FORMAT 5

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PROGRAM/DEGREE REQUIREMENT CHANGE (MAJOR/MINOR)

SUBMITTED BY:

Department	**Biology & Wildlife**	**College/School**	**CNSM**
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See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

PROGRAM IDENTIFICATION:

DEGREE PROGRAM	**Biological Sciences**	
Degree Level: (i.e., Certificate, A.A., A.A.S., B.A., B.S., M.A., M.S., Ph.D.)		**BA and BS**

A. CHANGE IN DEGREE REQUIREMENTS: (Brief statement of program/degree changes and objectives)

The Biology & Wildlife Department proposes the following broad changes to the Biological Sciences BA and BS programs:

- Increase the flexibility of the curriculum to allow students to pursue areas of study of particular interest by providing a) the option of a **concentration in the B.S. degree**, and b) more opportunity for students to choose among courses in order to fulfill requirements in both degree programs.
- Foster critical and creative thinking, effective expression, and the synthesis of scientific knowledge gained in courses by initiating a **new capstone project requirement** of all B.A. and B.S. students.
- Help students to complete UAF degree requirements in a timely manner by **increasing the number of required upper division courses** in the major.
- Change the level at which some courses are taught, in order to improve the alignment of courses in the curriculum and make better use of student time.
- Provide incoming students who are unprepared for Fundamentals of Biology I (BIOL F115X) with a strategy for succeeding in biology by adding an advisory paragraph to the catalog program description.
- Increase the flexibility and decrease the total credit requirement of the minor in biological sciences.
- Delete the list of special requirements for biology teachers in the previous catalog because they are unnecessary.

B. CURRENT REQUIREMENTS AS IT APPEARS IN THE CATALOG:

BIOLOGICAL SCIENCES
College of Natural Science and Mathematics
Department of Biology and Wildlife
907-474-7671
www.bw.uaf.edu

B.A., B.S. Degrees
Minimum Requirements for Degrees: 120 credits

The biological sciences program provides a broad education and sound foundation in the basic principles of biology. Students who major in biological sciences may pursue either a B.A. or B.S. degree.
The B.A. requires fewer credits in the major field than the B.S., but it gives greater emphasis in the social sciences and humanities and allows a greater breadth of subject matter. The B.S. degree includes a foundation in the basic sciences and stronger requirements within the biological sciences than the B.A. Candidates who expect to teach in public secondary schools must be sure that they meet education requirements.

Major — B.A. Degree

1. Complete the general university requirements. (See page 132. As part of the core curriculum requirements, complete: CHEM F105X* and F106X*.)

2. Complete the B.A. degree requirements (page 137).

3. Complete the following program (major) requirements:*
BIOL F115X—Fundamentals of Biology I..... 4
BIOL F116X—Fundamentals of Biology II.....4
BIOL F261—Introduction to Cell and Molecular Biology.....4
BIOL F271—Principles of Ecology.....4
BIOL F303—Principles of Metabolism and Biochemistry (4)
or CHEM F321—Organic Chemistry (3)
and CHEM F322—Organic Chemistry (3).....4 – 6
BIOL F310—Animal Physiology (4)
or BIOL F111X and F112X—Human Anatomy and Physiology I & II (8)
or BIOL F334W—Structure and Function of Vascular Plants (4)
or BIOL F342—Microbiology (4).....4 – 8
BIOL F362—Principles of Genetics.....4
BIOL F481—Principles of Evolution.....4
PHYS F103X—College Physics.....4
STAT F200X—Elementary Probability and Statistics.....3

4. Minimum credits required.....120

Major — B.S. Degree

1. Complete the general university requirements. (See page 132. As part of the core curriculum requirements, complete: MATH F200X* or MATH F272X*; and CHEM F105X* and F106X*.)

2. Complete the B.S. degree requirements. (See page 137. As part of the B.S. degree requirements, complete STAT F200X* or STAT F300*. Biology foundation courses may be used toward partial fulfillment of the natural science requirement.)

3. Complete the following program (major) requirements:*
a. Complete the following:

BIOL F115X—Fundamentals of Biology I.....4
BIOL F116X—Fundamentals of Biology II.....4
BIOL F261—Introduction to Cell and Molecular Biology.....4
BIOL F271—Principles of Ecology.....4
BIOL F303—Principles of Metabolism and Biochemistry (4)
or CHEM F321—Organic Chemistry (3)
and CHEM F322—Organic Chemistry (3).....4 – 6
BIOL F310—Animal Physiology (4)
or BIOL F111X and F112X—Human Anatomy and
Physiology I & II (8)
or BIOL F334W—Structure and Function in Vascular
Plants (4)
or BIOL F342—Microbiology (4).....4 – 8
BIOL F362—Principles of Genetics.....4
BIOL F481—Principles of Evolution.....4
PHYS F103X and PHYS F104X—College Physics (8)
or PHYS F211X and PHYS F212X—General Physics.....8
b. Complete biology electives**.....20

4. Minimum credits required.....120
** Students must earn a C grade (2.0) or better in each course.*
*** A maximum of 6 credits of independent study (course numbers ending in 97) may be applied to this requirement. Students may petition to substitute chemistry courses (up to 10 credits for the biology electives required for the B.S. degree.)*
Note: A foreign language is encouraged by the department in meeting requirements of the core curriculum.
Note: Biology foundation courses may be used toward partial fulfillment of the natural science requirement for the B.S. degree with a major in biological sciences.
Note: Candidates for the bachelor of science degree in general science wishing to major in biological sciences must satisfy both the requirements of their major curriculum and those listed above for a B.A. degree with a major in biological sciences.

Requirements for Biology Teachers (grades 7 – 12)*

1. Complete all the requirements of the biological sciences B.A. or B.S. degree.
or BIOL F111X and BIOL F112X—Human Anatomy and Physiology (8) ……..……..4 – 8

2. Complete the following:
BIOL F310—Animal Physiology (4)
or BIOL F111X and BIOL F112X—Human Anatomy and Physiology (8) …….…..…..4 - 8
BIOL F239—Introduction to Plant Biology (4)
or BIOL F334—Structure and Function of Vascular Plants (4) ……..……..….4 - 8
BIOL F342—Microbiology.....4

3. Complete one of the following:
BIOL F305—Invertebrate Zoology (5)
or BIOL F406—Entomology (4)
or BIOL F425—Mammalogy (3)
or BIOL F426W,O/2—Ornithology (3)
or BIOL F427—Ichthyology (4).....3 – 5

4. Complete the following:
PHIL F481—Philosophy of Science (3).....3
** We strongly recommend that prospective secondary science teachers seek advising from the UAF School of Education early in your undergraduate degree program, so that you can be appropriately advised of the state of Alaska requirements for teacher licensure. You will apply for admission to the UAF School of Education's post-baccalaureate teacher preparation program, a one-year intensive program, during your*

senior year. Above requirements apply to all candidates who apply to the UAF School of Education in spring 2006 or later for licensure in biology.

Minor

1. Complete the following:
BIOL F115X—Fundamentals of Biology I.....4
BIOL F116X—Fundamentals of Biology II.....4

2. Complete three of the following:
BIOL F310—Animal Physiology (4)
or BIOL F111X and F112X—Human Anatomy
and Physiology I and II (8).....4 – 8
BIOL F271—Principles of Ecology.....4
BIOL F303—Principles of Metabolism and Biochemistry.....4
BIOL F334W—Structure and Function in Vascular Plants.....4
BIOL F342—Microbiology.....4
BIOL F362—Principles of Genetics.....4
BIOL F481—Principles of Evolution.....4

3. Minimum credits required.....20

C. PROPOSED REQUIREMENTS AS IT WILL APPEAR IN THE CATALOG WITH THESE CHANGES:
(Underline new wording~~strike through old wording~~ and use complete catalog format)

There is a revised, clean version of the final catalog description attached at back. Do not print this version in the catalog.**BIOLOGICAL SCIENCES**

College of Natural Science and Mathematics
Department of Biology and Wildlife
907-474-7671
www.bw.uaf.edu

B.A., B.S. Degrees
Minimum Requirements for Degrees: 120 credits

The biological sciences major is appropriate for students with interests in the science of life.Programs in ~~T~~the biological sciences ~~program~~ provide~~s~~ a broad education and sound foundation in the ~~basic~~ principles of biology. Graduates are employed in environmental science, health services, biology education, and as technicians in laboratory settings. Graduates may also choose to pursue advanced M.S., pharmacology, nursing, Ph.D., or M.D. degrees. Biology faculty advisors can help students to choose courses that will best fit their goals.

Students who major in biological sciences may pursue either a B.A. or B.S. degree. Because biology is an interdisciplinary science, both programs include coursework in the physical sciences and mathematics. The B.A. requires fewer credits in biology ~~than the B.S., but it gives greater emphasis~~ and more credits in the social sciences and humanities ~~and allows a greater breadth of subject matter~~ than the B.S. degree, which focuses more intensively on biological science. The B.S. degree may be completed with or without a concentration. The B.S. degree without a concentration provides the most comprehensive education in biology. The B.S. degree with a concentration permits some degree of specialization in one of three sub-disciplines: cell and molecular biology, physiology, or ecology and evolutionary biology. ~~includes a foundation in the basic sciences and stronger requirements within the biological sciences than the B.A. Candidates who expect to teach in public secondary schools must be sure that they meet education requirements.~~

Incoming students who do not meet the prerequisites for Fundamentals of Biology I (BIOL F115X) and those who did not

complete a biology course in high school, are encouraged to take Biology & Society (BIOL F103X) or Natural History of Alaska (BIOL F104X) and General Chemistry I and II (CHEM F105X and CHEM F106X) during their first year, and to begin the BIOL F115X & F116X series in the sophomore year. Students unprepared for General Chemistry I (CHEM F105X) should take Basic General Chemistry (CHEM F103X) during the first year, and begin both the General Chemistry (CHEM F105X and F106X) and Fundamentals of Biology series (BIOL F115X and F116X) during the sophomore year.

Students majoring in the biological sciences must complete a capstone project during their junior or senior year. The goal of the capstone experience is to integrate skills and information students have learned in previous courses by conducting a mentored research project and communicating the results. To fulfill the capstone requirement, a student may either take a designated capstone course or complete a mentored research project with a faculty member and petition the Biology & Wildlife chair to have this research experience count toward the capstone requirement. Course credit for mentored research can be obtained by taking BIOL F488 or BIOL F397 or F497 credits. More information about the capstone requirement is posted on the UAF Biology & Wildlife website (http://www.bw.uaf.edu/). Students are strongly encouraged to speak to a biology advisor about how they plan to satisfy the capstone requirement well before the senior year.

Major -- B.A. Degree

1. Complete the general http://www.uaf.edu/catalog/current/baccalaureate/bac1.html - General_University_Requirements university http://www.uaf.edu/catalog/current/baccalaureate/bac1.html - General_University_Requirements requirements. (See page XXX. As part of the core curriculum requirements, complete: CHEM F105X* and F106X*.)

1. Complete the B.A. degree http://www.uaf.edu/catalog/current/baccalaureate/bac3.html - Bachelor_of_Arts requirements (See page XXX). As part of the B.A. degree requirements, complete STAT 200X*. As part of the humanities and social sciences requirement, take at least 9 credits of upper division coursework. As part of the minor, take at least 3 credits of upper division coursework.)

2. Complete the following program (major) requirements:*
   a. Complete the following courses:
      BIOL F115X--Fundamentals of Biology I……4
      BIOL F116X--Fundamentals of Biology II……4
      BIOL F260—Principles of Genetics……...4
      ~~BIOL F261--Introduction to Cell and Molecular Biology--3 credits~~
      ~~BIOL F271--Principles of Ecology--4 credits~~
      ~~BIOL F310--Animal Physiology (4)~~
         ~~or BIOL F334W--Structure and Function of Vascular Plants (4)~~
         ~~or BIOL F342--Microbiology (4)--4 - 8 credits~~
         ~~or BIOL F111X and F112X--Human Anatomy and Physiology I & II (8)~~
      BIOL F481--Principles of Evolution--4 credits……4
      PHYS F103X--College Physics--4 credits……4
      ~~STAT F200X--Elementary Probability and Statistics--3 credits~~
      ~~BIOL 303--Principles of Metabolism and Biochemistry (4)~~
         ~~or~~ CHEM F321--Organic Chemistry I…...……4
         ~~and CHEM F322--Organic Chemistry (3)~~

   b. Complete two of the following three biology breadth requirements**
      1. BIOL 360—Cell and Molecular Biology (3)
      2. BIOL 371—Principles of Ecology (4)
      3. Physiology: complete one of the following:
         BIOL F310--Animal Physiology (4)
         or BIOL F4xxW--Structure and Function of Vascular Plants (4)
         or BIOL F342--Microbiology (4)--4 - 8 credits
         or BIOL F211X and F212X--Human Anatomy and Physiology I & II (8)…7 - 12

   c. Complete three elective courses from course lists A, B, C, or D below, at least one of which is designated a W course***. If possible, satisfy all UAF core requirements for W and O courses and the biology capstone requirement with these elective courses……9 - 12

a. Complete a biology capstone project (No credit requirement)
The capstone requirement can be met through petition following the completion of a mentored research project with a faculty member (e.g. by taking BIOL 488, BIOL 497, or BIOL 498, or without course credits), or automatically by completing at least one of the following courses:

BIOL 4xxW – Plant Structure and Function (4)
BIOL 472W – Community Ecology (3)
BIOL 441W, O/2 – Animal Behavior (4)
BIOL 473W – Limnology (3)
BIOL 4XXW – Metabolism and Biochemistry (4)

3. Minimum credits required—120 credits

Major -- B.S. Degree without concentration

1. Complete the general university requirements (See page XXX. As part of the core curriculum requirements, complete MATH F200X* or F272X*, and CHEM F105X* and F106X*.)

2. Complete the B.S. degree requirements. (See page XXX As part of the B.S. degree requirements, complete STAT 200X* or STAT F300X and PHYS F103X* and F104X.*~~Biology foundation courses may be used toward partial fulfillment of the natural science requirement.)~~

3. Complete the following program (major) requirements.*
   a. Complete the following courses:
      BIOL F115X – Fundamentals of Biology I……..…4

      BIOL F116X – Fundamentals of Biology II…….....4
      BIOL F260 – Principles of Genetics……..4
      BIOL F360~~261~~ – ~~Introduction to~~ Cell and Molecular Biology……..4 3
      BIOL F371~~271~~ – Principles of Ecology……4
      BIOL F310 – Animal Physiology (4)
      or BIOL F4xxW – Structure and Function in Vascular Plants (4)
      or BIOL F342 – Microbiology (4)--4-8 credits
      or BIOL F211X and F212X – Human Anatomy and Physiology I & II (8)……..…4 - 8
      BIOL F481 – Principles of Evolution……..4
      ~~BIOL F303 – Principles of Metabolism and Biochemistry (4)~~
      ~~or~~ CHEM F321—Organic Chemistry I (43)
      and either CHEM F322 – Organic Chemistry II (3)
      or CHEM 451—General Biochemistry – Metabolism (3)……...…~~4~~ – ~~6~~7
      ~~PHYS F103X and F104X – College Physics (8)~~
      ~~or PHYS F211X and F212X – General Physics (8) – 8 credits~~

   b. Complete the following electives***. At least one course must satisfy the W requirement.
      Organismal elective – Complete one additional course from list D (below)……3-4
      Biology electives – Complete four additional courses at the 200 level or above, at least three of which must be from lists A, B, C, or D……..12-16

   c. Complete a capstone project (no credit requirement)
      The capstone requirement can be met through petition following the completion of a mentored research project with a faculty member (e.g. by taking BIOL 488, BIOL 497, or BIOL 498, or without course credits), or automatically by completing at least one of the following courses:
      BIOL 4xxW – Plant Structure and Function (4)
      BIOL 441W, O/2 – Animal Behavior (4)
      BIOL 472W – Community Ecology (3)
      BIOL 473W – Limnology (3)
      BIOL 4XXW – Metabolism and Biochemistry (4)

Major -- B.S. Degree with concentration

1. Complete the general university requirements (See page XXX. As part of the core curriculum requirements, complete MATH F200X* or F272X*, and CHEM F105X* and F106X*.)

2. Complete the B.S. degree requirements. (See page XXX As part of the B.S. degree requirements, complete STAT 200X* or STAT F300X and PHYS F103X* and F104X.* ~~Biology foundation courses may be used toward partial fulfillment of the natural science requirement.)~~

4. Complete the following program (major) requirements.*
   a. Complete the following courses:
      BIOL F115X – Fundamentals of Biology I……4
      BIOL F116X – Fundamentals of Biology II……4
      BIOL F260 – Principles of Genetics……4
      BIOL F360~~261~~ – ~~Introduction to~~ Cell and Molecular Biology……~~4~~ 3
      BIOL F371~~271~~ – Principles of Ecology……4
      BIOL F310 – Animal Physiology (4)
      or BIOL F4xxW – Structure and Function in Vascular Plants (4)
      or BIOL F342 – Microbiology (4)--4-8 credits
      or BIOL F211X and F212X – Human Anatomy and Physiology I & II (8)……4 - 8
      BIOL F481 – Principles of Evolution……4
      ~~BIOL F303 – Principles of Metabolism and Biochemistry (4)~~
      ~~or~~ CHEM F321—Organic Chemistry I (43)
      and either CHEM F322 – Organic Chemistry II (3)
      or CHEM 451—General Biochemistry – Metabolism (3)……~~4 – 6~~7
      ~~PHYS F103X and F104X - College Physics (8)~~
      ~~or PHYS F211X and F212X – General Physics (8) – 8 credits~~

   b. Complete the requirements of one of the following concentrations.*** When choosing courses to fulfill concentration requirements, students should consider the university requirement for two W courses and one O course, and the departmental requirement for a capstone project.

      Cell and Molecular Biology
      As part of the program requirements, take CHEM F322.
      Complete the following courses, at least one of which must satisfy the W requirement.
      BIOL F360 - Cell and Molecular Biology……3
      CHEM F450 – General Biochemistry—Macromolecules……3
      CHEM F451—General Biochemistry—Metabolism……3
      Cell & molecular or physiology electives – Take three additional courses
      from lists A or B, at least one of which must be from list A……9 - 12
      Biology breadth elective – Take one additional course from lists C or D……3 - 4

      Physiology
      Complete the following courses, at least one of which must satisfy the W requirement.
      BIOL F360--Cell and Molecular Biology……3
      Physiology or cell & molecular biology electives – take four additional courses
      from list A or B, at least two of which are from list B……12 - 16
      Biology breadth elective – take one additional course from lists C or D……3 - 4
      Biology elective – take one additional course from lists A, B, C, or D……3 - 4

      Ecology and Evolutionary Biology
      Complete the following courses, at least one of which must satisfy the W requirement.
      BIOL F371 - Principles of Ecology……4
      Ecology & evolutionary biology electives – Take two additional courses from list C……6 - 8

Organismal elective – take one additional course from list D……....3 - 4
Biology breadth elective – Take one additional course from lists A or B…….……...3 - 4
Biology elective – take one additional course from lists A, B, C, or D…….....3 - 4
STAT F401—Regression and Analysis of Variance (4)
or STAT F402—Scientific Sampling (3)……..3 - 4

c. Complete a capstone project - no credit requirement
The capstone requirement can be met through petition, by completing a mentored research project with a faculty member (e.g. by taking BIOL 488, BIOL 497, or BIOL 498, or without course credits), or automatically by completing at least one of the following courses:
BIOL 4xxW – Plant Structure and Function (4)
BIOL 441W, O/2 – Animal Behavior (4)
BIOL 472W – Community Ecology (3)
BIOL 473W – Limnology (3)
BIOL 4XXW – Metabolism and Biochemistry (4)

3. Minimum credits required - 120 credits

Courses that may be used to complete biology elective requirements****

List A – Cell and Molecular Biology
BIOL F360 – Cell and Molecular Biology (3)
BIOL F342 – Microbiology (3)
BIOL F417O – Neurobiology (3)
BIOL F462O – Concepts of Infectious Disease (3)
BIOL F465 – Immunology (3)
BIOL F4XX – Metabolism and Biochemistry (4)
CHEM 322—Organic Chemistry II (3)
CHEM F450 – General Biochemistry-Macromolecules (3)
CHEM F451 – General Biochemistry-Metabolism (3)
CHEM 470 – Cellular and Molecular Neuroscience (3)
CHEM 474 – Neurochemistry (3

List B – Physiology
BIOL F310 – Animal Physiology (4)
BIOL F317 – Comparative Anatomy (4)
BIOL F4xxW – Structure and Function in Vascular Plants (4)
BIOL F342 – Microbiology (4)
BIOL F335 – Epidemiology (3)
BIOL F417O – Neurobiology (3)
BIOL F422 – Physiology and Ecology of Overwintering (3)
BIOL F441W, O/2 – Animal Behavior (3)
BIOL F455W,O – Environmental Toxicology (3)
BIOL 457W – Environmental Microbiology (3)
BIOL F458 – Vertebrate Endocrinology (3)
BIOL F459O/2 – Wildlife Nutrition (4)
BIOL 462O – Concepts of Infectious Disease (3)
BIOL 465 – Immunology (3)

List C – Ecology and Evolutionary Biology
BIOL F371 – Principles of Ecology (4)\
BIOL F418 - Biogeography (3)
BIOL F422 – Physiology and Ecology of Overwintering (3)
BIOL 433 – Conservation Genetics (3)
BIOL F441W,O/2 – Animal Behavior (3)
BIOL F443W – Microbial Ecology (3)
BIOL 457W – Environmental Microbiology (3)

BIOL 462O – Concepts of Infectious Disease
BIOL F467 – Ecosystems of Alaska (3)
BIOL F469O – Landscape Ecology and Wildlife Habitat (3)
BIOL F471 – Population Ecology (4)
BIOL F472W – Community Ecology (3)
BIOL F473W – Limnology (3)
BIOL F474 – Plant Ecology (4)
BIOL F483 – Stream Ecology (3)
BIOL F485 – Global Change Ecology (3)
BIOL F486 – Vertebrate Paleontology (3)
BIOL F487 – Conceptual Issues in Evolutionary Biology (3)
BIOL F488 – Arctic Vegetation Ecology: Geobotany (3)
BIOL F489 – Vegetation Description and Analysis (3)
WLF 301 – Design of Wildlife Studies (3)
WLF 410 – Wildlife Populations and Their Management (3)

List D – Organismal

BIOL 301 – Biology of Fishes (4)
BIOL F305 – Invertebrate Zoology (4)
BIOL F317 – Comparative Anatomy (4)
BIOL F331 – Systematic Botany (4)
BIOL F406 – Entomology (4)
BIOL 418 – Biogeography (4)
BIOL F425W – Mammalogy (3)
BIOL F426W,O/2 – Ornithology (3)
BIOL F427 – Ichthyology (4)
BIOL F486 – Vertebrate Paleontology (3)
BIOL F489 – Vegetation Description and Analysis (3)

~~**Requirements for Biology Teachers (grades 7 – 12)***~~

~~1. Complete all the requirements of the biological sciences B.A. or B.S. degree.~~
~~– or BIOL F111X and BIOL F112X – Human Anatomy and Physiology (8) ……..4 – 8~~

~~2. Complete the following:~~
~~BIOL F310 – Animal Physiology (4)~~
~~– or BIOL F111X and BIOL F112X – Human Anatomy and Physiology (8) ……..4 - 8~~
~~BIOL F239 – Introduction to Plant Biology (4)~~
~~– or BIOL F334 – Structure and Function of Vascular Plants (4) ……..4 – 8~~
~~BIOL F342 – Microbiology.....4~~

~~3. Complete one of the following:~~
~~BIOL F305 – Invertebrate Zoology (5)~~
~~– or BIOL F406 – Entomology (4)~~
~~– or BIOL F425 – Mammalogy (3)~~
~~– or BIOL F426W,O/2 – Ornithology (3)~~
~~– or BIOL F427 – Ichthyology (4).....3 – 5~~

~~4. Complete the following:~~
~~PHIL F481 – Philosophy of Science (3).....3~~
~~** We strongly recommend that prospective secondary science teachers seek advising from the UAF School of Education early in your undergraduate degree program, so that you can be appropriately advised of the state of Alaska requirements for teacher licensure. You will apply for admission to the UAF School of Education's post-baccalaureate teacher preparation program, a one year intensive program, during your senior year. Above requirements apply to all candidates who apply to the UAF School of Education in spring 2006 or later for licensure in biology.*~~

Minor

1. Complete the following program (minor) requirements:*
   a. Complete the following courses:
      BIOL F115X--Fundamentals of Biology I……..…4
      BIOL F116X--Fundamentals of Biology II……....4
      BIOL 260—Principles of Genetics……..……..…4

   b. Complete ~~three~~3 – 8 credits from he followingcourses:****
      ~~BIOL F362--Principles of Genetics--4 credits~~
      1. BIOL 360 – Cell Biology (3)
      2. BIOL F371~~-271~~--Principles of Ecology (4)
      3. Physiology: complete one of the following:
         BIOL F310--Animal Physiology (4)
         or BIOL F4xxW--Structure and Function of Vascular Plants (4)
         or BIOL F342--Microbiology (4)
         or BIOL F211X and F212X--Human Anatomy and Physiology I & II (8)
         ~~BIOL F303--Principles of Metabolism and Biochemistry--4 credits~~
      4. BIOL F481--Principles of Evolution (4)

   c. Complete one elective course in biology at the 200 level or above……..……3 - 4

2. Minimum credits required……..……~~20~~18

** Student must earn a C grade or better in each course.*
***Because biology breadth courses for the BA degree serve as prerequisites for many upper division biology electives, the choice of which courses to complete should be made with consideration to which elective biology courses the student plans to complete.*
~~**A maximum of 6 credits of independent study (course numbers ending in 97) may be applied to this requirement. Students may petition to substitute chemistry courses (up to 10 credits for the biology electives required for the B.S. degree.)~~
****Independent study or research (course numbers ending in 97and 88, respectively) may be substituted by petition for a maximum of two required elective courses in biology (3-4 credits of independent study or research per substituted course). The subject area of the independent study or research will determine which biological subject area the credits satisfy.*
*****Courses that satisfy upper division elective credit may require prerequisites in addition to the required biology courses. ~~Students may petition to substitute chemistry courses (up to 10 credits for the biology electives required for the B.S. degree~~.)*
Note: A foreign language is encouraged by the department in meeting requirements of the core curriculum.
~~Note: Biology foundations courses may be used toward partial fulfillment of the natural science requirement for the B.S. degree with a major in biological sciences.~~
Note: Candidates for the bachelor of science degree in general science wishing to major in biological sciences must satisfy both the requirements of their major curriculum and those listed above for a B.A. degree with a major in biological sciences.

D. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.
The new capstone requirement will require an investment of resources, in the form of faculty effort, appropriate space, and equipment and supplies. The need for faculty effort will be met by shifting the course assignments of current faculty. The demand for some courses currently required but not

F360Cell and Molecular Biology), making it feasible to offer these courses once per year rather than once per semester. (In addition, the loss of the lab from BIOL 261 will help to accommodate all interested students in a single semester.) In addition, several current courses already meet the requirements of the capstone (BIOL 334W, BIOL 441W,O/2, BIOL 472W), and another (BIOL F473W) will be modified to meet the requirements. An additional capstone course in cell biology is currently under development and will be proposed next year. We anticipate that additional capstone courses will be needed in the future. These will be met by current faculty as they, in consultation with the chair, shift their course offerings to better meet student needs.

Capstone courses will utilize lab space in the new Life Sciences Building, which contains excellent, flexibly-designed labs suitable for a variety of cell, physiological, and ecological/evolutionary projects involving microorganisms and small plants and animals. The Life Sciences Building is scheduled to open in Fall 2013, just as the new curriculum (if approved) takes effect. The Institute of Arctic Biology greenhouse will continue to be utilized for larger plant-based projects (as is already the case for many biology courses).

Some capstone courses will require investment in equipment and supplies. Several courses slated to carry a capstone designation already exist and currently require research projects, so much of the equipment and supplies needed for these courses is already in place. The new courses and those undergoing more substantial conversions will require new equipment and supplies and funds will be sought from a variety of sources, including infrastructure-building research funding, Technology Advisory Board grants, and special requests to the CNSM Dean and UAF Provost. Barbara Taylor, the instructor of the proposed new Metabolism and Biochemistry capstone course, has already obtained new equipment for the course using INBRE funding.

The addition of concentrations to the biology B.S. is likely to be very popular with students. The change might result in an increase in the number of students majoring in biology, but we think the most notable impacts will be shifts in the choices of students already headed for a biology degree. In spring 2011, we polled 92 biological sciences majors in biology core classes to assess student interest in concentrations for the B.S. degree. Fully 99% of students – B.A. and B.S. majors alike - favored the addition of concentrations to the B.S., and the vast majority indicated that they would pursue a B.S. with a concentration if the option was available. Therefore, we anticipate an increase in the number of students pursuing the biology B.S. degree, relative to the B.A. (If it came to pass, this trend would counter a recent increase in B.A. relative to B.S. students observed over the past 3 years.) A reduction in the proportion of B.A. relative to B.S. students would be expected to cause a modest reduction in the number of biology students taking social science and humanities courses, spread across departments and disciplines.

More striking may be changes in the enrollment of particular biology courses. The cost of providing students more freedom to choose their courses is some degree of uncertainty, at least initially, about which courses they will choose and which may fail to attract sufficient enrollment. Based on our student poll, the majority of our current biology majors (60%) will choose to concentrate in cell biology or physiology; many of these students report an interest in the health sciences. As a result, enrollment in some ecology and evolutionary biology elective courses may fall in the future, and enrollment in cell and physiological courses may increase. The faculty will need to remain flexible and consider developing new elective courses and capstone courses on subjects of student interest in the future.

E. IMPACTS ON PROGRAMS/DEPTS:

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

Several chemistry courses are likely to experience an increase in enrollment as a result of the new biological sciences curriculum, including CHEM F321, F322, and F451. We have corresponded with chemistry chair Bill Simpson (during in spring 2012), and he has assured us that chemistry can accommodate the anticipated increase in enrollment in those courses.

Changes to the biological science minor requirements will affect students pursuing the Geosciences Option II Paleontology degree. Geosciences chair Sarah Fowell supports the proposed changes (May 2012 correspondence).

One of the curricular revisions we have proposed is to change the level of several courses, including Principles of Genetics (BIOL F362 -> 200 level), Introduction to Cell & Molecular Biology (261 -> 300 level), and Principles of Ecology (BIOL 271 -> 300 level). Since spring semester 2012, we contracted the following program representatives:

- Wildlife Biology and Conservation Program, Biology & Wildlife Department, CNSM, Mark Lindberg
- Department of Chemistry, CNSM, William Simpson
- Fisheries, School of Fisheries and Ocean Sciences, Trent Sutton
- Natural Resources Management, SNRAS, Dave Valentine
- Geography, SNRAS, Patricia Heiser

We registered some concerns from other programs about the changes in course level. The Principles of Ecologyshift from BIOL 271 to BIOL 371 will be somewhat awkward for the Wildlife Biology and Conservation program, because the course serves as a prerequisite for other 300-level courses in Wildlife. Change to the level and prerequisites of Principles of Genetics and Cell Biology were of some concern to the Department of Chemistry as these changes may affect credit distributions and course sequencing for their Biochemistry majors. Neither of these objections were serious enough to warrant blocking the course changes from going forward. We received no objections from Fisheries, NRM, or Geography.

F. IF MAJOR CHANGE - ASSESSMENT OF THE PROGRAM:

Description of the student learning outcomes assessment process.)

The latest versions of the Student Learning Outcomes Assessment Plans for the BS and BA in Biological Sciences (as submitted to the Provost's Office in May 2012) were written to evaluate the new curriculum. They include evaluation of students' understanding of basic concepts (through the ETS Field Test in Biology) and use the new Capstone Project requirement to ensure students are able to apply the scientific method to questions in Biology and are able to effectively communicate their results. We have also developed a statement of Intended Learning Outcomes that we expect students to obtain from this curriculum. Both documents are attached.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize program/degree change applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you drop a course, is it because the material is covered elsewhere? Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the program is not compromised as a result.

The proposed changes to the biological sciences B.A. and B.S. were motivated by the following broad goals.

- Fulfill the goals of the Biological Sciences Intended Learning Outcomes (see attached document at back), notably by encouraging critical and creative thinking and integration of skills by requiring all students to complete and communicate a capstone research project (description of capstone requirement also attached at back).
- Engage student interest by allowing them more freedom to choose subjects and courses of interest, while maintaining sufficient breadth.
- Assist students in completing the degree requirements within four years.

The proposed curricular changes will assist us in fulfilling the Intended Learning Outcomes by better balancing breadth and depth of the subject matter, and by encouraging students to do and communicate original scientific work. Although the biology core courses in the new curricula are fewer and less prescribed than in the past, they still cover the range of biological organization from molecules to populations. In addition to biology core courses, each concentration within the B.S. degree requires at least one upper division course well outside the area of specialization. The new curriculum encourages depth of study by a) requiring more upper division courses in biology, b) allowing students the option to concentrate on a sub-discipline, and c) requiring a capstone project. The capstone is a research project that the student chooses (with help from a faculty mentor), completes, and communicates in writing, incorporating previous knowledge from the scientific literature. Successful completion of the capstone project requires critical and creative thinking, integration of ideas, use of the scientific method, quantitative approaches, and effective communication skills.

Our intent in providing students more freedom to choose courses and subjects of interest is to engage them more actively in their coursework and to encourage them to experience their education in a more intentional manner.

The proposed curricula will assist students in completing their degrees in a timely manner. The increased flexibility of the course requirements should reduce scheduling difficulties. More importantly, the proposed curricula require more upper division credits, and integrate core writing and oral intensive courses better, than the old curricula. The proposed curricula specify 35 – 63 credits of upper division work (depending on course choices) for the B.A. and 33 – 50 credits for the B.S.; in contrast, the current biological sciences curricula specify only 14 – 54 and 15 – 41 credits of upper division coursework for the B.A. and B.S., respectively. While specific W and O courses are not required of all students in either program, the catalog description now explicitly addresses the need for students to include W and O courses within their elective biology course choices. The minimum number of credits need to complete all listed course requirements in the B.A. degree have increased somewhat with the proposed changes, from 111 credits required to complete the current B.A. to 115 credits to complete the proposed B.A. This is unfortunate, but was deemed necessary in order to include a sufficient number of upper division biology courses in addition to fulfilling the UAF, B.A. social science and humanities, minor, and major requirements. The minimum total required credits for the B.S. degree will decrease slightly under the proposed curriculum from the current 101 to 97.

The proposed B.A. and B.S. curricula include few required courses at the 200-level, and this may be a

cause for concern to reviewers. The dearth of courses at the 200-level reflects the challenge of introducing biology – a wide-ranging, complex, and interdisciplinary science – to college students. For students to be successful in introductory biology, they must apply a basic understanding of chemistry and mathematics, and they must be able to read and write at the college level. We require several prerequisites to be met before a student may enroll in Fundamentals of Biology I and II (BIOL 115X and 116X). These prerequisites, combined with the difficulty and expectations of the course, mean that the course is actually taught above the 100 level. This appears to be a problem common to biology departments at other universities, as well. In 2010-2011, the Teaching Advisory Committee of the Biology & Wildlife Department compared our UAF biology B.S. to similar programs at 7 other universities (California State University Humboldt, Stanford University, University of Alaska Anchorage, University of Nevada Las Vegas, University of Oregon, University of Utah, and University of Washington). With the exception of the UA system, all other programs fell into two categories: those that offered introductory biology at the 200 level and all subsequent biology courses at the 300 level and above, and those that offered introductory biology at the 100 level and skipped the 200 level entirely. In the proposed curricula, we have chosen the latter model, retaining the introductory sequence at the 100 level and requiring only a single 200-level biology course.Shifting the introductory sequence to the 200 level would disrupt articulation between UAF and other MAUs.

The proposed changes include shifting the level at which three courses are offered. These changes in course level are recommended to improve alignment of course content (in order to avoid excessive repetition) and to place courses at a level appropriate to student preparation. We propose that the Principles of Genetics (now BIOL 362) course drop to the 200 level and become a prerequisite for the Cell Biology course (now BIOL 261), which would in turn switch to the 300 level. Although this change is admittedly awkward, we chose genetics, rather than cell biology, as the first course in the sequence because the concepts and tools of genetics have become fundamental to all sub-disciplines of modern biology. The genetics instructors support this change and one of the instructors has stated that the course is already taught as if it were lower division. The change will free the cell biology instructors from the need to cover basic genetics and allow them to tackle material of greater depth and complexity. The cell biology course will, in turn, serve as a prerequisite for 400-level elective and capstone courses in cellular and molecular biology. This is a growing area of expertise in our department, and we anticipate an increasing need for specialized courses that build on the concepts of genetics and cell biology. We also recommend that the Principles of Ecology course switch from 200 level to 300 level. The argument for this change is not articulation but rather student preparation. Since progressively tighter prerequisites were adopted for the Fundamentals of Biology series in 2006 and 2008, both of the regular course instructors have noted an improvement in student comprehension and performance. Switching the course to the 300 level would help students to obtain their minimum number of upper division credits, and both course instructors feel that students are sufficiently well-prepared from their prerequisites classes to succeed at the 300 level.

The section specifying courses to be taken by biology teachers has been deleted from the catalog because we found them unnecessary; the standard biological sciences B.A. and B.S. requirements will provide adequate biology background for a secondary school teacher.

APPROVALS:

Signature, Chair, Program/Department of: Biology and Wildlife	Date Sept 20, 2012
Signature, Chair, College/School Curriculum Council for: CNSM	Date 28 Sept 2012
Signature, Dean, College/School of: CNSM	Date 10/1/12

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Signature, Chair, UAF Faculty Senate Curriculum Review Committee	Date

University of Alaska Fairbanks Biological Sciences Baccalaureate Intended Learning Outcomes

1. Knowledge

Graduates should demonstrate broad knowledge of core biological concepts, including evolution, inheritance and the expression of genes, cellular and organismal structure and function, and biologically-relevant pathways and transformations of energy and matter. Graduates should demonstrate depth of knowledge in at least one sub-discipline of biology.

2. Competency

Communication: Biology graduates should communicate clearly and accurately about biological issues in both oral and written form. In particular, they should be able to argue cogently from evidence, write the findings of a simple biological study in the format of a scientific paper, and give an effective oral presentation on a biological issue.

Technical proficiency: Graduates should be able to apply the basic tools of the biologist. They should be competent in basic laboratory skills and techniques. They should be able to record and maintain accurate data records and to summarize, graph, and interpret data sets using computer tools. They should be able to use computer software to produce a technical report that includes graphs, tables, and references .

Information literacy: Biology graduates should recognize when information is needed and have the ability to locate, evaluate critically, and use effectively the needed information. They should be aware of, and be able to access, publically available biological databases. They should be able to access the technical literature in biology using online resources, and to distinguish between peer-reviewed scientific literature and less dependable sources of information. They should be able to correctly interpret the goal, approach, and basic findings of a biological journal article. Graduates should cite others' work responsibly and accurately.

Quantitative approaches: Graduates should be able to apply quantitative approaches to problem solving in biology. In particular, they should be competent to recognize bias in data collection and appreciate the role of stochasticity in biological processes. They should be able to distinguish discrete and continuous variation, summarize and analyze data using statistics, and create visual displays of information that effectively summarize data.

Collaboration: Graduates should be able to collaborate effectively with others on scientific projects, leading to a productive outcome.

3. Critical and creative thinking

Graduates should be able to apply their knowledge of the principles of biology, chemistry, physics, and mathematics to solve problems in biology. They should be able to critically evaluate biological claims, such as those they will encounter in the scientific literature and the media. They should be able to address the impact of modern biology on society. Graduates should be able to formulate hypotheses and predictions, design a study, interpret the results logically, and communicate the results effectively.

Revised 6 March 2012; ratified by B&W faculty spring 2012

Capstone Project in Biological Sciences

The intent of the Biological Sciences capstone project is to integrate a range of knowledge and skills learned in previous courses, including scientific knowledge, quantitative literacy, and communication skills, and to apply these products of the university education to a creative activity. For a biologist, a fundamental expression of applied knowledge, creativity, and critical reasoning is to engage in scientific inquiry.

The capstone project in Biological Sciences consists of mentored research project on a biological topic that is completed in the junior or senior year. The capstone project must be designed or chosen by the student in consultation with a faculty mentor. The faculty mentor must approve the project before work begins. The project must include both evaluation of data and communication of the study intent, methods, results, interpretation, and conclusion in the form of a written paper. The capstone project requirement may be met in two ways, detailed below.

First, the student may pass, with C grade or better, a designated capstone course in Biological Sciences or Wildlife Biology and Conservation. Capstone courses are offered across a range of sub-disciplines within biology. A list of capstone courses in Biological Sciences can be found in the UAF catalog. All capstone courses include the expectation that the student will complete a biological research project. Typically, the capstone course instructor will introduce one or several model study systems and methodologies that will form the basis for the student's project. The course instructor will assist the student to design a study and analyze the results. The student will communicate the results of the project in a in a written report. Some capstone courses may require that students communicate their research findings in additional ways, such as in an oral report or poster presentation. In order to receive a C (2.0) grade or better in a capstone class, the student must receive a C grade or better on the capstone project.

Second, the student may satisfy the capstone requirement by conducting a research project with a faculty mentor, typically a member of the UAF Biology & Wildlife faculty. A student may receive course credits for the research project by enrolling in independent study (BIOL 397 or 497) or undergraduate biology research (BIOL 490 or URSA 488); however, course credits are not necessary for completion of the capstone project requirements. A more informal arrangement, in which the student performs and communicates a project under the supervision of a member of the Biology & Wildlife faculty or completes research in the context of an internship, may satisfy the capstone requirements as well. In either case, to satisfy the capstone requirement using a research project conducted outside a designated capstone course, the student must file a petition with the Biology & Wildlife department chair. The petition must include a memo by the student's faculty mentor confirming that the work was completed and a copy of the mentor's written assessment of the final paper, showing that the work was of satisfactory quality.

All capstone projects will be assessed using a common set of expectations. The rubric used by mentors to grade capstone projects may be viewed here <link>.

Final Evaluation of Capstone Project by Research Supervisor

To be completed by student

Student's name _____ Date _____

Capstone Project Title _____

Research Supervisor _____

To be completed by Research Supervisor

	Yes (excellent)	Somewhat (adequate)	No (inadequate)
Is the capstone project the product of data collection and/or analysis by the student?			
Does the capstone paper make a compelling argument for the significance of the student's research within the context of the current literature?			
Does the capstone paper clearly articulate the student's research goals?			
Are the methods appropriate given the student's research agenda?			
Is the data analysis appropriate and accurate?			
Does the author interpret the results skillfully and accurately?			
Are the tables and figures clear, effective and informative?			
Is there a compelling discussion of the implications of findings?			
Is the literature review appropriate and complete?			
Are the citations presented consistently and professionally throughout the text and in the list of works cited?			
Is the writing appropriate for the target audience?			
Is the paper clearly communicated and free of language errors?			

Document revised 15 May 2012; ratified by B&W faculty spring 2012

Revised, clean version of catalog description for Registrar.

BIOLOGICAL SCIENCES

College of Natural Science and Mathematics
Department of Biology & Wildlife
907-474-7671
www.bw.uaf.edu

B.A., B.S. Degrees

Minimum Requirements for Degrees: 120 credits

The biological sciences major is appropriate for students with interests in the science of life.Programs in the biological sciences provide a broad education and a foundation in the principles of biology. Graduates are employed in environmental science, health services, biology education, and as field and laboratory technicians Graduates may also choose to pursue advanced M.S., pharmacology, nursing, M.D. or Ph.D. degrees. Biology faculty advisors can help students to choose courses that will best fit their goals.

Students who major in biological sciences may pursue either a B.A. or B.S. degree. Because biology is an interdisciplinary science, both programs include coursework in the physical sciences and mathematics. The B.A. requires fewer credits in biology and more credits in the social sciences and humanitiesthan the B.S. degree, which focuses more intensively on biological science. The B.S. degree may be completed with or without a concentration. The B.S. degree without a concentration provides the most comprehensive education in biology. The B.S. degree with a concentration permits some degree of specialization in one of three sub-disciplines: cell and molecular biology, physiology, or ecology and evolutionary biology.

Incoming students who do not meet the prerequisites for Fundamentals of Biology I (BIOL F115X) and those who did not complete a biology course in high school are encouraged to take a biology course for non-majors such as Biology & Society (BIOL F103X) or Natural History of Alaska (BIOL F104X) and General Chemistry I and II (CHEM F105X and CHEM F106X) during their first year, and to begin the BIOL F115X & F116X series in the sophomore year. Students unprepared for General Chemistry I (CHEM F105X) should take Basic General Chemistry (CHEM F103X) during the first year, and begin both the General Chemistry (CHEM F105X and F106X) and Fundamentals of Biology series (BIOL F115X and F116X) during the sophomore year.

Students majoring in the biological sciences must complete a capstone project during their junior or senior year. The goal of the capstone experience is to integrate skills and information students have learned in previous courses by conducting a mentored research project and communicating the results. To fulfill the capstone requirement, a student may either take a designated capstone course or complete a mentored research project with a faculty member and petition the Biology & Wildlife chair to have this research experience count toward the capstone requirement. Biology course credit for mentored research can be obtained by taking BIOL F490, F397, or F497 credits. More information about the capstone requirement is posted on the UAF Biology & Wildlife website (http://www.bw.uaf.edu/). Students are strongly encouraged to speak to a biology advisor well before their senior year about how they plan to satisfy the capstone requirement..

Major -- B.A. Degree

1. Complete the general university requirements. (See page XXX. As part of the core curriculum requirements, complete: CHEM F105X* and F106X*.)

2. Complete the B.A. degree requirements. (See page XXX). As part of the B.A. degree requirements, complete STAT 200X*. As part of the humanities and social sciences requirement, take at least 9 credits of upper division coursework. As part of the minor, take at least 3 credits of upper division coursework.

3. Complete the following program (major) requirements:*

   a. Complete the following courses:

BIOL F115X--Fundamentals of Biology I	4
BIOL F116X--Fundamentals of Biology II	4
BIOL F260—Principles of Genetics	4
BIOL F481--Principles of Evolution	4
CHEM F321—Organic Chemistry I	4

PHYS F103X--College Physics--4 credits 4

b. Complete two of the following three biology breadth requirements**
1. BIOL 360—Cell and Molecular Biology (3)
2. BIOL 371—Principles of Ecology (4)
3. Physiology: complete one of the following:
BIOL F310--Animal Physiology (4)
or BIOL F434W--Structure and Function of Vascular Plants (4)
or BIOL F342--Microbiology (4)
or BIOL F213X and F214X--Human Anatomy and Physiology I & II (8) 7 - 12

c. Complete three elective courses from course lists A, B, C, or D below, at least one of which is designated a W course***. If possible, satisfy all UAF core requirements for W and O courses and the biology capstone requirement with these elective courses 9 - 12

d. Complete a biology capstone project (No credit requirement)
The capstone requirement can be met through petition following the completion of a mentored research project with a faculty member (e.g. by taking BIOL 497 or BIOL 490, or without course credits), or automatically by completing at least one of the following courses:
BIOL 434W – Plant Structure and Function (4)
BIOL 472W – Community Ecology (3)
BIOL 441W, O/2 – Animal Behavior (4)
BIOL 473W – Limnology (3)
BIOL 403W – Metabolism and Biochemistry (4)

4. Minimum credits required—120 credits

Major -- B.S. Degree without concentration

1. Complete the general university requirements (See page XXX. As part of the core curriculum requirements, complete MATH F200X* or F272X*, and CHEM F105X* and F106X*.)

2. Complete the B.S. degree requirements. (See page XXX As part of the B.S. degree requirements, complete STAT 200X* or STAT F300X and PHYS F103X* and F104X.*

3. Complete the following program (major) requirements.*
a. Complete the following courses:
BIOL F115X – Fundamentals of Biology I 4
BIOL F116X – Fundamentals of Biology II 4
BIOL F260 – Principles of Genetics 4
BIOL F360 – Cell and Molecular Biology 3
BIOL F371 – Principles of Ecology 4
BIOL F310 – Animal Physiology (4)
or BIOL F434W – Structure and Function in Vascular Plants (4)
or BIOL F342 – Microbiology (4)--4-8 credits
or BIOL F213X and F214X – Human Anatomy and Physiology I & II (8) 4 - 8
BIOL F481 – Principles of Evolution 4
CHEM F321—Organic Chemistry I (4)
And either CHEM F322 – Organic Chemistry II (3)
or CHEM 451—General Biochemistry – Metabolism (3) 7

b. Complete the following electives***. At least one course must satisfy the W requirement.
Organismal elective – Complete one additional course from list D (below) 3-4
Biology electives – Complete four additional courses at the 200 level or above, at least three of which must be from lists A, B, C, or D 12-16

c. Complete a capstone project (no credit requirement)

The capstone requirement can be met through petition following the completion of a mentored research project with a faculty member (e.g. by taking BIOL F490or BIOL F497, or without course credits), or automatically by completing at least one of the following courses:

BIOL 434W – Plant Structure and Function (4)
BIOL 441W, O/2 – Animal Behavior (4)
BIOL 472W – Community Ecology (3)
BIOL 473W – Limnology (3)
BIOL 403W – Metabolism and Biochemistry (4)

Major -- B.S. Degree with concentration

1. Complete the general university requirements (See page XXX. As part of the core curriculum requirements, complete MATH F200X* or F272X*, and CHEM F105X* and F106X*.)

2. Complete the B.S. degree requirements. (See page XXX As part of the B.S. degree requirements, complete STAT 200X* or STAT F300X and PHYS F103X* and F104X.*

3. Complete the following program (major) requirements.*
   a. Complete the following courses:

BIOL F115X – Fundamentals of Biology I	4
BIOL F116X – Fundamentals of Biology II	4
BIOL F260 – Principles of Genetics	4
BIOL F310 – Animal Physiology (4)	
or BIOL F434W – Structure and Function in Vascular Plants (4)	
or BIOL F342 – Microbiology (4)--4-8 credits	
or BIOL F213X and F214 – Human Anatomy and Physiology I & II (8)	4 - 8
BIOL F481 – Principles of Evolution	4
CHEM F321—Organic Chemistry I (4)	
and either CHEM F322 – Organic Chemistry II (3)	
or CHEM 451—General Biochemistry – Metabolism (3)	7

   b. Complete the requirements of one of the following concentrations.*** When choosing courses to fulfill concentration requirements, students should consider the university requirement for two W courses and one O course, and the departmental requirement for a capstone project.

Cell and Molecular Biology

As part of the program requirements, take CHEM F322.
Complete the following courses, at least one of which must satisfy the W requirement.

BIOL F360 - Cell and Molecular Biology	3
CHEM F450 – General Biochemistry—Macromolecules	3
CHEM F451—General Biochemistry—Metabolism	3
Cell & molecular or physiology electives – Take three additional courses from lists A or B, at least one of which must be from list A	9 - 12
Biology breadth elective – Take one additional course from lists C or D	3 - 4

Physiology

Complete the following courses, at least one of which must satisfy the W requirement.

BIOL F360--Cell and Molecular Biology	3
Physiology or cell & molecular biology electives – take four additional courses from list A or B, at least two of which are from list B	12 - 16
Biology breadth elective – take one additional course from lists C or D	3 - 4
Biology elective – take one additional course from lists A, B, C, or D	3 - 4

Ecology and Evolutionary Biology

Complete the following courses, at least one of which must satisfy the W requirement.

BIOL F371 - Principles of Ecology	4
Ecology & evolutionary biology electives – Take two additional courses from list C	6 - 8
Organismal elective – take one additional course from list D	3 - 4

Biology breadth elective – Take one additional course from lists A or B	3 - 4
Biology elective – take one additional course from lists A, B, C, or D	3 - 4
STAT F401—Regression and Analysis of Variance (4)	
or STAT F402—Scientific Sampling (3)	3 - 4

c. Complete a capstone project - no credit requirement
The capstone requirement can be met through petition following completion of a mentored research project with a faculty member (e.g. by taking BIOL F490 or F497, or without course credits), or automatically by completing at least one of the following courses:
BIOL 434W – Plant Structure and Function (4)
BIOL 441W, O/2 – Animal Behavior (4)
BIOL 472W – Community Ecology (3)
BIOL 473W – Limnology (3)
BIOL 403W – Metabolism and Biochemistry (4)

3. Minimum credits required - 120 credits

Courses that may be used to complete biology elective requirements****

List A – Cell and Molecular Biology
BIOL F342 – Microbiology (3)
BIOL F360 – Cell and Molecular Biology (3)
BIOL F403W – Metabolism and Biochemistry (4)
BIOL F417O – Neurobiology (3)
BIOL F462O – Concepts of Infectious Disease (3)
BIOL F465 – Immunology (3)
CHEM F322 - Organic Chemistry II (3)
CHEM F450 – General Biochemistry-Macromolecules (3)
CHEM F451 – General Biochemistry-Metabolism (3)
CHEM F470 – Cellular and Molecular Neuroscience (3)
CHEM F474 – Neurochemistry (3

List B – Physiology
BIOL F310 – Animal Physiology (4)
BIOL F317 – Comparative Anatomy (4)
BIOL F335 – Epidemiology (3)
BIOL F342 – Microbiology (4)
BIOL F417O – Neurobiology (3)
BIOL F422 – Physiology and Ecology of Overwintering (3)
BIOL F434W – Structure and Function in Vascular Plants (4)
BIOL F441W, O/2 – Animal Behavior (3)
BIOL F455W,O – Environmental Toxicology (3)
BIOL F457W – Environmental Microbiology (3)
BIOL F458 – Vertebrate Endocrinology (3)
BIOL F459O/2 – Wildlife Nutrition (4)
BIOL F462O – Concepts of Infectious Disease (3)
BIOL F465 – Immunology (3)

List C – Ecology and Evolutionary Biology
BIOL F371 – Principles of Ecology (4)
BIOL F418 - Biogeography (3)
BIOL F422 – Physiology and Ecology of Overwintering (3)
BIOL F433 – Conservation Genetics (3)
BIOL F441W,O/2 – Animal Behavior (3)
BIOL F457W – Environmental Microbiology (3)
BIOL F462O – Concepts of Infectious Disease (3)
BIOL F469O – Landscape Ecology and Wildlife Habitat (3)
BIOL F471 – Population Ecology (3)
BIOL F472W – Community Ecology (3)
BIOL F473W – Limnology (3)

BIOL F474 – Plant Ecology (4)
BIOL F475 – Vegetation Description and Analysis (3)
BIOL F476O – Ecosystem Ecology
BIOL F483 – Stream Ecology (3)
BIOL F485 – Global Change Ecology (3)
BIOL F486 – Vertebrate Paleontology (3)
BIOL F487 – Conceptual Issues in Evolutionary Biology (3)
BIOL F488 – Arctic Vegetation Ecology: Geobotany (3)
WLF F301 – Design of Wildlife Studies (3)
WLF F410 – Wildlife Populations and Their Management (3)

List D – Organismal

BIOL F301 – Biology of Fishes (4)
BIOL F305 – Invertebrate Zoology (4)
BIOL F317 – Comparative Anatomy (4)
BIOL F331 – Systematic Botany (4)
BIOL F406 – Entomology (4)
BIOL F418 – Biogeography (4)
BIOL F425W – Mammalogy (3)
BIOL F426W,O/2 – Ornithology (3)
BIOL F427 – Ichthyology (4)
BIOL F486 – Vertebrate Paleontology (3)
BIOL F475– Vegetation Description and Analysis (3)

Minor

1. Complete the following program (minor) requirements:*

   a. Complete the following courses:

      BIOL F115X--Fundamentals of Biology I 4
      BIOL F116X--Fundamentals of Biology II 4
      BIOL F260—Principles of Genetics 4

   b. Complete one of the following course options:**** 3 - 8

      BIOL F360 – Cell and Molecular Biology (3)
      or BIOL F371--Principles of Ecology (4)
      or BIOL F310--Animal Physiology (4)
      or BIOL F434W--Structure and Function of Vascular Plants (4)
      or BIOL F342--Microbiology (4)
      or BIOL F213X and F214X--Human Anatomy and Physiology I & II (8)
      or BIOL F481--Principles of Evolution (4)

   b. Complete one additional course in biology at the 200 level or above 3 - 4

2. Minimum credits required - 18

** Student must earn a C grade or better in each course.*
***Because biology breadth courses for the BA degree serve as prerequisites for many upper division biology electives, the choice of which courses to complete should be made with consideration to which elective biology courses the student plans to complete.*
****Independent study (BIOL F397 or F497) or research experience (URSA F388, URSA F488, and BIOL F490)courses may be substituted by petition for a maximum of two required elective courses in biology (3-4 credits of independent study or research per substituted course). The subject area of the independent study or research will determine which biological subject area the credits satisfy.*
*****Courses that satisfy upper division elective credit may require prerequisites in addition to the required biology courses.*
Note: A foreign language is encouraged by the department in meeting requirements of the core curriculum.