Oregon TECH

2022-23
Environmental Sciences Assessment Report
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Contents

Section 1 – Program Mission and Educational Objectives

Program Mission

The Bachelor of Science program in Environmental Sciences (BES) prepares students for immediate employment and graduate studies in the assessment and monitoring of environmental conditions and problems, including research, mitigation and restoration. The BES program focuses on interdisciplinary scientific study of ecology, natural resources, and sustainability with emphases on management, research, and communication. The curriculum is comprised of four integrated core areas in ecology & natural resources; data analysis & statistics; geographic information systems (GIS); and social sciences.

Students within the Environmental Sciences program put their knowledge into practice in the best place possible—the great outdoors. Emphasis is placed on active experiential learning. The program offers numerous and diverse opportunities for students to engage in applied research and resource management projects with the support of faculty and professionals through local and regional partnerships.

Mission Statement: ***Students analyze environmental conditions and problems through applied research and fieldwork, all within the stunning natural setting of the Klamath Basin.***

We believe there is a place in our program for everyone with an interest in natural resources, environmental issues, conservation and sustainability, or just being in the great outdoors! Environmental science and natural resources is a huge field that can accommodate a wide range of individual interests and skills whether it's working with wild animals, plants, people, or computers and technology. Our faculty and partners are here to help build an impressive resume of academic and work experience that will place students in the job or graduate program of their choice.

Graduates can expect to find employment in federal, state, and tribal government agencies, non-governmental organizations (NGOs), and education and research institutions. Students are also well prepared to enter graduate school. Students graduating from our program have taken positions with the U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, Oregon Department of Forestry, Oregon State Police Wildlife Enforcement, Klamath County Health Department, Klamath Irrigation District, Klamath County Soil and Water Conservation District, and the Nature Conservancy.

Mission Alignment

The BES program mission closely aligns with the Oregon Tech mission: *Oregon Institute of Technology (Oregon Tech), Oregon's public polytechnic university, offers innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences. To foster student and graduate success, the university provides a hands-on, project-based learning environment and emphasizes innovation, scholarship, and applied research. With a commitment to diversity and leadership development, Oregon Tech offers statewide educational opportunities and technical expertise to meet current and emerging needs of Oregonians as well as other national and international constituents.*

Our students experience active and applied learning in natural environments. They develop the collaboration and communication skills necessary to work on diverse teams to address environmental issues. Many students participate in research with faculty and agency partners (Table 1). Further, BES faculty and students engage with professional communities through publications and conference presentations (Table 2). These research and scholarly activities are in direct alignment with Pillars II & III of Oregon Tech's strategic plan which state:

> Pillar II COMMITMENT TO INNOVATION: Oregon Tech strives to be entrepreneurial and on the leading edge of student engagement, innovative teaching, and collaborative research.
> Pillar III COMMITMENT TO COMMUNITY: Oregon Tech is an active member of the communities that it serves. Students, faculty, and staff are encouraged to contribute to their physical, professional, scholarly, and social communities via leadership and active participation through their academic and professional expertise.

Table 1: Environmental Science faculty and student research projects 2022-2023.

Project	PIs	Agency Partners	Grants or gifts in kind	Number of OT students
Carnivore Study –tracking large and meso carnivores around campus	Jherime Kellerman – NSC Nate Bickford - NSC	Forest Service	10 game cameras with new rechargeable batteries and SD cards from the Forest Service	5
Halictidae Study – monitoring native pollinators and Apis mellifera on campus. Students are curating an entomological collection and contributing to the Oregon Bee Atlas project. Students are working to develop a pollen color chart for our region.	Christy VanRooyen - NSC Terri Torres - MATH	Oregon State University Department of agriculture Klamath Basin Beekeeping Association Oregon State Beekeeping Association	Field entomological collection boxes from Oregon State Bee Packages and use of honey spinner from Klamath Basin Beekeeping Association	7
Forest Fire Air Quality Research – this study is examining increased hospital burden with smoke from forest fires. Current research will be expanded from the Rouge Valley to include the Klamath Basin and examine the chemical composition of particulate matter in 2022. Additionally, this grant will fund the initial establishment of the Center for Advancing Interdisciplinary Research on the Environment and Health (AIRE Center) here at Oregon Tech.	Addie Clark - NSC Kyle Chapman - PHM Kerry Farris - NSC	U.S. Health Resources and Services Administration (HRSA) Rogue Valley Hospitals	$1,000,000 HRSA allocation of funds. Provost Creativity Grant $27,000	5
Western Yellow Rail migration using stable isotopes.	Jherime Kellerman - NSC	US Fish and Wildlife Service Bureau of Land Management	$3000	1

Project	PIs	Agency Partners	Grants or gifts in kind	Number of OT students
Klamath Falls City Parks Department- established a system of permanent vegetation monitoring plots in Moore Park. Provide the city with vegetation metrics that can help inform their management, in particular with fuels reduction.	Kerry Farris - NSC	Klamath Falls City Parks Department	Summer Creativity Grant	2-5
Demographics and reproductive effort of ponderosa pine in Moore Park	Kerry Farris - NSC	City of Klamath Falls	2023 Summer Creativity Grant $10,000	2-5
Feasibility of camera traps for inventorying large and small mammals in Moore Park	Kerry Farris - NSC	City of Klamath Falls	2023 Summer Creativity Grant $10,000	2-5
Monitoring soil moisture across four different habitat types within Moore Park	Kerry Farris - NSC	City of Klamath Falls	2023 Summer Creativity Grant $10,000	2-5
Avian response to riparian restoration, Cascade-Siskiyou National Monument.	Jherime Kellerman - NSC	Bureau of Land Management	4-year Cooperative agreement - $12,000 in year 1	1
Post-fire vegetation recovery in a western juniper/sagebrush/bitterbrush community - 20 years after the KAGO fire.	Kerry Farris - NSC	City of Klamath Falls; Klamath Chapter of the Oregon Native Plant Society	Time assisting in surveys by members of the Native Plant Society	2-5
Factors associated with non-native grasses and forbs in a western juniper/sagebrush/bitterbrush community.	Kerry Farris - NSC	City of Klamath Falls; Klamath Chapter of the Oregon Native Plant Society	Time assisting in surveys by members of the Native Plant Society	2-5

Project	PIs	Agency Partners	Grants or gifts in kind	Number of OT students
Sprague River water quality monitoring.	Ross Wagstaff-NSC	Klamath Soil and Water Conservation District	$6,000	3
Northern Waterthrush distribution and trends	Jherime Kellermann -NSC	Pacific Northwest Research Station, US Forest Service	$150,000	2
Ecological seed dispersal community dynamics	Jherime Kellermann -NSC			2

Table 2: Environmental Science faculty and student publications and conference proceedings.

BES Publications and Conference Proceedings

Environmental Science faculty names in bold and *identifies student name.

- Kyle A. Chapman, Adelaide E. Clark, **Kerry L. Farris**, and Sarah Fitzpatrick. 2023. Fires, Respiratory Hospitalizations, and Capacity Issues. Pp. 210-221 in Fleishman, E., editor. 2023. Sixth Oregon Climate Assessment. Oregon Climate Change Research Institute, Oregon State University, Corvallis, Oregon. https://blogs.oregonstate.edu/occri/oregon-climate-assessments.
- Lee Mitchell, Su Jin Lee, Kyle Chapman, **Kerry Farris**, Pooya Naderi, and Ashley Hanson. Identifying health care access gaps in areas of Oregon at high risk of respiratory hospitalization during wildfires. In Review.
- Collier, M*.; Trier, F; Torres, T. ; **VanRooyen, C.** February 2023. Pollen Collection and Analysis of Local Flora in Klamath Falls, OR. Poster presentation at the Oregon chapter of the Wildlife Society Conference and at the Oregon Tech Idea Fest.
- Edenhofer, K*.; Trier, F.*; Smith, M.*; Collier, M.*; Johnston, N.*; Aguayo, J.*; **VanRooyen, C.** 2023. Native Bees of the Klamath Basin. Poster presentation at the Oregon chapter of the Wildlife Society Conference and at the Oregon Tech Idea Fest.
- Edenhofer, K*; McDowell, Q.*; Stieber, M.*; Trier, F.*; **VanRooyen, C.** 2022. Native and Honeybee Research at Oregon Tech. Presentation at the Oregon Tech Environmental Science Project Symposium.
- **VanRooyen, C.;** Corzatt, L.; Schmerbach, D.; Torres, T. *Bee School – an introduction to bee keeping (presentation)* • Klamath Basin Beekeeping Association class. 2023, April 1st- 2nd.

Section 2 – Program Student Learning Outcomes

Upon completion of the program, students will have demonstrated the following abilities:

- **PSLO 1 - Foundational knowledge**
  Attain applicable foundational knowledge, technical skills, information literacy, and experience in several core areas of ecology, natural resources, & environmental sciences.
- **PSLO 2 - Collaboration**
  Actively collaborate with local and regional agencies, organizations, and community members that represent a diversity of perspectives.
- **PSLO 3 - Science Advocacy**
  Make and advocate for science-based and sustainable solutions to local and global environmental issues.

- **PSLO 4 - Data Analysis**
  Apply, interpret, and communicate appropriate analytical and statistical techniques to answer data driven scientific questions.
- **PSLO 5 - Geospatial Literacy**
  Demonstrate geospatial literacy through the utilization of appropriate technology to identify and address environmental problems.

PSLOs are reviewed annually to maintain relevance in a rapidly evolving job market. Our agency partners advise on essential skills and desired qualifications to ensure that our graduates are successful on the job. This year we combined our former PSLO 6 on communication with PSLO 4, as the desired outcome is to communicate effectively about their analysis of data to answer scientific questions.

Section 3 – Curriculum Map

Table 3: Mapping of ISLOs and PSLOs to the environmental science curriculum. Level of application: F – Foundational P – Practicing C - Capstone

University	**ISLO 1 - Communication**	**ISLO 2 – Inquiry & Analysis**	**ISLO 3 – Ethical Reasoning**	**ISLO 4 – Quantitative Literacy**	**ISLO 5 - Teamwork**	**ISLO 6 – Diverse Perspectives**		
Program		**PSLO 4**	**PSLO 3**	**PSLO 4**	**PSLO 2**	**PSLO 2**	**PSLO 1**	**PSLO 5**
COURSE								
COM 111Z	F							
SPE 321					P			
WRI 121Z	F							
WRI 122Z or 227Z	P							
WRI 345, 410, or 327	P							
ECO 201 or 202							F	
MATH 111				F				
MATH 112				F				
MATH 361		F		F				
MATH 362		P		P				
PHY 201				F			F	

BIO 211							F	
BIO 212	F	F			P			
BIO 213							F	
ENV 108					F			
ENV 111							F	
ENV 217			F				F	
ENV 224		F	P				P	
ENV 226	P	P		P			P	
ENV 314			P			P	P	
ENV 355			P			P	P	
ENV 434		C						
ENV 485			P					
GEOG 105								F
CHE 221-223		F		F				F
CHE 315		P		P				
CHE 465		P		P				
GIS 105		C						F
GIS 134								F
GIS 205								P
Plant elective					C		P	
Wildlife elective		C						C
Water elective	P	P		P				
ENV 466	C							
ENV 485		C						
ENV 420	C	C			C	C	C	
ENV 495 or BIO 255, 355,455	C	C		C	C			C

Section 4 – Assessment Cycle

The assessment cycle was revised this year to focus on courses that are required within all tracks of Environmental Science.

Table 4: BES assessment cycle 2021-2024. Level of application: F – Foundational P – Practicing C - Capstone

ISLO	PSLO	2022-2023	2023-2024	2024-2025
Communication				BIO 212 L – F ENV 226 – Final Presentations - P ENV 420 – Extern - C Research classes – C Exit Interviews - C
Inquiry & Analysis	**PSLO 4**		ENV 226 BIO 212L CHE 315 ENV 434 Exit Interviews	
Ethical Reasoning	**PSLO 3**			ENV 111 -F ENV 355 - P ENV 375 - C ENV 484 –- P Exit Interviews
Quantitative Literacy	PSLO 4		ENV 226 - P BIO 212L – F BIO 377 - P CHE 315 - P ENV 434 – C Research classes - C Exit Interviews	
Teamwork	**PSLO 2**			ENV 108 – F BIO 212 L – F ENV 375 – P Research Classes - C ENV 420 - C Exit Interviews
Diverse Perspectives	**PSLO 2**	ENV 217 - F ENV 314 – P ENV 355 –P ENV 420 – C Exit Interviews		
	PSLO 1	Assessed annually through curriculum completion. Exit Interviews	Assessed annually through curriculum completion. Exit Interviews	Assessed annually through curriculum completion. Exit Interviews
	PSLO 5	GEOG 105 – F GIS 205 – P Wildlife Elective - C Research Classes Exit Interviews		

Section 5– Assessment Data Collection Processes

In 2022-23 data was collected on three of six ISLOs and two of six PSLOs:

- ISLO 1 – Communication- Oregon Tech students will communicate effectively orally and in writing.

- ISLO 6 - Diverse Perspectives Cultural Sensitivity & Global Awareness
- PSLO 1 - Attain applicable foundational knowledge, technical skills, information literacy, and experience in several core areas of ecology, natural resources, & environmental sciences.
- PSLO 5 - Demonstrate geospatial literacy through the utilization of appropriate technology to identify and address environmental problems.

Performance Target:
The overall standard of success established by BES faculty members was a minimum of 80% of students assessed would score 75% or higher on the chosen artifact. For the communication surveys given at the ENV project symposium we wanted to see 100% of students score a 4 or better on the survey. On geospatial literacy, we wanted to see 80% of the GEOG 105 students score 75% or better on their map and orienteering labs. 80% of the students who presented at the project symposium to score a 3 for the geospatial technology and cartography categories of the geospatial literacy rubric. 100% of Natural Science faculty will participate in an elevated teaching workshop on best practices for inclusion.

Activity:

Annually, students demonstrate the attainment of foundational knowledge (PSLO 1) through the successful completion of curriculum. Data for the assessment of this PSLO includes enrollment and retention data. Each year the faculty review the curriculum to ensure that students are obtaining the skills necessary for job success.

Direct assessment data for the communication learning outcome (ISLO 1) was taken at our annual Environmental Science Project Symposium where attendees filled out a brief assessment of the quality of the student presentations and the effectiveness of their communication. Students developed their presentations as part of their ENV 495 research class experience.

Direct assessment data was collected for ISLO 6 on diverse perspectives, cultural sensitivity, and global awareness in our Environmental Professionalism course (ENV 355). Additionally, we collected data from employers about our students in our extern courses (ENV 420) and we tracked Natural Science faculty participation in Elevated Teaching Workshops. We also tracked the diversity of agencies that our students worked with as part of their ENV 495 research experience.

Our students were directly assessed on Geospatial literacy (PSLO 5) in physical geography, GEOG 105, and at our ENV Project Symposium.

The assignments and surveys for our assessment data can be found in Appendix A.

Sample:
Here are the sample sizes for each of the courses where assessment data was collected. One challenge of doing assessment within a relatively small program like BES, is that when we collect data within courses, the sample size is not generally statistically significant.

- Communication
  - 8 students
- Diverse Perspectives
  - ENV 355 - 9 students
  - ENV 420 – 2 students
  - ENV 495 – 8 students
- Geospatial Literacy
  - GEOG 105 - 23 students
- Exit Interviews – 2 of 7 graduating seniors
- First year retention rates – 12 students
- ENV Project Symposium assessment survey – 24 responses made up of students, faculty, administrators, and environmental professionals.

Reliability: The instructor of record was responsible for assessing the artifacts for their classes. At the end of the term, each instructor recorded their data in the Course Learning Outcome worksheets. The Environmental Science assessment coordinator is responsible for gathering all other provided assessment data.

Rubric: Rubrics for the project artifacts for ENV 355 and for evaluation Geospatial Literacy (PSLO 5) can be found in Appendix B.

Section 6– Assessment Data

Program Enrollment:

Table 5: BES Fall term week 4 headcounts 2017-2022.

Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021	Fall 2022
41	42	37	36	40	42

Enrollment within the environmental sciences program has remained relatively stable over the last six years. Unsurprisingly, we saw a small dip in enrollment during the height of the COVID 19 pandemic, but the fall 2022 data indicates that the program has recovered from the pandemic. Enrollment and retention continue to be of great concern for the environmental program and will be further addressed in our action plans.

1st Year Retention Rates

Table 6: First year retention rates with the BES program. Based on week 4 headcounts throughout the academic year.

2016-17	2017-18	2018-19	2019-20	2020-21	2022-23
62%	70%	45%	50%	60%	75%

A first-year retention rate of 75% is in line with Oregon Tech's target of 75% and much better than the national average retention rate of 59% for public undergraduate institutions as given by the National Center for Education Statistics. In 2020-2021 we established a goal of increasing retention by 5% over the following year, and we are excited to report that we surpassed this goal with a 15% increase in our retention rates.

Employment Rates and Salaries:

100% of Oregon Tech Environmental Sciences graduates are either employed or seeking an advanced degree within six months of graduation with a median salary of **$33, 436.** Employment rate and salary data is based on the 2022 graduates of the BES program, and was collected via exit surveys, career services surveys, and Linkedln. The amazing success of our graduates should be attributed to the well-designed program curriculum and the many opportunities for our students to do research or hold intern positions during their education. These experiences give our students the outstanding professional and technical skills needed in the competitive job market.

ISLO and PSLO data:

Table 7: ISLO and PSLO data for 2021-2022.

Performance Criteria	Assessment Methods	Application Level	Performance Target	Results	Met?
ISLO 1 Communication	ENV Project Symposium Survey	C	100% of students scoring a 4 or higher	**96%**	No, there was one score of a 3.

ISLO 6 Diverse Perspectives	ENV 355 Environmental Ethics assignment	P	80% of students scoring a 75% or higher	**90%**	Yes
ISLO 6 Diverse Perspectives	Faculty Participation in Elevated Teaching Workshops	Doesn't apply	100% of Natural Science Faculty participate	**87.5%**	No
ISLO 6 Diverse Perspectives	ENV 420 employer survey	C	80% of students score exceptional in the Attitude, Professionalism, and Teamwork categories.	**100%**	Yes
ISLO 6 Diverse Perspectives	Exit Interview		80% of students rate themselves as proficient or highly proficient	**100%**	Yes
PSLO 5 Geospatial Literacy	GEOG 105 map lab	F	80% of students scoring a 75% or higher	**100%**	Yes
PSLO 5 Geospatial Literacy	GEOG 105 Orienteering lab	F	80% of students scoring a 75% or higher	**100%**	Yes
PSLO 5 Geospatial Literacy	ENV Project Symposium	C	80% of students scoring a 3 in cartography and geospatial literacy	**75%**	No
BES 4-year Graduation Rate	None Given		Natural Science department goal of 50%	**22.2%**	No
BES 6-year Graduation Rate	None Given		Oregon Tech goal of 50% Natural Science department goal of 75%	**55.6%**	Yes for university. No for Natural Science department.
BES first year retention rate	None Given		75% goal set by Oregon Tech	**75%**	Yes
DFWI rate in BES specific courses.	None Given		Less than the institutional average of 12%	**4.3%**	Yes

Equity Gaps:

No equity gaps were identified in the courses chosen for the 2022-23 assessment process mostly due to insufficient data. Faculty were advised by the assessment executive committee to record a response of insufficient data if the class had fewer than five students within a specific demographic subcategory. The environmental science program is proud to be connecting students from underrepresented populations to innovative hands-on learning experiences. 30% of students who participated in extern (ENV 420) or research courses (ENV 495) in 2022-23 were from underrepresented populations. 2 international students participated in these courses. Further, 40% of the enrolled students in these classes identified as first-generation college students.

History of Results:

In the last 5 years the Environmental Science program has undergone major revisions to accommodate the changing needs in industry. Each year we review the program learning outcomes with guidance from our agency partners. Further, we are continually improving our assessment processes. This means that we do not have much historical data related to these specific PSLOs.

Table 7: History of results for BES assessment data.

Performance Criteria	Previous Action Plan	2018-19	2019-20	2020-21	2021-22	Current data	Interpretation
ISLO 1 Communication	None Given				**97%**	**96%**	Need more data.
ISLO 6 Diverse Perspectives	None Given					**90%**	Need more data.
ISLO 6 Diverse Perspectives	None Given					**87.5%**	Need more data.
ISLO 6 Diverse Perspectives	None Given					**100%**	Need more data.
ISLO 6 Diverse Perspectives	None Given					**100%**	Need more data.
PSLO 5 Geospatial Literacy	None Given					**100%**	Need more data.
PSLO 5 Geospatial Literacy	None Given					**100%**	Need more data.
PSLO 5 Geospatial Literacy	None Given					**75%**	Need more data.
4-year BES Graduation Rate	None Given	2012-13 27.3%	2013-14 31.3%	2014-15 27.3%	2015-16 40%	2016-17 **22.2%**	Rates below goal. Due to the high number of transfers into BES it is difficult to complete in 4 years.
6-year BES Graduation Rate	None Given	2012-13 31.8%	2013-14 43.8%	2014-15 54.5%	2015-16 50%	2016-17 **55.6%**	Rates below department goal, but improving.
BES first year retention rate	Write a Natural Science Retention Plan	70%	45%	50%	60%	**75%**	Covid had a significant impact on retention in BES. Retention efforts are working.

DFWI rate in BES specific courses.	None Given	2%	3%	1%	3%	**4.3%**	Continues to be much lower than campus average.

Student Success Stories:

We continue to have amazing students within the BES program. Below is a snippet from the Environmental Science Research Symposium program to give readers an idea of the outstanding work our students have been doing. For the full symposium program see Appendix C.

MOORE PARK VEGETATION PLOTS
Katlyn Baker, Gabbie Hering, Mattie Smith
PI Kerry Farris
This study established a system of permanent vegetation monitoring plots in Moore Park. The goal is to provide the City of Klamath Falls Parks Department with quantitative information that can help assess fire risk, aid in the development of management objectives, and monitor the effectiveness of prescriptive treatments.

HOLDING ON TO THE C'WAAM AND KOPTU
Tanikwah Lang
PI Klamath Tribes Ambodat Department
As an intern with the Klamath Tribes Ambodat Department, Tanikwah developed a variety of water analysis and restoration skills with the aim of protecting the culturally significant endangered sucker fish in the Klamath Basin.

Section 7– Action Plans

The BES first year retention rate was 75% which aligns with the university target of 75%. The low DFWI rates within BES courses indicate that our retention issues are not associated with program specific curriculum. This means that students are either facing attrition in their general educational requirements or are leaving Oregon Tech for reasons other than failing their classes. The graduation rate met the 50% Oregon Tech target with 55.8% of BES students graduating in six years. This is still lower than the Natural Science departmental goal of 75%. We had hoped to collect diverse perspectives data in ENV 314 last year, but due to staffing shortages, this course was not offered. In the future this course is an excellent opportunity to collect such data.

The communication goal we have set at the capstone level is ambitious, and while one presentation at the project symposium received a score of 3 in the category of "students effectively communicated the science in their presentation in a way that is easy to understand", we are overall pleased with our student's ability to communicate. We will continue to work with students throughout our curriculum to improve their scientific communication skills. As advisors, we are encouraging students to take science writing or grant writing as their upper division writing electives as the skills taught in these courses are the types of communication .

Our action plans for the coming year will focus on recruitment, retention, and graduation rates. Related to our PSLO assessments, we are going discuss how to better assess diverse perspectives within our program and improving the cartographic presentation of data in formal presentations.

Action Plans for 2023-2024

Goal 1: Increase enrollment in the program so that the retention rates are not dramatically influenced by the loss of a few individuals.

- Continue to improve marketing materials.
- Make visits with prospective students more impactful by focusing on interactive experiences.
- Connect with visiting high schools.
- Develop or improve articulation agreements with regional community colleges to facilitate transfers.
- Increase our presence in area K-12 schools.

Goal 2: Improve the culture of community within the BES program and the Natural Science Department as a whole.

- Have departmental activities that provide opportunities to engage in fun and social ways.
- Distribute workload equitably.

Goal 3: Continue to increase opportunities for students to conduct research or connect with internships.

- Implement a biology research series of courses taught by each faculty primary investigator. This will provide a means of tracking faculty and student participation in research at various levels. Presenting research findings either in a published paper or at a professional conference will be a capstone level requirement as part of this course.
- Refine the evaluation form used by employers to capture more data about our PSLOs.
- Reach out to federal and state environmental agencies to identify opportunities for faculty and students to connect with

Goal 4: Implement the environmental track curriculum allowing students to customize their educational experience to their profession of choice.

Goal 5: Improve the assessment process for the diverse perspectives ISLO. Students within the BES program regularly consider environmental issues from a diverse range of perspectives, but we have struggled with how to assess their ability to be culturally sensitive. This will be an agenda item in an upcoming meeting.

Goal 6: Improve student's geospatial literacy.

- Better communicate expectations for displaying geospatial data.
- Add an introductory R workshop to introduce students to R sooner in their curriculum.

ISLO data on Quantitative Literacy and Inquiry and Analysis and PSLO 4 will be collected in ENV 226, ENV 434, BIO 212L, CHE 315, and BIO 377 during the 2023-24 academic year.

Review of 2022-2023 Action Plans

Goal 1: Increase enrollment in the program so that the retention rates are not dramatically influenced by the loss of a few individuals.

- Meet with admissions/marketing to discuss how to better advertise the BES degree.
- Meet with university advisors to highlight the potential for BES to be an excellent alternative choice if they have students who want to switch majors.
- Update the ENV website.
- Visit local schools.

Goal 2: Write a retention plan for BES.

Goal 3: Add a project to ENV 108 – mentorship and teambuilding that requires first year students to partner with upper classman to better foster relationships among students. This course will also return to having an overnight field experience for students.

Goal 4: Continue to increase opportunities for students to conduct research or connect with internships.

- Formalize a process for tracking faculty workload related to research or partnership activities.

Goal 5: Develop tracks within the Environmental Sciences curriculum.

Goal 6: Schedule specific meeting times to discuss assessment.

Goal 7: Hire new chemistry faculty to teach CHE 315 and CHE 465.

Section 8– Closing the Loop: Reflection on previous work

2022-2023 was an exceptionally productive year for the Environmental Sciences program. Under the leadership of a new Department Chair, Dr. Nate Bickford, much effort was put into strategic planning which has resulted in increased enrollment and significantly improved retention.

We accomplished all the points listed under Goal 1 for increasing enrollment. There were a few enrollment strategies which proved to be particularly effective. We initiated a text and email system where faculty and current students contacted accepted students who hadn't paid a deposit. We received multiple responses from this with at least two students who committed to Oregon Tech because of this work. We learned that potential students are more likely to respond to the texts than email so will be keeping a texting system in 2023-34. Program faculty met with admissions staff who are responsible for tours helping to highlight our lab and research spaces and providing important talking points for them to share. This greatly improved the tours which are offered to prospective students.

Related to Goal 2, The Natural Science Department wrote a retention plan (Appendix D). Highlights from this plan include utilizing an early warning system through Inspire to identify students who were struggling in a class by week two of the term and then connecting them with support services. The Natural Science department set up a tutoring lab in the hall in DOW near the faculty offices. This center is well staffed throughout the week and provides help for both General Biology and General Chemistry which are key prerequisite courses in BES. We have found that offering help in spaces near the classrooms made the tutoring center much more accessible for students.

ENV 108 continues to be an important class for fostering connection between students and faculty. In 2022-2023, we returned to an overnight field camping experience after taking a break during COVID. We added a group project in this course to foster mentorship and teambuilding (Goal 3) where students worked in small groups to create social media content for the BES program. This was a successful way to foster mentorship between returning and first year students. We are continuing with a group project in 2023-24 but adding a community service component so students also get to engage with groups outside of BES.

As shown in Table 1, we are continuing to increase our partnerships in the region and providing research opportunities for our students. These high impact experiences are key to professional development in BES. Our department developed a series of research courses (BIO 255, 355, 455) where students will work on specific research projects under a faculty mentor. This provides a means for tracking faculty workload related to this work (Goal 4).

The Environmental science program was revised to include tracks in 2022-2023 (Goal 5). Students will now obtain a degree with a designated track that aligns with their professional goals. Given that Environmental Science is such a broad field, this will better communicate with employers the specific skills our students have obtained with their degree. We

hope that this will positively impact recruitment since high school students are more likely to recognize job potential within the various tracks. The five track options we now offer are:

- Wildlife, Fisheries, and Natural Resources
- Water and Wetland Resources
- Recreation and Science Ambassador
- Environmental Business and Economics
- Environmental Policy and Governance

For complete descriptions of the tracks view Appendix E.

We met twice last year to discuss assessment as outlined in Goal 6. These meetings were mostly about collecting assessment data. One thing that we need to improve is to focus more on our action plans and assessment results.

The Natural Science department hired two new chemists who will begin teaching in Fall of 2023 (Goal 7). Both individuals have experience related to environmental science. Dr. Owen has a lot of water quality research experience, and Dr. Hung has been studying the impacts of agricultural practices on antibiotic resistance. They will be responsible for teaching the BES courses CHE 315 and CHE 465 going forward. Their expertise will expand research opportunities for our students.

The Environmental Science program is building a reputation for excellence in science regionally. Our faculty have embraced Charge 4 of the Academic Master Plan "To develop a path for progress in entrepreneurial and collaborative applied research, inclusive pedagogy, and service to the profession, that broadens access, promotes student learning and success, and enhances the intellectual life of our students, faculty, and staff." We are thrilled with the successes we have had this year and look forward to continued improvement in the future.

Appendix A– Assessment Artifacts

Name: _____Understanding and using topomaps
Geog 105

The goal of this exercise is to familiarize students with the information available on 2-D and 3-D topographic maps and to use this information to interpret local landform and landscape features. Both 2-D and 3-D topographic maps produced by the U.S. Geological Survey will be used.

Working in groups of 2 or 3 people, select a plastic relief map among the ones laid out on the lab tables. Then, using the index for the topographic maps, identify a 7.5' topographic map that falls within the extent of your selected plastic relief map. Your instructor will show you how to use the index. Once you have located a 7.5' map, you will have a pair of maps, including one "2-D" (paper) and one "3-D" (plastic relief) map.

1. Title/location/date of your 2-D map:

2. Title/location/date of your 3-D map:

3. Scale of your 2-D map:

4. Scale of your 3-D map:

5. Which of these maps has a smaller scale, larger area?

6. How many feet on the ground does 1 inch equal on the 2-D map?

7. How many feet on the ground does 1 inch equal on the 3-D map?

Note that each corner of both maps indicates the latitude and longitude.

8. What are the coordinates of each corner of the 2-D map?

9. How many degrees, minutes, and seconds of latitude are shown on the 2-D map?

10. How many degrees, minutes, and seconds of longitude are shown on the 2-D map?

11. What are the coordinates of each corner of the 3-D map?

12. How many total degrees, minutes, and seconds of latitude are shown on the 3-D map?

13. How many total degrees, minutes, and seconds of longitude are shown on the 3-D map?

Topographic contour lines connect points of equal elevation across the map. The distance between contour lines is called the contour interval. Maps often have different contour intervals for different scales. Topography is interpreted by reading these lines with specific attention to the elevations and spacing of the lines. In order to know the elevation of specific points of interest, map users locate the nearest index contour and count up or down in elevation the number of regular contour lines until the point of interest is located. If the point happens to be located between two regular contour lines, the user will interpolate the elevation value based on the relative distance from sequential contour lines.

14. Contour interval of the 2-D map:

15. Contour interval of the 3-D map:

16. Index contours are slightly thicker and darker than regular contour lines.At what interval do they occur on the 2-D maps? At what interval do they occur on the 3-D maps?

17. What are elevations of the highest and lowest points on the 2-D map?

18. What is the approximate total relief shown on the 2-D map?

19. What are the elevations of the highest and lowest points on the 3-D map?

20. What is the approximate total relief shown on the 3-D map?

The maps for the following questions can be found on Canvas.

Use the Wocus, Oregon quadrangle to estimate the approximate elevation of each of the following landscape features surrounding Oregon Tech

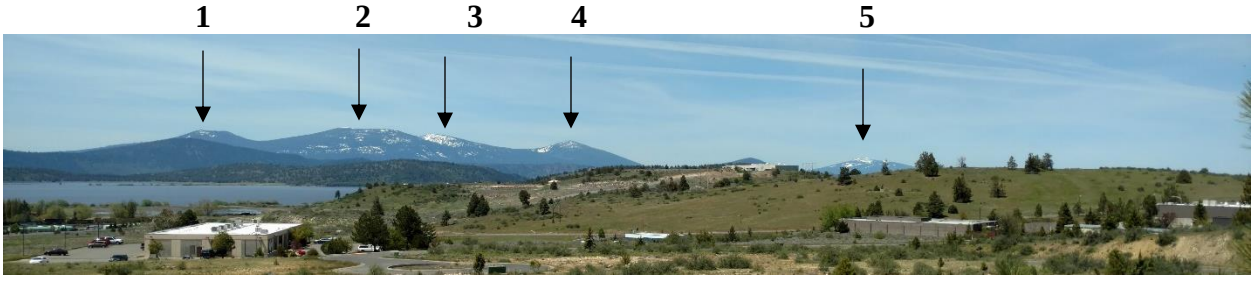
1. approximate floor elevation of Owens Hall

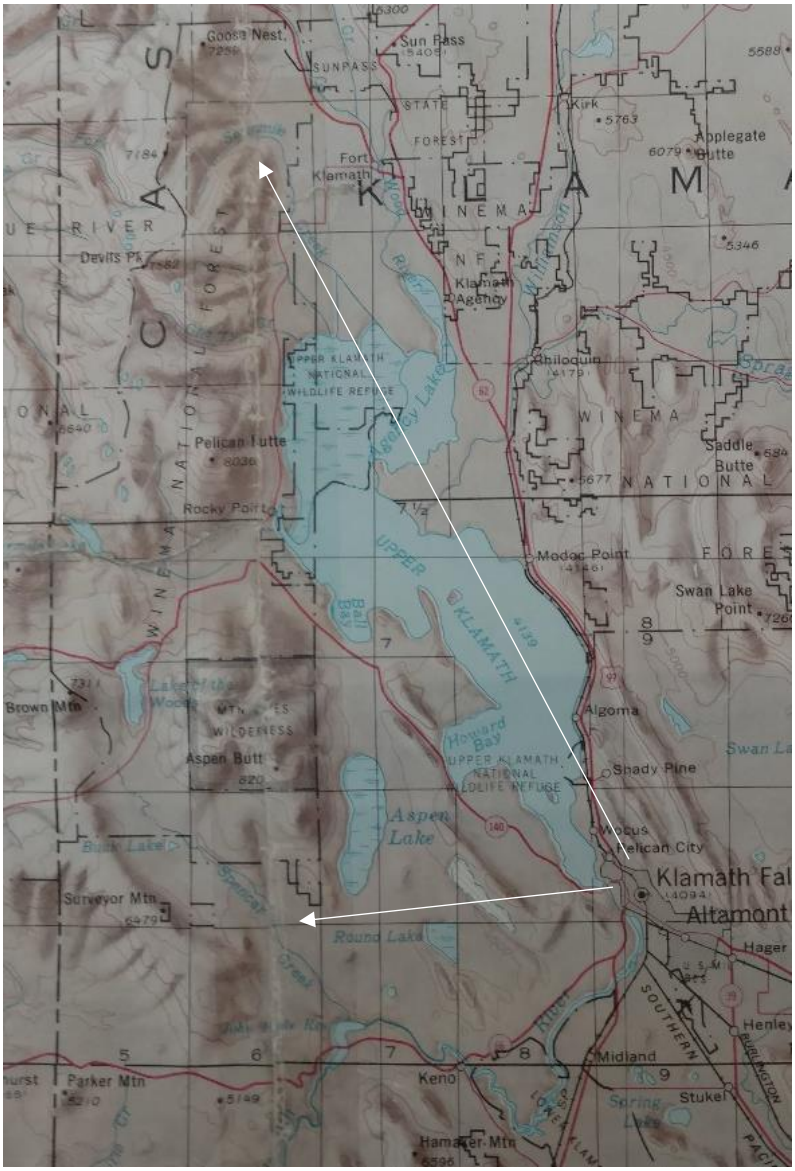
2. lowest elevation found on campus property.

3. elevation of the OT symbol on the hill above the solar panels

4. maximum (peak) elevation of the hill with the OT symbol

Challenge Section (extra credit possible, but no points will be deducted for this section.)
Now let's turn our attention to the volcanic peaks on the far side of Upper Klamath Lake. Using the **Aspen Lake** and **Pelican Butte Quadrangles** and the imagery (west side of Upper Klamath Lake viewed from the Oregon Tech campus) and inset map shown on the following page (approximate viewshed shown in white arrows), name the numbered peaks shown below and report their elevation values.





Peak 1:

Peak 2:

Peak 3:

Peak 4:

Peak 5:

Professional Presentation for ENV 355

Learning Objectives:

- Deliver a 10 minute professional presentation to your peers.
- Effectively communicate science to a diverse audience.

Directions:

Choose a scientific project with which you have been involved during your time at Oregon Tech that highlights some of the technical skills you have acquired during the program. Examples may include but are not limited to: a research project you completed for a course, a GIS analysis, a lab experience where you collected and analyzed data, or an internship or other external work experience related to environmental science.

Prepare a 10-minute presentation about your chosen project. Your presentation should include the following items.

- ✓ A **title slide** with your name, the OIT logo, and logos for any external partners with whom you collaborated on this work.
- ✓ **Introduction:** This section establishes the context for your project.
    - Why you were doing the work.
    - What you were trying to accomplish.
    - Relevant background information with citations.
    - For research projects, this is where you would state your questions/hypothesis.
- ✓ **Methods:** This section provides an explanation of how you did your work. Here are some possible things to include in this section.
    - Pictures/diagrams of equipment used.
    - Maps of locations
    - Pictures of you in the field doing the work.
    - Description of the data analysis methods.
- ✓ ***Results*:** This section summarizes results from your work.
    - Final products (maps, figures, tables, collections, etc.) You must include at least one figure or table which summarizes the results of your project.
    - What were the outcomes of the work?
- ✓ **Discussion:** Reflect on the meaning of the results of this project.
    - What did you learn from the experience?
    - For those who did more traditional research, was your hypothesis correct? Why or why not?
    - Interpretation of your results within the larger context of your field of study. How did your results compare with what is already known from the published literature?
    - How is the data from your project being used?
- ✓ **References and Acknowledgements slides**
    - Provide APA formatted citations for any publications cited in the presentation.
    - List the names of any collaborators on this project (group members, supervisors, mentors, primary investigators, or professors).

Thank you for attending the Environmental Science Research Symposium! Please fill out this brief assessment of the event.

Overall, how would you rate the quality of student presentations.				
Exceptional 5	Strong 4	Average 3	Poor 2	Abysmal 1

To what extent do you agree with this statement: Students effectively communicated the science in their presentation in a way that was easy to understand.				
Strongly Agree 5	Agree 4	Neutral 3	Disagree 2	Strongly Disagree 1

Do you have any constructive feedback to improve the symposium in the future?

Appendix B– Project Rubrics

BES GEOSPATIAL LITERACY RUBRIC

Demonstrate geospatial literacy through the utilization of appropriate technology to identify and address environmental problems.	High Proficiency (3)	Proficiency (2)	Limited Proficiency (1)	(0) No Proficiency OR does not apply to the assignment.
Map Interpretation	Student is clearly able to interpret all key characteristics of a map (scale, legend, theme, projection) and accurately apply this information to answer geospatial questions related to the theme of the map.	Student is clearly able to interpret all key characteristics of a map (scale, legend, theme, projection), but is unable to apply this information to answer geospatial questions related to the theme of the map.	Student is able to interpret some key characteristics of a map (scale, legend, theme, projection) but not all.	Student is unable to interpret the key characteristics of a map (scale, legend, theme, projection).
Land Navigation using a map and compass.	Student effectively coordinates the use of a map and a compass for land navigation. A student at this level should be able to demonstrate the following skills without prompting: • Adjusting for declination • Following a heading taken from a map. • Triangulation	Student coordinates the use of a map and a compass for land navigation. A student at this level should be able to demonstrate some but not all of these skills or may require prompting to complete these tasks: • Adjusting for declination • Following a heading taken from a map. • Triangulation	Student does not coordinate the use of a map and compass together for land navigation. However, the student can take a bearing on an object or follow a heading when supplied one.	Student is unable to use a compass for land navigation.

BES GEOSPATIAL LITERACY RUBRIC

Demonstrate geospatial literacy through the utilization of appropriate technology to identify and address environmental problems.	High Proficiency (3)	Proficiency (2)	Limited Proficiency (1)	(0) No proficiency or does not apply to the assignment.
Cartography	Student is able to create a map using geospatial technology which includes ALL appropriate elements and is easy to interpret. Appropriate elements include: title, reference information, author, date, compass, scale, key, and projection.	Student is able to create a map using geospatial technology which includes ALL appropriate elements but some aspects of the map make it difficult to interpret.	Student is able to create a map using geospatial technology which includes some of the appropriate elements but not all.	Student is unable to create a map using geospatial technology.
Applying geospatial technology to address an environmental problem.	Student effectively utilizes the most appropriate geospatial technology available to address a specific question related to a broader environmental problem. Student makes an informed evaluation of the data and completely supports their conclusions with appropriate analysis.	Student effectively utilizes geospatial technology to address a specific question related to a broader environmental problem. Student did not choose the best technology available to address the question. and/or Conclusions drawn from their analysis are not completely supported by the data.	Student utilizes geospatial technology to address a specific question related to a broader environmental problem but the data collection is incomplete or any conclusions drawn from their analysis are not supported by the data.	Student demonstrates no ability to use geospatial technology to address a specific question related to a broader environmental problem.

Ethics Rubric

Criteria	Ratings			Pts
Additional References	**10 pts** **Full Marks** Student provided references for two reputable sources and used the research as supporting evidence for their ethical decision.	**5 pts** **Partial Credit** Student made reference to two reputable sources in their paper but the information was loosely (or not at all) tied to their ethical decision.	**0 pts** **No Marks** Student failed to reference the addition sources in their paper and/or the cited information was from unreliable sources.	10 pts
Thesis Statement	**10 pts** **Full Marks** Strong thesis statement which clearly identifies the student's ethical choice and why that option was selected.	**5 pts** **Partial Credit** Thesis statement is weak and/or lacking reasoning behind the decision that was made.	**0 pts** **No Marks** Student failed to give a clear thesis statement.	10 pts
Writing	**10 pts** **Full Marks** Excellent grammar. Paper is clear, cohesive, and well documented in APA format.	**5 pts** **Partial Credit** Paper has a few grammatical errors but is still easily understood. Paper is clear or cohesive but not both. some APA formatting issues.	**0 pts** **No Marks** Paper lacks organization. Multiple grammatical errors which distract from the meaning of the paper. Failed to use APA citations.	10 pts
Ethical Reasoning	**10 pts** **Full Marks** Student arrived at a balanced decision taking into account perspectives of all stakeholders and the ethical principles that guide their actions.	**5 pts** **Partial Credit** Student arrived at a decision based on limited consideration of the various stakeholder perspectives. Logical sequence of ideas is loosely linked to the conclusion.	**0 pts** **No Marks** Student arrived at a decision based on personal opinion. Decision proposed in not feasible, acceptable, or ethically justified.	10 pts
				Total Points: 40

OREGON INSTITUTE OF TECHNOLOGY
Environmental Sciences
ENV 420- Environmental Sciences Externship

Student's Name:_____

Supervisor Name/Title:_____

Place of Employment:

_____

Oregon Tech Credit hours sought: _____ x 80 hours of work for each credit hour = _____total hours work required.

Supervisor Signature:_____ **Date:**_____

By signing above I certify that the student worked the minimum required hours for the credit received.

Performance Rating: Use the following scale to evaluate the student. A number range may be used.

E	**(P)**	**Exceptional**	**Performance exceeds expectations for skill level**
C	**(P)**	**Competent**	**Performance is at expected skill level**
D	**(P)**	**Developing/Digressing**	**Performance requires modification**
F	**(F)**	**Failing**	**Performance fails expectation for skill level**

Please rate the student based in the following areas. Provide a score for each individual objective by checking a rating on the left (if they are failing don't check any options). Using these objective scores, determine an overall rating for each of the 9 criteria by selecting the box on the right that matches their overall performance.

Rate the student's progress of the following criteria:		**E**	**C**	**D**	**F**
Rating E C D	**1) Organizational Skills**				
○ ○ ○	Shows an efficient and methodical approach while working	**Comments:**			
○ ○ ○	Performs procedures in sequential steps				
○ ○ ○	Develops and follows a process that works for him/her				
Rating	**2) Quality of work**				
○ ○ ○	Completes expected amount of work	**Comments:**			
○ ○ ○	Utilizes time efficiently				
○ ○ ○	Continuously shows improvement of work				
○ ○ ○	Performs well in a continuously changing environment				
Rating	**3) Judgment and critical thinking**				
○ ○ ○	Assesses situation before taking action	**Comments:**			
○ ○ ○	Anticipates potential problems				
○ ○ ○	Applies knowledge and uses judgment when problem solving				
Rating	**4) Perseverance**				
○ ○ ○	Shows an interest in learning despite setbacks	**Comments:**			
○ ○ ○	Demonstrates a commitment to improve work				
Rating	**5) Self confidence**				
○ ○ ○	Develops confidence in abilities	**Comments:**			
○ ○ ○	Performs collaboratively and independently				
○ ○ ○	Shows interest in participating without being told				

Rate the student's progress of the following criteria:			E	C	D	F
Rating E C D	**6) Attitude**					
❍ ❍ ❍	Accepts all tasks and assignments with a positive attitude	**Comments:**				
❍ ❍ ❍	Accepts advice without negative comments or behavior					
❍ ❍ ❍	Engages in respectful dialogue to better understand instruction					
Rating	**7) Punctuality and attendance**					
❍ ❍ ❍	Arrives on time	**Comments:**				
❍ ❍ ❍	Is ready to begin work					
❍ ❍ ❍	Communicates about absences prior to occurrence.					
Rating	**8) Professionalism**					
❍ ❍ ❍	Demonstrates appropriate behavior for work setting	**Comments:**				
❍ ❍ ❍	Understands ethical responsibilities of the profession					
❍ ❍ ❍	Adheres to all rules as stated by employer					
Rating	**9) Teamwork**					
❍ ❍ ❍	Works collaboratively to accomplish objectives	**Comments:**				
❍ ❍ ❍	Communicates effectively					
❍ ❍ ❍	Resolves conflict when necessary					
❍ ❍ ❍	Interacts appropriately and respectfully with others					

Student strengths:_____

_____

_____

_____

_____

Focus for improvement:_____

_____

_____

_____

_____

The information on this evaluation has been reviewed and:

I agree_____ **I disagree**_____ **Student signature:**_____

Comments:

Appendix C– ENV Research Symposium Program

ENVIRONMENTAL SCIENCE RESEARCH SYMPOSIUM

WEDNESDAY, DECEMBER 7, 2022, 6:00PM

Oregon Tech Klamath Falls Campus
Klamath Falls Campus, room DOW 100

STUDENT SPEAKERS

Kaile Edenhofer

NATIVE BEE AND HONEY BEE RESEARCH

Kaile Edenhofer, Quin McDowell, Makenzie Stieber, Filip Trier
PI Christy VanRooyen and Terri Torres

The purpose of this project was to provide baseline data on both native pollinators and Apis mellifera for continued monitoring of phenological trends with shifting climate and fire regimes in the Klamath Basin. Students are curating an entomological collection and compiling a variety of bee and flower data for analysis.

Quin McDowell

Makenzie Stieber

MOORE PARK VEGETATION PLOTS

Katlyn Baker, Gabbie Hering, Mattie Smith
PI Kerry Farris

This study established a system of permanent vegetation monitoring plots in Moore Park. The goal is to provide the City of Klamath Falls Parks Department with quantitative information that can help assess fire risk, aid in the development of management objectives, and monitor the effectiveness of prescriptive treatments

Filip Trier

Mattie Smith

CARNIVORE RESEARCH

Kaile Edenhofer, Quin McDowell, Tanikwah Lang
PI Jherime Kellermann

This study focused on trapping for large carnivore and meso-carnivore presence at Oregon Tech and was developed in response to recent cougar activity on campus. Students had the opportunity to develop their wildlife monitoring and advocacy skills.

Gabbie Hering

Katlyn Baker

HOLDING ON TO THE C'WAAM AND KOPTU

Tanikwah Lang
PI Klamath Tribes Ambodat Department

As an intern with the Klamath Tribes Ambodat Department, Tanikwah developed a variety of water analysis and restoration skills with the aim of protecting the culturally significant endangered sucker fish in the Klamath Basin.

Tanikwah Lang

Appendix D – Retention Plan

Retention Plan 2022 | October 6, 2022
Natural Sciences

Dr. Nate A. Bickford, Chair

INTRODUCTION & OVERVIEW
Student retention is one of the most important metrics in higher education. In the Natural Sciences we are happy with the direction of our retention, but it can be better. We plan to make a four-pronged plan to increase our retention. Our goal is to maintain a 77% retention rate in both BHS and ENV.

ACTON ITEMS
The first part of the retention plan is to start an early warning system. At the end of week 2 in each quarter the faculty will use software provided by the university to indicate students who are looking like they may be heading in the wrong direction. The software will send an email to advisor, the retention team, their coaches, etc. that indicate issues with the student's work in the class.

Second, once the email is sent via the system, it will then be on the advisors and associated retention team to help the student get back on track. This will require communication. The communication from faculty and retention team should go both ways, to each other as well as to the student. Our faculty will support the retention team to the best of our ability and time.

The third part of the retention plan is to develop strong tutoring plan.

- Connect students to the tutoring center in the library and make sure they are aware of the center. In our introductory classes we can create opportunities to interact with tutoring center.
- Make sure classes of concern have Student Instructors (SI's) to create time outside the classroom for specialized tutoring
- Dedicated tutoring center in DOW (may move to Boivin in the future). This will be staffed by student(s) from 10 am to 7 pm each weekday, closing earlier on Fridays

As a measure of success, we will keep track of the students who use these opportunities. This will allow us to measure success for individual students, but also of the program. Students will also self-report via surveys about the impact of the tutoring services.

The fourth part of the retention plan is to build a stronger relationship with the professional advisors and natural science faculty. We will ask the advisors to attend some of our meeting, especially related to curriculum. This will ensure that our early students are getting the help they need as well as ensuring the correct class sequence.

The fifth part of this retention plan is to continue to grow hands on interactive learning, both inside and outside the class. Active engagement teaching and mentoring are very powerful tools to keep student engaged while also creating very effective teaching opportunities. This is a strong retention tool that we can implement more fully within the program.

Appendix E – Track Curriculum

Environmental Sciences Program

Degree Offered

- Bachelor of Science in Environmental Sciences

Dual Major Options

- Bachelor of Science in Civil Engineering and Environmental Sciences
- Bachelor of Science in Renewable Energy Engineering and Environmental Sciences

The Bachelor of Science degree in Environmental Sciences focuses on interdisciplinary scientific study of ecology, natural resources, wildlife, data analysis, and sustainability with emphases on management, research, and communication. Active learning is central to our program which is why many ES classes have labs or field components.

The program offers numerous and diverse opportunities for students to engage in applied research, resource management projects, and community education events with the support of faculty and professionals through local and regional partnerships.

The core curriculum for all BES tracks consists of three major emphases:

- **Introduction to Science:** Biology, Ecology, Chemistry, Intro Environmental Science, Physical geography, Physics
- **Data analysis:** Statistics, Geographic Information Systems, R – modeling
- **General Education:** Math, Writing, Speech, Humanities, Social Sciences

Environmental sciences encompass a broad range of opportunities for students after graduation which is why in their second year, students select a specific track to focus their education for their career aspirations. The BES program currently offers five tracks: Wildlife, Fisheries and Natural Resources; Water and Wetland Resources; Recreation and Science Ambassador; Environmental Business and Economics; Environmental Policy and Governance. See descriptions below.

Wildlife, Fisheries, and Natural Resources

Students gather, analyze, and interpret data on wildlife and their habitats to promote organismic success and sustainable natural resources. They evaluate ecosystems to determine environmental impacts from proposed actions while applying standards established through various environmental laws. Examples of track specific courses include Wildlife, Mammalogy, Fisheries, Ornithology, Policy and Management, Conservation Biology, and Ecological Restoration and Monitoring.

Potential careers associated with this track: wildlife tech, wildlife biologist, fisheries biologist, wildlife management, forestry tech, rangeland management.

Water and Wetland Resources

Prepares individuals to apply the principles of aquatic ecology, hydrology, and natural resources management to the development, conservation, and management of freshwater environments. Within this track students will use surveying, remote sensing, geographic information systems, and analytical chemistry techniques to collect data on lentic and lotic systems. Examples of track specific courses include Aquatic Ecology, Watershed Science and Technology, Water Resources, and Treatment Wetlands.

Potential careers associated with this track: hydrologic tech, environmental scientist, wetland scientist, environmental lab technician, water conservation specialist.

Recreation and Science Ambassador

This track prepares students for environmental education and recreation leadership careers. Students educate diverse audiences on environmental and recreation topics and empower their audience to get involved. Within this track students will design and implement standards aligned curriculum for environmental education programs. Examples of track specific courses include Environmental Education, Risk Assessment and Wilderness First Aid, Coaching in Application, and Wilderness Navigation.

Potential careers associated with this track: Interpretive Park Ranger, Environmental Educator, Recreation Ambassador, Park or Resource Specialist, Outreach Specialist.

Environmental Business and Economics

In business there is increasing demand to consider the environmental impact of corporate actions for compliance and conservation purposes. In this track students will develop the analytical skills to assess, allocate, and sustainably manage natural resources. Examples of track specific courses include Environmental Ethics, Principals of Business Management, Globalization, and Marketing.

Potential careers associated with this track: Sustainability Management, Environmental Reporting Specialist, Corporate Environmental Professional, Environmental Consultant, Natural Resource Manager.

Environmental Policy and Governance.

The emphasis in this track is to examine the social dimensions of environmental issues. Students will gain the tools needed to inform environmental policy decisions. They will interpret current environmental laws and policies and advocate sustainable practices. Examples of track specific courses include Environmental Economics, Medical Sociology, Community Program Planning, and Leadership.

Potential careers associated with this track: Environmental Planning/Policy, Environmental Policy Analyst, Environmental Program Specialist, Compliance Analyst.

Program Learning Outcomes

Upon completion of the program, students will have demonstrated the following abilities:

1. Attain applicable foundational knowledge, technical skills, and information literacy in several core areas of ecology, natural resources, & environmental sciences.

2. Actively collaborate with local and regional agencies, organizations, and community members that represent a diversity of perspectives.

3. Make and advocate for science-based and sustainable solutions to local and global environmental issues.

4. Apply, interpret, and communicate appropriate analytical and statistical techniques to answer data driven scientific questions.

5. Demonstrate geospatial literacy through the utilization of appropriate technology to identify and address environmental problems.

Student Preparation

We believe there is a place in our program for everyone with an interest in natural resources, environmental issues, business management, conservation and sustainability, environmental education, or just being in the great outdoors! Environmental sciences is a huge field that can accommodate a wide range of individual interests and skill whether it's working with wild animals, plants, people, or computers and technology. We encourage students to explore the diversity of job opportunities with federal, state, and tribal agencies, non-governmental organizations (NGOs), and private industries to help guide your studies.

Career Opportunities

Our faculty and partners are here to help you build an impressive resume of academic and work experience that will place you in the job or graduate program of your choice. Graduates can expect to find employment in federal, state, and tribal government agencies, non-governmental organizations (NGOs), and education and research institutions. Students are also well prepared to enter graduate school. Students graduating from our program have taken positions with the U.S. Geological Survey, U.S. Bureau of Reclamation, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, Oregon Department of Forestry, Oregon State Police Wildlife Enforcement, Klamath County Health Department, Klamath Irrigation District, Klamath County Soil and Water Conservation District, the Nature Conservancy, and JELD-WEN Windows and Doors.

Degree Requirements

Students must meet the general education requirements, as stated elsewhere in this catalog, and complete the courses listed in the curriculum to obtain a Bachelor of Science in Environmental Sciences. Students are encouraged to develop a track emphasis area based on their own interests.

Students are required to pass each science course with a grade of "C" or better. This requirement is based on the quantitative skills needed in later courses as well as the degree of integration in subject material that is present throughout the program.

The Environmental Sciences Curriculum

Students within the Environmental Sciences program put their knowledge into practice in the best place possible—the great outdoors. This map shows required courses for the degree and recommended terms to take each course (the term sequence is subject to change depending on transfer courses, AP/IB/CLEP credit, and course availability).

Degree Required courses and recommended terms during which they should be taken:

Freshman Year

Fall

BIO 211 - Principles of Biology	Credit Hours: 4
ENV 108 - Mentorship and Team Building	Credit Hours: 1
ENV 111 - Intro to Env Sciences	Credit Hours: 4
GIS 103 - The Digital Earth	Credit Hours: 3

Winter

BIO 212 - Principles of Biology	Credit Hours: 4
GIS 134 - Geographic Info Systems	Credit Hours: 3
MATH 111 - College Algebra	Credit Hours: 4
WRI 121 - English Composition	Credit Hours: 4

Spring

BIO 213 - Principles of Biology	Credit Hours: 4
GIS 205 - Mobile and Web GIS	Credit Hours: 2
MATH 112 - Trigonometry	Credit Hours: 4
GEOG 105 - Physical Geography	Credit Hours: 4

Sophomore Year

Fall

CHE 221 - General Chemistry I	Credit Hours: 5
ENV 217 - Intro to Natural Resources Management	Credit Hours: 4
SPE 111 - Public Speaking	Credit Hours: 4
Track Course	Credit Hours: 4

Winter

CHE 222 - General Chemistry II	Credit Hours: 5
ENV 224 - Scientific Reason & Method	Credit Hours: 3
ENV 226 - Environmental Data Analysis	Credit Hours: 3

WRI 122 - Argumentative Writing	Credit Hours: 4
Or	
WRI 227 - Technical Report Writing	Credit Hours: 4

Spring

CHE 223 - General Chemistry III	Credit Hours: 5
ECO 201 - Principles of Microeconomics	Credit Hours: 3
or	
ECO 202 - Principles of Macroeconomics	Credit Hours: 3
Track Course	Credit Hours: 4
MATH 361 - Statistical Methods I	Credit Hours: 4

Junior Year

Fall

ENV 108 - Mentorship and Team Building	Credit Hours: 1
ENV 355 - Careers/Professionalism in Env Sci	Credit Hours: 3
Social Science Elective	Credit Hours: 3
Track Course	Credit Hours: 4
MATH 362 - Statistical Methods II	Credit Hours: 4

Winter

PHY 201 - General Physics	Credit Hours: 4
Track Course	Credit Hours: 4
ENV 314 - Environmental Policy and Management	Credit Hours: 3
ENV 434 - Advanced Data Analysis	Credit Hours: 4

Spring

Track Course	Credit Hours: 4
Track Course	Credit Hours: 4
Track Course	Credit Hours: 4

Upper Division WRI Elective	Credit Hours: 4

Senior Year

Fall

SPE 321 - Small Group/Team Comm	Credit Hours: 3
Track Course	Credit Hours: 4
Track Course	Credit Hours: 4
HUM Elective	Credit Hours: 3

Winter

Social Science Elective	Credit Hours: 3
Track Course	Credit Hours: 3
Track Course	Credit Hours: 4
ENV 485 – Habitat Management	Credit Hours: 3

Spring

ENV 484 - Sustainable Human Ecology	Credit Hours: 4
Humanities Elective	Credit Hours: 3
Track Course	Credit Hours: 3
Track Course	Credit Hours: 4
Track Course	Credit Hours: 3

Total for a B.S. in Environmental Sciences: 180 Credit Hours.

Track Courses by Track

Wildlife, Fisheries, and Natural Resources

Required within track	**Credit Hours: 30**
BIO 337 - Aquatic Ecology	Credit Hours: 4

BIO 367 - Plant Ecology	Credit Hours: 4
BIO 377 - Wildlife Ecology and Management	Credit Hours: 4
BIO 426 - Evolutionary Biology	Credit Hours: 3
BIO 446 - Conservation Biology	Credit Hours: 3
ENV 375 - Forest Ecology & Management	Credit Hours: 4
ENV 465 - Ecological Resto. & Monitoring	Credit Hours: 4
ENV 315- Environmental Chemistry	Credit Hours: 4

Track tech electives	**Credit Hours: 23**
BIO 386 - Ornithology	Credit Hours: 4
BIO 255 – Research	Credit Hours: 1
BIO 355 – Research	Credit Hours: 1
BIO 455 – Research	Credit Hours: 1
BIO 428 – Fisheries	Credit Hours: 4
BIO 369 - Mammalogy	Credit Hours: 4
BIO 313 – Botany & Plant Taxonomy	Credit Hours: 4
ENV 365 - Adv Field Methods in Env Sci	Credit Hours: 3
ENV 421 – Fire Ecology	Credit Hours: 4
GEOG 315 - Climatology & Atmospheric Sci	Credit Hours: 3
GIS 306 - Geospatial Raster Analysis	Credit Hours: 4
GIS 316 - Geospatial Vector Analysis I	Credit Hours: 4
GIS 332 - Customizing the GIS Environ I	Credit Hours: 4
GIS 426 - Geospatial Vector Analysis II	Credit Hours: 4
GIS 432 - Customizing the GIS Environ II	Credit Hours: 4
GIS 446 - GIS Database Development	Credit Hours: 2
GME 425 - Remote Sensing	Credit Hours: 4

Water and Wetland Resources

Required within track	**Credit Hours: 25**
BIO 337 - Aquatic Ecology	Credit Hours: 4
BIO 428 – Fisheries	Credit Hours: 4
CHE 315 - Env chem	Credit Hours: 3
CHE 465 - chem fate and transport	Credit Hours: 4
ENV 214 - Watershed Sci & Tech	Credit Hours: 3
ENV 321 – Water Resources	Credit Hours: 4
ENV 469 - Treatment Wetlands	Credit Hours: 3

Track tech electives	**Credit Hours: 28**
BIO 255 – Research	Credit Hours: 1
BIO 355 – Research	Credit Hours: 1
BIO 455 – Research	Credit Hours: 1
ENV 465 - Ecological Resto. & Monitoring	Credit Hours: 4
ENV 495 or ENV 420 - Research in Env. Sciences or Internship	Credit Hours: 4

GEOG 335 - Soils	Credit Hours: 4
GIS 306 - Geospatial Raster Analysis	Credit Hours: 4
GIS 316 - Geospatial Vector Analysis I	Credit Hours: 4
GIS 332 - Customizing the GIS Environ I	Credit Hours: 4
GIS 432 - Customizing the GIS Envirn II	Credit Hours: 4
GME 161 – Plane Surveying I	Credit Hours: 4
CE 374 - Hydrology	Credit Hours: 4
CE 405 - Sustainability & Infrastructure	Credit Hours: 3
CE 489 - Treatment Wetlands	Credit Hours: 3
GME 425 – Remote Sensing	Credit Hours: 4

Recreation and Science ambassador

Required within tract	**Credit Hours: 32**
BIO 337 - Aquatic Ecology	Credit Hours: 4
BIO 367 - Plant Ecology	Credit Hours: 4
BIO 377 - Wildlife Ecology	Credit Hours: 4
BIO 446 - Conservation Biology	Credit Hours: 3
ENV 315- Environmental Chemistry	Credit Hours: 4
ENV 466- Environmental Education (new)	Credit Hours: 3
ENV 460-Risk assessment and Wilderness first aid (new)	Credit Hours: 3
PHIL 325 - Environmental Ethics	Credit Hours: 3
PHED 355 – Coaching in Application	Credit hours 3
PHED 163 - Wilderness Navigation	Credit hours 1

Track tech electives	**Credit Hours: 15**
BIO 255 – Research	Credit Hours: 1
BIO 355 – Research	Credit Hours: 1
BIO 455 – Research	Credit Hours: 1
COM 226 - Nonverbal Communication	Credit Hours: 3
COM 237 - Intro to Visual Communication Credit Hours: 3	Credit Hours: 3
COM 248 - Digital Media Production	Credit Hours: 3
ENV 420 – internship in environmental sciences	Credit Hours: 1-3
GEOG 315 - Climatology & Atmospheric Sci	Credit Hours: 3
BUS 223 – Marketing I	Credit Hours: 3

PE electives	**Credit Hours: 6**
PHED 132 - Scuba: Advanced	Credit Hours: 1
PHED 145 - Relaxation and Flexibility	Credit Hours: 1
PHED 146 – Yoga	Credit Hours: 1
PHED 150 – Aikido	Credit Hours: 1
PHED 151 – Karate	Credit Hours: 1

PHED 160 - Cross Country Skiing: Begin	Credit Hours: 1
PHED 131 - Scuba: Beginning	Credit Hours: 1
PHED 161 - Snowshoeing: Beginning	Credit Hours: 1
PHED 162 - Ice Skating	Credit Hours: 1
PHED 292 - Water Safety Instructor	Credit Hours: 1
PHED 171 - Archery: Beginning	Credit Hours: 1
PHED 172 - Archery: Intermediate	Credit Hours: 1
PHED 130 – Rowing	Credit Hours: 1

Environmental Business and economics

Required within track	**Credit Hours: 30**
BUS 215 – Principles of Management	Credit Hours: 3
BUS 223 – Marketing I	Credit Hours: 3
BUS 314 - Entrepreneurship I	Credit Hours: 3
BUS 318 - Marketing II	Credit Hours: 3
BUS 319 - Integrated Marketing Comm.	Credit Hours: 3
BUS 335 - Entrepreneurship II	Credit Hours: 3
BUS 441 - Leadership I	Credit Hours: 3
COM 248 – Digital Media	Credit Hours: 3
ANTH 452 - Globalization	Credit Hours: 3
or	
HIST 452 - Globalization & Pac NW	Credit Hours: 3
PHIL 325 - Environmental Ethics	Credit Hours: 3

Track tech electives	**Credit Hours: 23**
ENV 347 - Environmental economics	Credit Hours: 3
BUS 415 – Environmental Regulation	Credit Hours: 3
BUS 416 – Environmental Management	Credit Hours: 3
ACC 201 – Accounting	Credit Hours: 3
BUS 326 - Sales/Sales Management	Credit Hours: 3
ECO 201 - Principles of Microeconomics	Credit Hours: 3
ECO 202 - Principles of Macroeconomics	Credit Hours: 3
GEOG 315 - Climatology & Atmospheric Sci	Credit Hours: 4
ENV 345 – Environmental Health	Credit Hours: 3
PHIL 335 - Philosophy of Science	Credit Hours: 3
PHIL 342 - Business Ethics	Credit Hours: 3
PSY 201 – Psychology	Credit Hours: 3
PSY 347 - Organizational Behavior	Credit Hours: 3

Environmental policy and governance

Required within tract	**Credit Hours: 28**
ANTH 452 - Globalization	Credit Hours: 3
GEOG 315 - Climatology & Atmospheric Sci	Credit Hours: 4
ENV 347 - Environmental economics	Credit Hours: 3

ENV 314 Policy and Management	Credit Hours: 3
PHIL 325 - Environmental Ethics	Credit Hours: 3
BUS 441 - Leadership I	Credit Hours: 3
SOC 205 Current health issues	Credit Hours: 3
PHM 321 – Community Program Planning	Credit Hours: 3
SOC 225 – Medical Sociology	Credit Hours: 3

Tract tech electives	**Credit Hours: 25**
ANTH 335 - The Built Environment	Credit Hours: 3
ECO 202 - Principles of Macroeconomics	Credit Hours: 3
COM 115 – Intro to Mass Media	Credit Hours: 3
COM 205 - Intercultural Comm	Credit Hours: 3
COM 256 - Public Relations	Credit Hours: 3
COM 276 - Democracy and Media	Credit Hours: 3
ECO 357 - Energy Economics & Policy	Credit Hours: 3
ECO 367 - Int'l Economics & Finance Mgt	Credit Hours: 3
HUM 345 - Digital Culture and Society	Credit Hours: 3
PHIL 342 - Business Ethics	Credit Hours: 3
WRI 122 - Argumentative Writing	Credit Hours: 4
PHIL 335 - Philosophy of Science	Credit Hours: 3
BUS 308 - Principals of International Business	Credit Hours: 3