

**Utah System of Higher Education
New Academic Program Proposal
Cover/Signature Page - Abbreviated Template**

Institution Submitting Request: University of Utah

Proposed Program Title: BS/BA in Biol. with emphasis in Ecology, Evol., and Environm¹

Sponsoring School, College, or Division: College of Science

Sponsoring Academic Department(s) or Unit(s): School of Biological Sciences

Classification of Instructional Program Code¹ : 26.1310

Min/Max Credit Hours Required of Full Program: Min Cr Hr / Max Cr Hr

Proposed Beginning Term²: Fall 2019

Institutional Board of Trustees' Approval Date:

Program Type:

☐	Certificate of Proficiency	☐	Entry-level CTE CP	☐	Mid-level CP
☐	Certificate of Completion				
☐	Minor				
☐	Graduate Certificate				
☐	K-12 Endorsement Program				
☐	NEW Emphasis for Regent-Approved Program <i>Credit Hours for NEW Emphasis Only:</i> Min Cr Hr / Max Cr Hr <i>Current Major CIP:</i> 26.1310 <i>Current Program Title:</i> Emphasis name change proposal <i>Current Program BOR Approval Date:</i>				
☐	Out of Service Area Delivery Program				

Chief Academic Officer (or Designee) Signature:

I, the Chief Academic Officer or Designee, certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Please type your first and last name _____ Date: _____

☐ I understand that checking this box constitutes my legal signature.

¹ For CIP code classifications, please see <http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55>.

² "Proposed Beginning Term" refers to first term after Regent approval that students may declare this program.

**Utah System of Higher Education
Program Description - Abbreviated Template**

Section I: The Request

University of Utah requests approval to offer the following : BS/BA in Biol. with emphasis in Ecology, Evol., and Environment effective Fall 2019. This program was approved by the institutional Board of Trustees on .

Section II: Program Proposal/Needs Assessment

Program Description/Rationale

Present a brief program description. Describe the institutional procedures used to arrive at a decision to offer the program. Briefly indicate why such a program should be initiated. State how the institution and the USHE benefit by offering the proposed program. Provide evidence of student interest and demand that supports potential program enrollment.

This proposal to rename and reorganize our emphasis in Ecology, Evolution and Environment is the outcome of a three-year effort to reform the undergraduate curriculum in the School of Biological Sciences (School). The initial organization of the reform effort was carried out by a task force that included members from all Divisions within the School (previously Department), whose goals were to assess (and remediate, if needed) the freshman-year experience and to make it easier for undergraduates to complete the major in four years.

Discussions were held among faculty in each of the Divisions as well as groups of faculty representing specific teaching areas (e.g. Cell Biology or Ecology). There was strong participation among both tenure-line and career-line faculty, and the discussions identified three major curriculum problems. First, in their first year, Biology students were not being exposed to the full breadth of the biological sciences, nor being offered laboratory classes. Second, biology has grown enormously in the 20+ years since our last curriculum reorganization, and this explosive growth has led potential employers of our undergraduates to seek more specialized training. Third, the diversity of course offerings makes it challenging for many undergraduates to identify the set of courses that best meets their interests and career goals.

To address the first of these challenges, a new first-year Biology curriculum has been developed. This course sequence, Fundamentals of Biology, includes two 3-credit lecture-type courses, and two 1-credit inquiry-based labs (8 credits total). The wide-ranging content of these courses was developed in consultation with the entire Biology faculty. This course sequence is being offered now (Fall 2018) with limited enrollment (~100 students), and will be available to all students beginning Fall 2019.

To address challenges two and three (the growth of the field of biology and difficulty for undergraduates to identify coherent sets of courses), the School proposes to expanding the number of emphases. The reorganization and renaming of an emphasis to Ecology, Evolution and Environment is a part of a larger effort that includes four proposed new emphases (Genetics & Genomics, Microbiology, Plant Biology, and Neurbiology). In addition, the School proposes changes in the required Biology core courses to allow increased flexibility and greater specialization. The proposed new core series will include the BIOL 1600 sequence (8 credits), BIOL 2020 (Cell Biology, 3 cr), and BIOL 2030 (Genetics, 3 cr). These emphases were approved by the school's Curriculum Committee, and presented to the faculty on October

22nd, 2018, and won near unanimous approval (29 for, 0 opposed, 1 abstention).

The current emphasis (Ecology & Organismal Biology) attracts 9% of our 1160 Biology major, and it is anticipated that this number will increase with the proposed name change. This emphasis is important for our students, who tend to be passionate about environmental issues. Most of the PAC-12 institutions have entire departments of Ecology and Evolution. This emphasis organizes instruction in an important area of biology, and offering this emphasis is important for serving the undergraduates of this state.

Labor Market Demand

Provide local, state, and/or national labor market data that speak to the need for this program. Occupational demand, wage, and number of annual openings information may be found at sources such as Utah DWS Occupation Information Data Viewer (jobs.utah.gov/jsp/wi/utalmis/gotoOccinfo.do) and the Occupation Outlook Handbook (www.bls.gov/oco).

There are career opportunities for undergraduate students earning a BS or BA in Biology with emphasis in Ecology, Evolution, and Environment in Utah. One example is with Federal Land Management, for example the US forest service, the Bureau of Land Management, or the National Park service, and also with state parks. Biologists employed in this sort of profession can work in diverse positions, including forester, fisheries expert, botanist, wildlife management, conservation biology, or in out-reach to the public. Recent years have seen strong growth in park visitation, and so this sort of employment should show strong demand for employees. Ecologists might also be employed in land administration (e.g. SITLA). Undergraduates with an emphasis in Ecology, Evolution, and Environment can also work in state offices such as the Utah Department of Environmental Quality. Diverse divisions might employ ecologists, including Division of Water Quality and Division of Air Quality. There are also jobs in the private sector. For example students receiving this emphasis might be employed as technicians in clinical or analytical labs, e.g. where expertise at insect identification could be highly valuable. The specialized training in this emphasis will make students especially attractive for positions as industrial ecologists (including Environmental Scientists). In general, these positions have a projected growth of ~ 2 - 3% per year.

The United States Bureau of Labor Statistics lists the following occupations with number of jobs nationally (data from 2015, 2016, or 2017): biological educators (49,910), biological technicians (82,100), biological scientists (37,590), conservation scientists (22,040), environmental engineers (53,800), environmental scientists (89,500), farming, ranching, and agricultural managers (1,028,700), forest and conservation workers (6,870), forest and conservation technicians (29,810), museum workers (31,000), natural science managers (56,700), urban planners (36,000), and zoologists and wildlife biologists (19,400).

This emphasis will also assist with the Governor's vision of a well-educated workforce. We expect this emphasis to increasing the rates at which young adults earn a BS/BA in Biology because its core requirements allow greater flexibility than the standard BS/BA in Biology at the University of Utah. In addition, the emphasis will help undergraduates to enroll in a coherent set of courses that that emphasizes Ecology, Evolution, and the Environment. As described above, this area is important to the Utah economy, and a degree carrying this emphasis will help to meet the demands of our current and future workforce.

Consistency with Institutional Mission/Impact on Other USHE Institutions

Explain how the program is consistent with the institution's Regents-approved mission, roles, and goals. Institutional mission and roles may be found at higheredutah.org/policies/policyr312/. Indicate if the program will be delivered outside of designated service area; provide justification. Service areas are defined in higheredutah.org/policies/policyr315/.

The proposed emphasis in Ecology, Evolution and Environment is consistent with the mission of the U: "The University of Utah fosters student success by preparing students from diverse backgrounds for lives of impact as leaders and citizens. We generate and share new knowledge, discoveries, and innovations, and we engage local and global communities to promote education, health, and quality of life."

The program will be delivered within our designated service area (at the U of U. in Salt Lake County).

Broad learning objectives for the Ecology, Evolution and Environment Emphasis in Biology

- **Ecology Evolution and Environment:** Students will understand the fundamental principles of ecology, evolution, and environmental biology. More specifically, students will understand how organisms interact with each other and their environment; they will understand fundamental evolutionary processes, such as mutation, genetic drift, and evolution by natural selection; they will understand population dynamics, how communities are structured and function, how energy flows through ecosystems, how humans influence ecosystems, and the integration and scaling of these ecological and evolutionary processes through space and time.
- **Structure and function**
Students will be able to apply knowledge of molecular, cellular, and organismal structures to explain the diverse set of functions – ranging from the sub cellular to behavioral to ecological and environmental – that underlie the remarkable diversity of organisms.
- **Systems:** Students will be able to explain how biological units interact to give rise to emergent properties at multiple levels of organization. These interactions range from the cellular level to cycling of matter to interdependency of organisms with their environment.
- **Ability to apply the process of science.**
Students will be able to apply the process of science to identify knowledge gaps, formulate hypotheses, and test them against experimental and observational data to advance an understanding of the natural world, and execute experiments and field studies.
- **Ability to use quantitative reasoning.**
Students will be able to use mathematical and computational methods and tools to describe biological systems and be able to apply quantitative approaches, such as statistics, quantitative analysis of dynamic systems, or mathematical modeling.
- **Ability to participate in the interdisciplinary nature of science through clear communication and collaboration with other disciplines**
Students will be able to use and apply concepts in ecological, evolutionary and environmental biology to communicate research data to broad audiences, write research articles and/or grant proposals, and present posters at meetings or symposia.
- **Ability to explain the relationship between science and society**
Students will be able to evaluate the interactions between organisms and society. Students will also evaluate public perception and decision-making about science relevant to this topic, and clearly communicate their implications to broad audiences.

Assessment of ELOs

- **Assessments and grades in courses.** Assessments (formative and summative) and grades in the emphasis-required and emphasis recommended elective courses will be used to evaluate student performance in the various targeted learning outcomes. For example, presentations in the seminar course are used to evaluate communication skills or grades in laboratory/field courses are used to evaluate the ability to apply the process of science. These data will be used by the school to interpret trends and as needed address curricular changes to improve certain outcomes.
- **Exit surveys.** Graduating students will be encouraged to fill out an on-line survey that asks for

self-assessment in emphasis-specific learning outcomes.

- **Feedback from alumni and tracking students after graduation.** Alumni will be periodically surveyed to ask how well their training in the Ecology, Evolution and Environment emphasis has helped them in their careers, and as members of an engaged society. The program will also collect data on the first position taken by graduates after completing their emphasis with the assumption that obtaining professional positions/graduate admissions is a measure of our graduates achieving the desired learning outcomes.

Finances

What costs or savings are anticipated in implementing the proposed program? If new funds are required, indicate expected sources of funds. Describe any budgetary impact on other programs or units within the institution.

This new emphasis will have no impact on the finances of the University of Utah. All courses in the emphasis are already being taught.

Section III: Curriculum

Program Curriculum

List all courses, including new courses, to be offered in the proposed program by prefix, number, title, and credit hours (or credit equivalences). Indicate new courses with an X in the appropriate columns. The total number of credit hours should reflect the number of credits required to receive the award. **For NEW Emphases, skip to emphases tables below.**

For variable credits, please enter the minimum value in the table below for credit hours. To explain variable credit in detail as well as any additional information, use the narrative box below.

Course Number	NEW Course	Course Title	Credit Hours
General Education Courses (list specific courses if recommended for this program on Degree Map)			
General Education Credit Hour Sub-Total			
Required Courses			
Add Another Required Course			
Required Course Credit Hour Sub-Total			
Elective Courses			
Add Another Elective Course			
Elective Credit Hour Sub-Total			
Core Curriculum Credit Hour Sub-Total			0

Are students required to choose an emphasis for the already-existing degree?	Yes or	No
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Course Number	NEW Course	Course Title	Credit Hours
Name of Emphasis:		Ecology, Evolution, and Environment	
required		BIOL 3410 Ecology and Evolution	3
Select 1 from A		BIOL 3310 Comparative Vertebrate Morphology	3
Organismal		BIOL 3315 Comparative Vertebrate Morphology Lab	1
		BIOL 3320 Comparative Physiology	3
Focus		BIOL 3325 Comparative Physiology Lab	3
		BIOL 3350 Physiology of Plants	3
		BIOL 3370 Microbial Biology	3
		BIOL 3430 Behavioral Ecology	3
		BIOL 5425 Mycology	4
		BIOL 5275 Microbial Diversity, Genomics & Evolution	4
		BIOL 5365 Form, Function & Adaptation of Plants	4
		BIOL 5370 Mammalogy	3
		BIOL 5385 Ornithology	4
		BIOL 5435 Plant Systematics	4
		BIOL 5445 Entomology	4
		BIOL 5460 Plant Ecology in a Changing World	3
		BIOL 5555 Ecol. & Evol. of Parasites & Pathogens	3
		BIOL 5910 Mathematical Models in Biology	3
Select 1 from B		BIOL 3270 Microbial Ecosystems	3
Ecology Focus		BIOL 3430 Behavioral Ecology	3
		BIOL 5345 Natural History of the Colorado Plateau	3
		BIOL 5365 Form, Function & Adaptation of Plants	4
		BIOL 5425 Mycology	4
		BIOL 5370 Mammalogy	3
		BIOL 5385 Ornithology	4
		BIOL 5440 Urban Ecology	3
		BIOL 5455 Desert Ecology Field course	3
		BIOL 5445 Entomology	4
		BIOL 5910 Mathematical Models in Biology	3
		BIOL 5460 Plant Ecology in a Changing World	3
		BIOL 5490 Ecosystem Ecology	3
		BIOL 5495 Biophysical Ecology	4
		BIOL 5555 Ecol. & Evol. of Parasites & Pathogens	3
		BIOL 5325 Tropical Field Biology	5
Select 1 from C		BIOL 3125 Molecular Tools for Evol. & Pop. Biology	3
Evolution Focus		BIOL 3380 Evol. & Physiol. Basis of Health	3

Course Number	NEW Course	Course Title	Credit Hours
		BIOL 3430 Behavioral Ecology	3
		BIOL 5140 Genome Biology	3
		BIOL 5221 Human Evolutionary Genetics	4
		BIOL 5255 Prokaryotic Genetics	3
		BIOL 5275 Microbial Diversity, Genomics & Evolution	4
		BIOL 5425 Mycology	4
		BIOL 5385 Ornithology	4
		BIOL 5435 Plant Systematics	4
		BIOL 5445 Entomology	4
		BIOL 5471 Quantitative Models in Evolutionary Biology	3
		BIOL 5510 Evolutionary Developmental Biology	3
		BIO 5910 Math Models in Biology	3
		BIOL 5555 Ecol. & Evol. of Parasites & Pathogens	3
		BIOL 5910 Mathematical Models in Biology	3
		BIOL 5370 Mammology	3
Select 1 from D		BIOL 3450 Rainforest Ecology & Conservation	3
Environment		BIOL 3460 Global Environmental Issues	3
Focus		BIOL 3470 Conservation Biology	3
		BIOL 3485 Conservation Biology Lab	1
		BIOL 5440 Urban Ecology	3
		BIOL 5460 Plant Ecology in a Changing World	3
Add Another Emphasis Course			
Emphasis Credit Hour Sub-Total			16
Total Number of Credits to Complete Program			16

Propose a NEW Emphasis to an existing Regent approved program

Program Curriculum Narrative

Describe any variable credits. You may also include additional curriculum information, as needed.

Note that the precise number of credits earned from the "select 1" from each category A-D will depend on the courses selected, as the list includes one-credit, 4-credit and 3-credit courses. Thus, the range is 12 - 16 credits.

Degree Map

Degree maps pertain to undergraduate programs ONLY. Provide a degree map for proposed program. Degree Maps were approved by the State Board of Regents on July 17, 2014 as a degree completion measure. Degree maps or graduation plans are a suggested semester-by-semester class schedule that includes prefix, number, title, and semester hours. For more details see <http://higheredutah.org/pdf/agendas/201407/TAB%20A%202014-7-18.pdf> (Item #3).

Please cut-and-paste the degree map or manually enter the degree map in the table below

Biology BS Degree Map with Emphasis in Ecology, Evolution, & Environment

First Year Fall Credit Hours

WTRG 2010 3
MATH 1210 or MATH 1170 4
BIOL 1610 3
BIOL 1615 1
BIOL 2870 1
University Credits 3
TOTAL 15

First Year Spring Credit Hours

BIOL 1620 3
BIOL 1625 1
CHEM 1210 4
CHEM 1215 1
MATH 1220 or MATH 1180 4
General Education-AI 3
TOTAL 16

Second Year Fall Credit Hours

CHEM 1220 4
CHEM 1225 1
BIOL 2020 3
General Education-BF 3
Bachelor Degree IR 3
TOTAL 14

Second Year Spring Credit Hours

CHEM 2310 4
BIOL 2030 3
General Education-BF 3
BIOL 3450 3
General Education-HF 3
TOTAL 16

Third Year Fall Credit Hours

PHSY 2010 or PHYS 2110 or PHYS 2210 or PHYS 3210 4
Biology Upper Division Elective 3
Biology Upper Division Elective Lab 3
General Education-FF 3
Bachelor Degree DV 3
TOTAL 16

Third Year Spring Credit Hours

PHSY 2020 or PHYS 2120 or PHYS 2220 or PHYS 3220 4

BIOL 3410 3

General Education-FF 3

Bachelor Degree-CW 3

BIOL 5555 3

TOTAL 16

Fourth Year Fall Credit Hours

Science Elective Credit 3

BIOL 5425 4

General Education-HF 3

Bachelor Degree QI 3

University Credit 2

TOTAL 15

Fourth Year Spring Credit Hours

BIOL 5370 3

Bachelor Degree QI 3

Upper division electives 3

University credits 3

University Credit 2

TOTAL 14

Biology BA Degree Map with Emphasis in Ecology, Evolution, & Environment

First Year Fall Credit Hours

WTRG 2010 3

MATH 1210 or MATH 1170 4

BIOL 1610 3

BIOL 1615 1

BIOL 2870 1

Bachelor Degree-Language 4

TOTAL 16

First Year Spring Credit Hours

BIOL 1620 3

BIOL 1625 1

CHEM 1210 4

CHEM 1215 1

MATH 1220 or MATH 1180 4

Bachelor Degree-Language 4

TOTAL 17

Second Year Fall Credit Hours

CHEM 1220 4

CHEM 1225 1

BIOL 2020 3

General Education-AI 3

Bachelor Degree-Language 4

TOTAL 15

Second Year Spring Credit Hours

CHEM 2310 4

BIOL 3410 3

General Education-BF 3

Bachelor Degree-Language 4

General Education-HF 3

TOTAL 17

Third Year Fall Credit Hours

PHSY 2010 or PHYS 2110 or PHYS 2210 or PHYS 3210 4

BIOL 2030 3

Upper Division General elective 3

General Education-HF 3

Bachelor Degree DV 3

TOTAL 16

Third Year Spring Credit Hours

PHSY 2020 or PHYS 2120 or PHYS 2220 or PHYS 3220 4

General Education-BF 3

BIOL 3450 3

Bachelor Degree-CW 3

Bachelor Degree-IR 3

TOTAL 16

Fourth Year Fall Credit Hours

Biology Upper Division Elective Lab 4

Biology Upper Division Elective 3

BIOL 5425 3

General Education-FF 3

Science Upper Division Credit 3

TOTAL 16

Fourth Year Spring Credit Hours

BIOL 5370 3

BIOL 5555 3

Science Upper Division Credit 3

General Education-FF 3

General Education-BF 3

TOTAL 15