

# UNLV

UNIVERSITY OF NEVADA, LAS VEGAS

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## Program Review Self-Study

Program Reviewed: Geosciences

Degrees: B.S. Geology, B.S. Earth & Environmental Science

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](mailto: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: **B.S. in Geology, B.S. Earth & Environmental Science**
  - a. Degrees and their abbreviations: **BS GEOL, BS EES**

### 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. Dave Kreamer**  
**Dr. Gabriel Judkins**

### 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 catalog descriptions are largely correct, but would benefit from careful editing to improve clarity. Specific errors are listed below:**

#### a) The graduation requirements listed in the 2016-17 catalog (quoted below) are ambiguous:

**“For graduation with a major or minor in geology, a minimum final grade of C (2.00) is necessary in all required geology-related courses. In addition, before enrolling in any geology course, the student must have completed each geology prerequisite for that course with a grade of C or higher.”**

**The phrasing shown below will be in force for the spring 2017 graduating class and included in the 2017-18 catalog”**

**“For graduation with a major in Earth and Environmental Science, major in Geology, or minor in Geology, a minimum final grade of C (2.00) is necessary in all required courses with a GEOG or GEOL prefix. In addition, before enrolling in any course with a GEOG or GEOL prefix, the student must have completed all GEOG and GEOL prerequisites for that course with a grade of C or higher.”**

**b) Learning outcome #6 for the major in Earth and Environmental Science is incomplete, it currently reads:**

**“6. Demonstrate sufficient skills in computers and multi-media systems for the application and presentation in earth science...” *Note: This sentence appears to be missing information which we are looking to correct.***

**c) There should be a learning outcome 7 for the major in Earth and Environmental Science that relates to the capstone.**

**d) Learning outcome #7 for the major in Geology (below) should be rewritten to remove the reference to imagery because the degree program does not require GEOL 430 (GIS).**

**“7. Be facile in computer applications in geology including spatial and imagery analysis applications, quantitative skills, and express themselves well in oral and written reports.”**

**e) Learning outcome #7 for the major in Geology (below) needs to be edited to remove references to geophysics and petroleum geology, which are not regularly offered by the department.**

**“8. Apply the techniques of at least two specializations within the field of geology (e.g., geophysics, hydrogeology, GIS, geochronology, petroleum geology) to the solution of appropriate research or applied problems.”**

**f) The EES description states:**

**Please see the UNLV College of Science, Department of Geoscience web page at <http://geoscience.unlv.edu> for information about department programs, faculty and facilities. This times out when you click the link, unlike the geology link. Recommendation - we need a direct link for EES - (<https://www.unlv.edu/degree/bs-earth-environmental-science>) .**

**g) The Learning outcomes for EES are different in the Undergraduate Catalog**

**([http://catalog.unlv.edu/preview\\_program.php?catoid=16&poid=3937&returnto=2841](http://catalog.unlv.edu/preview_program.php?catoid=16&poid=3937&returnto=2841))**

**which lists 6 numbered outcomes, and the Geoscience Academics site link (<https://www.unlv.edu/degree/bs-earth-environmental-science>) which reports 7 unnumbered outcomes.**

## 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 undergraduate Bachelor of Science degree in Geology (GEOL) is a rigorous program that is designed to: 1) prepare students for entry into the workforce as practicing geoscientists, and 2) provide them with the foundational knowledge required to pursue an advanced degree.

The undergraduate Bachelor of Science degree in Earth and Environmental Science (EES) is a science-based program designed to prepare students for a range of challenging careers in the broad fields of environmental and geologic sciences, including science education. The degree program also provides a solid foundation for those looking to pursue advanced degrees in education, environmental studies, public policy, or law.

#### **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 undergraduates achieve gainful employment in a variety of industries and many apply, and are admitted to, graduate schools. Many of our employed undergraduates 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, the building industry, the transportation infrastructure industry, and land use stewardship. As such, we remain engaged with the Las Vegas, regional, and national communities in helping to 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 undergraduate programs are very well integrated with the three core themes. Student learning and success is facilitated in our programs by a stepwise progression of majors courses which teach and reinforce fundamental geoscience concepts, ending with a capstone course for both the GEOL and Earth and Environmental Science (EES) degrees which synthesizes the main concepts in a comprehensive final project. Capstone courses for both degrees emphasize research and scholarship through the creation and presentation of research projects. Our undergraduate student population is diverse. Some of our 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. Almost all of our courses (> 95%), including general education classes are taught by full-time faculty. Use of part-time instructors is restricted to 1-2 general education courses per year and PhD students are only allowed to teach lecture sections after they have passed their comprehensive exam. Both part-time and student instructors are carefully mentored.**
- 2. We take full advantage of our location in terms of the opportunity for field instruction. 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).

3. From the student perspective, our department sits in a middle ground between teaching and research-intensive. As a result, our faculty make the time to mentor our students while involving them in research activities.
4. The students in our Geoscience programs are diverse. Currently our undergraduate students are approximately 53% male and 47% female. This is close to the 2010 U.S. Census Bureau's estimates of 49% male and 51% female for the United States. We are also well represented ethnically, with approximately 12% being Asian, 7% black, and 17% Latino.
5. By choice, we have elected to maintain a broad focus in our areas of specialization instead of narrowing it to create highly specialized groups. While this choice does adversely impact our ability to support high-end instruments it benefits our students by providing them an opportunity to become well-rounded scientists.

In summary, the undergraduate programs in Geoscience at UNLV are a solid blend of course offerings, including an opportunity for hands-on field study. Two undergraduate tracks are available to our students: one in Earth and Environmental Science, and the other in Geology. The varied and practical curriculum is geared toward giving students a firm basis in the fundamentals of Earth Science, combined with the opportunity to study a wide variety of extended topics relevant to the contemporary science and the job-market. Some students participate directly in faculty research projects and assist in our ongoing research programs. Our undergraduates come from diverse backgrounds and many go on to graduate school. Their preparation in our department gives the students the necessary background for graduate school, skills for the workplace, and hopefully, the inspiration to find satisfaction and joy in their profession.

### 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?

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. Briefly, stakeholders are any organization that benefit directly or indirectly from the work of our faculty and from the students who graduate from our programs.

2. What are specific stakeholder needs for graduates?

**Employers 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.**

**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.**

**Sales Engineers – the BLS predicts that ~4,900 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 \$97,650.**

**Expected growth in the above occupations is attributed to environmental concerns and population growth. At the regional level, we are seeing a decline in hiring by the multi-national mining and petroleum companies. 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?

**Our undergraduate programs do not produce graduates that are specifically trained for the different career pathways listed above. Rather, as is typical for undergraduate Geoscience degrees, our students are broadly trained and can potentially fill most or all of these career pathways. We do not currently anticipate that changes are needed to the GEOL or EES programs to produce qualified graduates.**

**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 undergraduate 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 meeting 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.

2. Discuss the placements of recent graduates:

**The Geoscience department does not systematically collect data on placement of graduates.**

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?<sup>1</sup>

**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.**

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

**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

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

<sup>2</sup> 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)

## IV. Program Resources

### A. Faculty Time

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
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



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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:

**We do not offer any specific non-major courses at the upper division, however, some students from other departments do take several of our 300-400 level courses. The presence of non-majors in these courses does not represent a burden on department resources. See comments under General Education 1-2 below.**

**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:

**1. Departmental resources are heavily weighted towards instruction of 100-level general education courses. The data shown below for the 2015-16 academic year is representative. Roughly half of the lecture sections offered by the Geoscience are taught at the 100-level, and serve the department’s general education mission. For the most part, these 100-level courses are taught by full time Geoscience faculty, with occasional participation by temporary faculty, part-time instructors (PTI), and PhD students. It is important to note that two of our full time faculty are “in residence”, which means that they teach 12 contact hours per semester, with a heavy emphasis on General Education. Likewise, UNLV also expects temporary faculty to focus on courses for general education and undergraduate majors.**

**2. Several of our 300-400 level courses (e.g., Geomorphology, Geographic Information Systems, Hydrogeology, Medical Geology, Geological Engineering, etc.) draw small numbers of students (< 10 per course) from outside our department. For these courses, the presence of non-majors is not a burden on department resources, and enhances the educational experience for our majors by broadening their viewpoints. An exception is GEOL 301 (Paleontology), this class typically serves roughly 130-160 pre-med students in addition to 20-30 of our own majors. This class alone makes up the difference in 200-300 level enrollment numbers between fall and spring (below).**

Fall 2015 Lecture Sections			
Level	Sections	Enrollment	Faculty (regular unless stated)
100	14	1381	2 PTI, 1 temporary, 1 PhD student
200-300	3	230	
field classes	1	30	1 temporary, plus 1 TA
400-600	2	49	
700	5	83	
Total	25	1773	

Fall 2015 Laboratory Sections			
Level	Sections	Enrollment	Faculty (TA unless stated)
100	23	847	
200-300	5	93	

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400-600	0	0	
Total	28	940	

Spring 2016 Lecture Sections			
Level	Sections	Enrollment	Faculty (regular unless stated)
100	15	1230	1 PTI
200-300	5	119	
field classes	2	28	plus 1 TA
400-600	7	140	
700	4	49	
Total	33	1566	

Spring 2016 Laboratory Sections			
Level	Sections	Enrollment	Faculty (TA unless stated)
100	22	819	
200-300	2	46	
400-600	7	86	2 taught by regular faculty
Total	31	951	

2. Does the combined load from A and B affect your unit's ability to offer courses for its major?  
If so, please describe:

**As can be seen from the above data approximately half of our lecture sections are taught at the 100 level by our faculty. Roughly 80% of our laboratory sections are devoted to supporting these 100 level lecture sections. These demands do create challenges in fulfilling our teaching needs for our major courses. One result is that we are often limited in the number of majors courses we can offer each semester. Another is that we do not have enough GA positions to fill all of our laboratory needs. The department lost a regular faculty member in Spring 16 and we have not been granted a replacement search as of this time. This increases the problem with offering sufficient numbers of majors courses. An illustration of the problem with GA shortage is that in Spring 16 two of our 400-600 level laboratory sections had to be taught by the faculty member instructing the course, and we often have to assign multiple major course laboratory sections to each GA.**

**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

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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).**

**As discussed elsewhere in this self-study, our 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.**

**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 Science.**

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.**

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 these are currently sufficient to meet our needs. Department research laboratories 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. This negatively affects our faculty and students' ability to conduct their research, and our ability to use instrumentation in our teaching efforts.**

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?

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12. Additional Comments

## V. Size of Program

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

Academic Level Key	
Undergraduate (UGRD):	Graduate (GRAD):
10 – Freshman	GR - Graduate
20 – Sophomore	PHD – PhD
30 – Junior	
40 – Senior	
50 – Post Bacc Undergrad	

### Headcount

Geology BS  
(GEYBS)

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
10	8	7	3	2	10	12	14	9	13	5	11	10
20	8	6	12	13	11	8	16	17	18	21	18	19
30	12	9	13	10	17	19	17	12	18	19	29	25
40	22	26	27	32	28	31	35	42	43	42	35	40
50			6	5	4	5	4	5	6	10	4	4

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	GEOG	100-Level	417	355	339	400	520	477	639	554	639	524
	GEOG	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

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		700- Level	89	106	90	83	88	71	77	70	108	84
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**Degrees Conferred**

**Department** Geosciences  
**Academic Career** UGRD  
**Academic Plan Description** Geology BS (GEYBS)  
**Degree** BS  
**Degree Description** Bachelor of Science

Academic Year - July to June	Degree Count
2005-06	2
2006-07	3
2007-08	8
2008-09	8
2009-10	5
2010-11	10
2011-12	7
2012-13	9
2013-14	12
2014-15	22
2015-16	11

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

**Headcounts at all academic levels from freshman to senior show a general upwards trend over the period 2011-2016, as do enrollments in 100 level and undergraduate major courses. This is fully in line with, and an expected result of, the Geoscience Departments initiatives to revise curriculum and increase undergraduate enrollments which were began in 2010 by the previous chair Michael Wells.**

3. If not, why not?  
 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 increasing 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?

**In general, yes. Some specific courses (e.g. Geographic Information Systems GEOL 430/630) regularly have excess demand, and students would like to see a larger array of offerings. However, overall we are offering sufficient courses for students to graduate on schedule.**

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

  3   Added   1   Eliminated

3. Why were the actions taken?

**A 300-level geochemistry course was deleted and replaced with a 400/600-level class to more accurately reflect the material covered by the current instructor. Two 400/600-level courses (medical geology, planetary geology) were added to reflect changing faculty interests.**

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

**Students routinely elect to postpone degree requirements in chemistry, math, and physics until late in their degree programs. Failure to complete these courses then becomes a hindrance to their progression.**

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

**Mineralogy (GEOL 220) and Field Geology I (GEOL 348) are bottleneck courses that are offered in the Fall semester, while GIS (GEOL 430/630) is a spring semester course that can be an issue for students enrolled in the EES program. Demand for these classes typically hovers right around capacity. Some years demand exceeds capacity, others it does not.**

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.

**We could improve progression by offering the aforementioned courses both semesters; however, since all are lab courses, the resources needed to do so would be significant. In addition to the faculty time required, each class would also need a graduate assistant to handle the laboratory portion. The field class also requires vehicles and drivers, which would interfere with other courses taught in the spring semester. The financially based solution would be to hire more faculty and graduate instructors. Non-financially based solutions may also be possible. For GEOL 220 and GEOL 430/630 we could explore to cross-listing those courses with other departments and thus increase demand to the point where it is efficient to offer them every semester. For GEOL 372 we could increase the prerequisite requirements to decrease demand from students enrolled in the Earth and Environmental Sciences degree program.**

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

Not at this time.

**B. Graduation Rates**

Program graduation numbers and rates are summarized below.

**First-time, Full-time Freshmen Graduating within Six Years (Geology BS - GEYBS)**

Fall 2001 - Fall 2009 Cohort

Cohort		Graduated			
Term	Number	in Department	%	any Department	%
Fall 2001	3	1	33.3%	1	33.3%
Fall 2002	1	1	100.0%	1	100.0%
Fall 2003	4	0	0.0%	0	0.0%
Fall 2004	1	0	0.0%	0	0.0%
Fall 2005	2	0	0.0%	0	0.0%
Fall 2006	1	0	0.0%	1	100.0%
Fall 2007	2	1	50.0%	1	50.0%
Fall 2008	1	0	0.0%	0	0.0%
Fall 2009	3	0	0.0%	1	33.3%
<i>Combined Cohort</i>	<i>18</i>	<i>3</i>	<i>16.7%</i>	<i>5</i>	<i>27.8%</i>

**First-year Retention of First-time, Full-time Freshmen (excludes transfers) (Geology BS - GEYBS)**

Fall 2012 - Fall 2014 Cohorts

Term	Cohort		Retained to Next Fall	
	Number		#	%
Fall 2012	7		6	85.7%
Fall 2013	7		7	100.0%
Fall 2014	4		2	50.0%
<i>Combined Cohort</i>	<i>18</i>		<i>15</i>	<i>83.3%</i>

**First-year Retention of Full-time, New Undergraduate Transfers (Geology BS - GEYBS)**

Fall 2012 - Fall 2014 Cohorts



**Program Review Self-Study**  
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Term	Cohort		Retained to Next Fall	
		Number	#	%
Fall 2012		1	1	100.0%
Fall 2013		3	3	100.0%
Fall 2014		7	7	100.0%
<i>Combined Cohort</i>		<i>11</i>	<i>11</i>	<i>100.0%</i>

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%)?

**From the data in the first table above, considering the entire cohort of students, the within department 6 year graduation rate is ~17%, below the UNLV goal of 50%. However, it should be noted that only a small number of our graduating majors were declared Geoscience majors in their Freshman year; many of our majors transfer from the other sciences and engineering.**

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

**These numbers represent years prior to (2001-2009) a complete revision of our undergraduate program curriculum, as discussed below in X-2 and 3 under the Quality section. We have anecdotal evidence that this has begun resulting in higher retention rates. The data for first-year retention rates for more recent years (2012-2014) above may reflect this.**

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

See (2) above.

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. DRI faculty occasionally teach 400/600 level courses in our department.**

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 students core curriculum science credit needs.**

3. Additional Comments

## VIII. Impact

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

- a. University

**As outlined elsewhere in this self-study our department commits a large proportion of its undergraduate teaching resources to 100-level courses in which we offer core curriculum science credits to all UNLV undergraduate students. Approximately half of our lecture sections are taught at the 100 level by our faculty, and 80% of our laboratory sections are devoted to supporting these 100 level lecture sections. Thus, the Geoscience Department is heavily committed to supporting undergraduate education at UNLV. These Geoscience courses provide a uniquely relevant perspective of how planet Earth operates, the abundance and environmental effects of our use of mineral and energy resources, and how life has evolved through changing environmental conditions. Graduates of our B.S. programs represent UNLV in a wide variety of state and local agencies as well as businesses both here and in other states across the U.S. ; examples include Geotek (a consulting firm), the Southern Nevada Water Authority, ExxonMobil, and Nevada mining companies such as Kinross Gold. Our strong undergraduate program acts as a conduit for students who enter our M.S. and Ph.D. programs, which have impacts outlined in the self-study of our graduate programs.**

- 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. Researchers in the department have discovered that large areas of exposed rock contain naturally occurring asbestos. 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

**As outlined in VIII-a and b above the Geoscience undergraduate programs produce graduates who go on to pursue graduate degrees both here at UNLV and elsewhere, and who are employed by a wide variety of public and private sector businesses both here in Las Vegas and nationally.**

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 such integration are the participation of students in the activities listed below under productivity. Our undergraduate students are involved in faculty research through supervised independent study projects, employment in faculty laboratories, 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:

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

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

**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.**

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

Based on the assessments of the two B.S. programs we find that overall our undergraduate students are satisfying their learning outcomes. For example, B.S. Geology students had an average of 78.6% satisfactory performance across a range of 10 courses and associated laboratories (based on the most recent 2016 assessment). B.S. Earth and Environmental Science students had an average of 98.3% satisfactory performance across a range of 5 courses and associated laboratories (based on the most recent 2016 assessment). The UNLV UULO assessed for 2016 was Inquiry and Critical Thinking for which we found that 100% of majors in both undergraduate B.S. programs performed satisfactorily.

Based on these results, we have the following recommended changes for the EES undergraduate degree. The admissions committee recommends consideration of an additional indirect qualitative assessment metric for Learning Objective #2, assessed via GEOL 335, to be developed before next year's assessment report is due. For our Geosymposium changes that will be implemented next year include giving the students additional examples of previously-successful work to help students better understand the scope of this research project. Feedback from the faculty instructor indicates that students get too stuck on finding a suitable topic/hypothesis to test which results in less time available to fully work on the GIS modeling and final project presentation. Action items by the assessment committee designed to alleviate this problem, include that students will be required to have preliminary GIS maps prepared at an earlier date which will allow for feedback which they can then use to improve their final project.

We have the following recommended changes for the Geology undergraduate degree. Based on exit interviews, students complaints were largely focused around class sizes being too large, especially those that include a field component. The faculty believe this was an anomaly of a particularly large class size moving through the program. If that occurs again, the faculty will discuss mechanisms to avoid the problems encountered having very large field classes. For learning objective #1 (LO#1) we found that students were often weaker early in their degree program and became stronger with more coursework through time. The assessment committee met and discussed these results, and action items for early next year (Spring 2017) are for the department faculty as a whole, to consider mechanisms with which to help improve early program success in this learning objective. For UULO Critical Thinking objective #7, assessed via GEOL 430 projects, poster creation and presentations at our Geosymposium, we find difficulties among the students with finding a suitable topic/hypothesis. Changes that will be implemented next year in the GEOL 430 course include giving the students additional examples of previously-successful work to help students better understand the scope of this research project. Action items include requiring students to have preliminary GIS maps prepared at an earlier date which will allow for feedback from faculty. The students can use this feedback to improve their final project.

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.

3. 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?

**Yes, see immediately below.**

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

**Historical Perspective:** Six years ago, the Department began working on combining two undergraduate B.S. programs, Earth Science, and Environmental Geology, into a single program, the Earth and

Environmental Science program we have now, as well as revising our B.S. Geology degree. A proposal for streamlining, updating and improving this program was made in 2011 under great faculty effort, as suggested by a NSF-sponsored UNLV Geoscience curricular review in which all Geoscience faculty actively participated. The UNLV Geoscience undergraduate program underwent a complete reevaluation and revision. This review involved a 1 ½ day National Science Foundation external peer workshop attended by all faculty. There followed data gathering and committee reports on Objectives (what the goals are for our academic programs), Expectations (what the professional/academic community expects of our graduates and how we can improve), and Models (surveys of other geoscience programs and their approaches). As a result, two of our three undergraduate programs were entirely revised, the third was taken off the books. The Earth and Environmental Science undergraduate major was compared with other models of programs throughout the nation, underwent extensive faculty discussion and revision, and major curriculum changes were instituted by the faculty.

Two years ago, we had undergraduate exit surveys and job place questionnaires which Dr. Dave Kreamer initiated. Undergraduate exit surveys contained considerable information that was diverse, and conversely there were some commonalities. The responses were approximately 1/3 from the Geology B.S. undergraduate major (GEO) and 2/3 from the Earth and Environmental Science B.S. undergraduate major. Generally none of our majors took any form of earth science course in high school, about half had a college level earth science course, and about 80% took a 100 level Earth Science course at UNLV before declaring our major. Many students in our program declared a major late, and decided on their major for a variety of reasons ranging from wanting to change from physics or engineering, liking the outdoors, and anticipated enjoyment in working in the field. Decisions to attend UNLV were usually based on proximity to home and work, although some were related to scholarship opportunities. Positive comments had many common elements including: the quality of the professors and staff, the friendliness in the Department, the comfort students had in interacting and approaching their professors, and many mentioned the fieldtrips. Suggestions for improvement included: more class selection and offering classes more than once a year, have college-level advisors specific to Geoscience and better advisor knowledge as to which courses fulfill elective requirements or need waiver forms or approvals, better heating and cooling in our buildings on campus (we have two of the oldest buildings on campus), and better transportation i.e. field vehicles. Most of these issues have been addressed, e.g. we have in recent years offered several classes during both Fall and Spring semesters that have traditionally been offered only one semester.

4. 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 such as these are usually incrementally made by individual instructors each semester as a regular process of preparing courses which have been taught previously.**

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

**We do not currently have information pertaining to this question.**

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

7. 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. 7-12.**

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. 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 GEOL and EES programs from the Fall 2016 – Spring 2017 Undergraduate Catalog can be found at the following links.

Geology B.S. Major:

[http://catalog.unlv.edu/preview\\_program.php?catoid=16&poid=3960&returnto=2841](http://catalog.unlv.edu/preview_program.php?catoid=16&poid=3960&returnto=2841)

Earth and Environmental Science B.S. Major:

[http://catalog.unlv.edu/preview\\_program.php?catoid=16&poid=3937&returnto=2841](http://catalog.unlv.edu/preview_program.php?catoid=16&poid=3937&returnto=2841)

**Appendix 2:** Aside from the UNLV undergraduate admissions standards the Geoscience undergraduate program admission requirements are a minimum GPA of 2.50 for admission to the major.

**Appendix 3:** The 2016 assessment reports for the Geology B.S. and the Earth and Environmental Science B.S. 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://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, [gail.griffin@unlv.edu](mailto:gail.griffin@unlv.edu), 702-895-0482.