ation of epidermal characters between congeneric species occasionally requires "lumping" more than one species in a diet category. Identification will often depend upon aboveground plant biomass records from the pasture or area where the fecal sample is taken. For species of big game that feed one place and excrete in another place, it is important to have aboveground plant biomass records from the places where the animals do their eating.

The identification of forbs in sheep feces on rangelands dominated by forbs poses an important problem. However, it appears that perennial foodplants forming more than 5% of the diet can be identified and quantified by the analysis of 100 fields of a microscope at 125 power magnification using known techniques for analyzing feces of herbivores.

Literature Cited
STORR, G. M. 1968. Diet of kangaroos (Megalaleia rufa and Macropus robustus) and Merino sheep near Port Hedland, Western Australia. The Royal Soc. Western Australia 51:25-32.

Value of Broom Snakeweed as a Range Condition Indicator1
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Highlight
Following an initial 13 year stabilization period, changes in broom snakeweed populations on southwestern pinyon-juniper ranges were investigated over a subsequent 13-year period. The changes which occurred appeared to be the result of oscillating populations rather than of range condition.

Broom snakeweed (Gutierrezia sarothrae (Pursh) Britt & Rusby) is a com-

1Data reported here were collected while the author was employed by the Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, Flagstaff, Arizona. Manuscript received July 12, 1969; accepted for publication August 23, 1969.

mon range weed in the West. In the Arizona pinyon-juniper type, for example, its cover is exceeded only by the cover of junipers (Juniperus spp.) and grama grasses (Bouteloua spp.) (Arnold et al., 1961). Broom snakeweed is important in range management because it is abundant, relatively unpalatable, and competitive with associated desirable grasses (Jameson, 1966). Snakeweed can be controlled by chemicals (Johnsen, 1966) and appears to be reduced by protection from grazing (Arnold et al., 1961). Observations also indicate that the species responds to changes in climate. This report describes some changes in snakeweed populations on protected study plots in northern Arizona from 1958 to 1966. These results should be useful in assessing the place of snakeweed in range ecology and range condition evaluation.

Methods
In 1959, 11 exclosures (about 1 acre in size) which contained snakeweed were established in the northern Arizona pinyon-juniper type. Vegetation on these plots was measured with the line intercept method (Canfield, 1941) in 1940 and again in 1953. Each plot was sampled with 20 randomly located 50-foot transects except at one location where only 10 transects were used. These results were reported earlier (Arnold et al., 1961). During this first period, snakeweed declined from an average of 4.77 percent cover in 1940 to 1.51 percent cover in 1953. On adjacent grazed plots the cover at the same dates was 5.14 and 1.72, respectively, or a decrease of 68 percent of the original ungrazed stand and 66 percent of the grazed stand. These similar reductions on both protected and grazed plots may have been caused by introduction of improved grazing management at about the same time that the plots were fenced or they may have resulted from drier conditions in northern Arizona in 1953 than in 1940 (Green, 1959).

In 1966 the transects on the protected plots were remeasured in the same way. The period from 1940 to 1953 was considered to have allowed recovery from past grazing treatment and changes during the period 1953 to 1966 were considered to represent
changes which occurred without grazing effects.

Results

Snakeweed increased (Fig. 1) from 1953 to 1966 on 7 of the 11 plots and decreased (Fig. 2) on the other 4 (Table 1). Maximum increase was 2.6% cover and maximum decrease was 2.9% cover. Three of the 11 plots had snakeweed cover of over 1% in 1953; all of these showed decreases in snakeweed cover from 1953 to 1966. The other 8 plots had snakeweed cover of 1% or less in 1953; 7 of the 8 showed increases in snakeweed cover by 1966. These changes resulted in an inverse relationship between the amount of snakeweed present in 1953 and the change of snakeweed cover between 1953 and 1966.

Table 1. Cover (%) and changes in cover of broom snakeweed on 11 plots in the northern Arizona pinyon-juniper type over a 13 year period.

<table>
<thead>
<tr>
<th>Plot No.</th>
<th>1953</th>
<th>1966</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.38</td>
<td>1.95</td>
<td>1.57</td>
</tr>
<tr>
<td>2</td>
<td>0.59</td>
<td>3.17</td>
<td>2.58</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
<td>2.65</td>
<td>1.66</td>
</tr>
<tr>
<td>4</td>
<td>0.18</td>
<td>0.23</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>1.31</td>
<td>1.02</td>
<td>-0.30</td>
</tr>
<tr>
<td>6</td>
<td>0.48</td>
<td>3.02</td>
<td>2.54</td>
</tr>
<tr>
<td>7</td>
<td>8.88</td>
<td>5.99</td>
<td>-2.89</td>
</tr>
<tr>
<td>8</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
</tr>
<tr>
<td>9</td>
<td>0.36</td>
<td>0.00</td>
<td>-0.36</td>
</tr>
<tr>
<td>10</td>
<td>0.30</td>
<td>0.52</td>
<td>0.22</td>
</tr>
<tr>
<td>11</td>
<td>3.16</td>
<td>1.26</td>
<td>-1.90</td>
</tr>
</tbody>
</table>

Mean 1.51 1.81 .30

Discussion and Conclusions

The results indicate that a major factor in changes of snakeweed is the decline of older communities and a buildup of younger communities. The changes did not appear to be due to climate; two plots within ½ mile of each other showed changes in percent cover of +0.06 and -0.30, two other plots about 5 miles apart had changes of +2.54 and -2.89.

On the average, continued protection from grazing did not result in changes in snakeweed cover. The average cover change for all 11 plots for the 13 year period was a 0.30% increase and this change was not statistically significant (t = 0.41 for paired plot comparison). The average snakeweed cover on these plots appears to
be in the range of 1 to 2%; fluctuations from these values seem to indicate population oscillations rather than range condition. Snakeweed, therefore, appears to be unreliable as a range condition indicator.

**Literature Cited**


**BOOK REVIEWS**


Paul Ehrlich, an entomologist by training and currently professor of biology at Stanford University, gained nationwide popular recognition two years ago with his book The Population Bomb (see JRM 22:211), a work that was received with mixed reaction.

There is no doubt that Dr. Ehrlich is a man with singular devotion to the cause of population control, and this present book, in which his wife joins as co-author, is a book-length "feature article" espousing that crusade. It is, as the jacket blurb states, "... (a) comprehensive, detailed analysis of the worldwide crises of overpopulation and the resulting demands on food, resources, and the environment." The book is indeed comprehensive and detailed, substantially documented with references and data, but one wonders if all the evidence is in and all the alternatives fully explored; given the book's genre the answer is probably not. Nevertheless, it is this reviewer's opinion that the ideas, the data, the concepts, and the conclusions which the Ehrlichs have presented are most deserving of serious study by everyone in the field of natural resources management.

Chapter 1 is a brief, succinct statement of The Crisis—"Spaceship Earth is now filled to capacity or beyond and is running out of food." In successive chapters (dealing with such subjects as Numbers of People; Population Structure and Projection; The Limits of the Earth; Food Production; Ecosystems in Jeopardy; Family Planning and Population Control; Social, Political, and Economic Change; etc.) the authors give their logical reasons for supporting such a premise and point out the interconnectedness between the crisis and environmental deterioration, hunger, resource depletion, war, and other social ills. It is important to note, however, that this is not a "scare" production nor was it intended as such. In the concluding chapter the Ehrlichs present "A Positive Program" in the form of six recommendations:

1. Population control is absolutely essential—it is not, however, a panacea (italics the authors').
2. Political pressure must be applied... to halt the growth of the American population.
3. A massive campaign must be launched to de-develop the United States—i.e., bring the economic system (especially patterns of consumption) into line with the realities of ecology and the world resource situation.
4. Following its start on that path, the United States can turn its attention to the problems of de-development of other DCs (developed countries), and the ecologically feasible semi-development of the UDCs (reviewer's italics).
5. The world cannot, in its present critical state, be saved by merely tearing down old institutions, even if rational plans existed for constructing better ones from the ruins.
6. The major necessary ingredient that has been missing from a solution to the problems... is a goal, a vision of the kind of Spaceship Earth that ought be...

Members of the range profession will be especially interested in the chapter "Food Production." One of the several theses advanced by the Ehrlichs in this chapter is that there is little, or no, land left in the world that is really "potentially arable." Although they do not specifically use the term "land classification and use," a good example is picturesquely described: "In 1954 large sections of the dry plains of Kazakhstan in the USSR were put into grain production. Premier Khrushchev had great hopes for this highly promoted 'virgin lands' program, but unfortunately the virgin turned out to be a harlot in disguise."

Whether you agree or not with the "population crisis," whether or not you are sympathetic with the "environmental crisis," here's a book that is worth reading because it is highly informative and presents a good picture of the temper of the times.—Francis T. Colbert, Denver, Colorado.