

**BIOLOGICAL ASPECTS OF CONSERVATION
1995 COMMITTEE REPORT**

Prepared for

**Dean Phillip R. Certain
College of Letters and Science
University of Wisconsin-Madison**

by

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PREFACE

Our report on the Biological Aspects of Conservation (BAC) major was prepared at the request of Dean Phillip Certain in a December 9, 1994 letter. Excerpts of the letter provide the rationale and charge to the committee.

Measured simply by size, the BAC program has been extremely successful, and it continues to be a very popular major. However, this rapid growth has also led to problems such as the necessity of providing suitable advising for the large number of students. This need for support comes at a difficult time on this campus when the College of Letters and Science and other schools and colleges are facing severe financial strains. To plan wisely for the future of the program, it seems appropriate at this time to conduct a focused review of the BAC major.

In asking for this review, I want to focus on how the program serves undergraduate students in biology on the Madison campus. This I ask your committee to consider in particular the following questions:

- What kinds of students are attracted to the BAC program, what are their academic and professional goals, and how successful has the program been in meeting these goals?
- How well are students being served by the current BAC curriculum? How well does the current Committee of Advisors function in establishing and updating the curriculum? Should we change the curriculum to better serve the students?
- How well are students in the BAC major being served by the current system of advising and internships? Given that majors with this number of students are advised by faculty, how can the Committee of Advisors become more active and effective?
- Are there institutional obstacles to improvement of this major?
- Can the BAC major benefit from collaboration with faculty in departments not currently represented on the Committee of Advisors?

I will then submit this report to the College of Letters and Science Academic Planning Council. I also will forward copies of your report to Associate Vice Chancellor Virginia Hinshaw, to Dean Roger Wyse of the College of Agricultural and Life Sciences, to other members of the Council of Biology Deans, and to other members of the campus community with interests in undergraduate biology education.

The Committee met four times from March to May 1995. In our deliberations we (1) interviewed the past BAC Chair, Don Waller Professor of Botany and each member of the BAC Advisory Committee, (2) reviewed documents on the major and its history provided by Don Waller, (3) conducted a written survey of BAC majors (Appendix 2), (4) analyzed the curriculum structure of related majors and programs and compared each with BAC, and (4) drafted this report. Each committee member made significant contributions to the text and analyses.

It is an especially important time to be considering the BAC major because of the continuing importance of the subject area, the rapid growth of the major under Don Waller's leadership as past BAC Chair, and as an example of a biology major that can benefit from among college cooperation. We ask that the merit of the BAC major and our recommendations be judged on the basis of the service provided by this major itself and not get caught up in or delayed by more across campus activities in the biological arena

We wish to thank the following persons for providing valuable assistance to the Review Committee, these are: Don Waller, the past chair of BAC; the BAC Committee of Advisors (Michael Adams, Jeffrey Baylis, Thomas Givnish, Tony Ives, Robert Jeanne, Karen Strier, Donald Waller, Daniel Young, and Karl Zimmerer) for their interviewed comments; the 39 BAC majors who responded to our survey; and Alice Justice and Bonnie Throgmorton of the Center for Limnology who provided staff assistance for the survey and report.

This in depth look has stimulated our interest in the major. We would be pleased to discuss the report with the Deans, the BAC Committee of Advisors and other interested parties. We request that we receive a response from you on this report, and any actions and deliberations that it may stimulate.

Respectfully and unanimously submitted by,

John J. Magnuson, Professor of Zoology (L&S) (Committee Chair)
Ronald L. Giese, Professor of Forestry (ALS)
Robert M. Goodman, Professor of Plant Pathology (ALS)
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EXECUTIVE SUMMARY AND RECOMMENDATIONS

Biological Aspects of Conservation (BAC) is a popular major in Letters and Sciences (L&S) that has grown rapidly since 1989 from essentially inactive to 150 declared majors in the fall semester of 1994. It is a broad biological major across departments and colleges and has considerable flexibility in selection of courses. It has minimum quantitative requirements and does not specify that depth be achieved in any area. Thus, the major is on the breadth side of any breadth and depth debate in the learning experience. It is coordinated by a group of volunteer faculty across the campus and has had a voluntary chair.

The majority of our committee believes that the major should continue.

The major must be able to stand on its own intellectually, that is, a second major should not be necessary to achieve "rigor" and "depth." The challenge is to retain its strength of breadth while increasing strengths in its quantitative and depth areas. When this major is tuned, it should remain broader than any departmental degree related to conservation biology but have increased strengths in quantitative skills and depth within the major.

Advising must be strengthened and be more evenly distributed among the BAC Chair and the BAC Committee of Advisors. Rotation of advisors from a broader number of faculty committed to BAC is needed. Career advising is needed to meet the desired and realistic futures of the students. A greater sense of identity is needed among students in the major. This is especially true given the interdepartmental nature of the major and the breadth of the degree. Greater access is needed to internships and research experiences with faculty, research scientists and graduate students.

The major must have a stronger and better supported institutional structure. The committee recommends that the position of the BAC Chair and BAC Committee of Advisors be enhanced and that support be provided for supplies and staff assistance. The greater involvement of the faculty and courses in College of Agriculture and Life Science (ALS) would enhance many aspects of the major. Integration of the major across L&S and ALS is encouraged; a number of specific institutional changes would be required by these Colleges.

Specific Recommendations

General: We recommend that the Biological Aspects of Conservation major be continued and strengthened to provide a broad interdepartmental and intercollege major in conservation biology. This consensus is contingent on the following major assumptions:

- a. that the "rigor" of the requirements be increased to include additional quantitative coursework and a requirement of "depth" as well as breadth within the major,

c. that the role of the BAC Chair and the BAC Committee of Advisors be strengthened along with other necessary services to meet the needs of the majors.

b. that a serious attempt be made to integrate the major across L&S and ALS,

Curriculum

We recommend that the curriculum be reviewed by the BAC Committee of Advisors and strengthened by:

- increasing in quantitative requirements, for example, statistics.
- depth within the major for 1 or 2 sub areas.
- a distribution of courses within the major from at least 3 departments and 2 colleges,
- increasing the number of potential courses from outside L&S in all three curriculum areas: I. Core Courses, II. Species and Field Biology, and III. Electives,
- requiring that the introductory ecology course be chosen from an array of courses appropriate for a biology major at the 300 or above level such as Bot/Zoo. 460, Zool. 315/316, For. 460 or 550,
- recommending Biol. 151/152 as the preferred introductory course for majors,
- adding a requirement of a social studies course in the area, for example, environmental law, resource economics or policy, and
- adding a BAC 699 and a BAC 691/692 senior thesis to the timetable

Advising

We recommend that advising be improved to include course, program and career consultation by:

- providing staff assistance (25-50% time) for detailed advising by a non faculty staff member who could be, for example, shared with Botany and Zoology to make a full time position,
- providing detailed information on the major and its goals to cross college advising and other advising units on the campus,
- having the BAC Committee of Advisors meet, plan and discuss the major and its needs and problems at least twice per semester,
- distributing the workload among the faculty advisors more evenly and reducing the number of students directly advised by the BAC Chair,
- tracking BAC students after graduation to developed a database that can be used in advising BAC majors about career opportunities.

Institutions

We recommend that institutional improvements be made in BAC by:

- the Dean appointing the BAC Chair in consultation with the BAC Committee of Advisors,
- having the BAC chair report directly to the Dean and Associate Dean and participate in the L&S Chairs and Directors meetings,
- having merit of the BAC Chair determined jointly by the Dean or Deans and by the BAC Chair's home department with input from the BAC Committee of Advisors,
- the Dean making explicit arrangements with the BAC Chair's home department for assistance with supplies and clerical and staff assistance in servicing the major,
- the Dean approaching the College of Agriculture and Life Sciences to develop shared participation in and management of the major,
- having a reciprocity in college requirements for BAC majors both in L&S and ALS,
- allowing BAC students to take a second major in a different college,
- waiving the 100 credit rule and B and T course constraints for BAC majors so that they have greater access to courses in ALS and other colleges,
- increasing opportunities for internships,
- continuing to recruit faculty advisors and internship participants from both L&S and ALS, as well as from other colleges as appropriate,
- developing a larger set of interested faculty in the BAC major in addition to the Committee of Advisors,
- developing a student organization and enhancements such as a BAC email bulletin board, peer advising, and seminar series.

Responses to the above recommendations fall in some cases to the Deans and in others to the BAC Chair and Committee of Advisors. The materials used and rationale of our recommendations are detailed below.

BIOLOGICAL ASPECTS OF CONSERVATION

GENERAL BACKGROUND

The BAC Major

Characteristics of the Major

Biological Aspects of Conservation (BAC) provides students with broad training in conservation biology. It emphasizes natural history, whole organism biology, ecological interactions and conservation biology. Aldo Leopold, Norman Fassett, and Arthur Hasler initiated the major in the 1940's to prepare students for careers as game wardens, ranger naturalists, and museum workers. As indicated in the BAC description (Appendix 1), opportunities have expanded to include environmental education; forest, game and park management; endangered species research and recovery; and conservation and consulting organizations. The major also appeals to students who either desire a liberal education in the intrinsic values of natural resources or are preparing for graduate education in conservation biology or related disciplines.

Biological Aspects of Conservation is a flexible major that attracts a wide diversity of students and depends on strong and well informed advising. Fifty credits are required for the major to be selected from three areas of identified courses: core courses (23-27 credits), species and field biology courses (12 credits), and elective courses (13-15 credits) (Appendix 1). Some of these courses also help meet college requirements, for example, the BAC chemistry requirement. Summer internships are encouraged. BAC is the only cross campus major in biology at or beyond the whole organism level. The major is on the breadth side of any breadth and depth debate in the learning experience.

BAC has minimum quantitative requirements and does not specify that depth be achieved in any area of the major. BAC students in the BS track do obtain a sufficient minimum of quantitative courses, while BA students might not. Students with double majors would achieve depth in a major, while BAC majors without a double major might not. Owing to high overlap with a number of majors in general requirements, students majoring in some departments, could, by carefully selection of courses, also meet requirements of the BAC major or at least could obtain two majors with a high overlap in courses. The quality of the major to individuals depends very much on good advising or wise selection by the students or both.

BAC was originated by faculty in both ALS and L&S and faculty from both colleges serve on the BAC Committee of Advisors. The chair and committee of nine faculty advisors (Botany 3, Zoology 2, Entomology 2, Anthropology 1, and Geography 1) are voluntary and no current campus resources are explicitly provided for the major.

Even with this joint formation and participation by L&S and ALS faculty, institutional rules (BAC is now a L&S major) normally preclude students from participating in courses and curricula outside of L&S. College policies also do not allow for double majors outside of L&S and discourage students from enrolling in courses not cross-listed with L&S. This limits access by BAC majors to important conservation and management dimensions of many biological resources. At present, almost all students receive a BS or a BA in L&S and many take a second major in L&S.

Should the Major be Continued?

The majority of the committee believes that there is justification for continuing the major, provided problems identified in the curriculum, advising, and institutional operations are overcome.

Some of the reasons for maintaining the major are given below.

The BAC major is sought as a major in L&S even though similar kinds of programs are in ALS - Wildlife Ecology for example. Nearly 60% of the 150 students majoring in BAC in 1994 are single major students, making the program the largest major in a conservation-orientated degree on campus. Thus, a large number of students want both the breadth of a L&S degree and a conservation biology degree. This is different than that provided by single majors in L&S (e.g., Botany or Zoology) or in ALS programs (e.g., Wildlife Ecology).

One third of the BAC majors receive the BA degree. Thus, the BAC major offers a unique vehicle for pursuit of a conservation biology major by students in the Arts.

Forty percent of BAC majors are double majors. Many of the BAC students (Appendix 2) see the joint major as a positive feature of their education and of potential benefit for future employment.

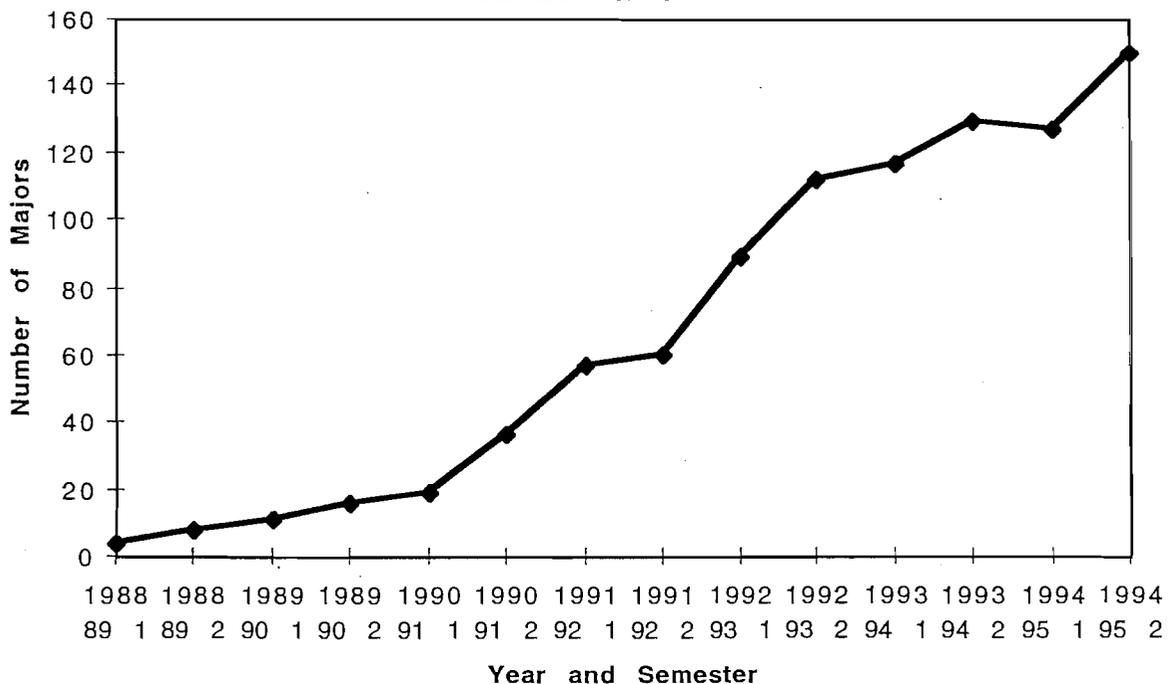
With the present structuring of biology into much narrower majors in both L&S and ALS, the Biological Aspects of Conservation major is uniquely important because it provides opportunity for conservation related studies across the many departments on the campus without moving out of L&S or ALS. Because the program with the most overlap with BAC, Wildlife Ecology, is currently over enrolled with steps being taken to reduce student numbers, the BAC program in L&S is an attractive alternative.

Nature Of The Students

Students majoring in the Biological Aspects of Conservation fall into several broad categories of 1) those with BAC as a double major and often with a professional interest in conservation biology, 2) those interested in conservation organismal biology but who desire a major with minimal quantitative requirements and/or broad choices for courses, and 3) those who seek a flexible major for a wide variety of

personal or mechanical reasons. Regardless of the reasons, the major has been popular and has grown rapidly since 1988 (Fig. 1). In 1994-95 semester 2, 150 students were majoring in BAC. All but four of these were BS or BA candidates in the College of Letters and Sciences. Only 1 (2%) of 38 BAC majors who responded to our student survey did not want to see the major continue; 31 (82%) strongly agreed that the major should continue and 6 (16%) others agreed that it should (Appendix 2).

Number of Majors in Biological Aspects of Conservation



In general, the students had similar characteristics for the four years from 1988-89 to 1991-92 as they had in the three years from 1992-93 to 1994-95 (Table 1) but some changes did occur.

Demographic features of BAC majors that have changed little and the student compositions in 1994-95 semester 2, were:

- residency (69% residents, 31% non-residents),
- gender (64% females, 36% males), and
- status (83% full-time, 17% part time).

Demographic features of BAC majors that changed more and the student compositions in 1994-95 semester 2, were:

- increasing percentage of BS over BA degree candidates (63% BS, 33% BA and 4% other in 1994-95 semester 2) and

- increasing percentages of students with double majors (42% with a double major, 58% with no double major in 1994-95 semester 2).

Second majors that were most common in 1994-95 2nd semester and their percent of all the second majors are:

- Zoology (41%),
- Geography (11%),
- English (10%),
- Botany (6%), and
- Wildlife Ecology (5%)

Several changes have been occurring in the second majors in addition to the increase in the number of BAC students with a second major. The most apparent is the increase in the percentage of Zoology/BAC double majors. Other departments with notable increases since the 1988-1992 period are Geography and English.

A total of 19 departments had students with BAC double majors in 1994-95 second semester. This is a decline from the 32 departments for the 1992-95 period.

Based on our survey of BAC students (39 respondents in Appendix 2), 25% transferred from another campus, 23% from another college at Madison, and 20% from another department in L&S. Their academic goals, i.e., highest degree sought, was an undergraduate degree (26%), a masters degree (35%), a professional degree (13%), or the PhD (28%). Thus, about 75% of the respondents planned to continue their education after the undergraduate degree. We should note that our sample of students was somewhat biased towards students with BAC as one of two majors (59% compared with 42% for the major as a whole). For professional goals, 67% expressed interest in being a professional in conservation biology in a federal or state agency, 26% in being a consultant in an environmental consulting firm, 20% in being a university teacher, 21% in being a lawyer, writer, or businessperson, 15% percent in being a teacher in elementary or secondary schools, and 18% in other activities. We were unable to obtain any information on what the majors did after graduation.

Table 1. Characteristics of Majors in the Biological Aspects of Conservation during the four years (88-89 to 91-92) compared with the three years (92-93 to 94-95) and the most recent semester (94-95 2). All numbers are expressed as percentages of students within each period. Double majors are listed in decreasing order of popularity during the most recent period.

	Period		Difference	Most Recent Semester 94-95 2
	88-89 to 91-92	92-93 to 94-95		
Degree Program				
BA	42	32	-10	33
BS	54	63	9	63
Other	4	5	1	4
Residency				
Non-Resident	35	30	-5	31
Resident	65	70	5	69
Gender				
Female	56	60	4	64
Male	44	40	-4	36
Status				
Full-Time	89	87	-2	83
Part-Time	11	13	2	17
Grade Point				
Sophomore	2.84	3.20	0.36	2.95
Junior	2.89	2.95	0.06	2.97
Senior	2.82	2.95	0.13	2.95
Total	2.82	2.94	0.12	2.94
Double Majors				
With double Major	20	38	18	42
No double Major	80	62	-18	58
Which Double Major				
Zoology	20.9	30.9	10.0	41.3
Geography	9.6	18.6	9.0	11.1
Botany	9.3	12.9	3.6	6.3
English	2.3	9.6	7.2	9.5
Wildlife Ecology	2.3	6.3	3.9	4.8
Anthropology	0.0	2.6	2.6	3.2
Electrical Engineering	0.0	2.2	2.2	1.6
History	2.3	2.2	-0.1	0.0
International Relations	2.3	2.2	-0.1	1.6
Geology and Geophysics	0.0	1.8	1.8	1.6

Continued*

*Table 1 Continued.

	Period		Difference	Most Recent Semester 94-95 2
	88-89 to 91-92	92-93 to 94-95		
Art	0.0	1.5	1.5	0.0
Bacteriology	0.0	1.5	1.5	1.6
Latin/Amer & Iberian St.	0.0	1.5	1.5	0.0
Psychology	0.0	1.5	1.5	3.2
Rural Sociology	0.0	1.5	1.5	0.0
Sociology	2.3	1.5	-0.9	0.0
Spanish	0.0	1.5	1.5	1.6
Landscape Architecture	0.0	1.1	1.1	0.0
Political Science	0.0	1.1	1.1	1.6
Ag. Journalism	9.3	0.7	-8.6	0.0
Elementary Education	0.0	0.7	0.7	0.0
Entomology	0.0	0.7	0.7	3.2
History of Culture	0.0	0.7	0.7	0.0
Molecular Biology	0.0	0.7	0.7	1.6
Philosophy	0.0	0.7	0.7	0.0
Theater/Drama	7.0	0.7	-6.2	1.6
Astronomy-Physics	0.0	0.4	0.4	1.6
Biochemistry	0.0	0.4	0.4	1.6
Economics	0.0	0.4	0.4	1.6
Journalism	4.7	0.4	-4.3	0.0
Poultry Science	0.0	0.4	0.4	0.0
Social Welfare	0.0	0.4	0.4	0.0
Afro-American Studies	7.0	0.0	-7.0	0.0
Communication Arts	4.7	0.0	-4.7	0.0
French	7.0	0.0	-7.0	0.0
Number of double Majors (Students per Semester)	5.4	45.3		63
Number of Departments (Total)	14	32		19
Number of BAC Majors (Students per Semester)	26	121		150

Some differences in academic performance and academic and professional goals existed among BAC students that were taking or not taking a double major (Appendices 2b and 2c). For fourth year students, academic performance (GPA) was slightly higher for those with a double major (with double major = 3.11, n= 48; with one major = 2.85, n = 47). The percent of students intending to continue past the bachelors degree was only slightly higher for those with a double major than those with one major (79% compared with 69%). Professional aspirations of the two groups were even more similar.

BA and BS students majoring in BAC had similar academic performances (GPA) in their fourth year (BS = 2.98, n=63; BA = 2.88, n = 27)

Comparison with Other Majors and Programs

The Biological Aspects of Conservation (BAC) major was compared to other closely-related biological curricula and other common double majors on the UW-Madison campus administered in ALS, IES and L&S. In this comparison, all majors were optimized for their congruency with BAC; i.e., where a choice of courses is available for required categories, courses meeting the BAC requirement were chosen. BAC requirements are described in Appendix 1. These one way comparisons of BAC and related curricula are tabulated in Appendix 3. The comparison with the most common double major Zoology is presented here in Table 2.

Each major was matched with BAC minimum requirements in the three areas: I. Core Courses (23-27 credits), II. Species and Field Biology Courses (12 credits), and III. Electives (to bring the total in the BAC major to 50 credits). The number of credits for a given major that were explicitly associated with required BAC courses in curricular context was divided by 50 (the total credits needed to fulfill BAC) to represent the "explicit" duplication. A second statistic, "plausible maximum", was calculated to reflect the reasonable potential for higher overlap (depending upon development of specialty areas, realistic substitutes, and the use of other major and college requirements). We note that these overlap values are of potential overlap; students also have the potential of double majoring in these majors with much less overlap than these possible maxima.

Agricultural and Life Sciences

LANDSCAPE ARCHITECTURE has one curriculum leading to a natural resources (non-professional) degree which emphasizes landscape planning/management. This option is strong on spatial relationships and weak in quantitative and species areas. A course in calculus or statistics or computer science is required as part of the ALS minimum requirement. This option has 35 students and shows a high potential overlap with BAC (Appendix 3-1); explicit overlap is 88%, the plausible maximum overlap is 100% if a student used species and field biology courses (BAC II) to fulfill the LA "specialty" requirement.

NATURAL RESOURCES CONSERVATION AND MANAGEMENT is one of four curricular options in the Forestry Department, the other three are accredited professional programs. This option emphasizes ecosystems and is broadly interdisciplinary. It is strongly quantitative and embraces policy, management, and biology. In contrast to BAC, a successor course to Chem. 103 or 109 is required, and courses in calculus and statistics and computer science are necessary. About 35 students are enrolled in this option. Explicit overlap with BAC is 88%; substitution of one ecology course would bring this to 96%.

WILDLIFE ECOLOGY emphasizes conservation, management and ecology of wildlife. It is population biology oriented and modestly quantitative. Like the Forestry major above, it adds management and policy considerations to the conservation aspects. A course in computer science and statistics is required. It is highly popular among undergraduates, with current enrollment at about 175 students and has the highest explicit overlap with BAC requirements of any major examined (100%).

Institute for Environmental Studies

IES CERTIFICATE PROGRAM, oriented to environmental problems and issues, is intended to promote environmental literacy. Its purpose is to enhance available majors rather than stand alone. The IES Certificate serves 180 students, of whom 20 declare double majors, including 13 (7%) who identify BAC as one of the majors. Less than 50% of courses explicitly are in common with BAC. One-third of the students major in biological sciences and another quarter in physical sciences. Thus, many certificate students automatically meet the remaining quantitative and/or biological requirements of BAC. A large number of humanities and social studies majors obtain the IES certificate and would have the capability of meeting the remaining BAC part III requirements. Thus, the overlap of IES with BAC could be substantial for many students.

Letters and Science

BOTANY has a basic biology curriculum with depth and a diversity of coursework. The major is achieved with a prescribed set of courses covering 6 breadth areas of plant biology; 5 of which must be covered. Two of the breadth areas are not available to BAC majors. Undergraduate research is stressed with a requirement for a Senior Thesis or equivalent. Beyond Chem. 103, an additional 10 credits of chemistry is required in the form of Chem. 104 and 343. Completion of the BS degree requires two intermediate math courses (usually calculus and statistics or computer science). Botany has about 50 majors. The explicit overlap with BAC is 86%.

ZOOLOGY is a basic biology curriculum enrolled with four standard tracks or other individually arranged programs (e.g. marine biology, aquatic ecology). A course in genetics is required as are one year of math, chemistry and physics with encouragement for organic chemistry, biochemistry, statistics and computer science. These quantitative courses and physics are not required by BAC. Zoology has about

250 majors. Overlap with BAC for general zoology (62%) and population zoology (72%) are lower than for those covered above. Potential duplication with BAC are 72% for the general zoology track and 82% for the population biology tracks.

Overlap with popular BAC double majors

Zoology and *Botany* were treated above.

English has little or no overlap with BAC except in some cases through L&S college requirements. The BS would have a little more overlap than the BA.

Geography has an explicit overlap of 18% if a 4 credit course is used in BAC group III and a 5 credit course (127) is used in group I. If 3 credit courses are used to resolve each group then the overlap falls to 12%.

Anthropology has an explicit overlap of 18%.

For the 6 most common double majors (*Zoology*, *Geography*, *Botany*, *English*, *Wildlife Ecology*, and *Anthropology*), the potential overlaps are highest for *Wildlife Ecology* (100%), *Botany* (86%), and *Zoology's* population track (82%); for the others it ranges from near zero to 72%.

CURRICULUM ISSUES

We have identified many of the curriculum issues in our discussions above on the nature of the BAC major and its comparison with other majors across the campus. We recommend that the curriculum be reviewed by the BAC Committee of Advisors and be strengthened along two fronts.

First, both BA and BS students should have similar minimum requirements for developing quantitative/analytical/theoretical skills and tools. These minimal skills might include advanced algebra, statistics, or computer science. Professional conservation biology requires such skills, interpreting information about conservation biology requires such skills, and the intermediate and advanced courses in the BAC major often expect such skills for comprehension and high performance. The BA students would be the primary benefactor because this requirement is not part of their L&S college requirements.

Second, while the breadth of the BAC major must be insured, it should be augmented with some depth within the major. This might be met by a combination of instituting a minimum credit load in intermediate and advanced courses, by the BAC Committee of Advisors rationalizing what constitutes depth in this major, and through student discussions of focal areas with BAC advisors. Some BAC advisors already encourage students to move in this direction. We think it is an important idea. It would benefit all BAC majors but especially those not taking a double major.

We also note that BAC does not require an intermediate or advanced ecology course (Bot/For/Zoo 460 for example). Instead Bot/Zoo 260 can be used to meet the core course requirements. While 260 is an important course especially in identifying issues for a general audience, we think that for a biology major, the introductory ecology course must be chosen from an array of courses at the 300 or above level such as Bot/Zoo. 460, Zool. 315/316, For. 460 or 550. We also think that a selection of courses was more appropriate for an introductory course rather than a single specified course, Bot/Zool 460, because of the breadth of interests covered in the major and the number of majors needing access.

We had several other specific curriculum concerns that we did not single out as recommendations. First, broader access is needed to courses about extinction. Courses in addition to Extinction of Species (Zool, WIEcol, & Envir St 360) should be among the choices, for example, courses on evolution or in the Geology and Geophysics Department. Second, a broader range of courses on conservation is needed rather than requiring only Conservation Biology (Bot 651) or Environmental Conservation (Geog 339). Third, the preference of Bot/Zool 151-152 should be recognized for a biology major. Fourth, a social studies course relevant to conservation biology would serve the majors well. And fifth, adding a BAC 699 and BAC 691/692 would provide emphasis to and facilitate the research and internship aspects of the major.

ADVISING ISSUES

The committee believes that advising is an even more critical issue in a broad, loosely specified major like BAC than in a narrow, more tightly specified major. Advising is key to an effective BAC major.

BAC operates with a loose confederation of faculty advisors from L&S and ALS, chaired until recently by Professor Don Waller in Botany. The BAC Committee of Advisors represents a good cross section of generally younger faculty who have an interest in undergraduate education and who work in areas related to conservation biology. Most have other undergraduate advising affiliations. Several teach courses that are taken by BAC majors. In our series of interviews, many of the faculty advisors cited positive features of the major, the students in it, and their experiences as BAC Committee of Advisors.

The advisors' high commitment to the majors is evident. They seem "in touch" with the students. All members of the BAC Committee of Advisors seem to share the view that by virtue of its popularity the major seems to be meeting the needs of a significant group of Wisconsin undergraduates. Yet, the group is only loosely affiliated and meets infrequently. It is not a focused or coherent group with a strong sense of ownership of the major.

Several advising issues need to be addressed:

- mechanisms to keep the major vital over the long term,
- communicating what the major is and is not, both in educational and professional terms, and
- the nature and quality of the advising services.

Keeping the major vital for the long term.

Mechanisms are needed to ensure a continued commitment of faculty participation in the BAC Committee of Advisors. No mechanism is evident to cultivate an interest in BAC among the broader faculty. There are many more faculty on campus whose interests overlap with BAC. This larger group forms the pool from which future BAC Committee of Advisors members will be drawn. One approach to maintaining the long term vitality of the BAC Committee of Advisors would be to rotate members from this broader group. In another L&S major (Molecular Biology) with similarities in structure to BAC, rotation is "fueled" by an annual solicitation from participants in a graduate training program in the area. Alternatively, a cluster of departments or groups within departments could be identified that would "contribute" advising time on a rotational basis. The issue here is to assure the long-term sense of awareness, caring, and commitment necessary for the vitality of BAC by assuring that faculty will be available to serve as advisors and sponsors of the majors.

A process is needed to bring the BAC Committee of Advisors together to share advising information, to consider academic issues (such as the curriculum) or to conduct other business designed to keep the major current and vital. We understand that the BAC Committee of Advisors meets rarely, and then on specific issues, and often with incomplete participation. Challenges, such as those raised in our report about curriculum, advising, and institutional relations, demand higher levels of involvement and participation by the BAC Committee of Advisors than has been demanded in the recent past. This comment is in no way a negative reflection on the past commitment of BAC Committee of Advisors nor of the intensive efforts of the past BAC Chair in advising students, but only to raise the issue of assuring the continued strength and relevance of the major to a changing campus and changing times.

Mechanisms are needed to distribute the advising workload equitably and with some consideration of student needs and interests. Nothing in the information available to our committee suggests that there is a problem with the matching of student interests with faculty, but in time this might become an issue if student interests were from quarters where faculty interests were not represented on the BAC Committee of Advisors. The present significant imbalance in the advising assignments of the present BAC Committee of Advisors also should be rectified.

Communication about the BAC major.

We believe that communication with students about the BAC major demands more coordination and thought than in the past considering the present popularity of the major. Mechanisms are needed to see that those who should consider the major have an informed opportunity to do so, and that those who choose the major do so for right reasons. We believe that BAC Committee of Advisors plays a critical role in assuring that students who come to BAC for diverse reasons get good, realistic advice. Help is often necessary for students in these types of situations to "find themselves".

Survey results (Appendix 2) and discussions with BAC Committee of Advisors members suggest that the majors come to BAC for a variety of reasons and have a wide range of career aspirations, from writing to teaching to working in the field of conservation at the bachelors level. Some students appear to find the BAC major because of an interest in this kind of biology as a career, some as a "flavor" to a liberal education but without strong professional or career goals, and some as "refugees". The refugees are either gravitating from more quantitatively demanding majors or from other campuses or Madison campus colleges. For some students, and perhaps especially for those moving within the Madison campus, the BAC major is an option primarily because of its breadth and highly flexible course requirements. The double majors seem to have included BAC because of their interest in more organismal or ecological topics and/or because of the small amount of additional work required for some future advantage.

In view of campus concerns about the scientific literacy in general and biological literacy in particular, the committee discussed the question of BAC as a major or

double major for non-traditional science majors. Such students with interests in English or History, or with career goals such as law, science writing, primary and secondary school teaching, or public policy, should know about and consider a BAC major. There is at present no coordinated mechanism to expand the awareness of such students about BAC as a possible major.

Thus, for at least two reasons, thought should be given by the BAC Committee of Advisors and the Deans about the type of information available to students.

Nature and Quality of Advising Services

Advising has many forms from traditional consultation with faculty advisors to interaction among students. In its broadest sense of helping students, advising services are important in:

- making wise course selections that will prepare majors for their futures,
- seeing and aspiring to appropriate career paths, and
- forming an interest and ownership in the major as a learning environment.

The second of these advising roles, career advising, needs critical attention in BAC. Our survey results (Appendix 2) were predominantly from seniors, and they revealed a general dissatisfaction with the role of advising, with a distinct trend to the negative when the topic moved from course selection to career-oriented advising. If our sample of 39 BAC majors reflects the general situation, it indicates a significant area for improvement in advising. Particularly in an unstructured major like BAC, perceptive and timely advising is needed to integrate thinking about the future with choices being made now. The present BAC major leaves considerable room for students to make course selections that may not fulfill their needs in preparing for graduate school or other future options.

Also critically needed are mechanisms to strengthen the identity of the major among BAC students and faculty as an academic and learning community. Opportunities are needed to enrich student-student interaction, sharing of information and experiences, and access to advisors. In our survey (Appendix 2), numerous students suggested ideas for strengthening the ties among students and between students and faculty. Some made specific suggestions: bring BAC majors together to share course information and other opportunities, or centralize or stabilize sources of information useful to students, and more active reaching out by the BAC Committee of Advisors to majors. Several suggested making it a requirement that students see an advisor. Some wanted more advisors to choose from, including those in programs like wildlife ecology or those involved in real conservation work. There were a number of calls for specific placement help. Formation of an undergraduate student organization, an email bulletin board, and providing a BAC "place" for information and gathering were indicated in the survey responses as being possibly helpful in these regards.

Students might be more able and interested than many of the faculty to locate and bring to campus representatives of environmental, legislative, policy and conservation groups to provide information about careers and the academic preparation needed. Students who have been successful with internships can provide information to other students. To assist in this advising we recommend that careers of BAC students be tracked after graduation to provide feedback to present students on what some possibilities are.

BAC majors would benefit from stronger faculty commitment to internships, practical experiences, or independent study. Many BAC students have found their way to this kind of activity and most who had not yet done an internship or independent study said they intended to do so in our survey (Appendix 2). Some achieved access to these opportunities from courses. Others heard about opportunities through campus jobs or the grapevine. In general, a greater need for such information is noted. Sharing such information among a number of biology majors might be efficient. One innovation would be to create and sponsor BAC 699 (independent study) or 691/692 (senior thesis) options, giving identity and at least the opportunity to take recognized independent work in BAC. Such a step would likely require listing faculty willing to sponsor BAC students. This listing could serve to identify the larger group of faculty who relate to the BAC major (see earlier comments on faculty ownership and the pool from which future BAC Committee of Advisors members will be drawn). Another option to be considered is a BAC research colloquium, staffed by BAC Advisors and others from the advising .

INSTITUTIONAL ISSUES

Several institutional concerns emerged during our interviews and discussions. The three major points are:

- improving the status of the BAC Chair and the BAC Committee of Advisors,
- providing adequate academic support of personnel and supply money, and
- facilitating the relationship between the BAC major and ALS or other colleges.

BAC Chair

The major immediate institutional impediment for BAC is the lack of a Chair. It is important for the success of the major that L&S recruit or reinstate a chair from among the faculty as soon as possible. Without an active chair, the major cannot continue to recruit additional advisors, provide information to potential new students, or supervise the academic progress of the current majors.

The BAC chair should be treated like any other Department Chair or Director. The chair should be a regular participant in the L&S Chairs' and Directors' meetings and report directly to the Dean or Associate Dean. Because of the interdisciplinary nature of the major, the BAC Chair must have direct access to the Associate Dean and the Dean. The Chair cannot be expected to pass requests for funding, staffing and other issues through his or her home Department Chair. As with regular Department Chairs, it would be appropriate to provide a modest reduction in instructional load to compensate for the increased administrative load, perhaps a 25% reduction.

We recommend that the BAC Committee of Advisors be polled to identify and nominate potential candidates for Chair, and that the Chair might occasionally come from ALS. The BAC Committee of Advisors also should provide annual evaluations of the chair to the Deans so that the merit can be determined by the Dean's Office in consultation with the BAC Chair's home department. To be an effective advocate and administrator for BAC, the BAC Chair may at times have to argue against the interests of her or his own department and will likely be doing extra service and administration that may not be appreciated by his or her executive committee.

We note that with 150 declared majors and probably as many more undeclared majors, BAC provides a service to a significant number of undergraduates. This major is very inexpensive in itself. There has been no office, no faculty, little or no budget, and all of the curriculum is based on courses offered by other departments. We strongly recommend that incentives and improvements be provided to guide this major.

We recommend that a budget be provided for a 25% time Academic Administrative Assistant and a modest supply budget. This would be equal to the support received for the Molecular Biology major. The staff and supply budget are to be used for record keeping, advising and communication with individual majors, to support the creation of

a student peer advising organization and for other supply costs related to the major such as discussed above under curriculum and advising issues. It is unrealistic to expect the BAC Chair's home department to provide supply funds and personnel for this major out of their own budget.

The BAC major provides a unique service to a very large number of liberal arts and science students on the campus, and it is worth an investment to maintain and strengthen it. Our recommendations are modest, especially given the present non funding of the major and the large number of majors.

Advising and Academic Support

The previous BAC chair has made several requests to the Deans for academic staff assistance for advising and administrative assistance. A part-time Academic Advisor was available for a few years that coincided with the period of greatest growth in the major. The identified need for career counseling, information about internships and other job opportunities, is best done by faculty. However, the BAC chair should not have to carry the main advising role, nor should individual faculty members be expected to help a student through the maze of detailed requirements to be met. There would be less burden on the BAC Chair and on individual faculty advisors if much of the detailed work could be done by an Academic Staff person, as is done in many large majors such as Sociology, Psychology, and English.

An Academic Advisor can provide several services: advising students about which courses to take to meet college requirements, advising students about appropriate courses needed, not only to meet the requirements of the major, but also about trajectories most likely to assist the student in reaching career goals, and steering students to the most appropriate faculty advisors. The Academic Advisor also can provide feedback to the BAC Chair about the performance of individual faculty advisors. The advisor could serve as a catalyst for students in the program, leading to the development of a student organization (see Advising issues above), and being a visible presence for the program.

There are several possible solutions, we identify two:

A 25-50% time person could be dedicated to BAC. This person would be expected to be well-informed about the major and its requirements as well as to be a source of information about relevant faculty and courses across the campus and to serve as an information source for students seeking internship.

Alternatively, there might be value in a shared full-time advisor for appropriate L&S Biology programs, for example Botany, Zoology, and BAC. Such an advisor might efficiently serve all three programs, but would have to be knowledgeable about the specific requirements and career opportunities in each major.

We also recommend that modest supply monies and a meeting space be provided to develop a student organization to provide peer advising. The rationale for a student organization of BAC majors was provided under advising issues.

Relationship of Major to L&S, ALS and Other Colleges

The BAC major is interdisciplinary and crosses both department and college boundaries. Ideally, the governance of the major should be accomplished jointly by L&S and ALS. Several departments and many faculty members in ALS have expertise and teaching interests appropriate to BAC.

At present the 100 credit rule in L&S severely limits BAC majors who seek courses and independent study in ALS or other colleges. The requirement that students take only courses marked T or C severely limits the breadth of courses students might take, and the inability of L&S students to receive degree credits for independent study courses taken with ALS faculty severely limits the educational options of BAC majors. Although only 14% of the students surveyed (Appendix 2) reported problems with the 100 credit rule, we view this as a major impediment to recruiting faculty advisors from ALS and other colleges, and we view the 100 credit rule as a limitation to a significant minority of students.

A greater effort should be made by the BAC Chair to recruit faculty advisors in ALS to serve BAC students. To facilitate this process, mechanisms should be developed for ALS faculty and those of other colleges who become involved in BAC to receive credit for their participation in their home departments and colleges.

We believe that this is an excellent time to begin communication and negotiation with ALS to allow greater inter-college collaboration with respect to courses and advising in BAC. The draft report (Issues and Recommendations for Undergraduate Instruction in the Biological Sciences at UW-Madison, April 5, 1995) recommends that "ALS and L&S enter into negotiations with the goal of reducing academic barriers to cross-college biological education." and that "Biological Aspects of Conservation (currently an L&S major) be available as both ALS and L&S majors". We encourage the Deans of L&S and ALS Deans to consider such possibilities.