



Academic Program Review

Program Name: Earth System Science - Master of Science

Academic Year 2025/2026

Recent Recommendations

Using your most recent review, please respond to all feedback and recommendations.

Response:

This is the first review of the ESS graduate programs at UAF. Therefore we do not have any prior feedback or recommendations. Because the program is relatively new, it provides an opportunity to identify and modify how we wish to assess learning outcomes in the program.

The ESS degree program is an unusual one, and therefore we provide a synopsis here.

ESS is a new program at UAF. It was approved in Nov 2022. It opened to US applicants in Jan 2023 and to international applicants in Jan 2025. A timeline can be viewed here.

ESS is a degree program that relies on functionality through a set of departments and via a governance team led by a coordinator. Its procedures can be viewed here.

ESS offers MS and PhD degrees with 9 options: either general ESS or ESS with one of 8 concentrations:

Sustainability (SUS), Ecosystems (ECO), Hydrology (HYDRO), Atmospheric and Climate Sciences (ATM), Cryosphere (CRYO), Solid Earth Geophysics (SOLID), Geoscience (GEOS), Geospatial Science (GSP).

ESS spans 6 departments (NRE, CXCS, CGEE, BW, ATM, GEOS) over three colleges (CNSM, CEM, CIS).

ESS faculty come from these departments and from 5 research institutes (IANRE, IARC, IAB, INE, GI).

There are 78 faculty participating in ESS: 44 tenure-track, 38 research.

There are 2 ESS graduates, both MS.

There are 38 current ESS students: 18 MS, 20 PhD.

The ESS program replaced six degree programs (PhD/MS Geophysics, PhD/MS Geosciences, PhD/MS Atmospheric Sciences).

Currently, ESS students predominantly come from the departments of GEOS (23) and ATM (6). This is because the ESS program replaced six degree programs (PhD/MS Geophysics, PhD/MS Geosciences, PhD/MS Atmospheric Sciences).

11 ESS students (9 current, 2 graduated) are from the other departments besides GEOS and ATM. In our view, these students represent the future of the program as having a cohort within each ESS concentration.

Future effort is needed to attract UAF students into ESS and to persuade current ESS faculty to encourage students into the ESS program.

All ESS students are required to take 5 credits spanning 3 courses (ESS 601, 602, 692).

Unfortunately, the required format of Google Sheets does not enable basic itemized and enumerated lists. The content we have prepared is best viewed within Google Doc capabilities. These itemized lists are difficult to read in Google Sheets. Furthermore, hyperlinks are not copied into Google Sheets. If you would like to view a better-formatted version of our review, including with itemized lists and active hyperlinks, please see:

https://docs.google.com/document/d/1fXbCnxbHx-qeR_1XynfIFMAJtboQzuZE3pl/BiGs/edit?usp=sharing

Student Learning Outcomes

Describe the assessment of your student learning outcomes (SLOs). Discuss your findings, changes you are making, and what you hope to see as a result.

Response:

The ESS program was designed in part with program review in mind. By requiring all students in both degree programs (ESS MS, ESS PhD) to take ESS 601, 602, and 692, this means that the SLOs from these three courses are closely coupled to the SLOs of the program. The instructors of the three ESS courses collectively reviewed the program SLOs and revised them based on revisions to their classes.

Did you make any curricular changes based on your most recent SLOA? If so, discuss what changes were made. If no changes were made, please discuss the strengths of your curriculum based on the assessment of your outcomes.

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Response:

NA (since this is our first SLOA). However, all three required ESS courses are still in states of evolution, whereby content and SLOs are changing.

As of 2017, all Baccalaureate programs are required to embed communication outcomes within their SLOA Plans. This is optional for non-Baccalaureate programs.

Communication outcomes in the SLOA plan are: [Embedded](#)

Check the checkbox to certify completion of the following tasks:

- ☒ Upload supporting documents to the Supporting Documents folder. This includes artifacts, rubrics, and other documents related to your SLOA.
- ☒ Upload your most recent SLOA to the Supporting Documents folder, even if no changes have been made since the last review.

Have changes been made to your SLOA document since your last review? [Yes](#)

If so, please summarize what changes were made.

Response:

Yes, we made minor updates based on changes made to the ESS required courses. We also included explicit reference to the ESS Student Research Symposium, which occurred in 2025.

High Impact Practices

Please indicate which high impact practices are currently being implemented in relation to the program's student learning outcomes.

- | | |
|--|---|
| ☒ Capstone Courses & Projects | ☒ Graduate Level Research |
| ☒ Collaborative Assignments & Projects | ☐ Writing-Intensive Courses |
| ☒ Diversity/Global Learning | ☒ Publications |
| ☐ ePortfolios | ☒ Communications |
| ☒ First-Year Seminars and Experiences | ☒ Scholarly Activities |
| ☒ Internships | ☐ Studios |
| ☒ Service or Community-Based Learning | ☐ Practicum |
| ☐ Undergraduate Research | ☐ Other |
| ☒ Labs | ☐ None of these |

Discuss how the HIPs in the program are reflected in the SLOA. If you have identified HIPs that are not included in the SLOA, please consider an update.

Response:

The 2025 review cycle prompted a new strategy of self-reporting for ESS graduate students, as well as a discussion of what kinds of HIPs we hope to track within the program. We are seeking to identify a relatively short list of HIPs and to ensure that each one represents significant investment (>20 hours + ideally assessment and feedback) rather than "Yes, I did this once" with no assessment or feedback. The HIPs we established are as follows:

- most significant meeting presentation
- degree-relevant internships or work
- thesis fieldwork or labwork performed off-campus
- contributed content for a proposal
- communication and outreach (e.g., public or K-12) (>20 hours total effort)
- academic mentoring (>20 hours total effort)
- volunteer service to the department, university, or profession (>20 hours total effort); note: not a TA
- publications

The document ESS_2025_tallies.pdf includes tallies in this HIPs for all students, based on their own responses. We received responses from 100% of the current (38) and graduated (2) students. However, with more time and a better survey (like a google form), we think we will be able to collect better and more feedback. Over the course of emailing with students, the language defining the HIPs evolved in order to clarify considerations. (For example, regular summer RA thesis-related work would not be considered a HIP, but an outside-UAF internship would be.)

The 2025 ESS Student Research Symposium (website, flyer, photos) was a major success of the program. As included in the supporting documents, the symposium showcased 42 poster presentations. As far as we can recall, it was the largest graduate student symposium held at UAF in the past decades, and our hope is to grow to 60 presentations in 2026. This effort is made possible by sponsorship from the UAF GDNP UARC (Geophysical Detection of Nuclear Proliferation University Affiliated Research Center), which supports graduate science education specific to its mission. The event includes social networking in addition to the professional poster presentation. In 2026, we are planning to assign faculty to evaluate posters, which would provide a formal assessment—beneficial to the student as well as to the future program review.

Student Success

Please reference the [Resources tab](#) for information on accessing the Student Success Data Dashboard and contacting your designated data liaisons.

Student Success Data Trends

Persistence:

Pass Rates:

Student Credit Hours:

Majors:

Degrees Awarded:

Other Trends (if applicable):

This is our first review, so we have no basis for comparison.

Achievement Disparities

Discuss any achievement disparities identified in your disaggregated student success data and explain how you plan to address them.

Response:

We have not identified any achievement disparities. As discussed elsewhere, we are hoping to grow the student numbers in all ESS concentrations, as having a “critical mass” is beneficial to students, faculty, and the program itself. (We are seeking programmatic sub-cohorts within the larger ESS program cohort, complementary to departmental cohorts.)

Closing the Loop

Please discuss how your student learning outcomes are reflected in high impact practices and student success data.

Response:

Please see our response under the section “High Impact Practices”.

Here we provide some self-reflection notes, which should help us with the full review in the future.

ESS is a new program, providing a great opportunity to track all students from the program inception. Further discussion is needed among ESS faculty and students to determine what these tracking metrics should be.

ESS needs an exit survey for recently graduated students.

ESS needs a tracking survey for its alums.

ESS needs to collect assessment documents from its required courses (ESS 601, 602, 692).

The ESS Coordinator needs to engage the ESS Governance Committee members and also ESS-participating department chairs in the review process. This requires establishing a draft response weeks prior to the deadline.

The tracking spreadsheet used for all ESS students is excellent, but it should be scrutinized and improved.

Collecting student feedback needs to begin at least 1 month prior to the program deadline review. Based on the experience in 2025, it takes dozens of repeated emails, including custom emails to student + advisor, to collect responses. Ultimately we received a 100% response rate, but it took 1 full week.

ESS is not a department. Therefore, for the full program review, will the “Financial Data” and “Department Profile” sheets not be needed?

Academic Program Profile

The following questions help show how your program supports the university's mission, connects with other UA programs, engages with the community, contributes through service courses, and supports student success after graduation. Please use this section to highlight the value your program brings to students, the university, and beyond.

UAF's Mission:

The University of Alaska Fairbanks is a Land, Sea, and Space Grant university and an international center for research, education, and the arts, emphasizing the circumpolar North and its diverse peoples. UAF integrates teaching, research, and public service as it educates students for active citizenship and prepares them for lifelong learning and careers.

In what ways does your program advance UAF's mission?

Response:

international center. ESS is international in terms of the nationalities of its students and faculty and in terms of the research conducted within the program.

emphasizing the circumpolar North. Arctic research is a cornerstone of UAF ESS and distinguishes it from other ESS programs around the world. UAF ESS is expected to become a cornerstone of UAF's international status as a world-leader in Arctic research. (The success of the first two ESS graduates foreshadow this.)

emphasizing its diverse peoples. ESS research is conducted within communities, and with community members, across Alaska.

integrates teaching, research. The ESS program at UAF is the curricular response to the world-class research at UAF within the field and subdisciplines of ESS.

How is your program related to others in the UA system?

Response:

Please see "ESS synopsis" above for how ESS is connected to departments at UAF. ESS is only offered at UAF, and it is making strong efforts to enable students and faculty from UAS and UAA to participate. (For example, the three required courses can be taken remotely.) The most ESS-related degree programs at UAF include programs from ESS-participating departments PhD Biological Sciences / MS Biological Sciences / MS Wildlife Biology

PhD Engineering / MS Geological Engineering / MS Civil Engineering

PhD/MS Natural Resources and Environment

PhD/MA Indigenous Studies

and also from non-ESS-participating departments

PhD/MA Anthropology

PhD Environmental Chemistry / MS Chemistry

PhD/MS/MA Interdisciplinary Studies

PhD/MS Oceanography

PhD/MS Fisheries

PhD/MS Marine Biology

PhD Space Physics / MS Physics

We have not listed related programs at UAA and UAS.

Who are your key community or external partners?

Response:

The “ESS synopsis” above describes alignment with 5 research institutes. Any community or external partners relevant to these institutes and their research (e.g., NOAA, USGS, U.S. Department of Defense, NSF) is a key community or external partner to ESS.

What role do your services courses play, if any?

Response:

ESS courses attract graduate students from outside of the ESS program. This is notable, given that these courses are not required by any other program, and because graduate students are often saturated with coursework and limited in research time.

How do your graduates succeed after leaving the program?

Response:

ESS has graduated two students:

ESS MS Ecosystems (Department of Biology and Wildlife). thesis was entitled “Vegetation analysis and mapping in evolving ice-wedge-polygon terrain, Prudhoe Bay region, Alaska”. is preparing a manuscript based on her thesis, and is working as a Technician at Cornell School of Integrative Plant Science.

ESS MS Hydrology (Department of Civil, Geological, and Environmental Engineering). recently published a paper in Water Resources Research entitled “Analysis of a Persistent Early Winter Open Water Zone Within the Ice-Covered Tanana River Near Fairbanks, Alaska Using Field Studies, Remote Sensing, and Hydraulic Modeling”. is now working as a Hydrologist at Alaska Division of Geological and Geophysical Surveys (in Fairbanks).

These students are banner examples of what we hope from the ESS program, in terms of their HIP experiences (e.g., both presented their research at professional conferences) and their new degree-relevant careers. Furthermore, they were both associated with departments that have degree programs besides ESS, indicating that ESS provided a more attractive route than those programs (e.g., MS Biology & Wildlife) and alternative programs (e.g., INDS).

We intend to track our graduate students, and we expect to have more graduates by the time of the full program review.

Submitter and Collaborator Names:

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Committee Review

Program Name: **Earth System Science - Master of Science**

Academic Year 2025/2026

Overall Recommendations

The college or school committees set the tone for helping each program feel seen during this process. We have provided you with feedback tags to attach to this program review. Please select as many as applicable.

- | | |
|--|---|
| ☒ Insufficient Narratives | ☐ Report Incomplete |
| ☐ Address Achievement Gap | ☒ Consider Curricular Revisions |
| ☐ Develop Online Offerings/Options | ☐ Improve Time to Degree |
| ☒ Increase Enrollment | ☒ Increase Graduates |
| ☐ Increase Retention/Persistence | ☐ Strengthen Advising Practices |
| ☐ May be asked to share Effective Practices | ☐ Recommendation to University-Wide |

Committee

Explanation of Overall Recommendations

Response:

The MS in ESS is a new academic program, this is its first program review and it has yet to graduate any students because students are not far enough along in the program. The program provided an overview of the program structure, with information on the number of students by program. There is significant feedback from the review team that will need to be addressed for the full-program review in 2027. Note that feedback below is identical between the MS and PhD in ESS given the newness and similarities in the two academic programs.

Student Learning Outcomes Feedback

- | | |
|--|---|
| ☐ Strong | ☐ Developing |
| ☐ Requires Minor Revision | ☒ Requires Major Revision |

Student Learning Outcomes Assessment Feedback

- | | |
|---|---|
| ☒ Strong Alignment with SLOA Plan | ☐ Clear, Concise Presentation of Findings |
| ☐ Compelling Learning Story | ☐ Missing a Direct Measure |
| ☐ Missing Active Verbs | ☒ Missing Curricular Connection |
| ☐ Missing Collaboration within Department | |

SLOA Feedback Narrative:

Provided four SLOs, each of which is clearly defined and each of which are comprised of sub-SLOs. Each SLO/sub-SLO has a set of criteria, procedures for assessment, and implementation plan; however, these all need to be more clearly defined. It will be important to provide all relevant artifacts, rubrics, and assessment instruments (rubrics and instruments are noted in the SLOA plan but not included) as supplementary documents to document the assessment process. In addition, evidence on how the SLOs/sub-SLOs are being met are also required for the full-program review in 2027, both in narrative form and as a supplementary document(s).

It is important to note that the SLOs/sub-SLOs are identical between the MS and PhD in ESS. Because these are different degree programs, the SLOs/sub-SLOs must be differentiated (in the case of MS versus PhDs, this is typically in the areas of depth and/or breadth of knowledge, scope of research, proficiency in communication, etc.). This will need to be addressed and resolved for the 2027 full-program review.

There are no curricular revisions to date. However, the program should use this section to discuss program/curricular strengths.

The program did not discuss how SLOs are reflected in the HIPs and student success data. Documenting continuous improvement and the closing of the loop are important components of the program review process, not just as an exercise, but to demonstrate that assessment results are used to make meaningful, evidence-based changes that enhance program quality and student learning. This process ensures accountability, fosters a culture of ongoing improvement, and provides clear evidence to accreditors and stakeholders that actions lead to measurable outcomes.

Will need to address in the next program review.

Student Success and Equity Feedback

Narrative:

As this is the first review for the ESS program, the Student Success Dashboard offers limited data and no prior basis for comparison, making it difficult to identify meaningful trends. The program outlines several potential measures in the Closing the Loop section that could enhance understanding of student success and gather valuable feedback. Few equity or achievement gaps are currently noted, with the dashboard showing a relatively balanced gender ratio and a slightly higher proportion of [REDACTED] students compared to [REDACTED] or [REDACTED] students. While the program mentions the creation of sub-cohorts to improve retention and graduation, details remain limited. To date, two students have successfully graduated and are employed in their fields, demonstrating promising outcomes for early program completers. Although no specific inclusive practices are mentioned, the program appears to be recruiting from across departments and positioning students for post-graduation success.

For the 2027 full review, the program should move forward with implementing some student success initiatives and provide detailed reporting on the outcomes and progress of these. Efforts should also focus on increasing enrollment and developing a clear, achievable plan to support student recruitment, retention, and graduation. In short, early indicators are positive, but the program should ensure it has clear, measurable results to present in the 2027 full review.

High Impact Practices Feedback

Narrative:

Reviewer Names: