luis Obispo**	**CSU Los Angeles**	**Humboldt State University**
Wildfire Science and the Wildland Urban Interface B.S.	**Fire Protection Engineering B.S. and Forestry and Natural Resources B.S.**	**Fire Protection and Administration B.S.**	**Forestry/Wildland Fire Management B.S.**
Wildland Urban Interface	Fundamental Thermal Sciences	Fire Protection and the Community	Forest Ecology
Statistics	Fire Dynamics	Fire Defense Planning	Forest Measurements
Natural Resource Management	Flammability Assessment Methods	Building Construction Aspects	Forest Health and Protection
Fire Ecology	Fire Modeling	Fire Disaster Planning	Forest Management
Land Use Planning and Community Resiliency	Egress Analysis and Design	Human Behavior and Fire Protection	Forest Mensuration and Growth
Firefighter Health and Safety	Fire Detection, Alarm and Communication Systems	Fire Protection Laws	California's Forests and Woodlands
Emerging Technologies and Topics	Water-based Fire Suppression Systems	Emergency Management and Terrorism	**Wildland Fire Behavior**
Workplace Stress, Behavioral, and Mental Health	Structural Fire Protection	Fire Leadership and Ethics	Silviculture
Wildfire Law and Economics	Fire Safety Regulation and Management	Advanced Hazardous Materials	Wildland Fuels Management
Introduction to Laboratory and Field Work	Smoke Management and Special Hazards	Fire Cause Investigation	Wildland Fire Use
Senior Thesis	Forensic Fire Analysis	Fire Laws and Codes	Forestry in Modern Society
The Physiology of Exercise and Health	Interface	Fire Prevention Administration	Wilderness Area Management
Human Impact on the Environment	Forest Practices and Env. Protection	Fire Equipment and Systems	Forest Economics and Finance
Conservation Biology	Forest Ecosystem Management	Fire Protection/Structural	CA and US Forest and Wildland Policy
Emergency Management, Operations, and Administration	Dendrology	Fire Finance	Forest Ecosystems
Special Topics in Wildfire Science	Land and Resource Management	Fire Research	Forest Restoration
Spatial Analysis and Remote Sensing	Fire Ecology	Capstone Course	Harvesting
Fire Behavior, Fuels, and Resource Management	Natural Resources Economics and Valuation		Forest Administration and Ethics
Geographic Information Systems	Conflict Management in Natural Resources		Advanced Forest Management
Exercise Fitness and Health	Silviculture and Vegetation Management		Forestry Capstone
Stress Management	Forest Health		Senior Thesis
Nutrition for Health and Exercise Performance	Natural Resource Policy		Selected Topics in Forestry
Similar Course Offerings			
Similar Topic Area, but with Forestry or Structure Fire Focus			

c. List of other curricula currently offered by the campus that are closely related to the proposed program.

Coursework offered in Biology, Kinesiology, Chemistry, and the GIS Certificate (offered through Extended Learning) are all supportive courses for a degree in wildfire science. However, no existing program, certificate, or degree at CSUSM is designed to specifically address fire issues, wildfire science, or the wildland urban interface.

d. Describe community participation, if any, in the planning process. This may include prospective employers of graduates.

THE 2014 WILDFIRE SYMPOSIUM, SACRAMENTO, CALIFORNIA

In June 2014 – CAL FIRE Local 2881 and Researchers from CSUSM hosted the first California Wildfires and Statewide Challenges Symposium in Sacramento, California. Community experts from the federal, state and local levels accepted invitations to attend the symposium. Topics ranged from environmental change to land management to firefighter staffing and safety. High-ranking officials from local, state, and federal agencies were all in attendance. The idea was simple enough – allow the experts to honestly view the California and national landscape as it relates to wildland and WUI fires and encourage common sense conclusions.

The discussions were insightful, particularly with regard to education and research. A universal conclusion was that urbanization has profoundly changed the California and National landscape forever, and that we are at least a generation behind urban strategies for fire suppression and response when dealing with these fires. In their 2014 Symposium publication, participants recommended the following:

> *"There is a need to create a comprehensive wildfire/WUI education and training program that meets the diverse needs of urban and wildland fire agencies with an emphasis on research and education on new tools, technologies, and operational strategies to meet the evolving risks and demands."*[8]

The results from the Symposium were presented to the Wildfire Task Force with the International Association of Fire Fighters (IAFF) in Washington, DC. Their conclusion at the end of the workshop similarly states:

> *"We need to develop advanced education and training programs focused on wildland and WUI firefighting that are accessible to career firefighters and diverse agencies throughout the U.S."*

Participants of the 2014 Symposium noted that one of the biggest points of concern for people applying to fire departments is whether or not to take the time to earn a bachelor's degree. Colleges and universities offer a variety of fire-related programs, but tend to focus specifically on fire administration, fire science (generally, often with an emphasis on materials science), and forestry. While aspects of all these fields should be incorporated into the CSUSM degree in Wildfire, none of the existing CSU programs meet the educational demand of the industry with regard to wildland and WUI fires.

[8] Rahn, M. and T. McHale. 2015. CAL FIRE Local 2881 Symposium: A Comprehensive View on the Future of Fighting Wildfires by a Team of Experts.

Creating this education pathway in collaboration with agency partners is key to the success and sustainability of this program. To date, we have had discussions with representatives from the following agencies and organizations regarding this new degree program:

CAL FIRE
National Institute of Standards and Technology (NIST)
International Association of Fire Fighters (IAFF)
IAFF Wildland Taskforce
Pechanga Band of Luiseño Indians Fire Department
CAL FIRE Local 2881
U.S. Forest Service
Los Angeles County Fire
San Diego County Fire

<u>IAFF Resolution #46, August, 2016</u>
International Association of Fire Fighters, Washington, D.C.

On August, 18, 2016 the IAFF Bi-Annual Convention met, and unanimously adopted by acclamation IAFF Resolution #46, entitled "Wildfire and WUI Research and Education Collaboration." This is the only resolution of its kind within the IAFF, representing the intent and will of over 310,000 firefighters throughout the United States and Canada. Submitted by CAL FIRE Local 2881, the Resolution was co-sponsored/authored by the following fire agencies:

<u>California:</u>
California Professional Firefighters
Local 112, Los Angeles City, CA
Local 1301, Kern County, CA
Local 3523, San Luis Obispo City, CA
Local F33, San Diego, CA
Local 798, San Francisco, CA
Local 2400, San Mateo County, CA
Local 1014, Los Angeles County, CA
Local 1289, Modesto, CA
Local 1067, Riverside City, CA
Local 3631, Orange County, CA
Local 1401, Santa Rosa, CA
Local 522, Sacramento, CA

<u>United States:</u>
Federal Fire Fighters Joint Council
Local 1364, Ventura County, CA
Local 1463, Hawaii
Washington State Council of Fire Fighters
Local 975, Austin, TX
Hawaii State Fire Fighters Association
Professional Fire Fighters of Massachusetts
Local 2086, Littleton, CO

<u>Canada:</u>
Local 2494, Fort McMurray, AB
Alberta Fire Fighters Association
British Columbia Professional Fire Fighters Association
Saskatchewan Professional Fire Fighters Association

Text from the Resolution, states:

…be it RESOLVED, The IAFF work in collaboration with <u>California State University San Marcos</u> to further the scientifically based studies and advanced <u>education programs</u> for fire fighters across the United States;

and be it further RESOLVED, That the IAFF will include the mission of Wildland Urban Interface (WUI) and Wildland firefighting as integral to the IAFF focus;

and be it further RESOLVED, That the IAFF will continue to lobby at the National level agencies and organizations and any other authority to ensure that the IAFF wildfire/WUI initiatives are given proper recognition and support by our federal government.

e. Provide applicable workforce demand projections and other relevant data.

Demand and Need

Between 2007-2011, local fire departments across the United States responded to over 330,000 wildfires each year.[9] Given the complexity of our communities, most firefighters will, at some point in their career, respond to a wildland or wildland urban interface fire. Therefore, this program will have local and national benefits far beyond just those agencies with significant responsibility for wildland areas (like CAL FIRE or the U.S. Forest Service).

There are over 1.1 million firefighters and 30,100 fire departments in the US.[10] Conservatively, if only about 9% of the US is part of the WUI, it is estimated that around 100,000 firefighters are regularly involved in wildland/WUI incidents at 2,709 departments across the country (although the International Association of Fire Fighters estimates the numbers are much higher). California has the largest wildland fire agency outside of the US Forest Service. CAL FIRE, is our statewide agency that is responsible for fire protection in the State Responsibility Areas (SRA) that covers over 31 million acres. This agency is the largest full service all risk fire department (including structure and wildland fires, medical aid, vehicle accidents, hazardous materials, natural disasters, etc.) in the Western United States and operates more fire stations year round than the New York (FDNY), Los Angeles (LAFD), and Chicago (CFD) fire departments combined. CAL FIRE and CAL FIRE Local 2881 support the development of this educational resource, and has expressed interest in participating in the creation and implementation of this program. This is an opportunity for our state resources to work together to advance one of our most critical needs.

Although firefighting response and effectiveness has vastly improved, many of the most basic issues have not been researched and considerable uncertainty remains. As a result, wildland and WUI fires have not kept pace with the advancements seen in structure and high-rise fires. For example, in 1973, the National Commission on Fire Prevention and Control published a report (America Burning) that was the result of nearly two years of work. Findings and recommendations from this report served as a catalyst for significant changes and advancements in our urban fire sector, including advanced education programs. The results are nothing short of miraculous, especially when you consider that the US population has increased by about 100 million people, with the concomitant increases in buildings and homes (**Table 1** – *advancements in structure firefighting in the United States*). Results of the 2014 wildland fire symposium (held in Sacramento, California) urge similar investment and advances in research and education.

Table 1. Trends in structure fires, deaths, injuries, and dollar loss in the United States. [11, 12]

Category	1971	2012	Percent Decrease
Deaths	7,570	2,385	68.5%
Property Loss (adjusted for 2012 dollars)	$12.85 Billion	7.10 Billion	44.7%
Number of Fires (structure)	996,900	374,000	62.5%
Injuries	Tens of Thousands (estimate)	13,050	unknown

Indeed, the societal and economic consequences from wildfires cannot be overstated. Large-scale wildfires have significant, and overlooked economic impacts, often exceeding billions of dollars in losses. Each fire has a unique personality and concomitant economic impacts. In California, the most

[9] Ahrens, M. 2013. Brush, Grass, and Forest Fires. National Fire Protection Association, Fire Analysis and Research Division.
[10] Communities Dealing with Wildland/Urban Interface Fire; WUI Fact Sheet, ICC and NARCD Councils, updated March 18, 2013.
[11] Data based on Appendix V, America Burning, the Report of the National Commission on Fire Prevention and Control (1973)
[12] Data based on US Fire Administration statistics (http://www.usfa.fema.gov/downloads/pdf/statistics/res_ bldg_fire_estimates.pdf)

alarming trend is that half of the twenty largest wildfires in recorded history have occurred in only the past decade, with many of these events having an unprecedented physical and financial impact to the state. The economic, social and environmental costs of wildfires are often staggering. Here in San Diego County, the 2003 and 2007 wildfires resulted in nearly $5 billion in economic losses to our region.[13] It is important that we see this education program as not only filling a need, but also serving as a catalyst for change.

Potential Employers

Wildland firefighting agencies operate at the federal level (National Park Service, Forest Service, Bureau of Land Management, Fish and Wildlife Service, and Bureau of Indian Affairs, and various Tribal Governments), the state level (Department of Fish and Wildlife, Land Management, CAL FIRE, and Office of Emergency Services), and local level in our cities and unincorporated areas of our counties. While some wildland firefighters work year-round and some work only during the fire season, the positions are always highly competitive. Prospective workers can often increase their chances of securing a job by earning a bachelor's degree, as well as seeking advancement within the agencies. In order to meet the demands of the industry, the degree necessarily should be designed to meet the education needs of a diverse cross section of the industry, while meeting the following objectives:

- Providing flexibility and accessibility to prospective and existing (working) professionals
- Creating a pathway for a "veterans to firefighters" program
- Providing the education and training important to federal, tribal, state, and local governments

California Occupational Employment Projections 2014-2024

Employment Development Department, Labor Market Information Division

Published August 2016

According to the California Employment Development Department, "Forester" is listed among the top 100 fastest growing occupations in California (2014-2024).[14] Further, they note that for these positions, employers are usually looking for candidates with a Bachelor's degree. The undeniable and expanding link between natural resource management and fires in the wildland and urban interface requires an evolving definition of what a traditional forester is, beyond simply the management of forests and silviculture. The proposed CSUSM program in Wildfire Science is designed to meet the evolving demand of wildfires and the growing concerns of the urban interface.

While the growth projection for this particular field suggests 36.4% increase in jobs, across the firefighting industry in California, the remaining job classifications will grow by 7% (on average). The total jobs (including new positions and replacement positions) is estimated to increase by nearly 4,000 positions within the state of California alone, with nearly 450 new job openings per year (on average).

[13] Rahn, M. 2009. Economic impact analysis of wildfires: the 2003 San Diego wildfires in retrospect. Wildfire Research Report #1. Montezuma Publishing, Spring 2009.

[14] California Employment Development Department, Labor Market Information Division, http://www.labormarketinfo.edd.ca.gov/OccGuides/FastGrowingOcc.aspx (visited August 30, 2016).

Occupational Title	Estimated Employment 2014**	Projected Employment 2024	Numeric Change 2014-2024	Percent Change 2014-2024	Average Annual Job Openings		
					New Jobs	*Replacement Need*	*Total Jobs*
Foresters	11,100	11,500	400	36%	40	50	90
Forest and Conservation Technicians	7,400	7,600	200	3%	20	310	330
First-Line Supervisors of Fire Fighting and Prevention Workers	2,400	2,600	200	8%	20	110	130
Fire Fighting and Prevention Workers	34,500	37,100	2,600	8%	260	1,000	1,260
Firefighters	33,200	35,600	2,400	7%	250	960	1,210
Supervisors of Farming, Fishing, and Forestry Workers	10,400	11,300	900	9%	90	250	340
First-Line Supervisors of Farming, Fishing, and Forestry Workers	10,400	11,300	900	9%	90	250	340
Forest, Conservation, and Logging Workers	4,700	4,800	100	2%	30	110	140
Forest and Conservation Workers	3,000	3,300	300	10%	30	70	100
ALL FIRE RELATED OCCUPATIONS	**107,100**	**115,100**	**8,000**	**7%**	**830**	**3,110**	**3,940**

CAL FIRE R.V.E.T.S Program
California Department of Forestry and Fire Protection

Recognizing the hardships accompanying reintegration into the civilian workforce, as well as the valuable skills and experiences veterans possess, the California Department of Forestry and Fire Protection (CAL FIRE) has launched Returning Veterans: Enlisting Their Skills for CAL FIRE Service (R.V.E.T.S). R.V.E.T.S. is CAL FIRE's grassroots effort to assist veterans with integration and transition into service with the Department. In partnership with a variety of organizations including, but not limited to, the California Department of Veterans Affairs (CalVet) and the California National Guard (Cal Guard), R.V.E.T.S. explores a variety of employment options and educational opportunities for veterans who have successfully served in the United States Armed Services.

Unites States Workforce Projections 2014-2024

United States Department of Labor, Bureau of Labor Statistics

According to the Bureau of Labor Statics, across the United States, the job growth outlook for firefighters from 2014-2024 is 5% (as fast as average), resulting in an estimated 17,400 jobs needed nationwide.[15] For First-line Supervisors of Firefighting and Prevention Workers, four states with high levels of wildland and WUI fires were included in the top ten for highest employment levels in the United States (Florida, California, Arizona, and Washington). California led the nation in highest employment levels of Firefighters, with other Texas and Florida taking second and third place, respectively. California also leads the nation with the highest employment for Forest Fire Inspectors and Prevention Specialists.

United States Department of Agriculture, Forest Service Workforce Need

Fire and Aviation Management Workforce and Development Strategic Framework (2013)[16]

The Forest Service was tasked by the Office of the Inspector General (OIG), through OIG Audit Report #08601-54-SF, to prepare for the timely replacement of critical fire management staff. As in most federal agencies, the Forest Service faces a significant number of retirements over the next 5-10 years. Many of the fire management positions require several years of formal and on- the-job training in order to become certified for firefighting duties. The report included recommendations for the development of plans for recruiting, training, developing and retaining those personnel who fill these critical positions.

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[15] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2016-17 Edition, Firefighters, http://www.bls.gov/ooh/protective-service/firefighters.htm (visited August 30, 2016).

[16] U.S Forest Service, Fire and Aviation Management. http://www.fs.fed.us/fire/people/workforce_succession_planning/ (visited August 30, 2016).

The Forest Service (FS) acknowledges the need to "develop a national workforce plan based on firefighters' position qualifications that focuses on identifying, assessing and meeting specific workforce needs relative to the Forest Service's strategic goals and objectives." Their goal is to provide for a highly qualified and professional workforce utilizing an interagency fire and aviation community as well as professional institutions that identify the skills, abilities and knowledge needed.

6. Student Demand

a. Provide compelling evidence of student interest in enrolling in the proposed program. Types of evidence vary and may include national, statewide, and professional employment forecasts and surveys; petitions; lists of related associate degree programs at feeder community colleges; reports from community college transfer centers; and enrollments from feeder baccalaureate programs, for example.[17]

In California, firefighters can be promoted to engineer, then lieutenant, captain, battalion chief, assistant chief, deputy chief, and finally, chief. For promotion to positions beyond battalion chief, many fire departments now require applicants to have a bachelor's degree, preferably in fire science, public administration, or a related field. Some firefighters eventually become fire inspectors or investigators after gaining enough experience. The National Fire Academy also offers a certification as Executive Fire Officer. To be eligible for certification, firefighters must have a bachelor's degree.

One of the biggest points of concern for people applying to fire departments is whether or not to take the time to earn a Bachelor's Degree. Earning this degree shows a strong commitment to the fire service, and develops a unique skill set that meets the evolving demands of the industry. Furthermore, it is widely recognized that a degree demonstrates that a job candidate has the ability to set a goal and achieve it, which is an important quality for a firefighter. Obtaining the degree also demonstrates that the candidate can communicate and problem solve effectively. A degree in Wildfire Science can be the added bonus that sets a candidate apart in a relatively competitive field.

Based on the information provided in previous sections, there is significant and growing support for this program at the federal, state, and local levels. This is evidenced by the various studies and reports referenced that highlight the need for programs in higher education. Our close collaboration with a diverse cross-section of agencies highlighted interest by existing firefighters across all levels of employment, experience, and rank.

Regionally, many community college campuses offer associate degrees in the fire science field. This is particularly true for southern California given our prominence as one of the highest-risk wildfire regions in the world. Currently, **56 colleges** in California offer some type of associate's degree in a "fire-related" field, with **sixteen** of these being located in the southern California region. Graduates of these programs will be able to transfer into our degree program.

[17] Contact Enrollment Management Services to obtain numbers of students with declared majors, options/concentrations/tracks/etc., and minors. Contact Academic Programs to obtain enrollment histories in specific courses. Surveys of potential employers might show the need for the proposed program. Please explain if there are discrepancies between national/statewide/professional manpower surveys and local findings. Contact the Career Center for assistance in completing this section.

b. Identify how issues of diversity and access to the university were considered when planning this program. Describe what steps the program will take to insure ALL prospective candidates have equitable access to the program. This description may include recruitment strategies and any other techniques to insure a diverse and qualified candidate pool.

Across our local, state, and federal fire agencies, there is a need to identify effective recruitment, selection, and retention practices to achieve a fire service workforce that reflects the community served. Additionally, the agencies specifically want to address the under-representation of races and ethnicities, women, and sexual orientations. Further, the fire industry as a whole represents employees across a diverse cross-section cultures, economics, religions, and politics.[18] Given that the recruitment for the proposed Wildfire Science program is uniquely linked to these agencies, it is our goal to ensure that our own program reflects similar goals of diversity and access.

We will work closely with our community colleges, fire service agencies, local, state, and federal governments to ensure that we have a diverse student population that is both reflective of those agencies, but also our region and state. All program marketing will foster and demonstrate a commitment to diversity and equitable program access. Messaging will clearly describe how and why our program values inclusion and diversity, emphasizing the goals of the CSUSM Diversity and Inclusion Strategic Plan (2016) and the California State University issued Executive Order 1097 (revised June 23, 2015). That policy (https://www.calstate.edu/eo/EO-1097-rev-6-23-15.pdf) affirms the following: "The California State University (CSU) is committed to maintaining an inclusive community that values diversity and fosters tolerance and mutual respect. We embrace and encourage our community differences in Age, Disability, Race or Ethnicity, Gender, Gender Identity or Expression, Nationality, Religion, Sexual Orientation, Genetic Information, Veteran or Military Status, and other characteristics that make our community unique.

c. For master's degree proposals, cite the number of declared undergraduate majors and the degree production over the preceding three years for the corresponding baccalaureate program, if there is one.

NOT APPLICABLE

d. Describe professional uses of the proposed degree program.

As proposed, this degree is both specific, and general enough to have reach across a wide cross-section of potential employment opportunities, beyond simply wildland firefighting. The degree is intended for both new job-seekers and working professionals already in the fire service industry. This includes positions related to fire issues related to land use planning, environmental review, and natural resource management. Students graduating from the program can work in support positions in an array of industries, all of which have specific needs, requirements, or are directly impacted by fire issues. This includes positions in the transportation sector, railroads, utilities, watershed/ecosystem management, and the insurance and home building industry. More traditional jobs can be found in forestry and fire protection fields including first-line supervisors, firefighters, fire Inspectors and investigators, foresters, and forest fire inspectors and prevention specialists. Positions in these fields exist in local, state, federal, and tribal governments. Given

[18] Fox, K., C. Hornick, and E. Hardin. 2006. Achieving and Retaining a Diverse Fire Service Workforce. International Association of Fire Fighters, and CWH Research, Washington, D.C.

the propensity of wildfires, and the observed expansion across North America, even our more traditional city and county fire agencies have recognized the growing need for fire professionals trained in the wildfire/WUI field. In fact, this growing demand resulted in the development of a new program under the International Association of Fire Fighters, to develop a nationally recognized wildfire firefighting training program which will identify critical Wildland firefighting skills that structural firefighters need to be safe and effective. Our partnership with the IAFF is intended to support this mission.

e. Specify the expected number of majors in the year of initiation and three years and five years thereafter. Specify the expected number of graduates in the year of initiation, and three years and five years thereafter.[19]

We are conservatively estimating an initial enrollment of 40 students in the first year of the program. The following table provides a one, three, and five-year projection of students in the Wildfire Science program at CSUSM:

Year	**Number of Students**	**Attrition**	**Number of Graduates**
Year 1	40	10%	0
Year 3	78	10%	38
Year 5	78	10%	38

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[19] Contact Academic Programs for assistance in estimating the number of majors and graduates.

7. Existing Support Resources for the Proposed Degree Major Program

Note: Sections 7 and 8 should be prepared in consultation with the campus administrators responsible for faculty staffing and instructional facilities allocation and planning. A statement from the responsible administrator(s) should be attached to the proposal assuring that such consultation has taken place.

a. List faculty who would teach in the program, indicating rank, appointment status, highest degree earned, date and field of highest degree, professional experience, and affiliations with other campus programs. For master's degrees, include faculty publications or curriculum vitae.

Faculty	Rank	Appointment Status	Highest Degree	Date	Field	Professional Experience
Tracey Brown	Professor	Tenured	PhD	1999	Biology	Conservation biology and ecology
William Kristan	Associate Professor	Tenured	PhD	2001	Biology	Biostatistics and landscape
George Vourlitis	Professor	Tenured	PhD		Biology	Conservation biology, ecology, land use change, atmospheric pollution, and climate change
Matthew Rahn	Program Director	Director/Lecturer Faculty	PhD/JD	2005	Ecology/Law	Director of environmental, policy, and wildfire programs
Nelson Bryner	Instructor	Lecturer Faculty	MS	1986	Chemical Engineering	Director of Wildfire Programs and Division Chief of Fire Research Division National Institute of

b. Describe facilities that would be used in support of the proposed program.

Given that the program is intended to be offered fully online, no space needs are anticipated. Online instruction or any real-time course needs would utilize currently existing classrooms in Extended Learning. No special labs or clinical facilities will be needed. Office space for staff, faculty, and any adjunct faculty is already provided for. Any additional future faculty needs for this program will work through the College of Science and Mathematics to identify any space needs.

c. Provide evidence that the institution provides adequate access to both electronic and physical library and learning resources [20]

See attached letter from Library

d. Describe existing academic technology, equipment, and other specialized materials[21]

See attached letter from IITS

[20] Contact the Library for this report.

[21] Contact Instructional and Information Technology Services (IITS) for a report addressing information technology and academic computing resources available to support the program. Programs currently possessing additional equipment and specialized material not addressed in the IITS report should include these here.

8. Additional Support Resources Required

a. Describe additional faculty or staff support positions needed to implement the proposed program.[22]

Extended Learning will be hiring a Program Director (60% FTE) who will also provide instructional support for the program. We also anticipate Extended Learning will be able to support 50% of a new full-time tenure-track professor in the Department of Biological Sciences who holds a Ph.D. in the field of ecology and/or fire science, along with startup costs. There are no other special characteristics that we anticipate our new hire to possess in order to perform her/his duties. We do anticipate hiring a part-time support-staff position to provide administrative needs. Finally, we will hire lecturer faculty as needed for any uncovered courses.

b. Describe the amount of additional lecture and/or laboratory space required to initiate and to sustain the program over the next five years.

None anticipated

c. Include a report written in consultation with the campus librarian, which indicates any necessary library resources not available through the CSU library system. Indicate the commitment of the campus to purchase these additional resources.[23]

See attached letter from Library – EL is committed to purchasing the recommended resources and is including these costs in the budget for the program.

d. Indicate additional academic technology, equipment, or specialized materials that will be (1) needed to implement the program and (2) needed during the first two years after initiation. Indicate the source of funds and priority to secure these resource needs.[24]

See attached letter from IITS

[22] Include additional faculty lines needed to support the course offerings indicated in 4.h and 4.m. Indicate whether any external funds are expected to support faculty lines.

[23] This should follow directly from the Library report in 7.c.

[24] Information technology and academic computing needs should follow directly from the IITS report in 7.d. Additional specialized equipment and materials that will be needed should be addressed here.

9. Self-Support Programs

a. Confirm that the proposed program will not be offered at places or times likely to supplant or limit existing state-support programs.[25]

As an online program, no significant space needs are required. In addition, any transient space needs will be provided by the existing classrooms and facilities at Extended Learning, which will avoid any potential impacts to existing state-support programs. The program director already has space allocated by EL, and all support staff will come from existing EL staff, with space already allocated.

b. Explain how state-support funding is either unavailable or inappropriate.

The Bachelor of Science in Wildfire Science and the Urban Interface is a program that specifically targets working professionals and individuals that require flexibility. The course offerings will be run on non-traditional 8-week cycles that working firefighters from all over the state can be participating in. Given the uniqueness of this program, the Department of Biology and the College of Science and Math value it as being a critical offering within the college portfolio and has made the carefully deliberated decision to pursue the development of this program via a self-support model.

c. Explain how the program is different, in one or more of the following ways, from state-supported campus offerings operating on campus:

   i. Primarily designed for career enrichment or retraining
   ii. Program location is significantly removed from state-supported campus facilities
   iii. The program client group receives educational or other services at a cost beyond what could be reasonably provided under state support.

The *Bachelor of Science in Wildfire Science and the Urban Interface* is a fully online program that is predominantly geared towards the sector of workforce directly linked to fire science and firefighting. This program offers specialized education and training opportunities for those in careers affiliated with the fire science field and would be able to reach a national and potentially global audience through the fully online delivery modality.

d. For self-support programs, please provide information on the per-unit cost to students and the total cost to complete the program (in addition to the required cost recovery budget elements listed in the CSU degree proposal faculty check list found earlier in this document).

The cost per unit is $349, with the total estimated cost to complete the program at $20,940. There is no tuition differential for out-of-state-students. In addition, all program management, staff support, space requirements and specialized equipment will be supported through Extended Learning. The funding for additional faculty, instructors, staff, infrastructure, equipment and supplies, laboratory space, and all other related resources will be funded entirely by a combination of funds from Extended Learning and federal grants and donations from industry as well as private foundations for the first five years of the degree. We are currently funded by CalFire L2881 at $50,000 per year, with the US Forest Service providing approximately $500,000 annually for research and laboratory support under an existing three year MOU between UARSC and the Department of Agriculture. A detailed self-support budget is provided with information on annual estimated student fees and expenditures.

[25] Pursuant to Executive order 1099, "Self-supporting special sessions shall not supplant regular course offerings available on a non-self-supporting basis during the regular academic year (Education Coder section 89708)."

Appendix 1 - Comprehensive Assessment Plan

ULOs	*PSLOs*	*Courses (where SLOs are addressed)*	*Assessment activities (to measure each SLO)*	*Suggested assessment tools*	*Assessment schedule – how often SLOs will be assessed*	*How will data/findings be reported?*	*Designated personnel to collect, analyze, and interpret studies*	*Program data/findings dissemination schedule*	*Anticipated closing the loop strategies*
1, 3	1) Demonstrate an understanding of the issues and risks related to firefighter health and safety with an emphasis on the wildland and wildland urban interface environments.	BIOL 391; FIRE 351, 352, 353, 354, 399, 489, 499; PHIL 430	Project requiring students to analyze research approaches and develop presentation	Rubric	Biennial cycle – every odd fall - work with local, state, and federal agencies on a formal inquiry and survey of students they hire, to assess outcomes	Rubric scores will be aggregated, reviewed by team; reported to program faculty; annual reports to Academic Programs and Partner Fire Agencies	Course instructor, program director and faculty	Semester following assessment activity	Program faculty will determine if change is needed; implement change in following year; re-measure the following year
1, 2, 3, 4	4) Communicate in both oral and written form wildfire and urban interface perspectives, concepts, and theories related to societal problems, threats, risks, and safety impacts								
1, 2, 3	2) Identify and analyze practices, and apply tools, tactics, and strategies to avoid, minimize, and mitigate the risks of fires in the wildland and wildland urban interface	BIOL 392; CHEM 311; FIRE 101, 105, 210, 355, 402	Simulation requiring students to apply problem solving techniques	Final Exam	Biennial cycle – every odd fall - work with local, state, and federal agencies on a formal inquiry and survey of students they hire, to assess outcomes	Exam scores will be aggregated, reviewed by team; reported to program faculty; annual reports to Academic Programs and Partner Fire Agencies	Course instructor, program director and faculty	Semester following assessment activity	Program faculty will determine if change is needed; implement change in following year; re-measure the following year
1, 2, 4	3) Apply scientific methods and statistical/mathematical concepts in order to demonstrate problem-solving and leadership skills within their field of study								

Appendix 2 – PSLO by Course Matrix

PSLO	Courses														
	Biol 216	Biol 391	Biol 392	Chem 311	Phil 340	FIRE 101	FIRE 105	FIRE 210	FIRE 351	FIRE 352	FIRE 353	FIRE 354	FIRE 355	FIRE 399	FIRE 402	FIRE 489	FIRE 499
1) Demonstrate an understanding of the issues and risks related to firefighter health and safety within an emphasis on the wildland and wildland urban interface environments.						I		I	D	D	D	D	I, D		D	D, M	M
4) Communicate in both oral and written forms wildfire and urban interface perspectives, concepts, and theories related to societal problems, threats, risks, and safety impacts		I	I			I	I		D	D	D, M	D		I, D		D, M	M
2) Identify and analyze practices, and apply tools, tactics, and strategies to avoid, minimize, and mitigate the risks of fires in the wildland and wildland urban interface		I	I			I		I	D, M	D	D	D		I, D	D	D, M	M
3) Apply scientific methods and statistical/mathematical concepts in order to demonstrate problem-solving and leadership skills within their field of study	I			D	D		I		D, M	D, M	D	D	D, M		D	D, M	M
I = Introduced; D = Developed; M = Mastered																	