ABSTRACT

Undergraduate range science programs are being evaluated and modified in an effort to keep the range science major relevant to the needs of future natural resource managers on rangelands. A questionnaire was sent to 28 universities and colleges with range programs in the western 17 states. Information requested pertained to job placement, undergraduate student numbers, course requirements, program goals, and obstacles to range undergraduate education. For universities as a whole, the decline in numbers of range students since the 1960s has stabilized and student numbers are projected to increase at a few institutions. Most range programs, however, have low student numbers with fewer than 10 graduates per year. Between 1997 and 2001, about 50% of range graduates in the western 11 states were hired by federal agencies, whereas about 25% of the graduates from the six Great Plains’ states were employed by federal agencies. About 55% of Great Plains’ graduates found jobs in the private sector with environmental consulting and the ranching industry being the primary employers. Although most faculty representatives reported good job opportunities in range management, current student numbers are low compared with that of the 1960s. Surveys suggested that low numbers are caused by poor student awareness of rangelands, a misconception that range science is simply another agriculture production major, and competing curricula in natural resource sciences and other areas. The viability of range programs at most universities is being challenged because student numbers largely dictate administrative support of undergraduate programs in the current competitive academic environment.

The undergraduate range science major is an integration of disciplines involved in the study, conservation, and utilization of rangelands. It can be characterized best by the six core courses required in most range curricula: principles of rangeland management, rangeland improvements, rangeland plants, rangeland monitoring and analysis, rangeland ecology, and rangeland resource planning. The range curriculum is similar across most institutions offering a range major because the curriculum is based on the course work required by the U.S. Office of Personnel Management for employment in federal range management. The curriculum's perceptions of range management change. Undergraduate range programs are being evaluated and altered by higher education in an effort to keep the range major relevant to the needs of future natural resource managers. The purpose of this survey was to document the number of students graduating with a range major in the USA and to determine faculty perceptions of the future of the range major.

MATERIALS AND METHODS

A short questionnaire was developed that asked eight questions about range curricula, numbers of graduates, job placement, and primary obstacles to growth of undergraduate range programs. The questionnaire was mailed in August 2001 to

Abbreviations: ASU, Angelo State University; FTE, full time equivalents; RSEC, Range Science Education Council.
faculty representatives at each college or university offering an undergraduate range program. These colleges and universities are members of the Range Science Education Council (RSEC) and the questionnaire was sent to each institution’s faculty representative to RSEC. Thirteen institutions in the Great Plains and 15 institutions in the western states (Table 1) were sent the questionnaire. Responses were received from all 28 institutions. Survey results for the institutions in the Great Plains states are presented separately from those in the western states. Land ownership in the Great Plains states is largely private, whereas state and federal agencies own and manage a major portion of land in the western states. This difference in land ownership is closely associated with curriculum development and job opportunities in these two regions.

**SURVEY RESULTS**

**Types of Range Programs**

Twenty-two of the institutions (Table 1) offered range majors and/or options in range science that required five or six of the core range courses as well as a number of other related courses in natural resources, wildlife management, and animal science. Most of these institutions offered emphasis areas in such specializations as range livestock production, environmental science, and ecological restoration. Emphasis areas required other complementary courses and allowed students to specialize within range science. Six of the institutions (Table 1) offered only an option or emphasis area in range and had only a few of the core range courses and other related course work. Most of these institutions had few students in their range program. The exception was Angelo State University (ASU), in San Angelo, TX, where there was a range option in the Department of Agriculture. About 15 students per year were graduated with a range option from ASU over the last several years.

**Number of Range Students Graduating**

**Great Plains.** An average of 41 range students were graduated annually by 11 institutions in the Great Plains from 1997 through 2001 (Table 2). The Department of Rangeland Ecology and Management at Texas A&M University contributed about one-half of this total. The number of range students graduating in 2002 and 2003 at Texas A&M University was projected to remain at about 20 per year. The other 10 institutions as a whole expected numbers of graduates to grow to the point that Texas A&M graduates will compose <30% of the total graduates for the Great Plains in 2003. About one-half of the 11 institutions projected increases in graduates. Although total number of graduates is increasing, all but two institutions expected to have <10 range students graduating in 2003 (Table 2).

**Western Region.** Compared with the Great Plains, the number of range graduates from 1997 through 2001 was more evenly distributed across the 11 institutions in the western region (Table 3), but 46% of the graduates were from University of Wyoming, Montana State University, and Colorado State University. Similar to the Great Plains, about one-half of the institutions in the western region projected increases in numbers of graduating seniors in 2003. Although most programs in the western region had more students than the Great Plains programs, only five of these schools projected having 10 or more graduates in 2003.

**Overall.** The average annual number of range graduates from all institutions was 114 students from fall 1997 through spring 2001. This number was about 60% of what it was in the first half of the 1960s (Box, 1964). Faculty representatives of most schools reported that university administrators generally require a minimum of 10 graduates/year for a major to remain viable. Many institutions unable to attract this number of range students have dropped their range programs or absorbed them into other administrative units (e.g., departments of natural resources). Range majors or options are no longer offered at 11 of the institutions (about 40%) surveyed by Box (1964).
as having programs qualifying graduates for federal jobs in range management. Box (1964) also reported that there were 32 other institutions in the early 1960s teaching range service courses for other disciplines, including forestry, agronomy, animal science, and botany. Very few of these institutions currently have range faculty or teach range courses. The reduced recognition and visibility of range science as an undergraduate program has range educators concerned.

Alternatively, faculty representatives of a few institutions projected an increase in student numbers. The size of the Texas A&M program and the growth projected for other institutions often is the result of offering a diversity of options within the range major or offering emphasis areas that are specific to the needs of the state. The Department of Rangeland Ecology and Management at Texas A&M University offered two range options and eight emphasis areas in one of the options. Utah State University recently modified its curriculum to offer four options within its range major, with the objective of attracting students from other natural resource areas. Chadron State College in Nebraska and South Dakota State University both offered a range livestock production option, which is highly relevant to private land states where livestock grazing is the principal use of rangelands. Emphasis areas have been used effectively to offer new, range-related curricula that attract students and that improve visibility of range undergraduate programs.

Primary Obstacles to Growth. Low enrollment continues to be a primary concern for range programs at most institutions. Several reasons for low student numbers were given by faculty representatives completing the survey. There was near-unanimous agreement of poor awareness of rangelands and range science among students, high school career counselors, the public, and even professionals in other natural resource and production agriculture disciplines. Several surveys indicated inadequate efforts to market the range curricula or to recruit new students at their institutions. Administrators and faculty colleagues who advise undergraduates frequently have a poor understanding, preconceived ideas, or misconceptions about rangelands and range science. This lack of visibility and recognition as a discipline results in relatively few students being referred to the range major. Moreover, rangelands do not have the inherent appeal of forests or wildlife to students. Students frequently have difficulty articulating the scope of the range major and are attracted to other environmental or natural resource curricula. Furthermore, most survey respondents stated that the range science discipline and programs have a restricted image and may be perceived to be closely tied to a single use and commodity—grazing livestock. Because there often is a bias against livestock grazing on rangelands, the discipline suffers from this association and limited view of its scope (Malechek, 2002). With its perceived close tie to production agriculture, range science is not viewed as ecosystem science and its graduates are not viewed as applied ecologists competent in ecosystem management and conservation.

Although the range curriculum at most institutions provides the education needed for expertise in the science and management of natural ecosystems, more recent curricula in natural resources management are competing with the range major for students in the area of rangeland resource management. The traditional range science curriculum is relatively inflexible (Malechek, 1992; Nicholson, 1992), requiring a fixed set of range and associated natural resource courses and a core of rigorous basic science courses; as a result, students are left with few choices and very few free electives (≤10 semester credit hours). This specificity in course requirements detracts from the major and is based largely on the standards set by the U.S. Office of Personnel Management for range conservationist positions. Several faculty representatives suggested that the traditional range science curriculum should be changed and that range science educators should be more innovative and forward-thinking in developing new range programs that are attractive to the student, the scientific community, and potential employers.

Full Time Equivalents

Schools in the Great Plains reported having 1.5 full time equivalents (FTE) or fewer dedicated to teaching undergraduate range courses, except for Texas Tech University (6.0 FTE) and Texas A&M University (10.0 FTE). Western schools varied from 1.5 to 4.8 FTE. Institutions with a greater number of FTE tended to have more students. The total number of FTE for all institutions was about 63. The number of teaching FTE in U.S. institutions apparently has not changed over the past two decades, because Kothmann (2000) reported a similar number of teaching FTE from 1986 to 1990.

Job Placement

Great Plains. About 55% of range students who graduated between 1997 and 2001 found jobs in the private sector, primarily in environmental consulting and ranch management (Table 4). Fifty percent of the graduates from Texas A&M University were employed in environmental consulting, whereas most of the other schools had very few graduates going into environmental consulting. Range graduates of Texas A&M University with an environmental science emphasis are finding excellent job opportunities with environmental consulting firms, public utility companies, municipalities, and federal environmental agencies. Most of the private sector jobs filled by graduates of the other institutions were in ranch management and grassland management for conservation organizations. Nearly 50% of the graduates from the other 10 schools found employment in the public sector, whereas <20% of the graduates from Texas A&M University went to work for state or federal agencies. Students at most institutions continued to view federal land management agencies as the principal employer of graduates. About 85% of the graduates from South

---

Table 4. Percentage of graduates of Great Plains and Western Region schools placed in each job area over the past 5 years.

<table>
<thead>
<tr>
<th>Job Area</th>
<th>Federal agency</th>
<th>State agency</th>
<th>Environmental consulting</th>
<th>Other private†</th>
<th>Graduate school</th>
<th>Other‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas A&amp;M University</td>
<td>10</td>
<td>7</td>
<td>50</td>
<td>25</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Other Ten</td>
<td>35</td>
<td>12</td>
<td>3</td>
<td>35</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Universities Mean Range</td>
<td>5-85</td>
<td>0-44</td>
<td>0-6</td>
<td>5-75</td>
<td>1-20</td>
<td>0-50</td>
</tr>
<tr>
<td>Western Region</td>
<td>48</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>16</td>
<td>9</td>
</tr>
</tbody>
</table>

† Other private includes all jobs in the private sector other than environmental consulting.
‡ Other includes volunteer positions and unknowns.

The size of the Texas A&M program and the growth projected for other institutions often is the result of offering a diversity of options within the range major or offering emphasis areas that are specific to the needs of the state. The Department of Rangeland Ecology and Management at Texas A&M University offered two range options and eight emphasis areas in one of the options. Utah State University recently modified its curriculum to offer four options within its range major, with the objective of attracting students from other natural resource areas. Chadron State College in Nebraska and South Dakota State University both offered a range livestock production option, which is highly relevant to private land states where livestock grazing is the principal use of rangelands. Emphasis areas have been used effectively to offer new, range-related curricula that attract students and that improve visibility of range undergraduate programs.
Dakota State University during 1997–2001 gained employment with federal agencies.

**Western Region.** Nearly 50% of the graduates from the range programs in the western region during 1997–2001 found employment with federal agencies (Table 4). Only two institutions, Brigham Young University and Colorado State University, reported having <35% of their graduates going into federal employment. State agencies generally did not employ many range graduates, except in the cases of the University of Arizona (20%) and Brigham Young University (15%). The private sector generally was not a significant employer of range graduates. Colorado State University and University of Idaho were exceptions where 35 and 10%, respectively, of the graduates went into environmental consulting and 25 and 21%, respectively, were hired by other private sector employers. Brigham Young University had 50% of their graduating seniors attend graduate school, whereas all other institutions had <20% of their graduates moving into graduate studies.

Results of the survey indicate that most range students graduating from 1997 through 2001 found jobs in range management or in their area of specialization (e.g., environmental science) within the range major. Although we did not collect the data necessary to calculate job placement rate for range graduates, placement rate was certainly greater than the 25 to 50% rate reported by Nicholson (1992) and probably greater than the 64% rate reported by Powell (1975). Most faculty representatives from the surveyed universities reported good job and career opportunities in range management for graduating seniors.

Job and career opportunities for range science graduates, however, are not as well defined and predictable as they were 20 to 40 yr ago. At that time, there was a more consistent need, spatially and temporally, for range conservationists and other range specialists in the federal government agencies. More recently, employment possibilities with the federal agencies for range graduates have decreased and job availability has become sporadic because of fluctuating funding patterns and changing hiring procedures. The long-term decline in job opportunities in federal agencies for range graduates is a result of fewer range-related positions as well as a redefinition, or simply a renaming, of the traditional range conservationist position. These new positions have similar responsibilities to the range conservationist position but have more trendy names, e.g., botanist, ecologist, or fuels management specialist, and education requirements that are not specific to the range science major.

Other employment opportunities in natural resources and agriculture have developed and range science graduates are well qualified for many of them. Range graduates in many parts of the USA are very competitive for jobs in environmental consulting, land management for conservation organizations and private land owners (including ranching), and conservation education for both private organizations and public agencies. The range major is unusual in that it provides a management-oriented and science-based, integrated curriculum that can be readily adjusted to prepare students for a wide-array of careers in natural resources and agriculture. Successful undergraduate range programs for the future will be those that develop new range-based curricula that provide graduates with the qualifications needed for a number of these employment possibilities.

The need to develop new range-based curricula is becoming increasingly obvious. The changing perception of range science education and the demands by university administrators to increase student numbers have resulted in the elimination or reorganization of several range programs in the last few years. Most recently, range programs at Utah State University, Colorado State University, and Oregon State University are in the midst of moving from individual range departments to being parts of larger, multiple-disciplinary departments where the focus and direction of undergraduate range education are uncertain. The Society for Range Management and the Range Science Education Council are facilitating an effort to redefine the range science major based on changing perceptions of the rangeland resource and future career opportunities. As suggested by McClaran (2000), the range curriculum may survive only when delivered in interdisciplinary natural resource or livestock production courses and curricula. The low enrollment numbers in all but the largest undergraduate range programs do not justify an individual major according to the measures used by most university administrators. Range science educators must look forward and lead in the development of these integrated courses and curricula so that other disciplines in natural resources or livestock production do not abandon the range management discipline.

**REFERENCES**


Sampson, A.W. 1954. The education of range managers. J. Range Manage. 7:207–212.