

EXECUTIVE SUMMARY
WSU Department of Earth and Environmental Sciences
Self-Study Document, Fall 2019

Author's Contact Information: **Rick Ford, Department Chair**
801.626.6942 (office) / rford@weber.edu

The following is a summary of the self-study document, highlighting important points. For complete information, please refer to the full, self-study document itself.

• **CONTEXT AND STRATEGIC PLANNING:**

For more than five decades, Weber State University has successfully pursued a dual mission by offering a wide range of baccalaureate and graduate programs while meeting regional community-college needs. Our vision is for Weber State University to be the national model for a dual-mission university that integrates learning, scholarship and community (WSU, 2012).

https://www.weber.edu/universityplanning/Vision_and_values.html

The Department of Earth and Environmental Sciences (EES) is one of seven departments within the College of Science (CoS) at Weber State University. It provides undergraduate education in geology, hydrology, environmental science, and geospatial technologies (remote sensing and geographic information science) for students wishing to complete the following degrees: (1) Bachelor of Science in geology; (2) Bachelor of Arts in geology; (3) Bachelor of Science in applied environmental geoscience; and (4) Bachelor of Science in Earth science teaching. The department supports other degree programs on campus by providing minor programs of study in geology, Earth science teaching, and geospatial studies, as well as geoscience emphasis areas for students pursuing a Bachelor of Integrated Studies (BIS). An institutional certificate of proficiency in geospatial analysis is also offered. Lastly, EES has benefited greatly from a change in our academic home and facilities since the time of our last program review (2012-2013). The Department, along with the rest of the College of Science, is now housed in the attractive and inviting Tracy Hall Science Center, which opened in August 2016.

Unique features of the Department's programs include the integration of a traditional geoscience curriculum with course work in the growing field of geospatial technologies at the undergraduate level, an emphasis on field-based learning, robust support for undergraduate research, well equipped analytical labs, and a cost-effective summer field camp for geology majors. We are particularly proud of our accomplishments in the area of undergraduate research. In the past five years, approximately 120 students (students were counted more than once if they participated in multiple UR projects) associated with the Department of Earth and Environmental Sciences participated in 14 faculty-guided undergraduate research projects, resulting in approximately 40 presentations at national or regional scientific conferences and/or the annual WSU UR Symposium.

EES had a total of 79 graduates (bachelor's degrees and certificates) over the last 5 years, averaging 15.8/year (Appendix A). Total student credit hours (SCHs) ranged between 5,729 (2014-15) and 6390 (2018-19) over the same period (Appendix A). The variation in SCHs roughly correlates with overall university enrollment trends. In Fall 2019, the distribution of majors (including double/dual majors) in our various degree and certificate programs was:

Geology (BS/BA):	63
Applied Environmental Geoscience (BS):	31
Earth Science Teaching (BS):	3
<u>Geospatial Analysis (Certificate):</u>	<u>12</u>
TOTAL	109

Recently, the College of Science has been engaged in strategic planning and has identified four strategic initiatives, on which each of its departments/programs will collaborate to achieve: (1) Develop a new interdisciplinary Environmental Science BS; (2) Revitalize our various secondary science and mathematics teaching programs; (3) Focus on workforce readiness across all degrees and programs; and (4) Promote teaching excellence and the widespread adoption of high-impact educational experiences (HIEE) and active-learning pedagogies. The Department of Earth and Environmental Sciences has identified department-level strategic initiatives that we think will advance our programs and substantially contribute to our college-level goals (please see full self-study document for details).

From 2008 to 2013, the number of departmental majors, across all degree programs, increased from 57 to 90 (58%). This period of rapid growth was challenging, and paralleled the national trend in geoscience enrollments as reported by AGI. More recently, with the uncertainty surrounding environmental regulation and remediation at state and federal levels, coupled with the volatility in geologic commodity prices (oil, gas, minerals), AGI reports that, nationally, undergraduate geoscience enrollments have remained relatively steady since 2012. However, our number of majors increased to 110 in Fall 2018, another 22% increase since 2013. [The official third-week major count, which does NOT include double/dual majors, for Fall semester 2019 indicates a decrease in departmental majors to 88.]

The EES faculty and staff are very much focused on the future of our department and have expended considerable thought and effort over the past two years to analyze and revise our curricula (see section 3.3 and Appendix J), in conjunction with major national efforts (NSF-sponsored summits on The Future of Undergraduate Geoscience Education), to better prepare students for the challenges of the 21st century. During the 2018-2019 academic year we finalized a set of curricula revisions and rebranded the Department of Geosciences as the Department of Earth and Environmental Sciences. In addition, in Fall 2018, the Provosts Office provided funding for 1.5 new faculty positions in the CoS in support of the College's Environmental Science initiative and the joint EES-Geography Geospatial Education program. EES faculty chaired successful searches for these two positions, as well as a search for a new EES Lab Manager, also supported by new funding from the Provosts Office. The environmental science search focused on bringing applied climate science expertise to the College and the departmental home of the successful candidate was left open. Dr. Caitlin Tems (PhD University of Southern California) accepted the Dean's offer and it was decided that EES will be her departmental home. Dr. Ryan Frazier (PhD University of British Columbia) was selected for the geospatial science position and he has a joint appointment across two colleges (EES/CoS and Geography/S&BS), a bold and exciting cross-college collaboration. Lastly, Sara Summers (WSU class of 2010, MS University of Notre Dame) joined the EES team as Lab Manager in January 2019.

• MISSION STATEMENT

Weber State University Mission Statement:

Weber State University provides associate, baccalaureate and master degree programs in liberal arts, sciences, technical and professional fields. Encouraging freedom of expression and valuing diversity, the university provides excellent educational experiences for students through extensive personal contact among faculty, staff and students in and out of the classroom. Through academic programs, research, artistic expression, public service and community-based learning, the university serves as an educational, cultural and economic leader for the region. (approved by Board of Regents July 2011)

The University interprets its mission and assesses its outcomes through the lens of three core themes -- ACCESS, LEARNING, and COMMUNITY.

(https://www.weber.edu/universityplanning/Assess_core_themes.html)

Departmental Mission and Vision:

(revised October 2019)

Mission: To advance Earth and environmental science literacy, education, research, community and professional service, and stewardship of Earth's inhabitants and life-sustaining systems.

Vision: To be the premier undergraduate Earth and environmental science program in Utah and the Intermountain West, focusing on student success, access, community engagement, and the training of the next generation of geoscientists, environmental scientists, geospatial professionals, and Earth science educators.

• CURRICULUM:

Since 2014, the geoscience community in the United States has been engaged in a comprehensive evaluation, sponsored by the National Science Foundation, of the future of undergraduate geoscience education (<http://www.jsg.utexas.edu/events/future-of-geoscience-undergraduate-education/>). The Department of Earth and Environmental Sciences participated in both the 2014 and 2016 academic summits hosted by the University of Texas at Austin and was committed to using the results of this national effort to evaluate and revise its courses and curricula to better prepare our students. One of the most important aspects of this national-level work is the fact that geoscience employers, from all sectors, were engaged in the process and the community now has a broad consensus on the content knowledge and skills that 21st-century geoscientists will need to be successful in the geoscience workforce and/or geoscience graduate programs (MS or PhD). In addition, in October 2017, our department hosted a 2-day workshop sponsored by the National Association of Geoscience Teachers (NAGT) that brought 2 outside facilitators to help us finalize new curricular emphases and to integrate sustainability science concepts across our revised curricula.

The recent curricular changes listed below, effective Fall 2019, represent a deliberate shift in both the Geology and Applied Environmental Geosciences degrees toward more emphasis on applied and environmental geoscience, which in turn will support the future job placement of geoscience graduates in the environmental and/or resource management sector of STEM-related jobs:

- GEO 3000 (Geoscience Methods & Careers, 3 cr hr) is a new course that is now required to help students transition from lower-division survey courses to upper-division courses involving field work and data analysis, develop workforce ("soft," "transferable," "essential") skills, and plan for professional licensure exams. We refer to this course as the "sophomore bridge" class.
- GEO 3080 (Applied Hydrology, 4 cr hr) is now a required course, reflecting the importance of water science to environmental consulting firms and working geoscientists.
- GEO 4560 (Environmental Geochemistry, 4 cr hr) is a new course that is now required, reflecting the importance of geochemical data and processes in understanding a wide variety of environmental issues. In the Geology degree, this course replaces the previously required GEO 4300 (Igneous and Metamorphic Petrology, 4 cr hr).
- GEO 4990 (Geoscience and Society Seminar, 2 cr hr) is a new senior seminar that will use case studies to show the application of geoscience principles and methods to real-world problem solving. The course will also help students connect their previous course work to the skills desired by graduate programs and employers.
- The previous Geology program had 2 options, A (Minor required) and B (no minor required). This revised program will not require a minor. Over the years, very few Geology majors completed a minor program of study. A minor has never been required for the Applied Environmental Geoscience degree.
- The total number of credit hours in geoscience courses increased in both the Geology and Applied Environmental Geosciences degrees. This increase was partially offset by a reduction in the required geoscience elective and/or cognate science credits. We think this increase is justified because the new curricula are better aligned to the essential content knowledge and science skills identified by The Future of Undergraduate Geoscience Education Project.

Each degree program, with the exception of the Geology BA, has a designated capstone course in which the students are expected to apply the knowledge and methods learned in previous courses in authentic, scenario-based projects or student teaching. The capstone course for geology (BS) majors is GEO 4510 – Geology Field Camp. Our field camp is different from traditional field camps in that we use a combination of local projects, students spend their evenings at home, and remote projects, where the students are camping during a multi-day assignment. This format has allowed us to keep the cost and duration (4 weeks) of summer field camp in check, which has greatly benefited our non-traditional majors (working, married, with children). We offer field camp every other summer, in a cooperative effort with the Department of Geosciences at Utah State University (Logan, UT).

• STUDENT LEARNING OUTCOMES AND ASSESSMENT:

The Department of Earth and Environmental Sciences has adopted nine (9) program-level learning outcomes (PLOs) that are common to its four (4) bachelor's degrees, and a curriculum grid that identifies the various courses for majors that address and comprehensively assess each of these learning outcomes. The Department's assessment report for academic year 2014-2015, submitted to the Office of Institutional Effectiveness, focused on our PLOs. Direct measures, and indirect measures in the form of exit interviews, indicated that EES graduates were meeting the PLOs and attaining geoscience competencies at an appropriate level. Our 2020 report will focus on assessment data from the

department's general education courses and key high-impact educational experiences (HIEEs), such as summer field camp, internships, and study abroad programs. The 2022 report will again focus on program-level learning outcomes (PLOs).

The Department of Earth and Environmental Sciences supports the General Education Program at Weber State University by offering five (5) courses, each are 3 credit hours, that may be used to satisfy the Physical Science (PS) breadth requirement for graduation:

- GEO 1030 PS Earthquakes and Volcanoes
- GEO 1060 PS Environmental Geoscience
- GEO 1110 PS Dynamic Earth: Physical Geology
- GEO 1130 PS Introduction to Meteorology
- GEO 1350 PS Principles of Earth Science (geology & meteorology for Elementary Ed. majors)

Three of the department's general education classes (GEO 1030, GEO 1060, and GEO 1110) are regularly offered in an online format through *WSU Online*, a comprehensive distance-learning program managed by the Division of Continuing Education. Typically, our online offerings reach maximum enrollment early in the registration period.

Arguably, one of best assessments of department-level work and responsiveness to the broader community is the “next-step” success of program graduates, in terms of their ability to enter the workforce and/or their acceptance into graduate programs. Beginning in 2012, the Department of Earth and Environmental Sciences began compiling an alumni database to determine where (both in terms of geography and subspecialty) in the geoscience workforce our graduates landed. We now have data (Table 1) on the majority (approximately 89%) of our graduates going back to 2003. Over this time period, EES graduates have been very successful in finding employment within the geoscience workforce and/or being accepted into geoscience graduate programs. We are very proud of the 80+% placement. The data summarized in Table 2 also indicate that a WSU geoscience degree has provided entry into a wide variety of geoscience/STEM positions. The top two employment sectors (other than secondary science education, where our Earth Science Teaching graduates have had nearly 100% placement) are mineral resources/mining and environmental geoscience. In addition, we were surprised to learn that only 12% of our recent graduates went on to graduate programs. This concern will be addressed during future program-level strategic planning, as we all would like to see this number increase for the long-term success of our graduates over their careers.

• **ACADEMIC ADVISING:**

Students declaring a major in the geosciences have an initial meeting with the department chair to discuss general goals and to go over the various degree programs offered by the Department of Earth and Environmental Sciences. A separate file is created for each major, minor, or BIS student, and is updated until graduation; these files are also maintained after graduation. The department administrative specialist works with the chair to “declare” the student's major within *CatTracks*, the University's e-transcript and degree-evaluation platform. Students are also assigned to different advisors depending on their major/minor. Most students meet with their advisor at least once a year to check progress and to develop a program of study for each semester or academic year until graduation.

**Table 1: Dept of Earth and Environmental Sciences:
Demographics & Graduate Data**

Geoscience Majors: Enrolled Fall Semester 2019			
Degree Program	Total	Males	Females
Geology BS/BA	54	27	27
Applied Environmental Geosciences BS	31	13	18
Earth Science Teaching BS	3	2	1
TOTAL	88	42	46
Total Majors (incl. double majors&certificates)	109		

Geosciences Graduates (Summer 2003-Fall 2017): Placement After Graduation (generally initial position)		
Employment Sector	#	Percent
Mining geologist/mining support/exploration	25	20.7 %
Teaching/science education (K-12)	23	19.0 %
Environmental/hazards geologist or scientist	20	16.5 %
Petroleum geologist / oil & gas tech service	7	5.8 %
GIS Analyst/technician/surveyor	7	5.8 %
Other geoscientist/hydrologist	5	4.1 %
Other STEM-related position	5	4.1 %
Higher Education (geosciences)	3	2.5 %
Attending graduate school (geosciences)	7	5.8 %
Subtotal (Geoscience/STEM Positions)	102	84.3 %
Presently looking for geoscience position	2	1.7 %
Employed in a non-geoscience position	15	12.4 %
Not working outside the home	2	1.7 %
TOTAL	121	100.1 %
Attended graduate school	14	11.6 %
Whereabouts Unknown	15	

The department's advising system has evolved since our last program review (2012-2013) from a decentralized system, where every faculty member was involved in advising, to a more centralized system where only 3 of the department's faculty are formally advising majors. This approach was taken in response to the rapid growth in majors and the retirement of senior faculty, to aid in consistent messaging, and to leverage an economy of scale with respect to faculty time.

We collect information about advising effectiveness by asking questions on the frequency and quality of advising during exit interviews with graduating seniors. These exit interviews indicate that graduates

met regularly (at least annually) with a department advisor, and are very satisfied overall with the quality of the advising they received.

• FACULTY:

The department currently has nine (9) tenured or tenure-track (“regular”/8.25 FTE) faculty, and five (5) adjunct instructors that teach part time on a regular basis, with a combined full-time equivalent (FTE) that has varied from 8.1 to 8.6 over the last 5 years. Seven of the regular faculty have full-time appointments within the Department of Earth and Environmental Sciences. David Matty, former Dean of the College of Science (2011-2018), has a 0.75-FTE appointment in the department and a 0.25-FTE appointment with the Office of Sponsored Projects. (The administration has informed the department that should Dr. Matty leave the university, his faculty line will revert to the Provost’s Office.) Ryan Frazier has a joint appointment (50/50) between EES and the Department of Geography (College of Social and Behavioral Sciences). The five full professors are a senior group, with a combined 120+ years of teaching experience. Curriculum vitae of the regular faculty are available on the Program Review website.

There likely will be one or more retirements within the next 5 years for which the department will need to plan. The retirements on the horizon will provide the department an opportunity to examine the possibility of new directions and sub-disciplinary specialties, with the goal of improving our various degree programs and better preparing our graduates to live, work, and learn in the 21st century. As a department, we are just beginning to have discussions about potential future directions, but we know we must plan for a future that will be substantially different from our present circumstances.

The faculty of the Department of Earth and Environmental Sciences are active scholars, and most have been either the lead author or a co-author on a publication since 2015. EES faculty regularly present the results from ongoing research at major geoscience conferences, notably, the annual meetings of the Geological Society of America and the American Geophysical Union. (Short CVs of the EES faculty are available on the program-review website.). Several faculty members are among the most productive researchers on campus and most have been very effective in incorporating undergraduate researchers in to their respective research programs. Many EES faculty have been very successful in writing and securing external grants to fund their research. In 2018, when we were still a 6-person department, there were five (5) active NSF grants overseen by EES faculty.

At the time of our last program review (2012-2013), all 6 regular faculty members were white males, and 3 of the 4 adjunct instructors were white males. In Fall 2019, after replacing retired faculty and growing to 9 regular faculty, 6 regular faculty are white males and 3 regular faculty are white females (Appendix B). Four of our 5 active adjunct instructors are white females and one is a white male. Progress has been made on gender diversity, but we struggle, as most geoscience departments do, to diversify with respect to ethnicity.

• PROGRAM SUPPORT:

The Department has adequate office-management support in the form of a three-quarter-time (0.75 FTE) administrative specialist (Appendix C). Marianne Bischoff was hired in 2012 and has provided excellent administrative support to the faculty and students. In addition, her work on the department’s eNewsletter and support of the department’s advising efforts have contributed directly to student retention and

success. Marianne's contributions and quality of work were recognized by her peers in the form of the 2015 Super Staff Award and again in 2017 as the recipient of the Presidential Outstanding Staff Award.

At the time of our last program review (2012-2013), EES was the only department in the College of Science, other than Mathematics, that did not have a lab manager. That program review, as well as every program review for the previous 15+ years, strongly recommended the addition of such a position to the department's staff. In 2018, we were given the opportunity to make our case for such a position, in the form of a departmental strategic plan, directly to the Provost's Office. The provost agreed to fund a geoscience lab manager and instructor position (fulltime, 10 months) and our first lab manager, Sara Summers (WSU '10), began work in January 2019. In addition to her lab manager duties, Sara Summers also teaches introductory labs and the occasional general education course. We are still experimenting with her specific work assignments to find the best model in terms of providing broad support for the department's students and faculty.

The faculty of the Department of Earth and Environmental Sciences think the most pressing staff-related issue facing the whole College of Science, not just our department, is the need for a **college-level lab/instrument technician**, as the college continues to upgrade its analytical capabilities through the acquisition of high-end equipment, such as the ICP-OES and ICP-MS. This equipment is shared among the various departments and requires a substantial commitment of time and resources to basic operations and maintenance. Such a position could act to support the analytical needs of all the departments in the college, and would be a key resource for students wishing to use the equipment for undergraduate research.

The Department of Earth and Environmental Sciences has an annual budget to meet very basic needs. Over the last 8 years, this annual budget, excluding faculty and staff salaries, has remained approximately \$23,000, which has been used mostly to cover general operating expenses (e.g. phones, copying, office supplies, instructional supplies), pay hourly wages, partly support conference travel (much of faculty travel has been covered by external grants), and partly support equipment/software purchases/maintenance. Over the same time frame, EES has increased its student majors and number of tenure-track faculty, who are actively engaging students in a variety of high-impact educational experiences (HIEEs). These are not inexpensive. The ever-increasing costs associated with field trips, lab equipment/consumables, and software licenses, among other expenses, will be unsustainable if we are unable to find more institutional support and/or raise course fees.

• **RELATIONSHIPS WITH EXTERNAL COMMUNITIES:**

EES faculty and staff have extensive contacts with governmental agencies, including the Utah Geological Survey, U.S. Geological Survey, USDA Forest Service, Utah Board of Education, NUAMES Academy, NASA, and county/city GIS and planning groups. Faculty members have undertaken a number of collaborative projects with these agencies, and faculty serve on outside committees, such as the Utah State Mapping Advisory Committee. We also have contacts with geoscientists working for private environmental, geotechnical, and mining-service companies, who provide feedback on performance of graduates they hire. Many of these contacts have also resulted in student internships. The Department also supports GIS applications across the campus, including managing a site license for ArcGIS that is used by multiple academic programs, Stewart Library, and Facilities Management.

The Department supports K-12 education in the community. We have been closely involved with the College of Science's Center for Science and Math Education (CSME), which was without a director at the time of our last program review (2012-2013). EES faculty have been actively involved with the Northern Utah Science Olympiad (extinct), the annual Ritchey Science & Engineering Fair hosted by the College of Science, MESA program, local Girl Scout troops, and the Utah Board of Education, working to revise the teaching standards for Utah's 9th-grade Earth Science course, bringing them in alignment with the Next Generation Science Standards (NGSS).

EES faculty are actively involved in a number of professional organizations and in service to the geoscience community. We have chaired sessions and led field trips at professional meetings, served as judges for outstanding publication awards, and regularly serve as reviewers for a number of geoscience journals. EES faculty routinely volunteer their time to review grant proposals and to serve on thesis committees for graduate students at other colleges and universities.

We organized and established the Geoscience Advisory Council (GAC) in Fall 2013 (renamed the **Earth and Environmental Sciences Advisory Council/EESAC** in 2018). This group of approximately 15 departmental alumni and friends of the department has held regular biannual meetings (fall and spring) since that time. In addition to providing regular feedback about workforce trends and hiring, the EESAC has planned and executed two very successful alumni events aimed at reconnecting graduates to the department: Antelope Island Picnic and GeoHike (October 2015); THSC Open House & Tailgate Party (October 2017). The EESAC has also been instrumental in providing internships for our students and providing feedback regarding proposed changes to our curricula and department name. The EESAC is also planning an Earth Science Career Day (February 28, 2020) for Spring semester, which will bring recent departmental alumni back to campus to share information and advice with our students about their job searches and day-to-day work as entry-level geoscientists.

• **STUDENT, FACULTY, ADJUNCT FACULTY AND STAFF STATISTICS:**

(Note: Data provided by Office of Institutional Effectiveness. This is an extract from the Program Review Dashboard and shows what will be sent to the Boards of Trustees and Regents)

Appendix A: Student and Faculty Statistical Summary

	2014-15	2015-16	2016-17	2017-18	2018-19
Student Credit Hours Total	5,729	6,297	5,854	5,824	6,390
Student FTE Total	191.0	209.9	195.1	194.1	213.0
Student Majors	95	107	104	104	110
Program Graduates	18	19	17	12	13
Student Demographic Profile					
Female	32	40	48	50	52
Male	63	67	56	54	58
Faculty FTE Total	8.21	8.62	8.27	8.12	n/a
Adjunct FTE	2.13	2.35	2.42	2.09	n/a
Contract FTE	6.08	6.27	5.85	6.03	n/a
Student/Faculty Ratio	23.26	24.35	23.60	23.91	n/a

Appendix B: Faculty Profile

Faculty (current academic year)

	Tenured and tenure-track	Contract	Adjunct
Number of faculty with Doctoral degrees	9	0	1
Number of faculty with Master's degrees	0	0	4
Number of faculty with Bachelor's degrees	0	0	0
Other Faculty	0	0	0
Total	9	0	5

Tenure-Track/Adjunct Faculty Profile (CVs of Tenured/Tenure Track Faculty Available on Program Review Website)

Name	Rank	Tenure Status	Highest Degree	Years of Teaching	Areas of Expertise
Balgord, Liz	Assistant	Tenure-track	PhD	6	Sedimentology & tectonics
Barker, Helen	Adjunct	n/a	MS		General geology
Childs, Elise	Adjunct	n/a	MS		General geology
Ford, Rick	Professor	Tenured	PhD	27	Geomorphology & Quaternary geology
Frantz, Carie	Assistant	Tenure-track	PhD	4	Low-temperature geochemistry & geobiology
Ryan Frazier	Assistant	Tenure-track	PhD	2	Geospatial science & remote sensing
Gentry, Amanda	Adjunct	n/a	MS		General geology
Hernandez, Michael	Professor	Tenured	PhD	19	Geospatial analysis and geologic hazards
Matty, David	Professor	Tenured	PhD	25	Mineralogy, petrology, & geochemistry
Matyjasik, Marek	Professor	Tenured	PhD	23	Environmental hydrogeology
Nielsen, Greg	Adjunct	n/a	PhD		General geology
Sara Summers	Adjunct	n/a	MS		General geology
Tems, Caty	Assistant	Tenure-track	PhD	4	Paleoceanography & climate science
Yonkee, Adolph	Professor	Tenured	PhD	28	Structural geology

Appendix C: Staff Profile

Name	Job Title	Years of Employment	Areas of Expertise
Bischoff, Marianne	Administrative Specialist	8	Office management, budget reconciliation, eNewsletter
Sara Summers	Lab Manager & Instructor	1	Lab management, lab safety, field-trip logistics, lab instructor

Appendix D: Financial Analysis Summary

(Data provided by the Office of Institutional Effectiveness)

Program Name					
Funding	14-15	15-16	16-17	17-18	18-19
Appropriated Fund	\$664,757	\$642,374	\$898,424	\$729,873	\$823,739
Other:					
Special Legislative Appropriation					
Grants or Contracts		\$10,654	\$3,570		
Special Fees/Differential Tuition	\$4,584	\$9,491	\$2,041	\$4,773	\$7,487
Total	\$669,341	\$662,519	\$904,035	\$734,646	\$831,226
Total FTE	191.0	209.9	195.1	194.1	213.0
Cost per FTE	\$3,305	\$3,156	\$4,633	\$3,784	\$3,902

• **RESULTS OF PREVIOUS PROGRAM REVIEW (2012-2013):**

The report (April 2013) of the external review team identified a number of challenges and made ten (10) recommendations for ways to improve the Department's programs. Since 2013, we have been able to implement each of the recommendations, to varying degrees, with the support of the Dean's Office and the central administration. Our actions are summarized below.

- **Recommendation 1:** The review team made a number of interconnected recommendations related to the department's geospatial science and technology curriculum and facilities.

Departmental Response: Michael Hernandez and Eric Ewert (Geography) secured a major NSF ATE grant (see section 6.3) to study and revise the geospatial curriculum. The new curricula for the geospatial analysis certificate of proficiency and geospatial studies minor took effect for Fall 2019. Michael was also involved in the programming and design of the computational classroom (TY 127) in Tracy Hall Science Center. This new classroom largely addressed the facilities issues raised by the review team.

- **Recommendation 2:** EES faculty need to routinely include salary and course-release funds (to pay for adjunct instructors) in the budgets for their external grant proposals.

Departmental Response: This is now the departmental norm and recent NSF grants have provided funds to pay adjuncts and thereby provide release time to faculty to devote to grant-related research.

- **Recommendation 3:** The department should be allowed to add a lab manager/instructor to its staff and should be allowed to replace retiring faculty, using this opportunity to increase faculty diversity while maintaining the department's success in serving a broad variety of students with variable goals and interests.

Departmental Response: Five years later, we were given the opportunity to make our case for a lab manager/instructor position, in the form of a departmental strategic plan, directly to the Provost's Office. The provost agreed to fund a geoscience lab manager and instructor position (fulltime, 10 months) and our first lab manager, Sara Summers (WSU '10), began work in January 2019. In addition, we were able to hire the top candidate during both the 2015 and 2016 faculty searches, resulting in increased gender diversity within the EES faculty.

- **Recommendation 4:** The review team made a number of recommendations focused on upgrading the department's instructional facilities, especially the IT/AV systems in classrooms and storage of its extensive teaching collections (mineral, rocks, fossils).

Departmental Response: This recommendation was fully implemented with the department's move into Tracy Hall Science Center in 2016.

- **Recommendation 5:** The department should investigate offering an associate degree, as a milestone for students advancing through its 4-year programs.

Departmental Response: EES is presently working with the Departments of Chemistry & Biochemistry and Physics to study the feasibility of an Associate of Science in physical science, which could possibly be of benefit to students in all three departments.

- **Recommendation 6:** The review team recommended eliminating the second-semester course in remote sensing (GEO 4400) and a review of all the department's course offerings, with an eye to combining courses, eliminating obsolete courses, and adding new courses.

Departmental Response: The department engaged in 2-yr study of its curricula (2016-2018), resulting in a major curricular overhaul that took effect for Fall 2019, including the deletion of GEO 4400.

- **Recommendation 7:** The review team recommended that EES majors be required to completed their chemistry and physics requirements earlier in their program of study. Reviewing and establishing meaningful course prerequisites was also recommended.

Departmental Response: This issue has much discussed as part of our 2016-2018 curriculum revision and measures were taken to get students started on the 2-semester chemistry sequence sooner (we added CHEM 1200/1210 prereqs/co-reqs to the Earth Materials [GEO 2050] course). However, our students still struggle with proper course sequencing and we are concerned about the possible impact this issue may have on the recruitment and retention of ESS majors. Departmental discussions are ongoing.

- **Recommendation 8:** The review team recommended the use of student teaching assistants (TAs) in the lower-division labs to help with faculty workloads and to provide EES majors the opportunity to gain higher-education experience and skills.

Departmental Response: As the budget has permitted, we are now employing student TAs in a number of key courses.

- **Recommendation 9:** Increase the frequency of key courses, particularly Structural Geology (GEO 3060) and Petrology (GEO 4300).

Departmental Response: We have taken specific steps to eliminate course "bottlenecks." Beginning in academic year 2013-2014, we have offered GEO 3060 each fall semester; previously it was offered every other year. We also allowed geology majors to substitute Geochemistry (GEO 4550) for the required Petrology (GEO 4300) course. With the return of former dean Dave Matty to the faculty in 2019, we will be able to offer GEO 4300 each spring semester. In addition, we have also started offering Historical Geology (GEO 1220), Applied Hydrology (GEO 3080), and Intro to GIS (GEO 3710) during both the fall and spring semester; previously they were offered once a year.

- **Recommendation 10:** The review team strongly supported the hiring of a new director for the Center for Science and Math Education (CSME); the directorship was vacant at the time of the external review.

College of Science Response: The College of Science conducted a search for a new CSME director who would also have a faculty/teaching appointment in one of its departments. That search failed. Subsequently, a new director was hired as a fulltime staff position, reporting to the dean of the College.

• **ACTION PLAN FOR CHALLENGES IDENTIFIED IN CURRENT SELF STUDY:**

Action Plan for Assessment-Related Findings: The departmental self-study documented in this report called to our attention the lack of progress we have made in the systematic assessment of student learning associated with high-impact educational experiences (HIEEs), namely undergraduate research, internships, and study-abroad experiences. We will work with other College of Science (CoS) departments, and possibly the Office of Institutional Effectiveness, to identify appropriate assessment instruments that we can use going forward.

Although not addressed in this report, the recent study and revision of our various curricula (see section 3.3) once again highlighted the challenge our students face with respect to their mathematic preparation and ability to succeed in college-level mathematics courses. Beginning with spring semester 2020, we will help facilitate the formation of math study groups for EES majors.

A third issue that once again came to light for us during this process is the low percentage (< 15 %) of our graduates who go on to graduate school after completing their bachelor's degree (see Table 1). Recognizing the importance of an advanced degree in the long arc of a science career, we will investigate and consider ways in which we might be able to grow this number.

Action Plan for Staff, Administration, or Budgetary Findings: By far the most important staff-related challenge identified and documented in this self-study is the need for a college-level instrument/lab technician. This position is crucial for the long-term sustainability and safety of the College's analytical laboratories. We will work with the other CoS departments and the dean to make the case for, and to identify funding for, such a position.

Although not addressed in this report, recent hiring of new faculty in the CoS and related tenure and promotion reviews have brought to light concerns related to faculty workloads, "burnout," and the support for grant writing and management. As a department, we are very pleased to see the dean of the college openly and vigorously working to understand these issues and to find solutions, in conjunction with the chairs and directors of the College.

Lastly, we must mention, as we do in every program-review self-study report, our very modest departmental budget. We understand the constraints that are placed upon our dean, and the Provost's Office, in terms of adequately funding every department in the College of Science and across campus. However, if the administration is serious about supporting faculty in the use of the wide array of high-impact educational experiences that we value as part of a 21st-century bachelor's degree, then growing the funding for these practices is imperative.

• **Information Regarding 2020 Review Team Members:**

1. Dr. Sue Harley – 801.626.7434 – sharley@weber.edu

Professor and Chair of Botany
Department of Botany
Weber State University
1415 Edvalson St. DEPT 2504
Ogden, UT 84408-2504
<https://faculty.weber.edu/sharley/>

Dr. Harley is chair of a department of similar size to EES and she has extensive experience with program reviews, faculty promotion and tenure, and shared governance at Weber State University.

2. Dr. Michael Bunds – 801.863.6306 – Michael.Bunds@uvu.edu

Professor of Earth Science
Department of Earth Sciences
Utah Valley University - College of Science - MS 179
800 W. University Parkway
Orem, UT 84058
<https://www.uvu.edu/directory/employee/?id=T3dDZ0FXcFBCajkwcWJ1dVVLSHRhZz09>

Dr. Bunds is an experienced professor, and former department chair, at UVU, a sister USHE institution with a similar mission, teaching load, and student body as EES at WSU.

3. Dr. Wing Cheung – 760.744.1150 (ext 3652) – wcheung@palomar.edu

Professor of Geography
Department of Earth, Space, and Environmental Sciences
Palomar College
1140 West Mission Road
San Marcos, CA 92069
<https://www2.palomar.edu/pages/wcheung/about-me/>

Dr. Cheung is a recognized leader in geospatial science and education at the undergraduate level and is involved in national and regional initiatives to align GIS and STEM education with workforce needs.

4. Dr. Lisa Collins – 310.434.8857 – collins_lisa@smc.edu

Professor of Geology
Department of Earth Science
Santa Monica College
1900 Pico Boulevard
Santa Monica, CA 90405
<http://www.smc.edu/EnrollmentDevelopment/IEC/StudyAbroad/Pages/Lisa-Collins.aspx>

Dr. Collins is an experienced mentor/supervisor for undergraduate search; prior to her current appointment at SMC, she participated in the development of an interdisciplinary environmental studies program at the University of Southern California.

End

(RLF / 27 December 2019)

