

Dr. S. Barron, N.I.H., Bethesda, Maryland; Professor K. Armitage, University of Kansas. These visitors precipitated many stimulating discussions and some were taken into the research areas for first-hand observations.

Assisted by John McLeod and Steve Martin, University of Wisconsin.
Supported by Grant No. M2599, National Institute of Mental Health.

Trends of Vegetation in the Near Six Elk Enclosures
on the Northern Yellowstone Wildlife Winter Range
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Project Number 121

Four vegetation sampling methods used by Walter Kittams and Gail B. Denton in 1958 and duplicated and extended this year by the writer and William Barmore are listed below:

1. The Parker 3-step line transect.
2. 32" square quadrat.
3. Belt transect (50 and 100 ft.).
4. Photography (on all the above sampling methods).

At Junction Butte a new elk enclosure was located and erected during the summer and all of the above listed sampling techniques were used in setting up a permanent type sampling in the area. Conclusions drawn by the writer are summarized in the report submitted to Yellowstone National Park authorities for each of the six elk enclosures and similar vegetation near each enclosure. The more pertinent trends shown by the study are summarized below:

1. Grass species show little change since 1958. Apparently too much topsoil (1-3 inches) has been lost in the Gardiner-Stevens Creek area for good production on the most heavily used sites in or outside the enclosures.
2. Willow (several species of Salix) and aspen are being severely decreased in density in the Lamar-Horseshoe and in much of the northern elk range.
3. Big sage (Artemisia tridentata) is slowly, in most areas, but rapidly in the Gardiner-Stevens Creek area, being eliminated.
4. Other browse plants such as Lonicera sp., Prunus sp., Vaccinium sp., Chrysothamnus viscidiflorus, and Tetradymia canescens are less heavily damaged but are threatened in local areas.
5. Willow and Aspen are showing spectacular gains in height and diameter inside the elk enclosures.
6. On many small areas such as knolls and upper portions of south facing slopes, much of the total plant density consists of undesirable forage species such as Phlox multiflora and P. hoodi, Chrysothamnus sp., Antennaria sp., and Artemisia frigida. Increase of these species with loss of Agropyron spicatum and Festuca idahoensis is, of course, undesirable.

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Recommendations for future work in the Lamar Horseshoe and along the Yellowstone River to the Gardiner area are listed:

1. Reread grassland quadrats and line transects at 5-10 year intervals.
2. Reread only "outside" aspen, willow and sage belt transects at 2-5 year intervals. Trend inside the exclosures on these species is already well established.
3. Use denuded areas inside exclosures for a plant-succession study. One plot of this type is located about 40 feet south of 0'.0" stake of the C₁-T₂ inside transect on the older (1958) elk exclosure. Soil is sandy-loam and erosion pavement. Bare area is about 15'x 6'. Invading plants now present are Camelina microcarpa, Agropyron spicatum, Erigeron corymbosus, Sedum stenopetalum, Astragalus miser.
4. Establish study on wildlife summer range to see if this high altitude is as good as previously assumed.
5. Check source of heavy sheet erosion along Cache and Miller Creeks.
6. In future studies allow two weeks at the culmination of study for analysis of vegetation trends.

Worked with William Barmore, Assistant Management Biologist, Yellowstone National Park, on this project.

Supported by a grant from Yellowstone National Park.

Limnological Studies on Swan Lake and Third Creek
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University of Wyoming
Project Numbers 74 and 108

The most significant new research done on the Third Creek study involved a detailed study of the insect fauna. Dr. Gordon Edwards assisted in this study and was responsible for the classification of these insects. A summary of this work appears elsewhere in this report under his project.

In connection with the age-growth study of brook trout in the beaver ponds of Third Creek, 110 brook trout were collected, lengths and weights taken, scale samples collected, and stomachs preserved for future study. Re-examination of the ecology of the five study Stations on Third Creek was carried out. During the summer of 1961 three Stations, I, IV, and V were stocked with 930 fingerling brook trout each. None of these Stations had trout in them previously. These three Stations were examined during the 1962 summer season and no fish were recovered from any of the three Stations, suggesting that they are unable to support a brook trout population. Up to the present time the reason for this inability to support brook trout has not been definitely determined, however, since all other factors are quite comparable to ponds in which brook trout are present, it is suspected that the lack of O₂ during winter months when these ponds are frozen over could be