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## PRINCIPLES OF WILDLIFE CONSERVATION—TESTING DISTANCE DELIVERY METHODOLOGIES

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**ABSTRACT:** In conjunction with faculty at Oregon State University, we developed a distance education course in two phases. During Phase I, conducted Spring of 1996, we used Oregon ED-NET (a simulcast satellite education system) to reach 143 students at 14 sites in Oregon. In the second phase, we offered the course nation-wide in a video format Spring term 1997 and enrolled 92 students at 13 sites. We will offer the video course again during Winter term 1998 following an expanded marketing plan. Our objectives in this paper are to present (1) course design and production information; (2) our experiences with satellite and video teaching; and (3) present information regarding student perceptions and satisfaction with the two distance delivery methods. In Phase I we used notebooks, computer discussion groups, two-way audio, and toll-free phone access to assist students in comprehending the materials. Lectures used computer-graphic screen shows, slides, and locally produced video segments. Based on regular evaluations assessing student learning and satisfaction, we redesigned and professionally produced the course for video distribution in Phase II. Evaluations indicate a high level of satisfaction with the course, but student interaction was minimal. We discuss pros and cons for offering similar courses using these technologies, and present future plans for course enhancement.

### INTRODUCTION

Fish and wildlife have increasingly become important elements, if not foci of critical environmental and natural resources issues (Kellert 1987). Ultimately, this is because wild animals are not only highly-valued in their own right, but also because they appeal to the general public (Kellert 1980). Fish and wildlife are vivid, and often aesthetically attractive, symbols of the environmental values the public desires. That fish and wildlife also can be indicators of ecological health helps elevate their prominence as factors in natural resource decision-making (Orr 1991). The prominent role of the spotted owl (*Strix occidentalis*) in debates about management of forest resources in the Pacific Northwest is exemplary. Public policies, such as the Endangered Species Act and sequential conservation titles of the Farm Bill, have elevated the social and economic significance of fish and wildlife. Thus it becomes critical that a broad range of people understand the relationships among wildlife resources, their habitats, and socio-economic factors.

Opportunities to systematically learn about wildlife, fish, ecological processes, and principles of natural resource conservation remain limited. Nature programming on television is likely the principle educational medium for many populations. For example, the most common means of

participation in “wildlife-related recreation” in Missouri was viewing nature programs on television; 80% of the residents did so (Witter 1992). There is a substantial need and demand for wildlife and conservation education at the undergraduate level. In 1987, 95 colleges and universities offered wildlife curricula, and 76 of these reported an undergraduate enrollment of 5,997 students (Hodgdon 1990). Although a recent survey has not been conducted, advisers at many institutions report substantial increases in undergraduate enrollment since 1987. At Oregon State University, for example, our undergraduate enrollment in fisheries and wildlife has increased 90% from 140 students in 1987 to 266 in 1997. The majority of members of The Wildlife Society (72.6%) indicate that additional training is needed at the undergraduate level by people entering the profession (Brown *et al.* 1994). Furthermore, Stauber (1993) has argued that traditional market agricultural programs will likely fail if conservation and environmental issues are not fully incorporated within them.

Interest in distance education on university campuses has increased at the same time as demand for fish and wildlife education. Colleges and universities have generally viewed distance education as a means of expanding their clientele base, and improving service to clients by offering courses to students off-campus and in asynchronous modes. We

attempted to meet both demands by developing a distance education course on wildlife conservation. In October 1995, the Department of Fisheries and Wildlife at Oregon State University received a \$56,000 grant from the US Department of Agriculture's (USDA) Higher Education Challenge Grants Program to develop a distance education course entitled Principles of Wildlife Conservation (FW 251). Under the grant, FW 251 was offered throughout Oregon as a simulcast satellite course Spring quarter 1996, and then developed as a video course for nation-wide distribution during the Spring of 1997 and again in Winter 1998. The goal of this paper is to describe the course and to relay what we learned about distance education in the process of teaching it. Our objectives are to present (1) course design and production information; (2) our experiences with satellite and video teaching; and (3) present information regarding student perceptions and satisfaction with the two distance delivery methods.

### COURSE FORMAT

The 10-week course included three 50-minute periods per week, and was comprised of 28 50-minute lecture periods, and two 50-minute exams. The course was roughly divided into four parts: (1) social and political aspects of wildlife conservation and management, (2) challenges to management of biodiversity, (3) population management, and (4) ecosystem management. Social and political aspects of wildlife conservation examined public attitudes and perceptions regarding wildlife, wildlife values, bioethics, and national and international laws conserving wildlife and natural resources. Part two, challenges to management of biodiversity, examined the components of biodiversity and the causes of declines in biodiversity including habitat destruction and fragmentation, introduction of exotic organisms, diseases, and over exploitation. Part three, population management, provided a primer on population processes and regulation, and explored single species management programs including threatened and endangered species, hunting, and animal damage management. Part four, ecosystem management, introduced concepts of landscape ecology, and show how they can be applied to wildlife conservation including design and management of protected areas, and integrating wildlife into management of other natural resources.

#### Modes of Instruction and Format

The course employed several modes of instruction and used various formats in presenting course content. The basic mode of instruction was a 50-minute lecture incorporating several presentation formats. During Spring 1996, the lectures were broadcast live via satellite over Oregon's Ed-Net 1 system. During Winter and Spring of 1997, lectures were video-taped in a studio and duplicated for video delivery during Spring 1997. Each set of videos contained 14 tapes with two lectures per tape. During Spring 1997 and Winter 1998, the course

could also be viewed on the educational cable TV channel of five Oregon metropolitan areas.

Fourteen instructors from OSU, Eastern University, U.S. Forest Service, and Oregon Department of Fish and Wildlife prepared course materials and delivered lectures. Approximately 50% of all lectures were accompanied by computer-graphic slides interspersed with color photo slides, graphics, and key points, definitions, and concepts in a bullet format. Approximately 50% of the remaining lectures employed high-quality overheads and slide presentations. Video feature articles and short segments were used in approximately 30% of the lectures. We used an internet bulletin board as a means of further discussing lecture content.

The video format of the course enabled us to modify our presentation of the course on-campus during Spring 1997. On-campus instructors delivered nine lectures live and the remainder were viewed on videotape. Videotapes were available for loan on campus in two locations (the OSU library's reserve reading room and the Department of Fisheries and Wildlife office). On-campus students could view live lectures when scheduled, or they could view the lecture on tape or cable TV. Thus, the video format gave both the students and instructor additional flexibility. On campus we used one class period each week as a discussion period and required the students to view the regularly scheduled lecture at another time. During the discussion periods, we addressed questions concerning previous lectures and discussed current events related to the course.

#### Course Materials

Materials for the course included two optional texts (Shaw 1985, Primack 1993) and a course notebook (Edge and Davis-Born 1997). The course notebook complemented the lectures and supplement the texts. The notebook contained a proposed lecture and exam schedule, course information, and lecture notes including graphs and figures with ample room for students to take additional notes. A section after each lecture contained discussion questions and recommended readings. The course notebook was developed as a website and can be viewed at <http://osu.orst.edu/instruct/fw251/>.

#### Testing, Grades and Evaluations

Tests for the course included one mid-term and one final exam. Each test included 50–75 multiple-choice questions, and were computer-scored using scantron forms. Exams were mailed to off-campus facilitators one week prior to the on-campus exam date. Off-campus facilitators were encouraged to synchronize exam dates with the on-campus class as much as possible. The final for the 1997 class was scheduled for Friday of exam week with final grades due the following Tuesday. Facilitators were encouraged to test early, or express mail or fax exams in order to meet the deadline for posting grades. Grades were based on a normal distribution. Each

exam packet also included an evaluation, which assessed students' perceptions of each lecture, ease and method of getting help, and an overall class evaluation.

#### Assistance for Students and Site Facilitators

We offered a range of services to meet the needs of students and site facilitators, including a course manager (CM), a teaching assistant (TA), a 1-800 phone line, and an internet discussion group. A full-time CM was in charge of logistical coordination with off-campus sites, distribution of handout materials, tests and evaluations, and was available during office hours via the 1-800 number to answer questions regarding course logistics. Our CM also developed marketing materials for the next year's presentation of the course. Our TA was available during office hours each day to answer questions from students regarding course content and graded the exams. In addition, the TA assisted in production of graphics and slides. Questions concerning course content were addressed to the TA via either the 1-800 number or an internet discussion group.

### COURSE EVALUATION

#### Enrollment and Test Scores

A total of 143 and 92 students enrolled in FW 251 during Spring quarters of 1996 and 1997, respectively (Table 1). We anticipate an enrollment of at least 155 Winter term 1998. During each year, we enrolled students at community colleges, high schools, and extension offices. Enrollment figures represented a substantial increase in the average quarterly enrollment for this course since 1990 ( $= 57$ ). During 1996, the course was taught at 13 sites off-campus; 2 of these sites (9 students) enrolled students for community college credit, rather than OSU credit. During 1997, the course was taught at 12 sites off-campus, including a high school in Greece; all students in 1997 enrolled for OSU credit. In 1997 the course videos were also used to supplement lectures for a similar course at the University of Montana and a natural resources course at Riverside High School in Portland, Oregon. For the Winter 1998 offering, ten high schools have committed to enrolling students and additional schools are interested in supplementing their current offerings. High school participation has increased substantially this year, and likely represents the greatest potential increase in student numbers. We attribute much of this increase in participation to our marketing plan focused on recruiting high schools.

Students enrolled in FW 251 differed by major between years and for on- and off-campus populations. Wildlife and fisheries majors composed 32% and 65% of the on-campus enrollment during 1996 and 1997, respectively. Off-campus, majors accounted for 12% and 16% of the enrollment during 1996 and 1997, respectively. All high school students each year had undeclared majors, but four of 38 freshmen entering

the Department of Fisheries and Wildlife in the fall of 1997 had taken the course in high school (12.5% of all high school students that have taken the course).

Knowledge scores, based on final grades, suggest that on- and off-campus populations and high school versus non-high school students performed equally in 1996; however, high school students did not perform as well as non-high school students in 1997. During 1996, the mean final score for on-campus students ( $= 68.2$ ,  $SE = 1.4$ ,  $n = 58$ ) did not differ (t-test,  $P = 0.064$ ) from off-campus students ( $= 64.7$ ,  $SE = 1.2$ ,  $n = 69$ ), and high school students ( $= 73.3$ ,  $SE = 4.7$ ,  $n = 3$ ) performed as well as non-high school students ( $= 66.1$ ,  $SE = 0.9$ ,  $n = 124$ ; t-test,  $P = 0.24$ ). In 1997, high school students performed well, but not as well as non-high school students ( $= 71.2$ ,  $SE = 2.4$ ,  $n = 19$  vs.  $= 79.3$ ,  $SE = 1.2$ ,  $n = 59$ ; t-test,  $P = 0.0015$ ), but on-campus and off-campus populations ( $= 79.0$ ,  $SE = 1.3$ ,  $n = 43$  vs.  $= 75.3$ ,  $SE = 1.9$ ,  $n = 35$ ; t-test,  $P = 0.11$ ) performed equally.

Table 1. Number of students enrolled in Principles of Wildlife Conservation by type of site, student and year.

Sites/Enrollment	Sp 96	Sp 97	W 98 <sup>a</sup>
Total enrollment	143	92	155
On-Campus enrollment	62	51	81
Off-Campus enrollment	81	41	74
Number of off-campus sites	13	12	12
Number of non-OSU colleges/univ.	5	4	2
Number of high schools	5	5	10
Extension offices	3	3	0
Number of high school students	7	25	21

<sup>a</sup>Final off-campus enrollment figures were not available at time of manuscript submission. Numbers represent minimum estimates based on discussion with off-campus facilitators.

#### Classroom Interaction

Classroom interaction was the most difficult aspect of the course (Diebel *et al.* 1998). Although we did not collect data on interactions during the satellite broadcasts in 1996, interactions rarely exceed five questions, answers, or comments per lecture, and many lectures had no interactions at all. The majority of interactions were instructor-initiated (Howard *et al.* 1996); very few were student-initiated. After the first exam in 1996, we began holding the satellite-link open for 5–10 minutes after the formal lecture period to provide for additional opportunities for students to ask questions. This format increased interaction some, but not substantially. Most interaction with students occurred during the lectures and the majority of the discussion was generated from the live class at OSU. During the video presentation of the course on-campus in 1997, most interactions occurred during live lectures, after the tape was played, or during the regularly scheduled discussions sessions.

Students did not make wide use of either the internet or the 1-800 phone number for asking questions. Although, >75% of students both on- and off-campus has access to the internet, only 12 and 6 students subscribed to the list-server, and a total of 7 and 4 questions were posed via this source during 1996 and 1997, respectively. Less than 25 questions were received over the 1-800 phone line each year; most calls were between facilitators and the course manager regarding logistical matters. Despite this lack of interaction, evaluations indicate that the majority of students felt that they had adequate access to instructors or the TA. During 1996, 88% of on-campus and 81% of off-campus students felt they had sufficient opportunity to ask questions. During 1997, 95% and 82% of the on- and off-campus students, respectively, felt they had sufficient opportunity to ask questions.

### Evaluations

We evaluated the course twice during the quarter, seeking input on each lecture, where and how students viewed the course, and demographics (gender, major/nonmajor, etc.). Modal responses for most lectures were 4 or 5 on a satisfaction scale of 1–5 (5 = high), and were <3 for one lecture in 1996 and two in 1997. These scores are consistent with scores obtained in most live offerings within the department. All lectures were retaped for the 1997 video phase, and the two lectures with poor ratings in 1997 were revised and retaped for 1998 video distribution. Review of written comments indicated some dissatisfaction with the number of instructors because of: (1) variation in style and quality of presentations, (2) variation in quality of course notebook content, and (3) students' inability to develop a pattern of note-taking consistent with instructor presentation style. Modal responses to questions regarding overall satisfaction with the course, including usefulness, and interest were mostly 4 (Figure 1). Written comments suggested dissatisfaction with the multiple-choice exam format for assigning grades because the questions failed to test students on their ability to integrate the fundamental principles of the course and were perceived as being trivial in nature. Many students commented on the flexibility in scheduling that the video course offered while others stated that they vastly preferred live lectures to a video. Three students stated that they would not have been able to take the course if not for the flexibility of viewing the video when convenient.

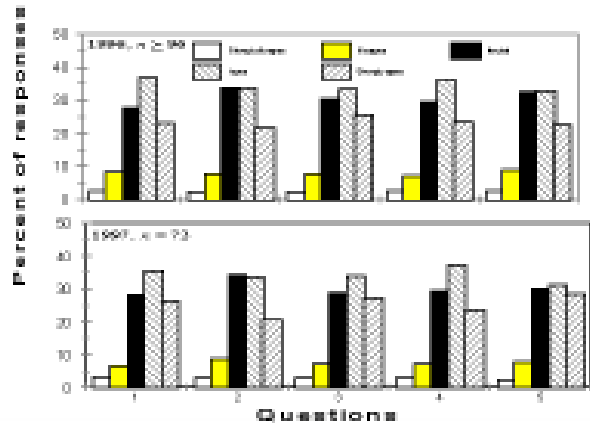


Figure 1. Percent of responses to five questions regarding overall distance delivery of Principles of Wildlife Conservation during 1996 and 1997. Question 1: As a result of this class, I have learned useful information. Question 2: This course increased my interest in the topic. Question 3: I knew what was expected of me in this course. Question 4: Overall, enough time was spent on each topic. Question 5: I would recommend this course to other students

### Cost Estimates and Fee Structure

Total estimated direct cost for producing the satellite version of the course was \$34,900 including CM, TAs (2 terms), copyright fees, printing and mailing, and satellite downlink and uplink fees. Estimated direct costs for producing the video version of the course in 1997 was \$28,873, which included CM, TAs (2 terms), printing and mailing, tape duplication, and marketing. Cost estimates do not include instructors' time or technical support provided by OSU's Communication Media Center, which may double the cost of offering the course. We invested approximately \$4,000 in marketing the 1998 course during 1997. Furthermore, a substantial amount of the instructor's and CM's time both years was related to marketing. The total direct cost for the two years was \$63,780, which is equivalent to \$174 per student-credit-hour for off-campus students. The OSU business office estimates that a typical lower division course taught on campus costs \$224 per student-credit-hour (Robert Durringer, OSU Business Affairs). Thus, our course was comparable in costs to similar courses taught on campus. Our grant from USDA paid for \$39,221 of our direct costs; the departments of Fisheries and Wildlife and Communication Media Center made substantial commitments to production of the course. Once marketing of the course is assumed by other OSU departments, we believe we can offer the course off-campus with minor instructor commitment and a TA to coordinate off-campus facilitation, testing and evaluation, and database management (< \$5,000/term).

Our grant from USDA also allowed us to highly subsidize tuition for off-campus students during the first two years of the course. We set tuition the first year at \$150, and during 1997 we charged \$200. During 1997, all off-campus students were required to make arrangements to view the tapes with our assistance. Options included local cable TV if available, or purchasing a set of tapes for \$225. High schools purchased these tapes for students and we loaned tapes to most other sites. However, our 1997 brochures implied that students would have to purchase the tapes, which likely reduced interest in the course. For the Winter 1998 term, tuition for high school students was set at \$225 via an arrangement with OSU's High School Outreach Program (HSOP) and \$315 for other off-campus students. Furthermore, HSOP made a one-time offer to purchase tapes for all high schools enrolling one or more students. During 1998 we also began a program of renting sets of tapes for \$35 plus a deposit of \$190.

## DISCUSSION

Overall, we were pleased with the enrollment and student response to both the satellite and video presentations of our course. Student satisfaction was high in spite of reduced classroom interaction and the number of instructors (Diebel *et al.* 1998). Many students expressed appreciation for access to a course that they would otherwise be unable to take any other way. Distance students performed as well as on-campus students, which is consistent with numerous studies of distance learners (Garrison and Shade 1990, Evans and Nation 1992, Bell and Tight 1993). High school students that took the class generally did well in the course, suggesting that offering advanced college credit provides an excellent fast-start opportunity for these students, and that the subject matter is appropriate for high school audiences. Furthermore, our enrollment of four freshmen during fall 1997 who had already taken our course suggests that the course might increase our undergraduate enrollment (a double-edged sword during difficult fiscal periods).

Our experience with both satellite and video technologies suggest that both methodologies have strengths and weakness, and are probably appropriate for different types of classes. Both approaches will require a substantial commitment by the instructor(s), requiring from three to six times the amount of effort to develop and conduct compared to an on-campus offering. In our minds, satellite delivery is most appropriate for special one-time offerings, professional courses, or for courses where interaction with distance audiences is important. Although interaction during our satellite delivery was minimal, we did little to foster it at the beginning of the course. Early exercises such as everyone in the class introducing themselves, reinforced by regular instructor-initiated questions and discussions could decrease students' fear of the technology (Diebel *et al.* 1998), and could substantially increase classroom interaction. Another

solution for lack of classroom interaction is the use of separate discussion periods led by the off-campus facilitator. This strategy is currently being used by some off-campus sites. Satellite courses are expensive to produce and maintain. Satellite fees and communications costs for our course were almost \$10,000, and do not represent market prices because Oregon Ed-Net subsidizes these costs. If the course was placed on a cost-recovery basis, tuition or technology fees would have to be relatively expensive, a situation that is probably most appropriate for professional-degree courses. For example, Oregon Health Sciences University offers a state-wide nursing program via satellite. Scheduling of a satellite course may also offer challenges unless it is done well in advance. Calling your up-link provider the term before you offer the course and requesting the 10:00–11:00, Monday-Wednesday-Friday slot is likely to result in a disappointing response. A final challenge to satellite delivery is the inevitable technology breakdowns. During our satellite delivery, we only had one instance where we were unable to uplink our broadcast for a 10-minute period, and three cases where a receive site had equipment problems, requiring us to mail a tape of the broadcast. However, we have heard some horror stories of daily problems with receive sites and frequent uplink site problems. Instructors must maintain a high degree of flexibility to be able to adapt to these challenges.

Producing the course in a video format provided us the opportunity of reaching a distance audience at a reduced cost, while decreasing scheduling problems. One-time production costs for the video course was relatively high, but now that the course has been produced, it is likely to generate income to the Department of Fisheries and Wildlife. Most importantly, our video course reduces scheduling conflicts with distance learners. Students can view the tapes at their leisure as long as they are prepared to take the exams at approximately the same date that we administer them to other sites. Furthermore, we can now offer the course totally asynchronously. For example, three high schools will expand the course into a full spring semester during 1998, rather than completing the course within the 10-week OSU quarter. Alternatively, students could compress the time needed and take the course during spring break.

A video course does offer some challenges. We encountered some resistance to the purchase price for the tapes, but believe that our rental program may reduce that problem and result in an increased enrollment in future years. A video course will require regular updating. Although our course was designed to be as timeless as possible (a principle is a principle) it is likely that one or more lectures will need to be updated annually. For example, we have two lectures on endangered species, which will need to be revised as soon as Congress reauthorizes and changes the Endangered Species Act. Revising tapes also requires a tracking database so that owners of tapes can be notified about updates. Finally, the video format presents challenges to lecture design and presentation. Our TV-oriented society has grown to expect high quality

production from something they view on the TV. Our lectures that were predominately “talking heads” consistently received the poorest evaluations. Fortunately, most natural resources subjects are visually attractive (i.e., students love to see pictures of animals and habitats). Furthermore, state and federal natural resources agencies usually have large video libraries, and footage for enhancing lectures can be obtained at low costs. All that is needed is the time required to solicit, view and select the appropriate roll-ins.

A major difficulty we encountered was marketing the class. Without an effective marketing system, you can produce an exceptional course that should have wide appeal and end up with just a few students. When we began our effort, the Office of Continuing Higher Education at OSU was the department that advertized distance education courses and enrolled off-campus students. However, their program had largely been designed to offer continuing education opportunities on campus; off-campus advertizing was minimal. Over 90% of the students we enrolled in our class the first two years were a direct result of the marketing we conducted from within the Department of Fisheries and Wildlife. We are convinced that there is a much larger market for this course, both nationwide and within Oregon. Within Oregon, all high school students are required to obtain a Certificate of Advanced Mastery (CAM) in one of eight subject areas. Most rural high schools in Oregon will offer the Natural Resources Systems CAM. Because the course meets many of the proficiency standards for the Natural Resources Systems CAM, we believe there is a potential market of up to 500 high school students participating in the course; many of these students would enroll for OSU credit and would later matriculate at OSU. OSU HSOP is beginning to develop an effective marketing system (we taught them many of our tricks), which should reduce our marketing requirements in the future. Every state in the country has at least one university offering undergraduate degrees in fisheries and wildlife, and with few exceptions all require a similar course in their curricula. OSU is one of two universities offering this course for distance learners. The University of Kentucky is the only other university that offers a similar course, and currently they only offer it to high school students.

#### Future Course Enhancements

We continue to revise and enhance our video course and have three major changes planned for the near future. In addition to lectures that are revised because of content changes, we plan to retape a few lectures each year and further enhance the visual attractiveness of the course with additional field footage. We have received a second grant from USDA to develop an interactive website to support our video lectures. Our objectives for the grant are to (1) develop a self-guided, interactive website to reach and motivate large audiences efficiently; and (2) identify effective components of distance education and distribute our findings to natural resources and agricultural sciences educators nation-wide. An interactive

module will supplement each lecture topic and will include hyper-linked text and graphical demonstrations of principles and concepts. Each module also will include a quiz covering the subject that will give students immediate feedback on their answers (e.g., “Correct,” or “B is incorrect because . . .”). Finally, all modules will contain a built-in evaluation so that we can receive feedback from the student as they finish the exercise. After this site is developed we will need to evaluate the access of potential students. Although a majority of students have internet access (Diebel *et al.* 1998), there is still the potential of outstripping the student’s technological resources, such as graphic software and modem capabilities. Beginning in the summer of 1998, we will offer an in-service training course to high school teachers who are interested in the course. Our in-service training will cover course logistics including website navigation, course content, and offer ideas for field exercises that teachers can use to supplement the course. Finally, we have asked The Wildlife Society to provide us with a peer-review of our course. To our knowledge, this would be the first peer-reviewed course in natural resources curricula. We hope to obtain professional suggestions for improving the course and a peer review may enhance our nationwide marketing efforts.

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