

UNLV

UNIVERSITY OF NEVADA, LAS VEGAS

Program Review Self-Study

Program Reviewed: Geosciences

Degrees: M.S. Geoscience, Ph.D. Geoscience

Program Chair or Director: Terry Spell

Dean: Stan Smith

Date of Report: December 12, 2016

GENERAL INSTRUCTIONS

1. Please provide Faculty CVs as a single electronic file (PDF preferred) or on a thumb drive *for the external reviewers*.
2. **Please complete the program review self-study using this template.**
3. If this review is covering several degree levels, please be sure to address *each level* in your responses to the questions.
4. Contacts for questions:
 - Chair of the Faculty Senate Program Review Committee found here: <http://faculty senate.unlv.edu/committees/program-review> or the Chair of the Graduate College Program Review Committee found here: <http://www.unlv.edu/graduatecollege/program-review-committee>
 - Gail Griffin in the Office of the Vice Provost for Academic Affairs: Gail Griffin, gail.griffin@unlv.edu, 702-895-

I. Program Description

A. College/Department/Program

1. College or School: **College of Sciences**
2. Unit: **Geoscience** Web address: <https://geoscience.unlv.edu/>
3. Program(s) being reviewed: **M.S. in Geoscience, Ph.D. in Geoscience**
 - a. Degrees and their abbreviations: **M.S. GEOL, Ph.D. GEOL**

B. Primary individual completing this worksheet

1. Name: **Terry Spell**
2. Title: **Chair and Associate Professor**
3. Date of self-study: **November – December 2016**
4. Campus Phone: **x51171**
5. Mail Stop: **4010**
6. E-mail: **terry.spell@unlv.edu**
7. Fax Number: **895-4064**

C. Other faculty involved in writing this report:

Dr. Michael Nicholl
Dr. Rod Metcalf

D. Please provide as Appendix 1 the most recent catalog description(s) of the program(s):

1. Is the description correct? If not, what needs to be changed?

The current catalog description of the M.S. degree is correct. The description of the Ph.D. degree has a significant mistake regarding timing of the comprehensive exams which needs to be corrected. We are currently working on this.

II. Centrality to Mission

A. Department/Program Mission

What is the program's mission statement (or the department's if the program does not have one)?

The mission of the Department of Geoscience is to serve the needs of the State of Nevada by being an active participant in the national and international geoscience community. We strive to provide an atmosphere for scholarly inquiry and creation of new knowledge emphasizing learning at undergraduate and graduate levels that blends research, teaching, and service. To foster an informed citizenry by education, we provide

students with a broad understanding of scientific knowledge and principles, and equip them with the skills to create and disseminate new knowledge and to function independently, collaboratively, and ethically with others in the profession and society as a whole. We produce accomplished graduates who are well prepared to enter the work force or to continue their education in graduate and professional programs.

The Masters of Science degree in Geoscience is designed to prepare students for a broad range of challenging careers in government service, private consulting, and industry. This thesis-based degree program also serves as a stepping-stone for those students who wish to pursue further graduate studies at the Doctoral level.

The Doctor of Philosophy degree in Geoscience is designed to prepare students for demanding research-oriented careers in academia, government service, private consulting, and industry.

B. Department/Program Mission Alignment

Briefly describe how this program is aligned to the mission of the University as described in the most recent mission statement, UNLV Mission <http://www.unlv.edu/about/mission>, and how it supports achievement of the institution's mission:

Our department and individual degree missions align well with UNLV's Top Tier Mission in multiple ways. We strive to positively impact the community and geoscience related industries by producing capable, scientifically literate graduates who are informed citizens and employable. Our graduate students achieve gainful employment in a variety of industries, and many go on to hold faculty positions at other universities. Many of our graduates work within the Las Vegas community, enhancing the quality of life for all by providing services to the water supply industry, the hazardous waste industry, and the building industry. As such, we remain engaged with the Las Vegas, regional, and national communities in fulfill their needs.

C. Core Themes

Briefly describe how this program supports UNLV's Core Themes (the core themes can be found at <http://www.unlv.edu/about/mission>):

The graduate programs are very well tied to the three core themes. Student learning and success is facilitated in our programs by integrated teaching and research. Detailed research and scholarship are at the core of both the M.S. and Ph.D. degrees, with the final product being a thesis or dissertation which is orally defended before a committee. Our graduate student population is diverse. Some students have been engaged in outreach programs with the Las Vegas community.

D. Excellence

List and briefly describe five highlights or areas of excellence of the program:

- 1. Our programs are well known and our Department is ranked in the top 100 nationwide (we are the only such department within the College of Sciences). Upon graduation a large majority of our MS and PhD students are continuing their professional career paths in Geoscience. We have graduated 63 students from 2012 to present (46 MS, 17 PhD) and more than 90% have entered either a private sector Geoscience position (Environmental/Engineering, Petroleum, Mining), academia (MS students to PhD program, Post-Doc, Research Scientist, Faculty position), or Government Agency.**
- 2. We take full advantage of our location in terms of the opportunity for field research. The department has invested heavily in vehicles and equipment. Our setting here allows us to put students on a wide variety of outcrops and geologic settings within a 60-90 minute drive. Very few schools have this capability. In addition, few schools have a 9-month field season that coincides with the academic year**

(September – May). Much of our research often takes students elsewhere in the U.S. as well as overseas. Graduate students in the Department have an array of analytical and sample preparation facilities, including: the Electron Microanalysis and Imaging Laboratory, X-Ray Diffraction and X-Ray Fluorescence Laboratory, Structural Geology Laboratory, Nevada Isotope Geochronology Laboratory, Nevada Plasma Facility Laboratory (ICP-MS) Las Vegas Isotope Science Laboratory, Environmental Soil Analytical Laboratory, Nevada Rock Deformation Laboratory, UNLV High Pressure Science and Engineering Center, Fluid and Melt Inclusion Laboratory, Optical Microscopy Laboratory, and mineral separation and rock preparation facilities.

3. From the student perspective, our department sits in a middle ground between teaching and research-intensive. We have a very favorable faculty to graduate student ratio of approximately 1:3. As a result, our faculty have time to mentor our students while involving them in research programs. Graduate students benefit from robust external research funding support to Department faculty, supporting graduate assistantships, fieldwork, and analytical work. The Department has averaged \$1.9 million in external funding per year over the last 10 years.
4. Our Geoscience programs are diverse. Currently our graduate students are approximately 58% male and 42% female. This is close to the 2010 U.S. Census Bureau estimates of 49% male and 51% female for the United States. We are also well represented ethnically, with approximately 20% being Asian, 2% black, and 8% Latino.
5. The Geoscience Department offers a wide variety of research areas from which graduate students can choose. A broad spectrum of the geosciences are represented by our graduate faculty's research, including hydrology, volcanology, petrology, paleontology, geochemistry, planetary geology, medical geology, tectonics, sedimentology, high pressure mineralogy, paleoclimatology, and economic geology. Our nationally and internationally recognized faculty grouped into six major research fields: Petrology & Geochemistry (eight participating faculty), Tectonics and Structural Geology (eight participating faculty), Climate and Surface Processes (four participating faculty), Hydrology and Environmental Science (three participating faculty), and Planetary Science (three participating faculty). The different research areas are supported through student access to state-of-the-art research equipment. Additionally, our students benefit from relationships between the Department and the Desert Research Institute (facility adjacent to campus). DRI research faculty, particularly those in with research Hydrology and Environmental Science, and in Climate and Surface Processes, routinely serve as Graduate advisors and committee members.

III. External Demand for Program

A. Stakeholders

1. Who are the main local and regional stakeholders of your educational programs, i.e., employers and entities benefiting from these programs, hiring the graduates, or admitting them to graduate and/or professional programs?

UNLV Geoscience programs focus on the study of the Earth and some of humanity's most important problems including energy, water, and mineral resources; the environment; climate change; and natural hazards such as volcanoes and earthquakes. The stakeholders of the UNLV Geoscience department include our students; alumni; private industries, government entities, and academic institutions who hire our students; and citizens of the State of Nevada and country who are served by our research activities. Industry stakeholders include private consulting firms that specialize in the areas of energy, mining, geotechnical engineering, water development, and environmental remediation; and companies producing precious metals, petroleum, and construction materials (sand, gravel, gypsum, concrete).

State and Local government agency stakeholders include the Southern Nevada Water Authority, Nevada Division of Environmental Protection, Nevada Department of Transportation, Nevada State Engineers Office, and Nevada Bureau of Mines and Geology. At the regional scale, similar agencies in Arizona, New Mexico, Utah, and California also benefit from our programs. Our programs serve local and regional offices of Federal government agencies including the US Geological Survey, US Bureau of Reclamation, US Department of Energy, US Bureau of Land Management, and US Environmental Protection Agency. Educational institutions, from local (e.g., Clark County School District, College of Southern Nevada, Desert Research Institute), to national, are served by our programs and graduates.

2. What are specific stakeholder needs for graduates?

Employers require graduates who are able to work well in a cooperative environment with others, design studies, synthesize data and formulate logical conclusions from it, and produce clear technical writing.

B. Needs for Graduates and Future Plans

1. What are the anticipated needs for program graduates over the next 3-5 years? Please cite sources of information.

The Geoscience Department trains students for several career pathways that are tracked by the US Bureau of Labor Statistics (BLS). According to the most recent (2015) Occupational Outlook Handbook published by the BLS Earth Science jobs are expected to grow at a rate equal to, or better than the national average for job growth (7%).

Environmental Scientists and Specialists – the BLS predicts that ~10,200 new jobs will be added between 2014 and 2024, which amounts to about 11% of the current workforce. The 2015 median yearly pay for this job description is \$67,460.

Geoscientists – the BLS predicts that ~3,800 new jobs will be added between 2014 and 2024, which amounts to about 10% of the current workforce. The 2015 median yearly pay for this job description is \$89,700

Hydrologists – the BLS predicts that ~500 new jobs will be added between 2014 and 2024, which amounts to about 7% of the current workforce. The 2015 median yearly pay for this job description is \$79,550.

Natural Sciences Managers – the BLS predicts that ~1,800 new jobs will be added between 2014 and 2024, which amounts to about 3% of the current workforce. The 2015 median yearly pay for this job description is \$120,160.

Expected growth in the above occupations is attributed to environmental concerns and population growth. At the regional level, we are currently seeing a decline in hiring by the multi-national mining and petroleum companies; however, future improvements in the economy are likely to lead to hiring increases. The smaller companies in those fields are continuing to hire, largely associated with domestic natural gas production and exploration for the raw materials associated with energy production/storage. Employment related to climate and water resource development is strong and appears to be driven by regional drought in the southwestern United States.

2. What changes to the program will those require?

We do not anticipate that changes to our current programs are required to meet these needs.

C. Success of Graduates

1. What steps does the department take to facilitate the success of graduates (e.g., internships, career fairs, employment talks, etc.)?

The Geoscience Department holds weekly seminars by invited external speakers each semester. These provide graduate students the opportunity to be exposed to new research ideas, learn about potential graduate advisors at other universities, and to meet these individuals. Each year ExxonMobil sends a representative to our department for a multi-day recruitment effort. Many of our students have received internships and employment through these interviews. Each spring semester the department holds a student run 2 day scientific research conference called Geosymposium. During this event students gain experience presenting results of their research as well as meeting the numerous representatives from industries that employ geoscientists. Most of our graduate students have experience travelling to, and presenting at, professional scientific conferences, such as the Geological Society of American and American Geophysical Union annual meetings.

2. Discuss the placements of recent graduates:

The Geoscience Department does not systematically collect data on placement of graduates. Unofficial tracking indicates that our recent graduates are currently working for ExxonMobil, the Bureau of Land Management, a few different mining companies in Nevada, the U.S. Geological Survey, and at various colleges/universities.

3. If the department or program does not have placement information on graduates, what is the plan to implement gathering that information?

At this time, there are no plans to collect data on placement of graduates.

3. Do placements match stakeholder needs as identified above in A of this section?

Unable to answer at this time.

4. If not, please explain.

Collecting data on placement of graduates has been discussed internally, but for a number of reasons has not been implemented. First and foremost, UNLV does not consider this a priority in terms of allocating resources to departments. Secondly, anecdotal evidence suggests that students are self-selecting a broad range of career paths (graduate school, government agency, private consulting, multi-national corporations, K-12 education, sales, etc.) and employers. As a result, attempting to identify commonalities would not be statistically feasible.

5. Does the program assess whether the graduates are meeting employer's needs?¹

We are broadly aware of the needs of employers who our graduates typically work with. Employers of geoscientists require graduates who are able to work well in a cooperative environment with others, synthesize data and formulate logical conclusions from it, and produce clear technical writing. Although we are confident that we produce graduates with these qualities, at the present time we have no quantitative means of assessing this outcome.

¹ This is a new question to respond to recently implemented program review enhancements by the NSHE. (3/16)

6. If not, what will the program do to get this assessment in place and by what date?²

The Geoscience Department will institute plans for a questionnaire to be sent to typical employers. This will seek specific feedback on what needs they have for Geoscience graduates they are considering employing. We will seek to complete this task by the end of Spring semester 2017.

7. Additional Comments

IV. Program Resources

A. Faculty Time

1. Faculty and GA Resources

Number of Instructors	Fall 2014	Spring 2015
Full Time Faculty	12	14
GA	19	19
PTI	0	2
FIRS & Visiting	3	0
All others	1	0

Number of Classes Taught	Fall 2014	Spring 2015
Full Time Faculty	21	28
GA	28	32
PTI	0	4
FIRS & Visiting	9	11
All others	2	0

Student Credit Hours Taught	Fall 2014	Spring 2015
Full Time Faculty	3237	3651
GA	376	366
PTI	0	15
FIRS & Visiting	2249	1931
All others	34	0

Percent of Classes Taught	Fall 2014	Spring 2015
Full Time Faculty	35.0	37.3

² If the program has no employer expectations information, there must be a plan to put such a program in place and it has to be stated. (3/16)

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GA	46.7	42.7
PTI	0	5.3
FIRS & Visiting	15.0	14.7
All others	3.3	0

Percent of SCH Taught	Fall 2014	Spring 2015
Full Time Faculty	54.9	61.2
GA	6.4	6.1
PTI	0	0.3
FIRS & Visiting	38.1	32.4
All others	0.6	0

2. For other non-major courses – e.g., upper division for the college or university, estimate the unit’s resources allocated to them:

The Geoscience Department does not run these types of courses at the graduate level.

General Education

1. If your program or unit offers General Education courses, please estimate what proportion of the unit’s resources are allocated to this area:

There are no general education courses at the graduate level.

2. Does the combined load from A and B affect your unit’s ability to offer courses for its major?
If so, please describe: **not applicable**

B. Budget

1. Please fill in the table with three years of financial expenditures to be used to respond to questions 2 and 3 below.

Budget category	FY 13-14	FY 14-15	FY 15-16
State Operating (2101)	\$ 6,859	\$ 3,072	\$ 3,173
Student Fees	\$ 14,253	\$ 32,656	\$ 39,443
Indirect Cost Recovery	\$ 24,301	\$ 3,064	\$ 20,036
Self-supporting	\$ 46,582	\$ 39,673	\$ 34,512
Total Allocations	\$ 91,995	\$ 78,465	\$ 97,164
Number of Graduate Assistantships (including GAs on grants)	36	34	34

2. Are these resources sufficient to meet the degree program’s instructional and scholarship needs?

Student Fees are sufficient, however, the classes that don't charge special fees are paid from the State Operating account (2101). Depending upon which expenses are allowable in the Special Fees account (65CJ), the state account would need additional funds for class supplies (line 30), analyses (line 30), maintenance of equipment (line 30) and field trip expense (line 15 & 30).

The Geoscience Department GA allotment is insufficient. Most (~80%) of our GA positions are dedicated to 100-level course laboratory sections which are almost exclusively taken by students from outside our department. Because of the need to offer these courses we often face a shortage of GA's to cover our major class laboratories. The Geoscience needs an additional 3-4 GA's each year to effectively cover all of our laboratory sections. Note that our total GA count has actually decreased from the FY 13-14 number.

3. If not, approximately what line items and amounts would be needed?

Additional funds may be needed for class supplies (line 30), analyses (line 30), maintenance of equipment (line 30) and field trip expense (line 15 & 30). However, this is likely to be variable year to year, and thus difficult to quantify. We would estimate an approximately 20% increase in funding over current levels is needed.

C. Other Funding and Resources

1. Is funding from other sources sufficient to assist the program in achieving its outcomes? Other sources to be considered include: differential tuition, grants and contracts, endowment income, and one-time gifts for student scholarships, other one-time gifts.

The Geoscience Department has a well-established scholarship program run by the UNLV Foundation. However, we would benefit from enhancing this system by establishing additional support as outlined below.

2. If not, which funding streams could most reasonably be increased to help the program attain its outcomes?

There is a need for additional scholarship support for Geoscience students. The Geological Society of Nevada (GSN) has entered into a scholarship endowment arrangement with the Foundation that also involves fundraising efforts from the department and college. Thus far, a significant portion of the minimum necessary endowment has been collected, however, additional donations are necessary before the first scholarships can be given. There is a current effort underway to advance the contributions from GSN as well as collect additional donations from faculty and alumni.

3. Has any new donor revenue been generated since the last program review?

Yes, new revenue has come in particularly in support of the still developing GSN scholarship. Funds include an initial donation from the GSN and also reflect donations raised from alumni and friends of the Geoscience Department and the College of Sciences. Multiple donors have come forward to support our annual Geosymposium conference, including Barrick Gold, Kinross Gold, ExxonMobil, Newmont Mining and the Southern Nevada Water Authority.

4. Has the unit engaged in fundraising activities to support the program over the last 5 years?

Yes, our focus has been on trying to achieve a goal of getting the GSN endowment vested by 5 years from the initial establishment. We are currently in about the third year of this fundraising effort.

5. What has been the result of these fundraising activities?

See 2-4 above.

6. Review the space data for your department and comment on its amount and quality. These data will need to be accessed by an individual with Archibus® access.

This has been done by the Geoscience Department office manager and the chair.

7. Is the quality and quantity of available consumable materials and supplies (e.g., office supplies or lab supplies) adequate and if not, explain why not:

Our department operating budget is marginal, and more so since we recently promoted our AAI to full time status in order to increase our staffing resources. These funds had to be pulled from our operating budget, and this was a necessary action due to the increased size of the department when we brought in the Forestry Inventory Analysis program 3 years ago, along with our increased enrollments. As a result we are often faced with difficult decisions for support of our office and department laboratories when funds are low. This impacts our ability to operate optimally in both teaching and student research.

8. Is the quality and quantity of available technology resources, such as computers adequate and if not, explain why not:

Many of our computers and the software that runs on them are outdated. Computing equipment often becomes obsolete after 3-5 years, and it may take another 2-3 years to replace them as we have to rely on the UNLV replacement program.

9. Is the quality and quantity of available equipment (other than computing) adequate and if not, explain why not:

We have in recent years systematically upgraded our major teaching lecture rooms and laboratories in the main Geoscience building (LFG) and the equipment in these is currently sufficient to meet our needs. Department research laboratories, which are used by students, need more institutional support in terms of machining and electronics technicians, laboratory managers, and funding for service contracts for instruments. Many of our laboratories are often inoperable for weeks to months due to problems associated with lack of sufficient support, especially because the lack of lab managers requires faculty or graduate students to reallocate their time to doing the repairs. This negatively affects our faculty and students' ability to conduct their research.

10. Is the quality and quantity of available library and information resources adequate and if not, explain why not:

Our library and information resources are adequate at this time.

11. Staffing

a. Are available department staff resources sufficient to attain the program's outcomes?

We have recently upgraded our AAI position to full time. With this change, our other 2 full time office staff, and continued use of 2 student workers in the office, we have sufficient staff resources at this time.

b. If not, what additional staff resources are needed and how would they be funded?

12. Additional Comments

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V. Size of Program

1. Below are headcount, course enrollment, and degrees conferred data from Decision Support.

Headcount

Geoscience
MS
(GEOMS)

Academic Level - Beginning of Term	Fall 2010 Prelim	Spring 2011 Prelim	Fall 2011 Prelim	Spring 2012 Prelim	Fall 2012 Prelim	Spring 2013 Prelim	Fall 2013 Prelim	Spring 2014 Prelim	Fall 2014 Prelim	Spring 2015 Prelim	Fall 2015 Prelim	Spring 2016 Prelim
GR	33	31	34	36	39	32	33	31	28	25	30	27
PHD		2										

Geoscience
PHD
(GEOPHD)

Academic Level - Beginning of Term	Fall 2010 Prelim	Spring 2011 Prelim	Fall 2011 Prelim	Spring 2012 Prelim	Fall 2012 Prelim	Spring 2013 Prelim	Fall 2013 Prelim	Spring 2014 Prelim	Fall 2014 Prelim	Spring 2015 Prelim	Fall 2015 Prelim	Spring 2016 Prelim
PHD	21	21	22	21	13	14	13	11	17	16	17	20

Course Enrollments

Department Name of Course	Subject	Course Number Level	Fall 2011 Prelim	Spring 2012 Prelim	Fall 2012 Prelim	Spring 2013 Prelim	Fall 2013 Prelim	Spring 2014 Prelim	Fall 2014 Prelim	Spring 2015 Prelim	Fall 2015 Prelim	Spring 2016 Prelim
Geoscience	GEOL	100-Level	461	507	550	537	507	596	684	664	626	644
		200-Level	18		28		33		58	21	26	
		300-Level	68	92	89	79	103	113	91	130	131	147
		400-Level	45	74	40	65	45	106	56	141	48	121
		600-Level	18	21	13	35	14	30	25	32	11	28
		700-Level	89	106	90	83	88	71	77	70	108	84

Degrees Conferred

Department	Geosciences
Academic Career	GRAD
Academic Plan Description	Geoscience MS (GEOMS)
Degree	MS
Degree Description	Master of Science

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Academic Year - July to June	Degree Count
2005-06	10
2006-07	6
2007-08	9
2008-09	2
2009-10	8
2010-11	11
2011-12	8
2012-13	13
2013-14	6
2014-15	10
2015-16	9

Degrees Conferred

Department Geosciences
Academic Career GRAD
Academic Plan Description Geosciene PHD (GEOPHD)
Degree PHD
Degree Description Doctor of Philosophy

Academic Year - July to June	Degree Count
2005-06	1
2006-07	1
2007-08	2
2008-09	3
2009-10	2
2010-11	5
2011-12	5
2012-13	2
2013-14	4
2014-15	2
2015-16	5

2. Discuss the headcounts from the last five years, i.e., are the trends in line with projections in your unit's strategic plan?

There are year to year fluctuations; however the M.S. and Ph.D. headcounts have generally remained at the same levels over the ~5 years surveyed. On average, the M.S. program has a higher headcount than the Ph.D. program. This is consistent with the Geoscience Departments history as a historically M.S. degree granting department which added the Ph.D. degree program more recently. The Department has a goal of increasing the number of Ph.D. students, which is in line with the new and current funding

formula that is heavily weighted towards the graduate programs and in particular the Ph.D.

3. If not, why not?

The Geoscience Department plans to increase the number of Ph.D. students in the future.

4. Does your program's enrollment trend differ from national trends?

National trends in Geoscience department enrollments were reported in 2011 by the American Geological Institute

(<http://www.americangeosciences.org/sites/default/files/StatusoftheWorkforce2011overview.pdf>). For the years reported, 1994-2010, there is a general downwards trend. The report states that the state by state data are quite variable as a result of local economies, companies hiring graduates, and individual department productivity and visibility.

5. If yes, please discuss the reasons:

The time periods represented by our data and national trends discussed above do not overlap, thus it is difficult to make direct comparisons. Our relatively stable trends compared to national trends may simply be a reflection of the variability in state data discussed in the American Geological Institute report.

6. Additional Comments

VI. Retention, Progression, Completion

A. Major Course Offerings

1. Are enough courses offered to meet enrollment demands?

Yes. However, there are semesters in which we do not offer a sufficient variety of graduate courses for our students' needs. This is a result of our department's large commitment of resources towards 100-level undergraduate service courses, as discussed in the self-study for our B.S. degrees. Furthermore, we have lost a tenure-track position in hydrology this past year due to a faculty departure. This position was not chosen for replacement by the administration, which has placed further burdens on our programs.

2. How many major courses have been added or eliminated in the last 5 years?

 2 Added 0 Eliminated

3. Why were the actions taken?

In the past five years we have added three courses. Growth in the area of geochemistry led to the introduction of an advanced topics class (GEOL 703 Topics in Advanced Geochemistry) so that faculty could better serve changing interests of the graduate population. A doctoral course in paleoclimatology (GEOL 737 Advanced Paleoclimatology) was added because there was a lack of 700-courses in that area, despite faculty and student interest. We most recently added a planetary science graduate course (GEOL 796: Advanced Topics in Geoscience - Planetary Science) to serve the interests of a new faculty member and her students. No courses have been deleted from the graduate catalog during the past 5 years despite a number of them not having been offered in >5 years. Removing inactive courses from the catalog has been suggested, but there has been a general lack of interest among the faculty.

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4. After reviewing the program, what additional actions should be taken to improve retention, progression, and completion?

Both our M.S. and Ph.D. programs could benefit from a more rigorous monitoring of students progression through the degrees. We need to be more diligent in enforcing deadlines for, e.g. thesis/dissertation proposal presentations and comprehensive exams. The programs have too many students who occupy GA positions beyond the nominal 2 or 4 years for the degrees.

5. Are there any courses that students routinely have difficulty getting enrolled in, that slow progression and/or graduation? If so, please identify them:

There are none.

6. If last question was answered yes, what steps can be taken to reduce “bottle-necks” in these courses. Please indicate *both* financially-based and non-financially-based solutions.

7. Can any changes in sequencing of courses be made to facilitate graduations?

There are no changes needed at this time.

B. Graduation Rates

Program graduation numbers and rates are summarized below.

New Masters Students Graduating in Less than Six Years (Geoscience MS - GEOMS)

Fall 2007 - Fall 2013 Cohorts

Cohort		Graduated in...							
Term	Number	2 Years	%	3 Years	%	4 Years	%	5 Years	%
Fall 2007	8	0	0.0%	2	15.4%	4	50.0%	4	50.0%
Fall 2008	13	1	7.7%	7	100.0%	9	69.2%	10	76.9%
Fall 2009	7	1	14.3%	4	66.7%	6	85.7%	6	85.7%
Fall 2010	6	1	16.7%	5	62.5%	5	83.3%	5	83.3%
Fall 2011	8	3	37.5%	6	54.5%	6	75.0%	25/34	73.5%
Fall 2012	11	2	18.2%	6	120.0%	30/42	71.4%		
Fall 2013	5	2	40.0%	30/53	56.6%				
<i>Combined Cohort</i>		10/58	17.2%						

New Doctoral Students Graduating within Eight Years (Geosciences PhD - GEOPHD)

Fall 2004 - Fall 2012 Cohorts

Cohort		Graduated in...											
Term	Number	3 Years	%	4 Years	%	5 Years	%	6 Years	%	7 Years	%	8 Years	%
Fall 2004	3	0	0.0%	1	33.3%	1	33.3%	1	33.3%	2	66.7%	2	66.7%
Fall 2005	2	1	50.0%	1	50.0%	1	50.0%	1	50.0%	2	100.0%	2	100.0%

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Fall 2006	7	1	14.3%	2	28.6%	3	42.9%	3	42.9%	3	42.9%	3	42.9%
Fall 2007	3	0	0.0%	0	0.0%	1	33.3%	1	33.3%	1	33.3%	1	33.3%
Fall 2008	2	1	50.0%	1	50.0%	1	50.0%	1	50.0%	1	50.0%	8/15	53.3%
Fall 2009	5	0	0.0%	1	20.0%	4	80.0%	4	80.0%	9/17	52.9%		
Fall 2010	2	0	0.0%	0	0.0%	0	0.0%	11/22	50.0%				
Fall 2011	4	0	0.0%	1	25.0%	11/24	45.8%						
Fall 2012	1	0	0.0%	7/28	25.0%								
<i>Combined Cohort</i>		3/29	10.34%										

*Doctoral graduation rates include only doctoral degree conferrals.

Using the data in the tables above, please answer these questions:

1. Are trends in 6-year cohort graduation close to the University's goals (UNLV's undergrad goal is 50%)?

The data in the table above for the M.S. program show that for the combined cohort we have a low percentage of students (~17%) who complete their degrees in the nominal 2 year period. This increases to above 50% during the 3rd year, and is above 70% for the 4th year and beyond. We exceed UNLV's goal.

The data in the table above for the Ph.D. program show that for the combined cohort we have a low graduation rate (25%) at the nominal 4 years, rising to 46% at 5 years, and to just above 50% of students completing the degree in 7 or more years. This is close to UNLV's goal.

2. If not, what is being done to reach the goal?

Although we meet or exceed UNLV's goals the Geoscience Department wishes to move towards better graduation rates as outlined in VI-4 above under Retention, Progression, Completion.

3. Discuss how and why the graduation rate is changing.

Not applicable to these data.

4. Additional Comments

VII. Relationship to Other Programs

1. What relationship does your program have to other programs (such as transfers, collaborations, partnerships) in the NSHE system?

Geoscience Department faculty occasionally interact with faculty and students from CSN.

2. What the relationship does this program have to other programs at UNLV (e.g., collaborations, partnerships, affiliated faculty, General Education requirements, etc.)?

As summarized in IV-A-2 under Program Resources above, the Geoscience Department is heavily invested in providing 100-level service classes that serve to fulfill our undergraduate student's core curriculum science credit needs. Many of our graduate students are teaching assistants for labs for these courses.

3. Additional Comments

VIII. Impact

1. What impact has this program had or will have in the following areas:

a. University

The UNLV administration has recently been strongly promoting a Top Tier initiative to advance UNLV into the upper echelon of research-active universities. In order for this initiative to succeed, it is critical for the university to support the top-performing units. The Geoscience Department was the first science unit to offer MS and PhD degrees. In terms of National rankings, the Geoscience Department is the highest ranked unit amongst the UNLV Colleges of Science and Engineering, the two colleges that must be a major component of any effort to obtain Top Tier Status. Given this early leadership in research productivity, the success of the Geoscience department should be considered a critical component to the Top Tier Initiative, and thus, to meeting goals put forward by the UNLV administration.

b. Community

Geoscience is extremely relevant to Las Vegas, Clark County, and the state of Nevada. After tourism, mining is the second largest business sector in the state. Nevada has the second most earthquakes amongst the lower 48 states. Water scarcity is a major issue in the entire state, but especially in Las Vegas and Clark County. The desert regions of Nevada are being considered as major potential sources for wind, solar, and geothermal energy. The issues of energy and water scarcity are both exacerbated by the specter of climate change. In contrast to the importance of geology, residents of Las Vegas are largely unfamiliar with the earth sciences, and our department provides a connection through both instruction and outreach. As an example of outreach, when natural events are newsworthy, our faculty are regularly contacted by local news agencies to provide insight to the public.

c. Field

A good example of the impact of our graduate programs and faculty is the Geoscience Departments relationship with the Las Vegas Natural History Museum, the Nevada Division of State Parks (Valley of Fire, Spring Mountain Ranch, and Cathedral Gorge), BLM, and National Park Service. These efforts are led by Dr. Josh Bonde, Dr. Steve Rowland, and their students, and were fundamental to the creation of the Thule Springs Fossil Beds National Monument north of Las Vegas.

2. What are the benefits to the institution of offering this program?

See VIII-1-a above.

3. Are there examples of the integration of teaching, research, & service that you would like to highlight (e.g., faculty mentoring leading to student presentations at conferences, service learning classes, community service activities involving students, or other student activities and/or achievements that you think are noteworthy)?

The best examples of integration are the participation of students in the activities listed below under productivity. Our graduate students fully participate in teaching and research within the department. GA's are assigned several laboratory sections each semester to instruct. These laboratory sections are tightly integrated with the class lecture sections taught by regular faculty members. Our students are co-authors on published manuscripts and regularly attend national and regional scientific meetings where they present the results of their research.

4. Additional Comments

IX. Productivity

1. Please provide an indication of faculty productivity appropriate for your unit:

The Geoscience Department faculty are highly productive, both in terms of external grant funding received and research publications, the primary drivers of UNLV's Top Tier initiative. External grant funding has increased over the past 10 years as shown below:

FY16 (YTD)	\$3,058,752
FY 15	\$3,281,743
FY 14	\$2,103,814
FY 13	\$1,304,683
FY 12	\$1,353,237
FY11	\$2,078,529
FY 10	\$1,998,162
FY 09	\$1,385,840
FY 08	\$1,322,803
FY 07	\$1,660,068
FY 06	\$1,432,041

Geoscience faculty published an average of 59 manuscripts per year in scientific journals during the past 5 years, with 68 published in 2015. Over 100 scientific abstracts were presented orally or by poster display at venues such as the Geological Society of America and American Geophysical Union annual meetings in 2015. This is typical of most years.

2. Additional Comments

X. Quality

A Admission and graduation requirements

1. Please provide program admission requirements as Appendix 2 from the current UNLV catalog:

2. Are there any updates that need to be made to the catalog and if so, what are they?

See I-D under Program Description above.

3. How many full-time advisors are available at the college level?

There are 7 available advisors in the College of Sciences advising center. However, all graduate advising is done within the Geoscience Department.

B. Outcomes and Assessment

1. Student Learning Outcomes and Program Assessment Plans and Reports by program concentration are listed at <http://provost.unlv.edu/Assessment/plans.html>. Please attach the most recent assessment report as Appendix 3.

3. Describe specific program changes made based on the program's evaluation of its assessment reports:

Based on the assessments of the M.S. and Ph.D. programs we find that overall our M.S. and Ph.D. students are satisfying their learning outcomes. This is demonstrated by satisfactory performance in GEOL 701 (96.5% for M.S. and 100% for Ph.D. based on the most recent 2016 assessment) and faculty feedback and advisor reports (96% for M.S. and 100% for Ph.D. based on the most recent 2016 assessment).

Based on assessment we have identified two areas of concern. For the M.S. program we find that students often fail to complete required sequential program paperwork in a timely manner. 65% of M.S. students (as of the 2016 assessment) were found to be behind the timeline for submitting paperwork such as committee selection and proposal defense. For the Ph.D. program we find that students are not completing their comprehensive exams in a timely manner. 38% of Ph.D students (as of the 2016 assessment) are behind in completing these important exams according to schedule. The Assessment Committee in cooperation with the Graduate Student Committee, is concerned about these results because this situation results in students taking longer to complete their degree program. The planned action item based on the above data and discussion among faculty is to have the Graduate Coordinator play a larger, stronger, and more consistent communicative role in encouraging students and advisors to complete important paperwork and milestones in a timely manner. Unsatisfactory evaluations will be more rigorously implemented when deadlines are not met. A more rigorous implementation of the existing rules, including loss of funding will be applied. Additionally, many changes are being discussed as to how the timing for progression through the program should occur and how these deadlines can be better structured to help student learning.

Our department has also agreed to apply scholarship monies to better support our students financially. It is hoped that this measure will help alleviate financial pressures on students allowing them to focus better on their learning and progression through the program.

Lastly, the assessment committee discussed our 3yr assessment plan with recommendations for changes and improvements to be developed and incorporated into the next plan. Action items are to take these suggestions to the entire department faculty during the Spring 2017 semester for their consideration and implementation.

4. Has the program revised its curriculum such as changing prerequisites, adding or eliminating required or elective courses, or co-curricular experiences for the degree(s) in the last 5 years?

The Geoscience Department has not seen the need to make significant curriculum changes in recent years beyond having added a few courses to suit current faculty and student needs as outlined in VI-3 above under Retention, Progression, Completion.

- a. If yes, what changes were made and why?

See 4 immediately above.

5. Has the program revised course content or instructional approaches (pedagogy, technology) in the last 5 years?

Yes, see immediately below.

- a. If yes, what changes were made and why?

Changes in content and inclusion of technology are usually incrementally made by individual instructors each semester as a regular process of preparing courses which have been taught previously.

6. Describe any other changes made in the last 5 years (for example, advising) based on assessment reports:
7. List and describe two specific improvements in student learning outcomes and why they represent forward movement.³

We do not currently have information pertaining to this question.

8. Additional Comments

XI. Conclusions, Self-Assessment

A. Faculty Review of self-study

1. On what date did the program and/or department faculty review this self-study?

The Geoscience Department faculty reviewed this document on Dec. 8-12.

2. What were the results of the faculty review?

Several faculty members made comments and corrections to the original document. Those have been incorporated into this final version.

3. What are the top 3 priorities and/or needs for the future development of the program?

- a. **Improved support by the administration and the College of Sciences: Instruction. Science instruction, and the requirement of small class sizes of laboratories, are inherently expensive. In turn, a robust College of Sciences will carry their weight in bringing in external research grants, providing needed indirect costs to support the University. Additional state-funded GAs and faculty lines are needed.**
- b. **Improved support by the administration and the College of Sciences: Research Facilities. Facilities are not sufficiently supported. Facilities are used in both instruction and in research, and if the university benefits from the receipt of indirect cost returns, these funds should be put back into the maintenance of the facilities required by the Colleges who generated them. Otherwise, it is not sustainable.**
- c. **Improved support by the administration and the College of Sciences: Institutional Support. It is common to experience difficulties and delays in getting paperwork processed through Purchasing.**

³ This is a new question to respond to recently implemented program review enhancements by the NSHE. (3/16)

Faculty position searches are often approved relatively late, with the result being that we are months behind competing institutions in getting advertisements out and searches underway. One result is that we miss hiring top candidates because they receive offers elsewhere before our search process is completed. Response from Human Resources is often slow and non-traditional aspects of requested positions are difficult to get approved.

4. What are the strengths of the program?

See II-D under Centrality To Mission above.

5. What are the challenges facing the program?

See XI-3 immediately above.

6. What recent additions, corrections, or other changes have been made to the program that reflect changes or developments in the field?

We do not anticipate that changes to our current programs are required to meet these needs.

B. Other comments

1. Is there anything else you would like to discuss about the program?

The NSHE also requires that any action steps identified based on the review of the program and the status of the action steps be ready for consideration at the December board meeting the year the program review is completed. You will be contacted about this after the external review has been completed.

Appendix 1: Catalog descriptions of the M.S. programs from the Fall 2016 – Spring 2017 Graduate Catalog can be found at the following links.

Geology M.S.: http://catalog.unlv.edu/preview_program.php?catoid=17&poid=4174

Geology Ph.D.: http://catalog.unlv.edu/preview_program.php?catoid=17&poid=4175

Appendix 2: Aside from the UNLV graduate admissions standards the Geoscience graduate program admission requirements are outlined on our Department website at the following link.

<https://geoscience.unlv.edu/academics/apply-to-graduate-school/>

Appendix 3: The 2016 assessment reports for the Geology M.S. and Ph.D. programs are attached separately.

NEXT STEPS:

- A. Create an executive summary of this self-study, using the template provided, that is *no more than 2 pages long*.
- B. Email the self-study and the executive summary to:
 - Chair of the Faculty Senate Program Review Committee found here: <http://facultysenate.unlv.edu/committees/program-review> or the Chair of the Graduate College Program Review Committee found here: <http://www.unlv.edu/graduatecollege/program-review-committee>
 - Gail Griffin, gail.griffin@unlv.edu, 702-895-0482.