



College of Arts and Sciences

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29 July 2016

MEMO

TO: Kate Miller
Provost/VPAA

FROM: Paula M. Lutz *Paula M. Lutz*
Dean, Arts and Sciences

RE: Program Review for Geology & Geophysics' B.S. in Environmental
Geology & Geohydrology—Dean's recommendation

The B.S. in Environmental Geology & Geohydrology was a silent degree program for much of the past two decades. As stated in the IPR, it was 'discovered' about five years ago and repurposed into an environmental science degree. There have been three graduates in the past five years with eighteen majors currently in the program. In its steady state, it is estimated that there will be 4-5 graduates per year.

Students in this program are described as more mathematically facile than those in the other two bachelors programs. These are their highest quality undergraduate students with strong computational skills. This degree does fit well with areas of distinction such as clean water in the West and WyCEHG (Wyoming Center for Environmental Hydrology and Geophysics) and the current emphasis on computational sciences.

The Department of Geology & Geophysics has one of the top research programs at UW and an excellent national ranking based primarily on graduate research (\$2.5M/year in external funding over the past five years). Their primary undergraduate degree, the B.S. in Geology, has strong enrollment. This program and the B.A. in Geology and Earth Sciences do not. How many bachelors degrees should the department run with its heavy focus on research and graduate work?

The Dean sees two possible paths here. One, consider this 'renovated' B.S. as a new program and allow it additional time to build enrollment. Two, after thorough examination of the three bachelors programs in this department, create several options or tracks within the strong B.S. in Geology to encompass these B.S. students as well as the B.A. in Geology and Earth Sciences. The Dean's recommendation is the second path.

ACADEMIC PROGRAM REVIEW – GEOLOGY & GEOPHYSICS

1. *Program:* BS – Environmental Geology & Geohydrology

2. *Level:* Undergraduate

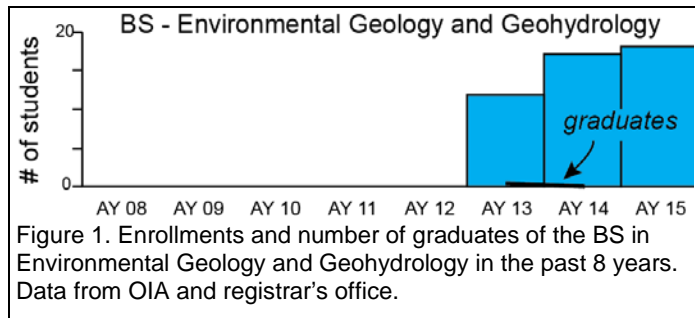
3. Department of Geology & Geophysics, College of Arts & Sciences

4. *Head:* Paul Heller, 766-3386, heller@uwo.edu

Acting Head: Carrick Eggleston, 307-223-2312, carrick@uwo.edu

5. *Program productivity:*

A. The program has been on the books for many years with few majors because the faculty who had championed the program left UW in the late 1990s. Due to an upsurge in interest in both water-related issues as well as environmental issues, the program was revamped and updated in 2010 into a rigorous, quantitative degree program. Since that time we have graduated 3 people.



B. The program has 18 majors at the present time (Figure 1). Our long-term expectation is that, at this enrollment, we will graduate about 4-5 students/year. Because of the academic rigor of the program, some students who start the EGGH program decide to transfer to the BS program partway through. We think that this simply reflects high academic standards for the program.

6. *Program quality:*

A. There is no accreditation in this field.

B. *Credentials of Faculty:*

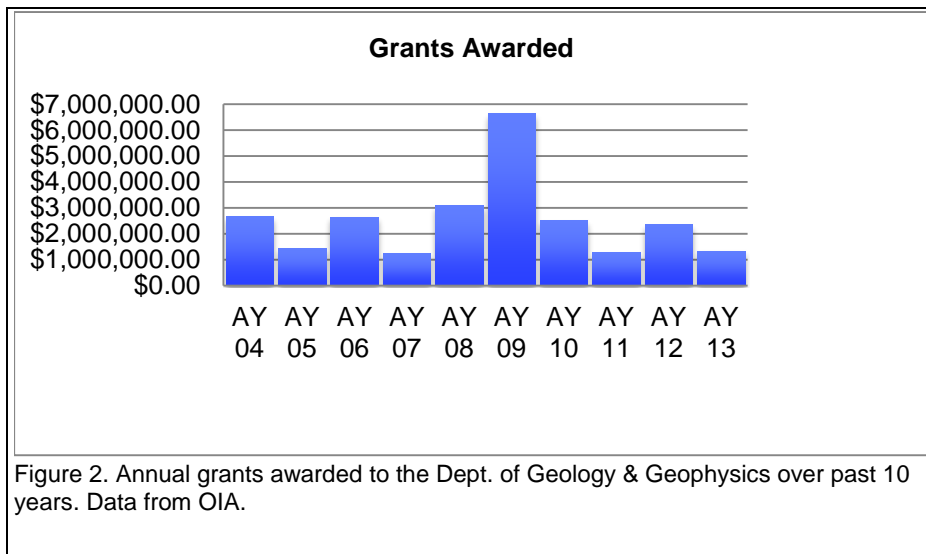
Name	Status	Highest Degree	Discipline
Erin Campbell-Stone	APL	Ph.D.	Geology
Brad Carr	APR	Ph.D.	Geophysics
Michael Cheadle	Faculty	Ph.D.	Geophysics
Po Chen	Faculty	Ph.D.	Geophysics
Mark Clementz	Faculty	Ph.D.	Geology
Ellen Currano	Faculty (25%)	Ph.D.	Geology
Janet Dewey	APR	M.S.	Geology
Ken Dueker	Faculty	Ph.D.	Geophysics
Carrick Eggleston	Faculty	Ph.D.	Geochemistry
B. Ron Frost	Faculty	Ph.D.	Geology
Carol Frost	Faculty	Ph.D.	Geochemistry
Dario Grana	Faculty	Ph.D.	Geophysics
Paul Heller	Faculty	Ph.D.	Geology
W. Steve Holbrook	Faculty	Ph.D.	Geophysics
Robert Howell	Faculty	Ph.D.	Planetary Sciences
Neil Humphrey	Faculty	Ph.D.	Geology
Barbara John	Faculty	Ph.D.	Geology
John Kaszuba	Faculty	Ph.D.	Geochemistry
Subhashis Mallick	Faculty	Ph.D.	Geophysics
Brandon McElroy	Faculty	Ph.D.	Geology

James Myers	Faculty	Ph.D.	Geology
Andrew Parsekian	Faculty (75%)	Ph.D.	Geophysics
Cliff Riebe	Faculty	Ph.D.	Geology
Bryan Shuman	Faculty	Ph.D.	Geology
Ken Sims	Faculty	Ph.D.	Geochemistry
Susan Swapp	APR	Ph.D.	Geology
Ye Zhang	Faculty	Ph.D.	Geology

II. *Demographics*: In terms of ethnicity, if we are talking about race, we have three Asians (including Indian) and the rest are white. The faculty is 74% male and 26% female.

III. *Grants*: OIA data, shown in Figure 2, only goes through 2013. New grants in 2013 came to \$1,334,899.

C.



Program Reputation:

I. Our department has been ranked 42 (second quartile) in the most recent (2014) U.S. News and World Report ranking of Earth Sciences departments. This is tied with Purdue University, University of Miami and University of Utah.

II. This year we had 301 applicants to our graduate program, a number that has slowly been increasing. Based on past years records, of these we will interview c. 25-30. Of those we will likely make c. 15-20 offers. Our recent history indicates that between 50-75% of students who are made offers will accept.

On the undergraduate side, enrollments both nationally and at the University of Wyoming (Figure 3), follow the price of a barrel of oil. Our long-term trends follow national trends for undergraduates, but have an increasing trajectory compared to national trends.

D. *Curriculum*: BS in Environmental Geology & Geohydrology

Required: Any Geol. 1000-level class; Geol 2000 (Geochemical Cycles); Geol 2010 (Mineralogy); Geol 2080 (Field Geology); Geol 2100 (Stratigraphy and Sedimentation); Geol 4444 (Geohydrology); Geol 4490 (Geochemistry); Geol 4777 (Geochemistry of Natural Waters); Geol 4880 (Earth Surface Processes); Geol 4820 (Capstone); Chem 1020 (General Chemistry I); Chem 1030 (General Chemistry II); Phys

1110 or 1210 (General or Engineering Physics); Math 2200 (Calculus I); Math 2205 (Calculus II). **Plus one of the following:** Life 1010 (General Biology); or Stat 2050 (Fundamentals of Statistics); or Math 2210 (Calculus III); or Phys 1120 (General Physics II); or Phys 1220 (Engineering Physics II). **Electives – pick 18 credits from the following list:** Geol 2020 (Intro. to Petrology); Geol 2070 (Intro. to Oceanography); Geol 2100 (Stratigraphy and Sedimentation); Geol 3005 (Principles of Geophysics); Geol 3400 (Geologic Hazards); Geol 3500 (Global Change); Geol 3600 (Earth and Mineral Resources); Geol 3650 (Energy, A geological perspective); Geol 4113 (Geological Remote Sensing); Geol 4525 (Environmental Data Analysis); Geol 4610 (Structure and Tectonics); Geol 4888 (Glaciology).

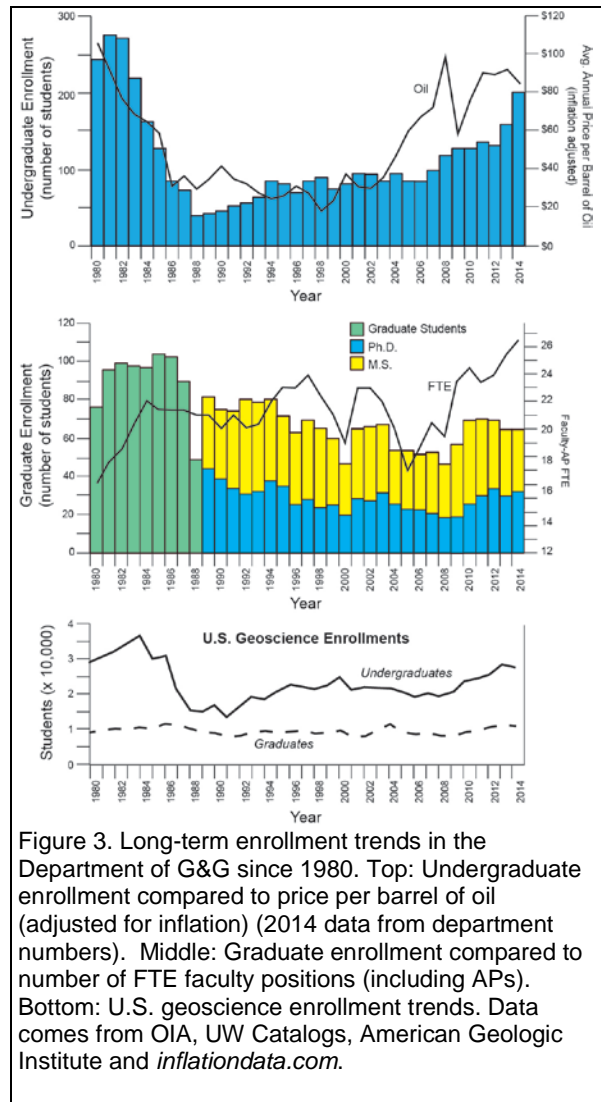
E. Only offered on main campus.

F. *Quality of Assessment Plan:* BS in Environmental Geology and Geohydrology

Assessment of our undergraduate degrees are all centered on mathematical competency within the context of geoscience – all of our undergraduate students to become more mathematically literate. We have added more problem solving, quantitative and computational components to our courses, and we expect to see improvement in student mathematical literacy during their time in our program. To monitor student improvement we administer a math exam to our students in a required sophomore level class (Geol 2000) and in a required senior class (Geol 4280). The test includes questions in 14 categories. Students in the EGGH BS program tend to be more mathematically facile than those in our other undergraduate degrees; this major has more quantitative course work than any of our other undergraduate degrees. The EGGH majors tend to be some of our very best undergraduate students.

G. *Strategic Plan:*

While this degree has been on the books for many years, the faculty that championed it left UW some time ago and it had very few students enrolled. In the late 2000s, after the 2008-2009 downturn, the department decided to diversify and increase the flexibility of its undergraduate degree programs. The entire philosophy behind the



restructuring of the EGGH program was to use existing faculty and existing teaching capacity to increase the number of pathways that different undergraduates with different interests and goals could take through our course offerings. We sought to increase flexibility without increasing expense in an environment, at the time, of budget cuts. That is, the whole idea was to use existing resources to diversify our offerings and become more attractive to students. Also, there were increases in student interest in and concern with hydrogeology and environmental issues that led us to revamp the EGGH degree to reflect modern technologies and concerns. This in part reflects societal changes centered on the issue of clean water in the west as well as the fact that our faculty have increasing strength in environmental subdisciplines. For example, the Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG) was created about 4 years ago with NSF EPSCoR support. Starting in AY 2013 the number of students entering the EGGH program began to increase to 18 students over the past two years (Figure 1) – remembering that it takes time for students to become aware of a new degree program and then start to sign up for it. Since the degree is new, we have yet to see more than one student graduate from the degree per year, and only 3 students have graduated with the EGGH degree in the past five years. Our expectation is that the degree will graduate about 4-5 students per year, once we get past the initial stage of students entering the program. This will mean that we expect fewer than 25 students to graduate over any 5-year period, unless overall enrollment increases. It is important to remember also that EGGH is our most challenging degree program – the low graduation number reflect several students who start in the EGGH program but then decide to transfer into the regular Geology BS program after finding the requirements in EGGH to be too challenging. Thus, there are only downsides to elimination of EGGH – no money is saved if students simply traverse the BS degree instead, or some students leave and take their tuition money with them. None of the courses are taught for EGGH alone, and BS students can structure the elective in the BS to cover the EGGH coursework – but there is most definitely value in the name on the diploma when students enter the workforce.

Last year we adjusted the degree a bit in order to fit better with the University's plan to articulate with community colleges (2+2 plan). Our expectation is that we may gather more students into the major over time as water issues loom large in the public consciousness, and with the near-term reduction in oil and gas exploration, which is primarily served by our other BS (Geology) degree. We feel the degree is an important component of our undergraduate program.

7. Mission Centrality –

Our BS in EGGH relates directly to UW's STEM initiatives, including both the UW Science and Engineering Initiatives. Because EGGH is more quantitative and computational than our standard BS degree, it compliments the University Plan's emphasis in computational geosciences. The degree also supports the mission of UW's interdisciplinary water programs, including the educational goals of the \$20 million EPSCoR Track 1 grant that funds the Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG). The program contributes directly to the State of Wyoming in several ways. First, some of the students are involved in projects through WyCEHG that monitor aspects of ground water and surface water in the state. Second, these students have the goal of working for water and environmental consulting firms in the Rocky Mountains. Finally, the program supports Environment and Natural Resources Program.

Academic Program Review: **Geology BS Environmental Geology & Geohydrology**

Section 8 – Cost

a) Ratio of student credit hours per FTE (AY 2014/15): **270.3**

b) Direct instructional expenditures (FY 2015): **\$3,822,890**

i) Per student FTE: **\$16,344**

ii) Per total degrees awarded: **\$109,225**

iii) Non-personnel expenditures / total academic FTE: **\$8,834**

c) Course enrollment (AY 2014/15)

i) Classes falling under university minimums: **4**

ii) Lower-division courses falling under university minimums: **0**

e) Research expenditure per tenure-track FTE (FY 2015): **\$95,046**