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ABSTRACT

This study sought to identify the areas of most critical concern for curriculum emphasis for a department of wildlife science. The questionnaire was developed from existing documents and modified by a committee. Included in the sample were college seniors, graduates, employers, and faculty members. An overall rate of return of 65% (141 usable questionnaires) was achieved. There was considerable agreement among the various groups. The single item ranked as most critical was knowledge of political obstacles to the implementation of sound resource programs. The second was ability to deal with cost considerations (economics) of wildlife problems. Thinking and problem solving skills also received high priority. These items indicate a need for new social and thinking skills, rather than a continuation of a traditional wildlife education program. (RH)

Instructional Development

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AN ASSESSMENT OF

EDUCATIONAL NEEDS

FOR THE

DEPARTMENT OF WILDLIFE SCIENCE

By

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October, 1975

ABSTRACT

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This study seeks to identify the areas of most critical concern for curriculum emphasis for the Department of Wildlife Science. It does not purport to provide specific solutions or final answers; rather, it should serve as a basis for analysis and planning..... 1

The questionnaire was developed from existing documents, and after being revised by a committee of five department members, was pilot tested and sent out to Wildlife Professionals. Four groups were included--graduates of the department since 1970, seniors who graduated in June 1975, employers and faculty members. An overall rate of return of 65 percent (141 usable questionnaires) was achieved..... 3

Most conclusions were made by subtracting the "Present Performance" scale score from the "Future Importance" scale score to obtain a "Difference Score". (see sample questionnaire in Appendix A.) The larger the difference, the more critical the need..... 5

There was considerable agreement found for the various groups. The single item ranked as most critical was "Knowledge of political obstacles to the implementation of sound resource programs"; the second was the "Ability to deal with cost considerations (economics) of wildlife problems..... 13

Thinking skills such as (1) critical thinking and the use of judgment, (2) planning and forecasting future trends, (3) independent thinking for creative solutions; and (4) systematic problem solving from an environmental perspective were cited as critical by virtually all groups. A final area of agreement involved energy and its impact on the environment..... 16

There was consensus on low criticality for skill in managing populations for sport hunting and sport fishing, the more traditional aims in Wildlife Science..... 16

A second analysis using rankings on performance and importance only - and not Difference - found similar results for the most critical items, with the exception of the economics concern and two of the thinking skills..... 17

These items of concensus appear to be interrelated and to indicate that rapid changes in the field require new social and thinking skills, rather than a continuation of a traditional wildlife education..... 18

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*Note: Appendices have been published separately and are available upon request from the Division of Instructional Development.

FOREWORD

The use of survey techniques to gather data on the educational needs of students, while not new, is fairly rare in higher education settings. This study aims at identifying needs for undergraduate students in the Department of Wildlife Science at Utah State University. It is similar in intent to an assessment conducted and published for the U.S.U. Department of Civil and Environmental Engineering. The aim is the same in both studies: to identify those needs which are most critical, and thereby to provide guidance for the design of programs. The aim is not to specify immediate solutions to these problems, something which can come only after careful analysis and planning have taken place; but to specify which problems are most deserving of resolution.

The study has been made possible by funding under a grant from the fund for the Improvement of Post-Secondary Education (OEG-0-74-8677) to conduct instructional development at the university department level. Particular thanks are due to the members of the Wildlife Science Department for their quality assurance role, specifically Drs. Bill Helm, George Innis, John Kadlec (Dept. Head), Allen Stokes, and Fred Wagner. In addition, appreciation is expressed to Drs. John Hunt, Jim Kennedy, and Richard Schreyer of the Department of Forestry for assistance in locating previously conducted research for the College.

While the conclusions expressed herein are necessarily those of the researcher, it is hoped that others will examine the data and draw additional conclusions. This document is presented as a springboard for discussion. It will succeed to the extent that planning to meet

the future needs of the Wildlife Science Department takes place.

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I. INTRODUCTION

"Tomorrow's resource graduate can no longer be taught to seek the one best solution based on traditional assumptions. Tomorrow's resource manager will be playing chess, not checkers. Each decision will affect other decisions. There will not be one best move to discover, but a range of moves whose implication will only be understood in terms of future possible moves." [1]

Education in the field of Wildlife Science is currently approaching a crossroads. In view of widespread environmental concern from all sectors of society, the traditional training for a role in fish and game management is seen by many as inadequate for the demands of jobs which most graduates in the field will take. New skills, attitudes and redirected training will be required to deal with conflicting demands of various interest groups. The most conservative view of the future would suggest that more such competencies will be required for tomorrow's graduate.

This research aims at documenting the most critical needs for graduates in the field. For the purposes of this study, "need" is defined as the discrepency between "what is" and "what should be". The focus was deliberately extended to deal with the future, as seen by 141 persons associated with the U.S.U. Wildlife Science Department, i.e. graduates, employers, senior students and faculty. The study is meant to serve as a basis for discussion and planning, not as the final word.

Predictions for the future are notorious for their inability to deal with unforeseen contingencies. For example, a number of predictions made as recently as five years ago made no provision for the energy shortage, casting doubt upon the accuracy of their far ranging conclusions. [2]

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1. Carl H. Reidel, "Education for Integrated Resource Management", paper presented to the Forest Curriculum Development Project, Estes Park, Colorado, November 15, 1972, p. 11.

2. David R. Francis, "Tomorrow's Bright Future Turns to Gloom," The Christian Science Monitor, June 9, 1975, p. 21.

While the present research was conducted with an eye toward the future, no delusions are held about respondent's predictions as being anything more than projections based upon present trends. To some extent, the use of a future-oriented questionnaire serves as a means to an end, a technique to stretch the imaginations of participants to take an expanded, long-range view of wildlife problems.

II. PROCEDURES

Preliminary steps in the conducting of the needs assessment study began with the formation of a Quality Assurance Committee in May, 1975. The immediate task for this group was to develop a survey plan and to provide a sounding board for development of a questionnaire. Some preliminary decisions made by this group were: (1) the questionnaire should attempt to probe the views of the future held by respondents; (2) the focus should be on undergraduate, rather than graduate education; and, (3) in formatting the questionnaire, the two responses for each question, "actual performance" and "future importance" should be separated. (see sample Questionnaire in Appendix A).

Developing the Questionnaire

A list of likely concerns was identified from existing documents in the department—particularly the statements on graduate and undergraduate education (April, 1975) by the department—and from previous needs assessments conducted at U.S.U. as well as other institutions. In addition, the Committee helped to generate some additional concerns specific to the Wildlife field. An item pool of over 80 items was developed, and from these a selection for the pilot instrument was made.

Pilot Testing and Use

After several revisions in format as well as content, a pilot test instrument consisting of 54 questions was sent to 33 persons. Telephone interviews with respondents to the questionnaire suggested several alterations which reduced the number of questions to 45 and brought the length down to five pages.

The four groups for sampling and the number of questionnaires sent out were as follows:

(1) all senior students from the previous year (graduated June, 1975) -- 78

(2) graduates (since 1970) who had responded to a short employment questionnaire from the College of Natural Resources. -- 51

(3) employers of U.S.U. graduates, identified by job title throughout the U.S. -- 75

(4) faculty members attending the departmental retreat. --14

To some extent, a built-in source of bias existed for graduates, since current addresses were available only for those responding to the previous questionnaire. The revised questionnaires were mailed in mid-July to all groups but faculty with a follow-up letter on August 6th.

Polling of faculty opinion took place at the departmental retreat, September 4th and 5th, where faculty members completed 14 questionnaires. Following the tabulation of results, there was considerable discussion of the preliminary results from all groups.

Considerations of Reliability

The questionnaire, shown in Appendix A, is essentially a self-report instrument. Techniques for assessing reliability using an internal consistency method (e.g. split-halves or Kuder-Richardson formula) are clearly inappropriate, since each item must be dealt with separately. In order to assess the reliability of the instrument, three persons involved in the pilot sample were asked to fill out a second questionnaire.

Correlating their responses for both times of taking the questionnaire, the results are shown in Table 1.

TABLE 1:

Reliabilities for Three Persons on "Present Performance" and "Future Importance" Scales of the Questionnaire.

	Present Performance	Future Importance	Difference (I-P)
Subject #1	.67	.53	.75
Subject #2	.27	.71	.46
Subject #3	.61	.66	.64
Average (Mean) Reliability	.52	.64	.61

With the exception of one person (Subject #2) on the Present Performance scale and consequently the Difference statistic, the reliabilities are consistently above .50, which would generally be acceptable for an attitudinal instrument. Conclusions about one scale being more reliable than the others would be presumptious using these data, due to the small sample size. (3 people) It is of interest to note that the Difference statistic appears to be at least as reliable as either of the other two scales.

POSSIBLE BIAS FROM NON-RESPONDENTS

In any study of a survey nature, some portion of persons will not respond, for one reason or another. The researcher is then left with the problem of determining to what extent the sample obtained is representative. At least three strategies are employed by researchers to handle this question:

(1) The researcher can continue to send letters and make telephone calls until virtually all questionnaires have been obtained.

(2) if the proportion of nonrespondents is considerable, (Borg and Gall suggest 20% or more)[1], it may be advisable to conduct interviews of a sample of non-respondents, to establish a similar response pattern; and

(3) on the basis of significant demographic characteristics available, the researcher may obtain an estimate of the representativeness of the sample.

For this study, the third approach has been taken, i.e., using demographic characteristics to establish representativeness. Two separate analyses were conducted, one for all three groups based upon geographic status and a second one for graduates only, based upon their employment or non-employment in the Wildlife field. In both cases, a Chi Square test was used, and in neither instance was the group of non-respondents shown to be significantly different from those responding to the questionnaire. From this evidence as well as the fairly substantial overall response rate to the questionnaire (65%) one can conclude that major bias from non-respondents is unlikely.

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1. Walter R. Borg and Meredith D. Gall, Educational Research: An Introduction, New York: David McKay Company, Inc. 1971, pp. 209-210

III. RESULTS

"The professional wildlife manager frequently finds himself in the center of new, sometimes explosive issues and debates... As his professional career expands, he must deal increasingly with social forces and therefore must be aware of new public attitudes, community interests and political pressures."[1]

Before dealing extensively with the questionnaire results, it is useful to examine certain demographic characteristics of respondents.

Rate of Response

The overall rate of response to the questionnaire was 65 percent. Table 2 below summarizes the numbers of questionnaires sent out and returned.

TABLE 2:

Number of Responses Received From Questionnaires Mailed

Group	Sent Out	Number Returned	Percent
Graduates (Since 1970)	78	56	76%
Seniors (Graduates June 1975)	51	25	49%
Employers	75	46	61%
Faculty	14	14	100%
Total	218	141	65%

Highest response came from graduates (72%) and employers (61%). Last year's seniors were somewhat lower, with a return rate of 49 percent.

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[1] John L. George, Samuel S. Dubin, and Benjamin M. Nead, "Continuing Education Needs of Wildlife and Fisheries Managers," Wildlife Society Bulletin, Vol. 2, No. 2, Summer, 1974

To some extent, the contrasting return rate for other graduates and seniors may be a function of the accuracy of the current address available.

Geographic Distribution of Respondents

The geographical distribution of returns for the mailed questionnaire is shown in Table 3. The largest percentages of respondents are located in the seven Mountain States (25%), Utah (19%) and the three West Coast States (15%). An analysis was done to see if the response rate to the questionnaire varied significantly by region. While the results did not reach statistical significance, there was an unexpectedly larger portion of non-respondents from Utah than from areas outside Utah.

Future Orientation

Respondents' projections of the future are of interest, but are probably of peripheral importance for development of curriculum. This item served as a means to an end, namely getting respondents to consider the future in their deliberations of what skills, attitudes and competencies would be important for students.

Table 4 displays the distribution of responses by group. Scenario A is meant to be a somewhat pessimistic view of the future; Scenario B is meant to be fairly neutral; and Scenario C fairly optimistic. Two positions midway between the three scenarios, items D and E, were inserted

TABLE 3: GEOGRAPHIC DISTRIBUTION OF RESPONDENTS.

	Graduates	Seniors	Employers	All Groups	Percent
1. West Coast Washington Oregon California	8	3	9	20	16
2. Utah	12	8	3	23	18
3. Mountain States Idaho New Mexico Nevada Colorado Arizona Wyoming Montana	12	4	16	32	25
4. North Central Kansas North Dakota Nebraska Iowa South Dakota	7	1	0	8	6
5. South Central Oklahoma Missouri Texas Louisiana Arkansas	1	0	0	1	1
6. Central Minnesota Illinois Wisconsin Ohio Michigan West Virginia Indiana Kentucky	5	3	2	10	8
7. North Maine Pennsylvania New Hampshire New Jersey Vermont Connecticut Massachusetts Maryland New York Delaware	5	4	3	12	9
8. Washington, D. C.	0	0	11	11	9
9. South Tennessee Georgia Mississippi Florida Alabama S. Carolina Virginia N. Carolina					
10. Non-Continental U.S. and Overseas Hawaii Puerto Rico Alaska Overseas	3	1	0	4	3
Total	56	25	46	126	100

TABLE 4: FUTURE ORIENTATION

	Graduates	Seniors	Employers	Faculty	All Groups	Percent
A. Large numbers of people inhabit all nations in situations ranging from moderate overcrowding to chaotic overpopulation. Industrial production has declined due to lack of resources, and hunger is the common denominator of mankind. Pollution has made many environments extremely unhealthy.	3	1	2	1	7	5
D. Position between A and B	22	8	15	7	52	37
B. Population growth strains the resources of many underdeveloped countries, while developed countries grow richer. Some forms of pollution have been eradicated, but environmental strain continues. International efforts at cooperation have had some success, although many forms of wildlife are extinct or endangered.	17	10	17	4	48	34
E. Position between B and C	11	3	8	2	24	17
C. New technology has allowed production worldwide to more than keep pace with population expansion. A rapidly rising standard of living, a strong concern for environmentally-sound solutions to problems, and a cooperation among nations characterize the world situation.	3	1	0	0	4	3
None of the above (or no response)	0	2	4	0	6	4
Total	56	25	46	14	141	100

to lessen the discomfort of being forced to take an extreme position, but still allow respondents to indicate a direction of their view.

All groups tended to respond more toward the "pessimistic", rather than the "optimistic" end of the scale. Graduates and professors responded most frequently in the mildly pessimistic category (D), while seniors and employers tended to favor the more neutral position (B). It is of interest to note how few (overall, 8 percent) responded in the strong pessimistic or strong optimistic positions (A or C). As expected, there seems to be a cautious "wait and see" attitude, rather than much certainty about the future. Evidence from telephone interviews with the pilot sample respondents indicated that respondents kept these predictions in mind while completing the rest of the questionnaire.

Interpreting the Difference Statistic.

As stated earlier, a need has been defined as the discrepancy between "what is" and "what should be." To measure this difference on items in the questionnaire, a difference score was computed between the "Future Importance (I)" of an item and the "Present Performance (P)" as rated by the respondent. The size of this difference indicated the "criticality" of the need. If the respondent left either "Present Performance", or "Future Importance" blank, or marked "Don't Know," his rating of the item was not included in the calculation of Difference (I-P). In some cases, particularly with employers, there was reluctance to rate the department's present performance, and the "Don't Know" column was marked extensively. In cases where the number of usable responses

was less than 50 percent of the total group, that item has arbitrarily been marked with a dash following the number.

For the interpretation of this Difference or "Criticality Index", consider three examples. The first and most frequently encountered is the case where the "Future Importance" is perceived as greater than the "Present Performance". The size of the difference could be seen as an indication of the need: the larger the difference, the more critical the need. Another example results when the "Present Performance" is roughly equivalent to the "Future Importance". This could occur where both Present Performance and Future Importance are either high or low, and would indicate minimal attention to this need is warranted now. A final example, somewhat rare, occurs when the rating for "Present Performance" exceeds that for "Future Importance." In this case, the Difference is negative and would be interpreted as saying that too much emphasis is being placed on that area in the curriculum at present, that a student's time could probably be spent more profitably in other ways.

Items Cited as Most Critical By All Groups

A number of items were viewed as critical by all, or almost all groups. All items will be discussed in more detail in the following sections, by category, but this section examines the ones with considerable agreement in ranking high or low.

Table 5 allows a quick look at the items cited as most and least critical by the four groups polled. The total, cited last, is a numerical averaging of all responses, regardless of group.

TABLE 5:

THE HIGHEST AND LOWEST RANKED ITEMS BY DIFFERENCE (I-P) FOR EACH GROUP

GRADUATES

Highest Ranked			Lowest Ranked		
Rank	No.	Item	Rank	No.	Item
1	8	Political obstacles	36	25	Technical report writing
2	5	Cost considerations	37	34	Retain public ownership of wildlife on private lands
3	13	Equipment & resources available on the job	38	40	Professional standards and ethics
4	20	Critical thinking and judgment	39	41	Participation & expression in the arts
5	17	Planning & forecasting future	40	35	Standards of excellence in scholarship
6	7	Energy and its impact	41	22	Dealing with probabilities rather than certainties
7	19	Independent thinking, creative solutions	42	10	Animal behavior and ecology
8	21	Apply tools to practical problems	43	12	Managing fish population for sport fishing
9	16	Water pollution biology	44	9	Mathematics
10	14	Ability to use the computer	45	3	Managing game populations for sport hunting

SENIORS

Highest Ranked			Lowest Ranked		
Rank	No.	Item	Rank	No.	Item
1	5	Cost considerations	36	44	Familiarity with a second culture
2	8	Political obstacles	37	40	Professional standards and ethics
3	36	Positive attitudes toward himself and own abilities	38	23	Isolating the assumptions of an argument
4	42	Acquire and maintain physical fitness	39	33	Motivation for educational goals of own choosing
5	19	Independent thinking, creative solutions	40	27	Effective use of English
6	6	Endangered species problems	41	26	Explain concepts to another person in the field
7	20	Critical thinking and judgment	42	25	Technical report writing
8	16	Water pollution biology	43	15	Controlling animal populations to limit depredation loss
9	17	Planning and Forecasting	44	12	Managing fish populations for sport fishing
10 *	14	Ability to use the computer	45	3	Managing game populations for sport hunting
	43	Current thinking, exciting ideas			

* Asterisk indicates tied ranks.

EMPLOYERS

Highest Ranked			Lowest Ranked		
Rank	No.	Item	Rank	No.	Item
1	8	Political obstacles	36	15	Controlling animal populations
2	18	Solve problems systematically	37	32	Political activism
3	7	Energy and its impact	38	4	Managing game populations for food production
4	24	Communicate to other disciplines	39	35	Standards of excellence in scholarship
5	20	Critical thinking and judgment	40	11	Managing fish for food
6	5	Cost considerations	41	33	Motivation for educational goals of own choosing
7	19	Independent thinking, creative solutions	42	9	Mathematics
8	1	Total ecosystem planning	43	31	Involvement with professional organizations
9	17	Planning & forecasting future	44	12	Managing fish populations for sport fishing
10	25	Technical report writing	45	3	Managing game populations for sport hunting

FACULTY

Highest Ranked			Lowest Ranked		
Rank	No.	Item	Rank	No.	Item
1	8	Political obstacles	36	42	Acquire and maintain physical fitness
2	17	Planning & forecasting future	37	2	Awareness of pressures on wildlife resources and options open to society
3	19	Independent thinking, creative solutions	38	38	Self reliance, ability to fend for himself
4	1	Total ecosystem planning	39	33	Motivation for educational goals of own choosing
5	20	Critical thinking and judgment	40	31	Involvement with professional organizations
6	27	Effective use of English	41	10	Principles of animal behavior
7	7	Energy and its impact	42	6	Endangered species problems
8	18	Solve problems systematically	43	12	Managing fish populations for sport fishing
9	23	Isolating the assumptions of an argument	44	3	Managing game populations for sport fishing
10			45	34	Retain public ownership of wildlife on public lands

*Asterisk indicates tied ranks

TOTAL (ALL GROUPS)

Highest Ranked

Rank	No.	Item
1	8	Political obstacles
2	5	Cost considerations
3	20	Critical thinking and judgment
4	17	Planning & forecasting future
5	19	Independent thinking, creative solutions
6	18	Solve problems systematically
7	7	Energy and its impact
8	24	Communicate to other disciplines
9	1	Total ecosystem planning
10	16	Water pollution biology

Lowest Ranked

Rank	No.	Item
36	22	Dealing with probabilities rather than certainties
37	15	Controlling animal populations
38	35	Standards of excellence in scholarship
39	34	Retain public ownership of wildlife on public lands
40	33	Motivation for educational goals of own choosing
41	31	Involvement with professional organizations
42	10	Principles of animal behavior
43	9	Mathematics
44	12	Managing fish populations for sport fishing
45	3	Managing game populations for sport hunting

Figures 1 and 2 show these same findings (for higher ranked items) in graphic form, for each of the groups polled.

Clearly, the most critical need as identified by all respondent groups is "Knowledge of political obstacles to the implementation of sound resource programs." It is ranked either first or second in criticality by all groups.

The second item seen as most critical is "Ability to deal with cost considerations (economics) of wildlife problems." It is ranked first by seniors, second by graduates, sixth by employers, and twelfth by faculty. In some ways the concern with economic considerations is a parallel to the political concern discussed above.

Next in criticality are a series of four thinking skills which are ranked as high in criticality by all groups. These concerns are as follows: (1) Skill in critical thinking and use of judgment; (2) Skill in planning and forecasting future trends; (3) The ability to think independently and to arrive at creative solutions to problems; and (4) Ability to solve problems systematically from a broad environmental perspective. While the exact ranking of these four concerns varies by group, it is noteworthy that of the top ten items ranked by each group, faculty and employers include all four of these skills. graduates and seniors include three. There is a reasonable concensus on the discrepancy between present performance and future importance of these thinking skills.

Essentially, respondents seem to be saying that these thinking skills are vitally important ant that present educational programs are not providing these crucial skills.

A concern with energy and its impact on the environment is demonstrated by three of the four groups ranking this item in the top ten in criticality.

A final note of consensus should be made for the extremely low rankings in criticality given to the two questions involving skill in managing populations for sport hunting and sport fishing. The item for sport hunting was ranked lowest by graduates, employers, and seniors and next to lowest by faculty. The item involving sport fishing was ranked slightly higher for each of the groups. For each of the groups, these items were ranked in the lowest three. All groups polled seemed to be saying that training for the traditional fish and game roles involving sport hunting and sport fishing receive too much emphasis. There is remarkable consensus on this point.

An Alternative Ranking Interpretation

The foregoing analysis represents one method of analyzing the needs assessment questionnaire. An alternative approach, based on performance and importance ranking only--and not the difference (I-P)--offers additional explanatory power.

The procedures for analyzing the data were fairly straightforward. First, ranking for each of the forty-five items was done separately using group (and total) means on "Actual Performance" and "Future Importance". Then, arbitrarily, a cutoff point of the highest ten and the lowest six items was chosen. Each item which fell into these highest and lowest item categories for any of the four groups was tabulated, and the results are shown in the following three tables.

Table 6 shows those items ranked by any of the four groups (or in the "Total" ranking) in the top ten or bottom six. The first column gives the question number; the next column gives the number of times this concern appeared for the four groups plus the total group.

Table 7 is handled in similar fashion, in this case with "Actual Performance".

Table 8 combines the results of the two previous tables by showing those items which appeared in two or more of the categories.

Of particular interest are the items which appear high in importance but which are ranked low in performance. By inference, these four items point directly to portions of the undergraduate Wildlife curriculum which ought to be improved. Another set of items which suggest program changes are those six items ranked high in performance but low in importance. The inference is that too much emphasis is being placed on these concerns relative to their importance.

Comparison of the Two Approaches

The results of the two separate analyses are quite similar. The six items identified in the second ranking procedure as being high in performance but low in importance are all found in the top ten items for the total ranking by the difference. Similarly, the two concerns dealing with managing fish and game populations for sport fishing and sport hunting show up high in performance but low in importance. Many other similarities are notable. Perhaps of more concern would be an explanation of the discrepancies between the two analyses.

For example, why does the concern about cost considerations (economics) not show up in the second ranking analysis? The answer is simply that

no group cited this concern as extremely high in importance, while virtually all are extremely low in performance. Rather, the rankings in importance range from eighteen to thirty, considerably outside the range for inclusion in Importance (top ten). It is included in the very bottom rankings on Performance, from forty-second to forty-fifth place. A similar rationale could be cited for the inclusion or exclusion of each of the other items where disparities in the analyses are apparent.

Each form of analysis has its advantages as well as its drawbacks. The ranking by Difference (I-P) emphasizes the numerical discrepancy between Importance and Performance ratings, regardless of relative standing on the Importance or Performance scales. The alternative ranking procedure deals only with extreme rankings for the groups (high and low) and may be strongly affected if differences across groups are major ones. The reader is invited to examine the varying lists of priority items and to note the findings of both approaches. Each analysis offers a form of simplifying the complexity of the data and highlights certain items of priority. The aim, besides promoting discussion, is to find areas where the analyses compliment each other. As noted above, these areas are many.

TABLE 6:

QUESTIONS RANKED IN TOP 10 ON PERFORMANCE

QUESTION	NO. GROUPS*	
3	5	Managing game populations for sport hunting
10	5	Principles of animal behavior and ecology
12	5	Managing fish population for sport fishing
31	4	Involvement with professional organizations
2	4	Awareness of pressures on wildlife resources
30	3	Motivation to update skills
40	4	Professional standards and ethics
26	3	Explain concepts to another person in the field
34	3	Retain public ownership of wildlife on public lands
25	3	Technical report writing
35	2	Standards of excellence in scholarship
33	1	Motivation for educational goals of own choosing
43	1	Initiative to examine current thinking in field
9	1	Mathematics
21	1	Practical problems in real settings
15	1	Controlling animal population to limit depredation loss
27	1	Effective use of English
36	1	Positive attitude toward himself
38	1	Self-reliance
6	1	Endangered species problems
15	1	Controlling animal populations
		LOWEST 6
18	1	Systematic Problem solving
17	1	Planning and forecasting the future
13	1	Equipment and resources available on the job
7	1	Energy and its impact
14	1	Ability to use computer
42	3	Physical fitness
4	4	Managing game populations for food production
41	4	Participation and expression in the arts
8	4	Political obstacles
5	5	Economics
44	5	Familiarity with a second culture

* Faculty, 1974-75 Seniors, Other Graduates, Employers, and Total. Total was included to emphasize unaminity.

TABLE 7:

QUESTIONS RANKED IN TOP 10 ON FUTURE IMPORTANCE

QUESTION	No. Groups*	
19	5	Independent thinking, creative solutions
20	5	Critical thinking and judgment
24	5	Communicate to other disciplines
21	4	Practical problems in real settings
1	4	Total ecosystem planning
8	4	Political obstacles
2	3	Awareness of pressures on Wildlife resources
30	3	Motivation to update skills
18	3	Systematic problem solving
45	3	Knowledge of current events related to wildlife
7	3	Energy and its impact
10	1	Principles of animal behavior and ecology
23	1	Isolating underlying assumptions
43	1	Familiarity with a second culture
17	1	Planning and forecasting future
26	1	Explain concepts to another in the field
28	1	Skill in communicating research to others
35	1	Standards of excellence in scholarship
36	1	Positive attitude toward himself
40	1	Commitment to prefessional standards and ethics

LOWEST 6 ON FUTURE IMPORTANCE

42	1	Physical fitness
35	1	Standards of excellence in scholarship
34	1	Retain public ownership of wildlife on public lands
32	1	Attitudes of Political Activism
12	1	Managing fish population for sport fishing
22	1	Deal with probabilities rather than certainties
9	2	Mathematics
15	4	Controlling animal populations
4	4	Managing game population for food production
3	4	Managing game population for sport hunting
44	5	Familiarity with a second culture
41	5	Participation and expression in the arts

* Faculty, 1974-75 Seniors, Other Graduates, Employers, and Total Total was included to emphasize unanimity.

An Item Analysis by Groups

The reader is invited to examine each item's ranking in the following sections. Items are grouped in the same logical category as were used in the questionnaire, as follows:

Section 1:	Technical knowledge and skills.	(Items 1-16)
Section 2:	Thinking Skills	(Items 17-23)
Section 3:	Communication Skills.	(Items 24-29)
Section 4:	Attitude and Motivation	(Items 30-40)
Section 5:	Background and Breadth.	(Items 41-45)

For each item, rankings are given for "Present Performance," "Future Importance", and "Difference (I-P)". As described above, the "Difference" ranking has been used most extensively in drawing conclusions. In each section, items are presented in order of their criticality (Difference) ranking, with most critical items listed first, etc.

Because a difference score was computed only when both "Present Performance" and "Future Importance" were marked, the number of difference scores indicates all who responded to <u>both</u> scales for a particular question. When fewer than 50% answered, the number is followed by a dash (-).

An Item Analysis by Groups

The reader is invited to examine each item's ranking in the following sections. Items are grouped in the same logical category as were used in the questionnaire, as follows:

Section 1: Technical knowledge and skills.	(Items 1-16)
Section 2: Thinking Skills	(Items 17-23)
Section 3: Communication Skills.	(Items 24-29)
Section 4: Attitude and Motivation	(Items 30-40)
Section 5: Background and Breadth.	(Items 41-45)

For each item, rankings are given for "Present Performance," "Future Importance", and "Difference (I-P)". As described above, the "Difference" ranking has been used most extensively in drawing conclusions. In each section, items are presented in order of their criticality (Difference) ranking, with most critical items listed first, etc.

Because a difference score was computed only when both "Present Performance" and "Future Importance" were marked, the number of difference scores indicates all who responded to <u>both</u> scales for a particular question. When fewer than 50% answered, the number is followed by a dash (-).

SECTION 1:

TECHNICAL KNOWLEDGE AND SKILLS

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
8. Knowledge of political obstacles to the implementation of sound resource programs.							
Graduates	2.429	4.679	2.265	49	40	1	1
Seniors	2.609	4.667	2.043	23	39	5	2
Employers	1.750	4.391	2.625	24	45	12	1
Faculty	1.857	4.429	2.571	14	44	11	1
TOTAL	2.245	4.557	2.336	110	43	5	1
5. Ability to deal with cost considerations (economics) of wildlife problems.							
Graduates	2.353	4.345	2.000	51	42	18	2
Seniors	2.143	4.240	2.238	21	44	24	1
Employers	2.080	3.935	1.920	25	43	23	6
Faculty	2.000	3.786	1.846	13	42	30	12
TOTAL	2.209	4.136	2.009	110	44	24	2
7. Knowledge of energy and its impact upon the ecosystem.							
Graduates	2.939	4.464	1.531	49	28	9	6
Seniors	3.261	4.600	1.348	23	22	7	16
Employers	2.360	4.239	2.040	25	42	19	3
Faculty	2.667	4.667	2.000	12	26	2	7
TOTAL	2.844	4.432	1.661	109	33	11	7

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
1. Knowledge of total ecosystem planning.							
Graduates	3.216	4.464	1.255	51	21	10	15
Seniors	3.409	4.696	1.364	22	18	3	15
Employers	2.960	4.600	1.840	25	29	5	8
Faculty	2.231	4.500	2.231	13	38	8	4
TOTAL	3.081	4.551	1.523	111	24	6	9
13. A working knowledge of equipment and resources available to the practitioner on the job.							
Graduates	2.245	3.857	1.755	49	44	34	3
Seniors	2.833	4.120	1.333	24	36	31	17
Employers	3.080	3.674	.920	25	24	32	27
Faculty	3.000	3.786	.786	14	15	32	35
TOTAL	2.652	3.837	1.357	112	37	32	13
14. The ability to use the computer to solve wildlife problems.							
Graduates	2.458	3.811	1.478	46	39	36	10
Seniors	2.545	4.000	1.500	22	41	37	10
Employers	2.952	3.622	.810	21	30	34	30
Faculty	2.714	3.786	1.071	14	21	29	29
TOTAL	2.610	3.778	1.291	103	39	34	15
16. Technical expertise in the area of water pollution biology.							
Graduates	2.722	4.280	1.528	36	37	22	9
Seniors	2.882	4.300	1.588	17	33	18	8
Employers	3.182	3.929	1.227	22	20	26	18
Faculty	2.667	4.214	1.417	12	25	20	23
TOTAL	2.862	4.159	1.448	87	32	22	10

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
4. Skill in managing game populations for food production.							
Graduates	2.300	3.054	.780	50	43	43	31
Seniors	2.545	3.667	1.136	22	40	42	22
Employers	2.636	2.558	.429	21	39	45	38
Faculty	2.143	3.692	1.462	13	39	35	22
TOTAL	2.398	3.066	.868	106	41	43	32
2. Awareness of the increasing pressures on limited wildlife resources, and the options open to society.							
Graduates	3.549	4.625	1.078	51	6	11	22
Seniors	3.826	4.739	.864	22	4	2	26
Employers	3.320	4.543	1.320	25	12	6	14
Faculty	3.769	4.357	.538	13	4	14	37
TOTAL	3.580	4.590	1.027	111	5	4	25
6. Knowledge of endangered species problems.							
Graduates	3.060	3.857	.780	50	26	33	32
Seniors	2.708	4.360	1.667	24	38	15	6
Employers	2.680	3.674	1.320	25	38	31	15
Faculty	3.308	3.286	.000	13	8	39	42
TOTAL	2.929	3.830	1.000	112	29	33	26
11. Skill in managing fish stocks to produce a food crop.							
Graduates	2.939	3.942	1.152	33	29	31	20
Seniors	3.417	4.150	.667	12	15	29	32
Employers	3.318	3.523	.364	22	14	38	40
Faculty	2.636	4.429	1.727	11	29	12	14
TOTAL	3.077	3.885	.936	78	25	29	28

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
15. Expertise in controlling animal populations to limit depredation loss.							
Graduates	2.773	3.500	.767	43	35	41	33
Seniors	3.556	3.650	.222	18	10	43	43
Employers	2.783	3.220	.609	23	33	42	36
Faculty	2.714	3.643	.929	14	22	36	33
TOTAL	2.909	3.448	.653	98	30	43	37
10. Ability to apply principles of animal behavior and ecology.							
Graduates	3.904	4.107	.173	52	2	26	42
Seniors	3.625	4.640	1.000	24	7	6	25
Employers	3.808	4.196	.654	26	4	20	34
Faculty	3.786	4.214	.429	14	2	19	41
TOTAL	3.810	4.241	.483	116	3	1	42
9. The ability to apply mathematics to problems in wildlife.							
Graduates	3.353	3.418	.020	50	14	42	44
Seniors	3.417	4.000	.625	24	16	36	35
Employers	3.400	3.600	.240	25	10	36	42
Faculty	2.692	4.077	1.385	13	23	24	24
TOTAL	3.301	3.645	.357	112	15	40	43
12. Skill in managing fish populations for sport fishing.							
Graduates	3.865	3.736	.027	37	3	37	43
Seniors	3.923	3.952	.154	13	3	39	44
Employers	3.920	3.761	-.080	25	2	40	44
Faculty	3.833	2.929	-.750	12	1	40	43
TOTAL	3.885	3.694	-.092	87	2	38	44

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
3. Skill in managing game populations for sport hunting.							
Graduates	4.038	3.696	-.269	52	1	39	45
Seniors	3.652	3.720	.000	23	6	41	45
Employers	3.962	3.289	-.600	25	1	41	45
Faculty	3.786	2.857	-.929	14	3	42	44
TOTAL	3.913	3.486	-.368	114	1	41	45

SECTION 2:

THINKING SKILLS

	Mean Present Perf.	Mean Future Imp.	Mean Diff (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
20. Skill in critical thinking and use of judgment.							
Graduates	2.880	4.600	1.694	49	31	5	4
Seniors	2.913	4.480	1.652	23	32	10	7
Employers	2.920	4.727	1.958	24	31	1	5
Faculty	2.583	4.714	2.167	12	32	1	5
TOTAL	2.864	4.630	1.796	108	31	1	3
17. Skills in planning and forecasting future trends.							
Graduates	2.760	4.400	1.633	49	36	13	5
Seniors	2.727	4.292	1.524	21	37	19	9
Employers	2.720	4.348	1.840	25	36	14	7
Faculty	2.000	4.571	2.571	14	41	5	2
TOTAL	2.649	4.381	1.780	109	38	12	4
19. The ability to think independently and to arrive at creative solutions to problems.							
Graduates	2.961	4.527	1.529	51	27	7	7
Seniors	2.875	4.600	1.708	24	34	8	5
Employers	2.800	4.652	1.840	25	32	2	9
Faculty	2.500	4.643	2.250	12	35	3	3
TOTAL	2.857	4.593	1.714	112	34	3	5
18. Ability to solve problems systematically, from a broad environmental perspective.							
Graduates	2.922	4.382	1.471	51	30	14	11
Seniors	3.000	4.417	1.435	23	30	12	12
Employers	2.500	4.644	2.120	25	41	3	2
Faculty	2.643	4.643	2.000	14	28	4	8
TOTAL	2.807	4.500	1.673	113	35	9	6

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
21. Abiltiy to apply the tools of wildlife science to practical problems in real settings.							
Graduates	3.098	4.607	1.529	51	25	4	8
Seniors	3.250	4.680	1.417	24	23	4	14
Employers	3.192	4.533	1.423	26	19	7	12
Faculty	3.286	4.143	.857	14	10	23	11
TOTAL	3.174	4.550	1.400	115	20	7	11
23. Skill in isolating the assumptions which underlie a particular argument.							
Graduates	2.775	3.980	1.175	40	34	28	18
Seniors	3.474	4.000	.526	19	13	34	38
Employers	3.000	3.905	1.000	23	28	27	23
Faculty	2.615	4.500	1.923	13	31	7	10
TOTAL	2.947	4.016	1.105	95	27	26	20
22. Skill in dealing with probabilities rather than certainties, to assume a tentative approach to life.							
Graduates	3.182	3.558	.349	43	24	40	41
Seniors	3.174	4.000	.783	23	24	35	31
Employers	3.091	3.595	.636	22	23	37	35
Faculty	2.668	4.357	1.833	12	27	13	13
TOTAL	3.099	3.735	.690	100	23	26	36

SECTION 3:

COMMUNICATION SKILLS

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
24. Ability to communicate with those in other disciplines to resolve problems of a technical nature.							
Graduates	3.260	4.643	1.400	50	17	2	13
Seniors	3.174	4.480	1.304	23	25	11	18
Employers	2.704	4.609	2.037	27	37	4	4
Faculty	2.857	4.571	1.714	14	19	6	15
TOTAL	3.061	4.596	1.570	114	1	2	8
28. Skills in communicating research findings and knowledge to others.							
Graduates	3.353	4.357	.980	51	15	15	25
Seniors	3.417	4.240	.833	24	17	23	27
Employers	3.074	4.478	1.630	27	26	9	11
Faculty	2.714	4.286	1.571	14	20	18	20
TOTAL	3.224	4.369	1.172	116	18	13	17
27. Skills in the effective use of English (Spelling, punctuation grammar.)							
Graduates	3.294	4.357	1.039	51	16	16	24
Seniors	3.826	4.333	.409	22	5	17	40
Employers	3.077	4.348	1.346	26	25	13	13
Faculty	2.333	4.286	2.083	12	37	16	6
TOTAL	3.250	4.343	1.099	111	16	15	21

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
29. Speaking skills.							
Graduates	3.250	4.444	1.167	48	19	12	19
Seniors	3.500	4.250	.652	23	12	21	33
Employers	3.125	4.341	1.250	24	22	15	17
Faculty	2.923	3.857	1.077	13	18	28	28
TOTAL	3.239	4.316	1.065	108	17	18	24
25. Skill and practice in technical report writing.							
Graduates	3.588	4.236	.660	50	5	23	36
Seniors	4.042	4.280	.250	24	1	20	42
Employers	2.741	4.239	1.704	27	35	18	10
Faculty	2.462	3.929	1.615	13	36	27	19
TOTAL	3.357	4.214	.930	114	11	20	29
26. The ability to explain concepts to another person in the field.							
Graduates	3.522	4.469	.935	46	8	8	28
Seniors	4.000	4.238	.316	19	2	25	41
Employers	3.318	4.048	.955	22	15	21	25
Faculty	3.077	3.714	.692	13	14	34	16
TOTAL	3.510	4.206	.790	100	7	21	33

SECTION 4:

ATTITUDES AND MOTIVATION

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
37. A sense of the cosmopolitan, a cross-cultural perspective.							
Graduates	2.800	3.923	1.200	45	33	32	17
Seniors	2.857	4.143	1.250	20	35	30	19
Employers	2.783	3.805	1.136	22	34	29	19
Faculty	2.615	3.500	1.000	13	30	38	32
TOTAL	2.784	3.875	1.170	100	36	30	18
30. Motivation to continue to update knowledge and skills following graduation.							
Graduates	3.449	4.618	1.224	49	11	3	16
Seniors	3.565	4.750	1.174	23	9	1	21
Employers	3.560	4.413	.880	25	6	11	28
Faculty	3.273	4.071	1.000	11	11	25	31
TOTAL	3.481	4.518	1.111	108	8	8	19
36. Positive attitudes toward himself and his own abilities.							
Graduates	3.360	4.357	1.060	50	13	17	23
Seniors	3.286	4.360	1.095	21	20	16	3
Employers	3.292	4.444	1.043	23	17	10	22
Faculty	3.300	4.154	1.100	10	9	22	27
TOTAL	3.324	4.367	1.067	104	14	14	23
32. Attitudes of political activism, a set of personal convictions to implement change.							
Graduates	2.875	3.836	.958	48	32	25	26
Seniors	3.091	4.217	1.182	22	28	26	20
Employers	3.130	3.378	.522	23	21	40	37
Faculty	2.583	4.071	1.667	12	33	26	17
TOTAL	2.943	3.774	.990	105	28	35	27

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
39. Motivation work for society's betterment, a social conscience.							
Graduates	3.184	4.111	.857	49	23	25	30
Seniors	3.091	4.083	1.000	22	29	33	24
Employers	3.292	3.932	.833	24	16	25	29
Faculty	3.077	4.154	1.250	12	13	21	26
TOTAL	3.176	4.052	.925	107	21	25	30
38. Self-reliance, ability to fend for himself.							
Graduates	3.367	4.321	.939	49	12	20	27
Seniors	3.318	4.360	1.136	22	19	14	23
Employers	3.292	3.933	.750	24	18	24	32
Faculty	3.385	3.714	.538	13	7	33	38
TOTAL	3.343	4.143	.889	108	13	23	31
40. Commitment to professional standards and ethics.							
Graduates	3.706	4.291	.627	51	4	21	38
Seniors	3.565	4.160	.609	23	8	23	37
Employers	3.889	4.522	.741	27	3	8	33
Faculty	2.929	4.286	1.357	14	15	16	25
TOTAL	3.626	4.343	.739	115	4	16	34
35. Commitment to standards of excellence in scholarship.							
Graduates	3.481	4.074	.558	52	9	27	40
Seniors	3.125	3.760	.625	24	27	40	34
Employers	3.542	3.841	.375	24	7	28	39
Faculty	3.000	4.500	1.500	14	16	10	21
TOTAL	3.360	3.985	.649	114	10	28	35

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
34. A commitment to retaining public ownership of wildlife found on private lands.							
Graduates	3.478	3.962	.644	45	10	30	37
Seniors	3.273	4.087	.810	21	21	32	30
Employers	3.381	3.953	.952	21	11	22	26
Faculty	3.444	2.400	-1.286	7	6	44	45
TOTAL	3.408	3.860	.606	94	9	31	39
33. Motivation to select and pursue educational goals of his/her own choosing.							
Graduates	3.240	3.963	.755	49	20	29	34
Seniors	3.545	3.958	.455	22	11	38	39
Employers	3.500	3.409	.318	22	9	39	41
Faculty	3.167	3.571	.500	12	12	3	39
TOTAL	3.349	3.743	.571	105	12	36	40
31. Involvement with professional organizations in the wildlife field.							
Graduates	3.538	4.232	.712	52	7	24	35
Seniors	3.455	4.208	.818	22	14	27	29
Employers	3.668	3.630	.111	27	5	33	43
Faculty	3.500	3.786	.500	12	5	31	40
TOTAL	3.549	3.986	.566	113	6	27	41

SECTION 5:

BACKGROUND AND BREADTH

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
45. Knowledge of current events, public issues as related to wildlife affairs.							
Graduates	3.250	4.582	1.327	52	18	6	14
Seniors	3.167	4.560	1.417	24	26	9	13
Employers	3.320	4.370	1.280	25	13	16	16
Faculty	2.692	4.286	1.615	13	24	45	18
TOTAL	3.184	4.479	1.368	114	19	10	12
42. Initiative in acquiring and maintaining physical fitness.							
Graduates	2.362	3.736	1.426	47	41	38	12
Seniors	2.478	4.250	1.783	23	43	22	4
Employers	3.000	3.614	1.048	21	27	35	21
Faculty	2.100	2.692	.600	10	40	43	36
TOTAL	2.495	3.687	1.347	101	40	39	14
43. Initiative to examine current thinking, exciting ideas in the field.							
Graduates	3.192	4.327	1.115	52	22	19	21
Seniors	2.955	4.375	1.500	22	31	13	11
Employers	3.542	4.289	1.000	24	8	17	24
Faculty	2.538	4.500	1.923	13	34	9	9
TOTAL	3.114	4.341	1.261	111	22	17	16

	Mean Present Perf.	Mean Future Imp.	Mean Diff. (I-P)	No. Diff. Scores	Ranking on Perf.	Ranking on Imp.	Ranking on Diff.
44. Familiarity with a second culture, for example, through experience with a foreign language.							
Graduates	2.044	2.923	.864	44	45	45	29
Seniors	2.000	3.522	1.619	21	45	44	36
Employers	1.955	2.814	1.100	20-	44	44	20
Faculty	1.929	2.929	1.000	14	43	41	30
TOTAL	2.000	2.992	1.091	99	45	45	22
41. Commitment to participation and expression in the arts (literature, music, sculpture, etc.).							
Graduates	2.478	3.019	.578	45	38	44	39
Seniors	2.478	3.292	.826	23	42	45	28
Employers	2.524	2.956	.762	21-	40	43	31
Faculty	1.538	2.357	.923	13	17	45	14
TOTAL	2.369	2.978	.716	102	42	44	35

Areas of Agreement and Controversy

As would be expected when sampling opinion on any question, some areas of agreement are readily apparent while others are not. By examining the size of the standard deviation for a particular item, a relative measure of the dispersion of responses -- or degree of agreement or disagreement -- may be obtained. A complete listing of items and their standard deviations is given in Appendix C. Also included are two columns showing items with highest and lowest levels of agreement on Performance, Importance and Difference (I-P).

One cautionary note should be added, however, in interpreting the standard deviation or the variance statistic. That is the question of whether the disagreement occurs between groups, say between seniors and employers, or across all respondents, on a generally controversial item. This analysis of standard deviations does not make that distinction and thus contains elements of both sources of variation.

Certain items from previous analyses stand out as showing fairly high agreement. Item #1, "knowledge of total ecosystem planning" shows high agreement on Importance, Performance, and Difference. Substantial agreement exists upon the importance of item #8, "Knowledge of political obstacles to the implementation of sound resource programs, "although there is somewhat less agreement as to the present performance of the department. Items 18, 19, and 20 -- dealing with systematic problem solving, creative and critical thinking -- show considerable agreement on importance, but less in the rating of present performance. Substantial agreement occurs for item 24, "ability to communicate with those in other disciplines".

Certain items show considerable disagreement, most of which appear to be controversial current topics. For example, respondents disagree on the importance of "skill in managing game populations for food production" and "a commitment to retaining public ownership of wildlife found on private lands." Where there was considerable agreement as to a "knowledge of political obstacles," there is considerable disagreement as to the need for "attitudes of political activism,"..."personal convictions to implement change." But the concern for a " social conscience," working for society's improvement, shows high agreement in the difference statistic. What this may reflect is a fairly widespread suspicion of politics and activism, but a recognition of the need for political awareness and socially oriented motives.

IV. CONCLUSIONS

This report summarizes the results of a survey of 141 persons for the Wildlife Science Department at Utah State University. These people, sampled from four groups, returned questionnaires as follows:

Graduates of the department since 1970 -	56
Seniors graduating June 1975 -	25
Employers of Wild life graduates -	46
Faculty, Department of Wildlife Science -	14

The overall return rate of 65 percent of questionnaires, after six weeks and one follow-up letter, would seem to indicate considerable interest on the part of those completing the questionnaire. In their written comments (included in Appendix B), a number of persons state that this type of study was important at this time.

The returned questionnaires give a profile of geographic location of graduates and others involved in Wildlife work, as well as some insight into prevailing attitudes toward the future. Based upon a comparison of demographic characteristics of respondents and non-respondents, the bias from non-respondents was felt to be minimal. Most respondents took a slightly pessimistic view of future trends in population, resources, levels of pollution. These findings of demographic characteristics and future orientation are of interest, but are not of central importance to this study.

What is important from this survey, in view of the undergraduate curriculum in the Department of Wildlife Science, is the pattern of similar responses across groups on a number of concerns. All groups gave "knowledge of political obstacles to the implementation of sound resource programs" as

a most critical concern. The "ability to deal with cost considerations (economics) of wildlife problems" was listed as a close second in order of criticality, although in a second analysis based upon top and bottom rankings, this concern did not emerge. Aside from these two concerns, four items involving thinking skills were ranked as critical by the various groups. These skills include critical thinking and the use of judgment, independent thinking and creative solutions to problems, planning and forecasting future trends, and systematic problem solving from an environmental perspective. The last two of these thinking skills were confirmed in the second analysis, while the other two were omitted. The concern with energy and its impact upon the ecosystem was found critical in both analyses. Two items which were not viewed as critical at this time in either analysis were skills in managing fish and game populations for sport fishing and sport hunting.

What these groups seem to be saying quite clearly is that the field of Wildlife Science has been changing rapidly. The traditional emphasis upon fish and game training for sport fishing and sport hunting are no longer adequate for the work by most professionals in the field. With the increasing environmental concern on the part of numerous organizations, the ability to deal realistically with political pressures and cost considerations are crucial for tomorrow's wildlife graduate. Skills in planning and analysis, independent thinking, creativity and use of judgment in decision-making are critical for undergraduate education. These findings of the most critical concerns appear to be interrelated and to provide some definite directions for undergraduate curriculum revision. The implementation of change will require imagination and, ironically, a number of the same social and thinking skills identified in the survey. Clearly, a degree of agreement exists across groups which can open the way for curriculum redirection at this time.

SOURCES: WILDLIFE DEPARTMENT INFORMATION

1. Robert L. Barry and John T. Ketti, "Some Reasons Why Students Transfer out of the College of Natural Resources," Logan, Utah: a research report for the College of Natural Resources, Utah State University, 1972.

2. Department of Wildlife Science, Graduate Curriculum Committee, Graduate Student Handbook and Final Report of the Committee, Utah State University, Logan, Utah, May 1974, pp.72.

3. John L. George, Samuel S. Dubin, and Benjamin M. Nead, "Continuing Education Needs of Wildlife and Fisheries Managers," Wildlife Society Bulletin, Vol. 2, No. 2, Summer, 1974.

4. Ernest M. Gould, Jr., "To Plan is to Act," Journal of Forestry, Vol. 73, No. 2, Feb. 1975.

5. James J. Kennedy, "Can Undergraduate Forest Economics be Taught?" Logan, Utah: Dept. of Forestry and Outdoor Recreation, paper presented to the Western Forest Economists Conference, Wimmie, Oregon, May 5-7, 1975.

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7. James J. Kennedy, "Results of Questionnaire of 1972 College of Natural Resources Freshman Class," Utah State University, May 1972.

8. John Lavin, "Teamwork in Resource Management," Journal of Forestry, Vol. 73, No. 2, February, 1975.

9. James H. Mortensen, Exploring Occupations in the Natural Resources, University Park, Pennsylvania: The Pennsylvania State University, 1973, pp.91.

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11. Carl H. Reidel, "Educ. for Integrated Resource Management," paper presented to the Forest Curriculum Development Project, Estes Park, Colorado. Nov. 15, 1972.

12. Thomas G. Scott, "Are We Training Too Many Wildlife Students?" Wildlife Society Bulletin, Vol.3, No. 2, Summer, 1975.

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APPENDIX A

Cover Letter for Questionnaire

Future Oriented Questionnaire

Follow-up Letter

COLLEGE OF NATURAL RESOURCES
UMC 52
Utah State University
Logan, Utah 84322

Department Wildlife Science
752-4100 EXT. 7928

July 16, 1975

The Department of Wildlife Science needs your help. We live in a rapidly changing world and our Department must change to keep pace. We need your input to determine the kinds of changes which should be made.

The undergraduate curriculum is of particular concern. Most of you are familiar with at least the broad outlines of the course sequence. At present, undergraduates take courses designed to provide a background in basic science as well as an understanding of ecology, biology, and communications. A terrestrial or an aquatic course sequence option rounds out the curriculum.

Two questions are important to our deliberations: 1) Is the curriculum adequate for today's world?, and 2) How important will various skills and knowledge be for graduates of the future? For this, we'd like to draw on your experience and perspective for guidance.

Please fill out the questionnaire today and mail it in the enclosed envelope. To be included, we need to receive your response by August 15. Your response is important, and a prompt reply will be most helpful to us.

Sincerely,

John A. Kadlec

John A. Kadlec
Professor and Department Head

JAK:cg

Enclosures

DEPARTMENT OF WILDLIFE SCIENCE
UTAH STATE UNIVERSITY

Future Oriented Questionnaire: An Exercise In Alternative Futures

The following statements describe alternative future views (1985-2000) of the world in which we live. As you read these, check the one with which you identify most closely.

____ A. Large numbers of people inhabit all nations in situations ranging from moderate overcrowding to chaotic overpopulation. Industrial production has declined due to lack of resources, and hunger is the common denominator of mankind. Pollution has made many environments extremely unhealthy.

____ B. Population growth strains the resources of many underdeveloped countries, while developed countries grow richer. Some forms of pollution have been eradicated, but environmental strain continues. International efforts at cooperation have had some success, although many forms of wildlife are extinct or endangered.

____ C. New technology has allowed production worldwide to more than keep pace with population expansion. A rapidly rising standard of living, a strong concern for environmentally-sound solutions to problems, and a cooperation among nations characterize the world situation.

____ D. A position between A and B above.

____ E. A position between B and C above.

Directions: In light of your projections for the future, respond to each of the concerns listed below by following the directions for the left and the right columns.

Example: Question No. 1 should read, starting in the left column:

"Rate the present performance of the Department of Wildlife Science in providing students with . . . knowledge of total ecosystem planning" (on the scale of "successful" to "unsuccessful").

Then, reading in the right column:

"Evaluate the importance of this concern for future resource management" (on the scale of "important" to "unimportant").

Your careful consideration of each item is appreciated.

Rate the Present Performance of the Department of Wildlife Science in providing students with . . .							Evaluate the Importance of this concern for future resource management						
	Successful				Unsuccessful	Don't Know		Important			Unimportant		Don't Know
	5	4	3	2	1			5	4	3	2	1	
Technical Knowledge and Skills													
1. Knowledge of total ecosystem planning.													
2. Awareness of the increasing pressures on limited wildlife resources, and the options open to society.													
3. Skill in managing game populations for sport hunting.													
4. Skill in managing game populations for food production.													
5. Ability to deal with cost considerations (economics) of wildlife problems.													
6. Knowledge of endangered species problems.													
7. Knowledge of energy and its impact upon the ecosystem.													
8. Knowledge of political obstacles to the implementation of sound resource programs.													
9. The ability to apply mathematics to problems in wildlife.													
10. Ability to apply principles of animal behavior and ecology.													
11. Skill in managing fish stocks to produce a food crop.													
12. Skill in managing fish populations for sport fishing.													
13. A working knowledge of equipment and resources available to the practitioner on the job.													
14. The ability to use the computer to solve wildlife problems.													

	Rate the Present Performance of the Department of Wildlife Science in providing students with						Evaluate the Importance of this concern for future resource management					
	Successful				Unsuccessful	Don't Know	Important				Unimportant	Don't Know
	5	4	3	2	1		5	4	3	2	1	
15. Expertise in controlling animal populations to limit depredation loss.												
16. Technical expertise in the area of water pollution biology.												
Thinking Skills												
17. Skills in planning and forecasting future trends.												
18. Ability to solve problems systematically, from a broad environmental perspective.												
19. The ability to think independently and to arrive at creative solutions to problems.												
20. Skill in critical thinking and use of judgment.												
21. Ability to apply the tools of wildlife science to practical problems in real settings.												
22. Skill in dealing with probabilities rather than certainties, to assume a tentative approach to life.												
23. Skill in isolating the assumptions which underlie a particular argument.												
Communication Skills												
24. Ability to communicate with those in other disciplines to resolve problems of a technical nature.												
25. Skill and practice in technical report writing.												
26. The ability to explain concepts to another person in the field.												

Rate the Present Performance of the Department of Wildlife Science in providing students with . . .							Evaluate the Importance of this concern for future resource management					
Successful				Unsuccessful	Don't Know		Important				Unimportant	Don't Know
5	4	3	2	1			5	4	3	2	1	
						27. Skills in the effective use of English (Spelling, punctuation, grammar).						
						28. Skills in communicating research findings and knowledge to others.						
						29. Speaking skills.						
						Attitude and Motivation						
						30. Motivation to continue to update knowledge and skills following graduation.						
						31. Involvement with professional organizations in the wildlife field.						
						32. Attitudes of political activism, a set of personal convictions to implement change.						
						33. Motivation to select and pursue educational goals of his/her own choosing.						
						34. A commitment to retaining public ownership of wildlife found on private lands.						
						35. Commitment to standards of excellence in scholarship.						
						36. Positive attitudes toward himself and his own abilities.						
						37. A sense of the cosmopolitan, a cross-cultural perspective.						
						38. Self-reliance, ability to fend for himself.						
						39. Motivation work for society's betterment, a social conscience.						
						40. Commitment to professional standards and ethics.						

Rate the Present Performance of the Department of Wildlife Science in providing students with . . .	Successful 5	4	3	2	Unsuccessful 1	Don't Know	Evaluate the Importance of this concern for future resource management	Important 5	4	3	2	Unimportant 1	Don't Know
Background and Breadth													
41. Commitment to participation and expression in the arts (literature, music, sculpture, etc.)													
42. Initiative in acquiring and maintaining physical fitness.													
43. Initiative to examine current thinking, exciting ideas in the field.													
44. Familiarity with a second culture, for example, through experience with a foreign language.													
45. Knowledge of current events, public issues as related to wildlife affairs.													

Please list additional skills or concerns which you feel are important.

COLLEGE OF NATURAL RESOURCES
UMC 52
Utah State University
Logan, Utah 84322

Department Wildlife Science
752-4100 EXT. 7928

August 6, 1975

Dear Sir:

A short time ago we sent you a questionnaire which was designed to help us do a better job of establishing the goals and priorities for our curriculum. Your input to this survey is very important if the survey is to be really valid.

This letter is to thank you for the time and interest you have already invested if your return has been sent; and if it hasn't yet, to encourage you to do so as soon as possible. If for some reason the questionnaire did not reach you, we will mail another upon request.

Again we express our appreciation for your willingness to participate in this study.

Sincerely,

John A. Kadlec

John A. Kadlec
Professor and Department Head

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