

PROGRAM OR AREA(S) OF STUDY UNDER REVIEW:

EARTH SCIENCES

Summary of Program Review:

NOTE about this review: This program review is a review of the **Earth Sciences Department**, which consists of three areas (programs): Earth Sciences (EART 110, GEOL 110, GEOL 111), Environmental Science (ENVS 115), and Geography (GEOG 101, 110). The new GIS Certificate program (GEOG) will undergo program review in 2024/2025.

Geology program review was conducted in 2021. Environmental Science and Geography will undergo separate reviews in the future.

A. Major Findings**1. Strengths:**

- High fill rates indicate evidence of effective scheduling practices.
- Average class size higher than institutional average.
- Successful course completion rates higher than institutional average.
- Earth Sciences courses serve as a GE requirement and serve transfer students.

2. Areas for Improvement:

- The department saw an overall decline in enrollment, which is consistent with the institution and California Community Colleges enrollment decline. The major factor in this decrease is due to Covid-19 during Spring 2020 through Spring 2022 where instruction abruptly shifted to online delivery.
- Develop degree and certificates in Earth Sciences to increase student demand and enrollment.
- GEOL 199 needs to be archived
- Develop stronger STEM focused intersectional pedagogy and curriculum.

3. Projected Program Growth, Stability, or Viability:

The average annual Earth Sciences-related job openings in Napa county is 540, for SF Bay Area it is 17,010, and in the state of California it is 106,500, according to RPIE.

The AGI report indicates employment projections from the U.S. Bureau of Labor Statistics (BLS) a 4.9% increase in geoscience jobs between 2019 and 2029. For comparison, the projected growth of the U.S. workforce over the same timeframe is expected to be 3.7%.

An advanced degree or certificate is required for occupations within the Earth Sciences.

Given this data and the role of Earth Scientists to find solutions to climate challenges, global natural resource, and natural hazards, the Earth Sciences department is projected stability and prepared for growth over the next few years.

B. Program's Support of Institutional Mission and Goals

1. Description of Alignment between Program and Institutional Mission:

- The courses reviewed in this Earth Sciences program review meet GE requirements and prepare students for evolving roles in a dynamic world.
- Courses serve students seeking transfer courses.

2. Assessment of Program's Recent Contributions to Institutional Mission:

- Development of Environmental Science AS-T degree

3. Recent Program Activities Promoting the Goals of the Institutional Strategic Plan and Other Institutional Plans/Initiatives:

- Participate in MESA/STEM internship program
- Participate in the STEM Summer Bridge programs
- Participate in the MESA/STEM Fair

C. New Objectives/Goals:

The immediate objectives are:

- Usher ENVS AS-T degree through curriculum
- Archive GEOL 199

The goals are:

- Increase GEOL 111 enrollment
- Draft AS-T in Geology and certificate degrees
- Develop a pathway partnership between local high schools, the geology program, and the local/regional geology workforce through curriculum alignment, field trips, guest lecture series, and volunteer/work experience.
- Improve student equity by increasing representation of accomplished people of color currently in the geosciences.

D. Description of Process Used to Ensure "Inclusive Program Review"

This report covers the following program, degrees, certificates, area(s) of study, and courses (based on the Taxonomy of Programs on file with the Office of Academic Affairs):

Program	Earth Sciences			
Area of Study	Geology	Geography	Earth Sciences	Environmental Science
Courses	GEOL 110	GEOG 101	EART 110	ENVS115
	GEOL 111	GEOG 110		
	GEOL 199			

Taxonomy of Programs, July 2022

SECTION I

I. PROGRAM DATA

A. Demand

1. Headcount and Enrollment

	2019-2020	2020-2021	2021-2022	Change over 3-Year Period
Headcount				
Within the Program	331	382	283	-14.5%
Across the Institution	8,181	7,208	6,714	-17.9%
Enrollments				
Earth Sciences	54	78	59	9.3%
EART-110	54	78	59	9.3%
Environmental Science	33	23	--	-100%
ENVS-115	33	23	--	-100%
Geography	72	98	84	16.7%
GEOG-101	24	44	33	37.5%

GEOG-110	48	54	51	6.3%
Geology	228	233	174	-23.7%
GEOL-110	186	198	142	-23.7%
GEOL-111	42	35	32	-23.8%
Within the Program	387	432	317	-18.1%
Across the Institution	33,102	30,409	25,580	-22.7%
<i>Source: SQL Enrollment Files</i>				

Headcount represents the number of unique students enrolled within the program during the academic year.

One student in 3 courses counts as “1”.

Enrollment reflects the number of registrations by individual students. One student in 3 courses counts as “3”.

RPIE Analysis: The number of students enrolled (headcount) in the Earth Sciences Program decreased by 14.5% over the past three years, while headcount across the institution decreased by 17.9%. Enrollment within the Earth Sciences Program decreased by 18.1%, while enrollment across the institution decreased by 22.7%.

*Enrollment in the following areas of study and courses changed by **more than 10%** ($\pm 10\%$) between 2019-2020 and 2021-2022:*

Area of study and course with enrollment increases:

- Geography (16.7%)
- GEOG-101 (37.5%)

Areas of study and courses with enrollment decreases:

- Environmental Science (-100%)
- ENVS-115 (-100%)
- Geology (-23.7%)
- GEOL-111 (-23.8%)
- GEOL-110 (-23.7%)

For Environmental Science and ENVS-115, which were offered in two of the past three years, enrollment decreased by 30.3% between 2019-2020 and 2020-2021.

Program Reflection:

Overall, enrollment has decreased by **18.1%** across the Earth Sciences department. This is below the overall decline across the institution of 22.7%.

Growth is evident in the Earth Science and Geography courses by **9.3%** and **16.7%**, respectively. Decline is evident in the geology courses and environmental sciences courses by 23.7% and 100%, respectively.

The geology, earth science, environmental science, and physical geography courses are introductory courses and fulfill GE requirements. World Geography is a requirement in the Child Family Studies degree program.

At this time, the department does not offer a transfer degree or certificate degree. To address the decreasing enrollment trend, linking the courses to an AS-T degree and certificate degrees could strengthen the department and demand for courses. Developing an AS-T in Geology and Environmental Science would provide another pathway choice for transfer students seeking gainful employment. Developing certificate programs that support non-transfer students into the workforce, such as in an area of geotechnical services and environmental technicians, should be considered. Connecting courses to a degree or certificate can improve student demand and enrollment.

An area of concern is the decrease in enrollment in the Environmental Science course. During the highest enrollment year (2019/2020), one section of ENVS 115 was offered each semester. Fall 2021 the course was assigned to an adjunct instructor who later had to decline the course, which resulted in class cancellation during Covid. Fall 2022 the course was canceled due to low enrollment, also during Covid. Given the California state mandates addressing Climate Change, it would be favorable to develop opportunities to prepare students for careers and jobs in the Earth Sciences fields.

2. Average Class Size

	2019-2020		2020-2021		2021-2022		Three-Year	
	Sections	Average Size	Sections	Average Size	Sections	Average Size	Average Section Size	Trend
Earth Sciences	2	27.0	4	19.5	4	14.8	19.1	-45.4%
EART-110	2	27.0	4	19.5	4	14.8	19.1	-45.4%
Environmental Science	2	16.5	1	23.0	--	--	18.7	--
ENVS-115	2	16.5	1	23.0	--	--	18.7	--
Geography	3	24.0	4	24.5	4	21.0	23.1	-12.5%
GEOG-101	1	24.0	2	22.0	2	16.5	20.2	-31.3%
GEOG-110	2	24.0	2	27.0	2	25.5	25.5	6.3%
Geology	7	32.6	10	23.3	8	21.8	25.4	-33.2%
GEOL-110	5	37.2	8	24.8	6	23.7	27.7	-36.4%
GEOL-111	2	21.0	2	17.5	2	16.0	18.2	-23.8%
Program Average*	14	27.6	19	22.7	16	19.8	23.2	-28.3%
Institutional Average*	1,348	24.6	1,171	25.9	1,105	23.1	24.6	-6.1%

Source: SQL Enrollment and Course Sections Files

Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$\frac{\text{Total \# Enrollments}}{\text{Total \# Sections}}$

Total # Sections

It is not the average of the three annual averages.

RPIE Analysis: Over the past three years, the Earth Sciences Program has claimed an average of 23.2 students per section. The average class size in the program has been lower than the average class size of 24.6 students per section across the institution during this period. Average class size in the program decreased by 28.3% between 2019-2020 and 2021-2022. Average class size at the institutional level decreased by 6.1% over the same period.

Average class size in the following areas of study and courses changed by more than 10% ($\pm 10\%$) between 2019-2020 and 2021-2022:

Areas of study and courses with decreases in average class size:

- Earth Sciences (-45.4%)
- EART-110 (-45.4%)
- GEOL-110 (-36.4%)
- Geology (-33.2%)
- GEOG-101 (-31.3%)
- GEOL-111 (-23.8%)
- Geography (-12.5%)

For Environmental Science and ENVS-115, which were offered in two of the past three years, average class size increased by 39.4% between 2019-2020 and 2020-2021.

Program Reflection:

The average class size for laboratory courses sharply decreased during 2020/2021 and 2021/2022, due to the need to reduce class size to address and meet mandatory safety restrictions and concerns related to Covid. Class size for labs were strictly limited to 18 in Fall 2021 and Spring 2022 to meet safety requirements.

The average class size for lecture courses decreased likely as a result of the Covid pandemic in 2020/2021 and 2021/2022.

Class size is anticipated to increase now that distance and space restrictions have been lifted, Covid is better understood, and more options for modes of instruction are available.

It is important to note that EART 110 is an integrated lecture/lab. The class size for labs are determined by the number of workstations in the lab classroom. There are 24 stations in the lab classroom and the average section size for EART 110 is 27, resulting in students doubling up at workstations in 2019/2020. The lab classroom has limited space and to accommodate growth in the department and maintain lab safety, additional lab sections would be necessary and a larger lab facility should be considered.

The decrease in GEOL 110 lecture in 2019/2020 is not alarming as it was intentional to add more sections and decrease the average class size from 40 closer to 30 to align with institutional averages, while still accommodating enrollment growth and maintaining good pedagogical practices of smaller class size.

3. Fill Rate and Productivity

Fill Rate*

	Enrollments*	Capacity	Fill Rate
2019-2020	387	432	89.6%
2020-2021	403	400	101%
2021-2022	296	334	88.6%
Three-Year Program Total	1,086	1,166	93.1%
Institutional Level	79,507	106,455	74.7%
Productivity*			
	FTEs	FTEF	Productivity
2019-2020	43.6	2.9	15.0
2020-2021	50.3	4.2	12.0
2021-2022	36.9	3.5	10.5
Three-Year Program Total	130.8	10.6	12.3
<i>Source: SQL Enrollment and Course Sections Files</i>			

***RPIE Analysis:** Fill rates within the Earth Sciences Program tend to be higher than the fill rate at the institutional level. [Compare program-level rate of 93.1% to institution-level rate of 74.7% over the past three years.] Between 2019-2020 and 2020-2021, enrollment increased while capacity decreased, resulting in an increase in fill rate. Between 2020-2021 and 2021-2022, both enrollment and capacity decreased, resulting in a decrease in fill rate (due to a higher rate of decrease in enrollment).*

Productivity ranged from 10.5 to 15.0 over the past three years. [Productivity has not been calculated at the institutional level.] The three-year program productivity of 12.3 is lower than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTEs (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

**Note: Fill rates and productivity reported in the table do not include two Earth Sciences section offerings for summer terms over the past three years. As a result, the enrollment figures reported here might differ from those reported in Section I.A.1.*

Program Reflection:

Fill rate in the department is relatively high at 93.1% which indicates courses are scheduled at appropriate days and times that maximize enrollment. All other course sections are scheduled online, or hybrid with in-person meetings during the day. If an additional sections of EART 110 Lec/Lab were to be added, we can consider offering it in the evening.

One physical geology (GEOL 110) online course was offered each during Summer 2021 and Summer 2022 and is not reflected in the data above.

4. Labor Market Demand

Program Reflection:

This section does not apply to the Earth Sciences Program, as it is not within the Career Technical Education Division.

While this section is not required for the Earth Sciences program review, it is valuable information when making decisions regarding the direction of the department and to identify areas of growth and workforce need.

The two Labor Market Data sources used are RPIE and American Geosciences Institute (AGI).

AGI is under the directive of National Academy of Sciences as a global network of associations representing geoscientists (Earth scientists). The Institute maintains databases of academic geoscience programs and conducts regular surveys on geoscience graduates in the United States and globally. It also provides focused workforce data information and conducts regular surveys and reports on the state of the geoscience (Earth Science) workforce.

Economic Development Department Standard Occupational Classification Description (SOC Code):	Numeric Change in Employment	Projected Growth (% Change in Positions; 2018 Base Employment vs. 2028 Projected Employment)	Projected Number of Positions
Occupations Related to Disciplines in Earth Sciences			
Napa County (2018-2028)	+220	+9.6%	2,600
Bay Area ^A (2018-2028)	+15,270	+11.2%	163,730
California (2018-2028)	+90,500	+15.8%	720,380
Occupations Related to Disciplines in Geography			
Napa County (2018-2028)	+440	+6.7%	10,320

Bay Area ^A (2018-2028)	+11,180	+9.9%	136,870
California (2018-2028)	+68,400	+9.4%	1,017,150
Combined Occupations Related to Earth Science and Geography			
Napa County (2018-2028)	+540	+7.4%	11,240
Bay Area ^A (2018-2028)	+17,010	+10.1%	207,980
California (2018-2028)	+106,500	+11.3%	1,317,900
<p><i>Source: Economic Development Department Labor Market Information, Occupational Data, Occupational Projections (http://www.labormarketinfo.edd.ca.gov)</i></p> <p><i>^ABay Area counties include: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma. Figures also include San Benito County (reported with projections for Santa Clara County).</i></p>			

RPIE Analysis: The figures reported in the table above pertain to Standard Occupational Classifications (SOC) from the Economic Development Department of California. Due to the large number of occupations included in the analysis, a list of SOC is not included here. Please contact RPIE for a full list of occupations.

For Occupations related to disciplines in Earth Sciences, the Economic Development Department projects an **increase in 220 positions for Napa County and an increase of 15,270 positions for the Bay Area for the Earth Sciences Program (Earth Sciences focused) by 2028 (compared to 2018)**. This increase in positions translates into a **9.6% increase for the industry within Napa County and an 11.2% increase for the industry within the Bay Area (not including Napa County, 2018-2028)**. **The projections for the state of California reflects the projected growth in positions reflecting 15.8% growth in the industry (for 2018-2028)**.

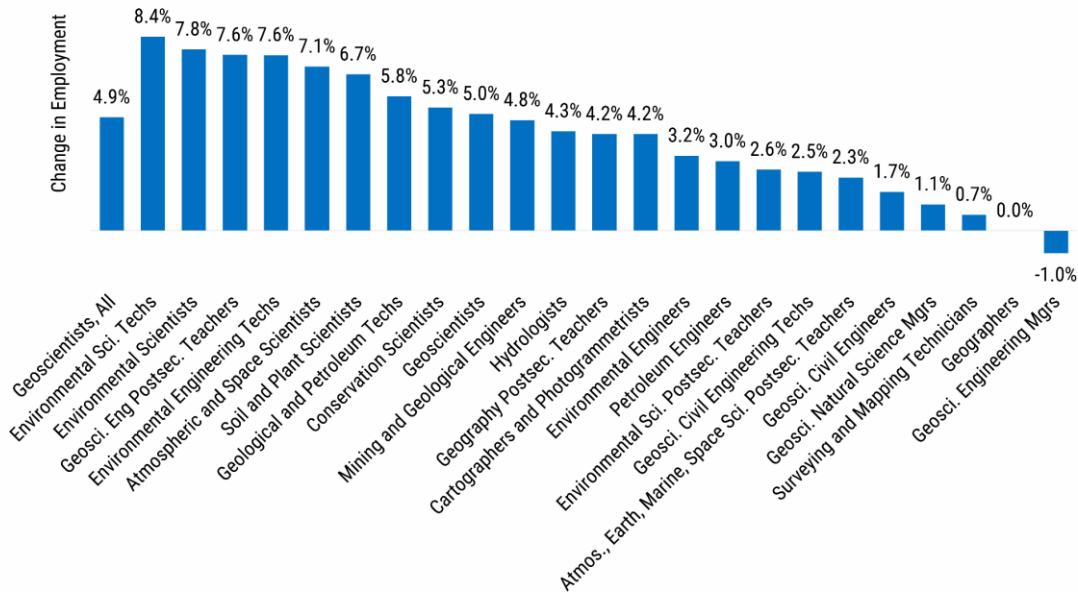
For occupations related to disciplines in Geography, the Economic Development Department projects an **increase in 440 positions for Napa County and an increase of 11,180 positions for the Bay Area for the Earth Sciences Program (Geography focused) by 2028 (compared to 2018)**. This increase in positions translates into a **6.7% increase for the industry within Napa County and a 9.9% increase for the industry within the Bay Area (not including Napa County, 2018-2028)**. **The projections for the state of California reflects the projected growth in positions reflecting 9.4% growth in the industry (for 2018-2028)**.

For a combined analysis of occupations related to disciplines in Earth Science and Geography, the Economic Development Department projects an **increase in 540 positions for Napa County and an increase of 17,010 positions for the Bay Area for the Earth Sciences Program (Earth Sciences and Geography combined) by 2028 (compared to 2018)**. This increase in positions translates into a **7.4% increase for the industry within Napa County and a 10.1% increase for the industry within the Bay Area (not including Napa County, 2018-2028)**. **The projections for the state of California reflects the projected growth in positions reflecting 11.3% growth in the industry (for 2018-2028)**.

AGI Report: Geoscience Workforce Projections 2019-2029. Geoscience workforce expected to grow by 4.9%

Employment projections from the U.S. Bureau of Labor Statistics (BLS) indicate an overall 4.9% increase in geoscience jobs between 2019 and 2029, from 460,242 jobs in 2019 to 482,726 jobs in 2029. For comparison, the projected growth of the U.S. workforce over the same timeframe is expected to be 3.7%. While growth rates for individual geoscience occupations range between 0% and 8.4% for all but geoscience engineering managers (-1%), those occupations projected to gain the greatest number of jobs are environmental scientists (7,100 jobs), environmental science technicians (2,900 jobs), and environmental engineers (1,800 jobs).

Projected Geoscience Workforce Changes by Occupation (2019-2029)



Credit: AGI; data derived from the U.S. Bureau of Labor Statistics, Employment Projections

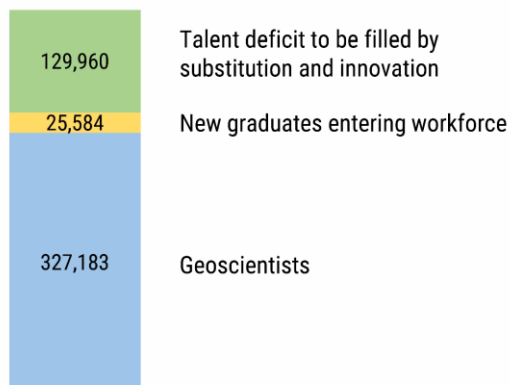
The majority of geoscience job growth over the coming decade will be within the professional, scientific and technical services sector where 39% of geoscientists currently work. This sector is projected to gain just over 16,000 jobs between 2019 and 2029, an 8.4% increase over this period. The support activities for mining sector which includes oil and gas support activities, currently employs approximately 2% of geoscientists and is expected to grow by 32% gaining just over 3,500 jobs.

Of those industries projected to see a decline in total geoscience employment between 2019 and 2029, the oil and gas extraction industry is projected to contract the most with a reduction of just over 2,800 jobs, followed by the federal government which is projected to shed just over 1,000 jobs. The utilities, wholesale trade, and manufacturing sectors are projected to shed a total of 700 jobs by 2029.

Based on the age demographics of the current geosciences workforce as identified by the BLS, with an average retirement age of 65, then 27% of the existing geoscience workforce will be retiring by 2029. The number of geoscience graduates entering the workforce each year will not be sufficient to fill the gap created by these retirements and the addition of over

22,000 new jobs that are projected to be created in the profession by 2029. As a result, the expected geoscience workforce deficit will be approximately 130,000 full-time equivalent geoscientists by 2029.

Geoscience Workforce Talent Deficit in 2029



Credit: AGI; data derived from the U.S. Bureau of Labor Statistics, Employment Projections and Current Population Survey, and AGI Directory of Geoscience Departments

Full employment in the geosciences is expected to continue over the coming decade and we expect there will be a continued increase in the use of innovative technologies such as artificial intelligence and machine learning to fill the expected talent gap by increasing workplace efficiencies.

Source: AGI Date updated: 2020-10-26. Data Brief 2020-025. Written and compiled by Leila Gonzales and Christopher Keane, AGI, October 2020 <https://www.americangeosciences.org/geoscience-currents/geoscience-workforce-projections-2019-2029#:~:text=Employment%20projections%20from%20the%20U.S.,is%20expected%20to%20be%203.7%25>.

Program Reflection:

The average annual Earth Sciences-related job openings in Napa county is 540, for SF Bay Area it is 17,010, and in the state of California it is 106,500, according to RPIE.

The AGI report indicates employment projections from the U.S. Bureau of Labor Statistics (BLS) a 4.9% increase in geoscience jobs between 2019 and 2029. For comparison, the projected growth of the U.S. workforce over the same timeframe is expected to be 3.7%.

The report also states 27% of the existing geoscience workforce will be retiring by 2029 and the expected geoscience workforce deficit will be approximately 130,000 full-time equivalent geoscientists.

Occupations within the Earth Sciences require advanced education or certificate completions. The Earth Sciences department currently does not have a transfer degree or certificate degree options. Given the projected increase in Earth Science-related jobs, an AS-T Environmental Science degree and a Certificate in Geographic Information Systems (GIS) are already in development. Future considerations include an AS-T in Geology. Certificate programs that support non-transfer students, such as in an area of geotechnical services are also under consideration.

Given California’s mandates to address climate change, the courses within the Earth Sciences can be positioned to provide training and preparation for occupational growth.

B. Momentum

1. Retention and Successful Course Completion Rates

Level	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
	Rate	Course Rate vs. Program Rate		Rate	Course Rate vs. Program Rate	
		Above	Below		Above	Below
Earth Sciences	97.3%	X		94.1%	X	
EART-110	97.3%	X		94.1%	X	
Environmental Science	96.3%	--	--	94.4%	X	
ENVS-115	96.3%	--	--	94.4%	X	
Geography	96.4%	--	--	95.6%	X	
GEOG-101	97.0%	X		96.0%	X	
GEOG-110	96.1%	--	--	95.4%	X	
Geology	95.2%	--	--	88.1%		X
GEOL-110	95.1%	--	--	88.9%		X
GEOL-111	95.4%	--	--	84.3%		X
Program Level		95.9%			91.1%	
Institutional Level		90.4%			74.8%	

Source: SQL Enrollment Files

-- Indicates a value that is within 1% of the program-level rate.

Bold italics denote a statistically significant difference between the course-level rate and the program-level rate.

Bold denotes a statistically significant difference between the program-level rate and the institutional rate.

Note: Grades of EW (Excused Withdrawal) for spring 2020 and beyond are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: Over the past three years, the retention rate for the **Earth Sciences Program was significantly higher than the rate at the institutional level.** The retention rates of courses within the program were not significantly different from the program-level rate. The retention rate for the Earth Sciences Program falls in the fourth quartile (Q4) among program-level retention rates (across 58 instructional programs, over the past three years). The retention rate for Earth Sciences is among the top 25% of retention rates among NVC programs.

Over the past three years, the successful course completion rate for the Earth Sciences Program was significantly higher than the rate at the institutional level. The successful course completion rates for Geology and GEOL-111 were significantly lower than the program-level rate. The successful course completion rates for Geography and GEOG-110 were significantly higher than the program-level rate. The successful course completion rate for the Earth Sciences Program falls in the fourth quartile (Q4) among program-level successful course completion rates (across 58 instructional programs, over the past three years). The successful course completion rate for Earth Sciences is among the top 25% of successful course completion rates among NVC programs.

Over the past three years, the difference between retention and successful course completion at the program level (4.8%) was significantly lower than the difference at the institutional level (15.6%). This figure represents the proportion of non-passing grades assigned to students (i.e., grades of D, F, I, NP).

The following Earth Sciences Program course claimed a difference (between retention and successful course completion) that exceeded 10%:

- GEOL-111 (11.1%)

Program Reflection:

High retention rates can be attributed to the quality of student-faculty communication and student support provided by department faculty. Full-time and part-time faculty are empathetic, community-focused, and readily available to the students.

A second contributing factor to high retention is the variety of teaching methods. Project based methods, applications based methods, and topic conceptualization are used throughout the labs and lectures.

Most students that enroll in the department courses are not science majors and historically, the courses have been taught from an “appreciation” perspective. The past 4 years, that approach has changed and the courses have incorporated necessary conceptualized math, primary and secondary research data, and standard science report writing.

2. Student Equity

	Retention Rates (Across Three Years)		Successful Course Completion Rates (Across Three Years)	
	Program Level	Institution Level	Program Level	Institution Level
African American/Black	94.2%	87.5%	85.6%	66.6%
Latinx/Hispanic			90.7%	71.2%

First Generation			90.8%	73.9%
Veteran			92.3%	72.6%
19 or less			92.2%	73.1%

Source: SQL Enrollment Files

Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in **bold italics**.

Shaded cells pertaining to retention rates indicate that statistically significant differences for those groups were not found at the institutional level.

Note: Grades of EW (Excused Withdrawal) for spring 2020 and beyond are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: This analysis of student equity focuses on the five demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all other demographic groups, combined) over the past three years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the five groups listed above.

Within the Earth Sciences Program, the retention rate among African American/Black students was higher than the rate at the institutional level. (The difference was not statistically significant.)

Within the Earth Sciences Program, the successful course completion rates among African Americans/Blacks, Latinx/Hispanics, First Generation students, Veterans, and students 19 or less were significantly higher than the rates at the institutional level.

These patterns are consistent with the findings that emerged from the comparison of retention and successful course completion at the program vs. institutional level, where the program-level rates were significantly higher than the institution-level rates for both retention and successful course completion. (See Section I.B.1 above).

Program Reflection:

Retention among African American students is 94.2%, however the successful completion is 85.6%. This indicates students are staying in the course, but not receiving the support needed to successfully complete, or to withdraw from the course if needed. Successful completion rates for all three demographics are higher than institutional success rates.

Strategies to implement/expand equity include STEM-focused DEI education and professional learning for department faculty, implementing intersectional curriculum and pedagogy, and increasing representation of geoscientists of color via discussion panels and guest speakers.

A second strategy to address equity is to collaborate with other NVC STEM programs and Napa County middle and high schools in the Pilot a STEM Summit. The Summit is a supportive academic pipeline that would better prepare students for college-level STEM programs.

3. Retention and Successful Course Completion Rates by Delivery Mode (of Courses Taught through Multiple Delivery Modes, i.e., In-Person, Hybrid, and Online)

This section does not apply to the Earth Sciences Program, as courses associated with the program were not offered through multiple delivery modes within the same academic year between 2019-2020 and 2021-2022.

C. Student Achievement

1. Program Completion

This section does not apply to the Earth Sciences Program, as the program does not confer any degrees or certificates, based on the most recent taxonomy (July 2022).

2. Program-Set Standards: Job Placement and Licensure Exam Pass Rates

This section does not apply to the Earth Sciences Program, as the discipline is not included in the Perkins IV/Career Technical Education data provided by the California Community Colleges Chancellor's Office, and licensure exams are not required for jobs associated with the discipline.

SECTION II

II. CURRICULUM

A. Courses

Subject	Course Number	Date of Last Review <i>(Courses with last review dates of 6 years or more must be scheduled for immediate review)</i>	Has Prerequisite* Yes/No & Data of Last Review	In Need of Revision <i>Indicate Non-Substantive (NS) or Substantive (S) & Academic Year</i>	To Be Archived (as Obsolete, Outdated, or Irrelevant) & Academic Year	No Change
EART	110	01/15/2016	no	no		no change
ENVS	115	Not Available	no	no		no change
GEOG	101	Not Available	no	no		no change
GEOG	110	Not Available	no	no		no change
GEOL	110	06/01/2019	no	no		no change
GEOL	111	Fall 2019	no	no		no change
GEOL	199				yes	

*As of fall 2018, prerequisites need to be validated (in subsequent process) through Curriculum Committee.

B. Degrees and Certificates⁺

Degree or Certificate & Title	Implementation Date	Has Documentation Yes/No	In Need of Revision+ and/or Missing Documentation & Academic Year	To Be Archived* (as Obsolete, Outdated, or Irrelevant) & Academic Year	No Change
Environmental Science AS-T	Fall 2023	yes			

*As of fall 2018, discontinuance or archival of degrees or certificates must go through the Program Discontinuance or Archival Task Force.

⁺Degrees and Certificates cannot be implemented until the required courses in them are approved and active.

Program Reflection:

There are no curriculum revisions needed at this time. The Environmental Sciences AS-T is in the process of curriculum approval with the intended implementation date of Fall 2023. All courses required for the transfer degree already exist.

Planning in progress for a Geology AS-T is in progress with the intended implementation date of Fall 2024. Two courses, Historical Geology Lecture and Historical Geology Lab need to be developed to align with TMC.

SECTION III

III. LEARNING OUTCOMES ASSESSMENT

A. Status of Learning Outcomes Assessment

Learning Outcomes Assessment at the Course Level

Number of Courses	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
7	1	1	14%	14%

Learning Outcomes Assessment at the Program/Degree/Certificate Level

Degree/Certificate	Number of Outcomes*	Number of Outcomes Assessed	Proportion of Outcomes Assessed

		Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years

Program Reflection:

Assessment is up to date and ongoing.

GEOL 199 is offered intermittently based on student demand and will be archived in Fall 2022.

B. Summary of Learning Outcomes Assessment Findings and Actions

Program Reflection:

SECTION IV

IV. PROGRAM PLAN

Based on the information included in this document, the program is described as being in a state of:

- Viability
- Stability
- Growth

*Please select ONE of the above.

This evaluation of the state of the program is supported by the following parts of this report:

Relative stability in the department is indicated by:

- Student enrollment decreased by 18.1% over the past three years, healthier than the institutional decrease of 22.7%.
- The average class size within the department is 23.2 students per section.

- Fill rates within the Earth Sciences department are at 93.1%, higher than the fill rate at the institutional level.
- Successful course completion rates were higher than the institution.
- Labor Market Demand shows projected growth in Earth Science-related jobs within Napa County at +9.8% and +10.4% in the San Francisco Bay Area.

Complete the table below to outline a three-year plan for the program, within the context of the current state of the program.

PROGRAM: EARTH SCIENCES

Plan Years: 2023-2024 through 2025-2026

Strategic Initiatives Emerging from Program Review	Relevant Section(s) of Report	Implementation Timeline: Activity/Activities & Date(s)	Measure(s) of Progress or Effectiveness
Environmental Science AS-T	I. Program Data 4. Labor Mkt Demand I. Program Data A. Demand 1. Enrollment	Fal 2023	Complete curriculum approval process
Geology AS-T	I. Program Data 4. Labor Mkt Demand I. Program Data A. Demand 1. Enrollment	Fall 2024	Complete curriculum approval process
GIS Certificate	I. Program Data 4. Labor Mkt Demand I. Program Data A. Demand 1. Enrollment	Fall 2023	Complete curriculum approval process
DEI and Intersectional pedagogy and curriculum into classes.	I. Program Data B. Momentum 2. Student Equity	Spring 2023 and beyond	increase in student retention and success rates.

Describe the current state of program resources relative to the plan outlined above. (Resources include: personnel, technology, equipment, facilities, operating budget, training, and library/learning materials.) Identify any anticipated resource needs (beyond the current levels) necessary to implement the plan outlined above.

Note: Resources to support program plans are allocated through the annual planning and budget process (not the program review process). The information included in this report will be used as a starting point, to inform the development of plans and resource requests submitted by the program over the next three years.

Description of Current Program Resources Relative to Plan:

- Reliable and consistent wi-fi in lab classroom
- Dedicated space for existing geology equipment used in rock specimen preparation and laboratory experiments (a dedicated workroom for rock cutter/saw, sediment sorting equipment, rock splitter)
- The lab classrooms require assessment of existing equipment (microscopes, etc) and upgrades if necessary.
- Updating the “map room” to be used as a second Earth Sciences lab.
- Licensing renewal for ESRI software
- Develop an Earth Sciences learning environment/lab in the Rose Garden space outside the Geology Lab. This garden space can be re-landscaped with two pathways that walk students and Napa community members through the geologic history of California and Napa County. Rock specimens from the Great Valley Sequence, Franciscan Formation, and Sonoma Volcanics can be donated, labeled, and placed. Additional elements could also include native plants and Napa County watershed information.

V. PROGRAM HIGHLIGHTS

The program-level plan that emerged from the last review included the following initiatives:

Earth Sciences does not have a previous program review, but Geology (now combined with Earth Sciences) underwent PR in 2021. These are the strategic initiatives emerging from Geology program review, spring semester of 2021:

- Increase GEOL 111 enrollment
- Develop an AS-T degree and/or geotech certificates
- Recruit adjunct instructors
- Improve student equity within the geosciences
- Revise outdated Curriculum
- Complete GEOL 199 CLO assessment

A. Accomplishments/Achievements Associated with Most Recent Three-Year Program-Level Plan

- Hiring 1 or more adjunct geology instructors.
- Fill rate increased, reflecting high demand for earth sciences courses and effective scheduling practices.
- Curriculum revisions were made and current courses are updated.
- Developing an Environmental AS-T degree

B. Recent Improvements

- The department implemented an effective adjunct hiring process, resulting in 2 new hires.

C. Effective Practices

- The department incorporates effective scheduling practices, resulting in a high fill rate.
- The faculty actively engage students in labs and lectures and are available outside of scheduled class time for academic support.

Completed by Supervising Administrator:

Robert Van Der Velde, Senior Dean

Date:

11/14/22

Strengths and successes of the program, as evidenced by analysis of data, outcomes assessment, and curriculum:

Earth Sciences is a small program not currently awarding any degrees, but it provides preparation for transfer with general education courses. Although enrollments declined due to COVID-related restrictions, numbers are rebounding and the development of a GIS program is supported by labor force data showing strong employment growth for students with this credential.

Areas of concern, if any:

As a one-person faculty program, support from a strong adjunct faculty is essential.

Recommendations for improvement:

Develop AS-T in Environmental Science and Geology; Continued attention to enrollment, carefully monitor course offerings to add where demand dictates.

Anticipated Resource Needs:

Resource Type	Description of Need (Initial, Including Justification and Direct Linkage to State of the Program)
Personnel: Faculty	Strong adjunct faculty are essential, especially for development of a GIS certificate tied to labor market needs.
Personnel: Classified	
Personnel: Admin/Confidential	
Instructional Equipment	
Instructional Technology	The program requires stable and up-to-date technology to keep pace with the needs of transfer programs and employers
Facilities	
Operating Budget	
Professional Development/ Training	
Library & Learning Materials	

