



FIG. 1. Prescribed burning on Ballard's marsh.

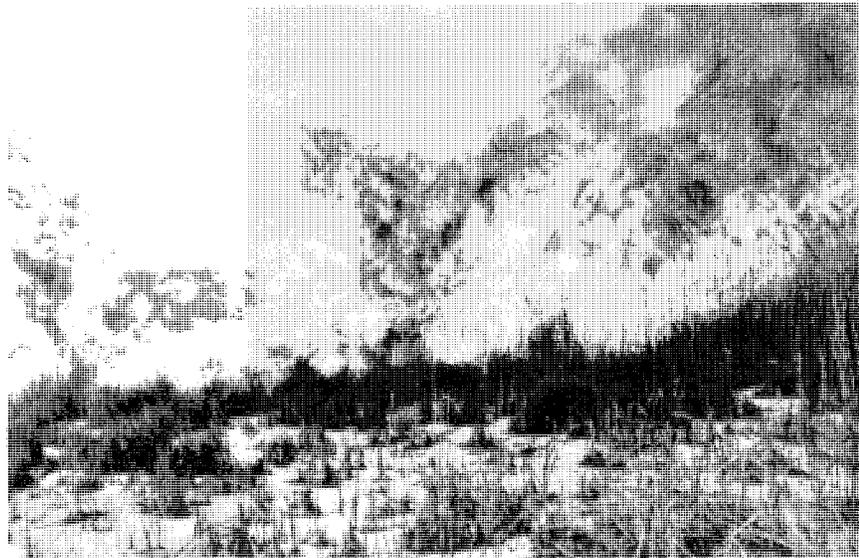


FIG. 2. The marsh was burned when snow was on the ground to insure control of fire.

Marsh Burning for Waterfowl

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THE OBJECTIVE of this study was to determine if burning, along with other related habitat manipulation methods would help in restoring a reed-choked (*Phragmites communis*) marsh for waterfowl use. The following discussion applies to that portion of north-central Nebraska known as the Sandhills. The Sandhills are an ecologically unique grassland area comprising approximately one-fourth of the State or about 20,000 square miles. Distinctive characteristics include an abundance of well-managed grasses, sub-irrigated hay meadows, a cattle-grazing economy, and a diversity of wildlife resources. The hills for which the region is named are round-topped, loose, porous sandy soils covered by native vegetation. Between the hills are sub-irrigated meadows and exposed groundwater lakes and marshes. There is little surface run-off; streams are fed by spring underflow. Annual precipitation within the Sandhills region is about 20-24 inches. Because of the sandy soil and the wind, little of this area is suitable for agricultural purposes. It is often said that the wind blows 365 days a year. In the winter, winds of 40 to 60 miles per hour are not uncommon. In small areas where the soil is denuded of vegetation, the wind action gradually shifts the sand so that crater-like holes called blow outs are formed.

The human population of this area is sparse and scattered. Ranches vary in size from 1,000 acres to 100,000 acres or more. Stocking rates range from 10-20 acres per cow. Ground water supplies are abundant and near the surface.

Trees are not common in the Sandhills proper but are generally restricted to the stream courses or near the ranch headquarters. The primary trees of this grassland include cottonwood (*Populus deltoides*) eastern red cedar (*Juniperus virginiana*), willows (*Salix spp.*), green ash (*Fraxinus pennsylvanica*), ponderosa pine (*Pinus ponderosa*), hackberry (*Celtis occidentalis*) and box elder (*Acer negundo*). The Sandhills also encompass National Forest lands that comprise approximately 200,000 acres. Forested portions are hand planted.

The primary vegetation found on the uplands include sand reed-grass (*Calamovilfa longifolia*), sand bluestem (*Andropogon hallii*), sand sage (*Artemisia filifolia*), little bluestem (*Andropogon scoparius*), sand lovegrass (*Eragrostis trichodes*), needle and thread (*Stipa comata*), sandhill muhly (*Muhlenbergia pungens*), grama grasses (*Bouteloua spp.*), wild rose (*Rosa arkansana*), sand cherry (*Prunus besseyi*), lead plant (*Amorpha canescens*), soapweed (*Yucca glauca*), blowout grass (*Redfieldia flexuosa*), wild plum (*Prunus americana*) and sand dropseed (*Sporobolus cryptandrus*).

Primary grasses on the sub-irrigated meadows are big bluestem (*Andropogon gerardi*), Indian grass (*Sorghastrum nutans*), slender wheatgrass (*Agropyron trachycaulum*), switchgrass (*Panicum virgatum*) and sloughgrass (*Spartina pectinata*).

Grasses common to the wet meadow areas are cut for winter forage. The hay is generally stacked loose; however in recent years many ranchers are using baling machines. The bales are usually left in the meadows for the cattle during the winter months.

The lakes and marshes of the sandhill region are alkaline, shallow and fluctuate from year to year depending on rainfall. Lake bottoms range from hard sand to a soft muck. Very few lakes have maximum depths exceeding 10 feet. These lakes and marshes are important waterfowl breeding and migration stopover areas.

Plants characteristic of these water areas are cattail (*Typha latifolia*), reed (*Phragmites communis*), wild rice (*Zizania spp.*), pond-

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weed (*Potamogeton spp.*), big duckweed (*Spirodela polyrhiza*), duckweeds (*Lemna spp.*), rush (*Juncus spp.*), arrowhead (*Sagittaria latifolia*), coontail (*Ceratophyllum demersum*) and bulrushes (*Scirpus spp.*).

Ballards Marsh Game Management Area, situated in the Sandhills was established on July 24, 1930, and consists of some 1,600 acres. Marsh area with water depth to 5 feet makes up 660 acres while the remainder is hay meadow and range land. The area provides good sharp-tailed grouse hunting and limited pheasant and mule deer hunting. Muskrats are an important furbearer of the marsh but are subject to little trapping pressure.

Presently the marsh is choked with common reed. The density of this emergent plant has increased, the edge effect of the marsh has decreased, feeding and loafing areas have become obliterated and the valuable waterfowl food and cover plants have gradually been crowded out. Activities and movements of waterfowl, especially young broods, are restricted. Many desirable plants such as duckweed, pondweed, and wild rice, occur only in nominal numbers. Competent early observers have noted that wild rice was once a common species on Ballards Marsh. Few ducks are harvested from the area each year. However, only decades ago it was considered a prime waterfowl breeding and hunting area.

Ducks using the marsh include both dabblers and divers. The primary ducks observed on the marsh during migration are mallards, blue-winged teal, green-winged teal, gadwall, baldpate, ringnecks, and redheads. Few broods are produced on the marsh.

Because of extreme climatic cycles in Nebraska, plant succession can be rather rapid. Man's intervention with natural drainage patterns of Sandhill lakes and marshes also increases the rate of ecological change. A good waterfowl marsh in the Sandhills is merely a temporary stage of plant succession. Efficient management would call for reversion of plant succession to a sub-climax plant community attractive to waterfowl and which would facilitate harvest.

Management on the marsh area is limited because of a variety of problems and conditions. Among them are limited funds and legal complications in water level control.

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Since controlled burning has been demonstrated to be an effective and economical method of manipulating certain habitats in other regions of the world, consideration was given to the use of fire as a primary means of restoring Ballards Marsh to waterfowl productivity. In so doing, problems became apparent. Prescribed burning, for example, had never been used as a game management tool in Nebraska. Commission policy discourages landowners from burning. Range fires, however, are a part of the history of the Sandhills. Each summer considerable acreage is burned by wildfires. Nearly all of these are lightning-caused. As a consequence, wildfires have come to be feared, but not understood.

Despite past prejudices, it was felt that careful experimentation with fire would do more good than harm, since the marsh had already ceased to be useful for maximum wildlife productivity. In an effort to remove the rank, dense growth of the reed, a prescribed burn was scheduled. Control of growth was not an objective of the burn. Rather, it was hoped that burning would destroy the old growth, thus allowing other habitat manipulation measures to be used.

In late February, 1966, approximately 100 acres of the marsh were burned. Burning was postponed until the marsh was frozen and snow covered the surrounding range to minimize the possibility of a wildfire. The thickness of the ice was 9-12 inches, with 2-4 inches of snow on the surrounding range. Two propane operated weed burners were used to ignite the non-foliolate reed. Fuel was supplied by two twenty-pound tanks. These proved quite mobile and burned for approximately four hours. Weather characteristics on the two days when burning was conducted were as follows: On February 23, the relative humidity was 72%, temperature 30° F and the wind velocity 15 mph. On the 24th, the relative humidity was 60%, temperature 37° F and the wind velocity 7 mph.

Results of burning were irregular wide channels with unburned patches and strips of vegetation remaining. The fire left a 2 to 6 inch stubble, probably a result of the vapor zone developing from the accompanying steam.

On January 18 and 19, 1967 burning again was initiated under similar weather conditions. On the 18th, the relative humidity was 67%,

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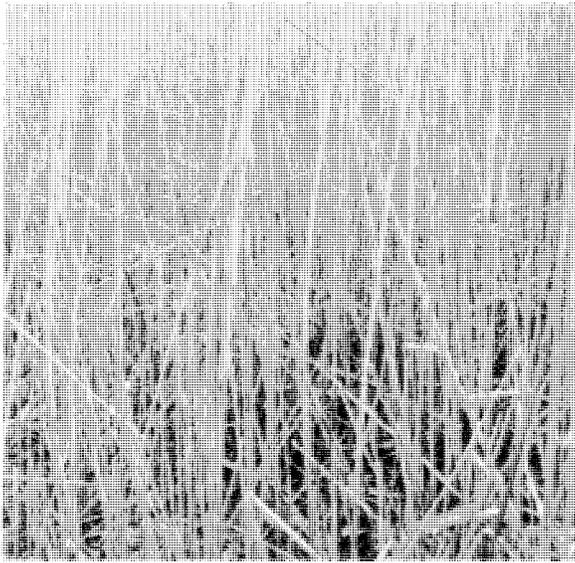


FIG. 3. Reed density in marsh before prescribed burn.



FIG. 4. After prescribed burn, reed density one year later was decreased 85%.

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temperature 17° F and the wind velocity a varying 20-26 mph. On the 19th the relative humidity was 52%, temperature 42° F and the wind velocity 17 mph. There appeared to be little correlation between the humidity and temperature, as the combustibility of the vegetation varied only slightly over the 4 days.

Burning was attempted on a portion of the marsh burned the previous year without success. New growth was sparse and lacked several years' mulch accumulation. The new plants did not appear nearly as combustible as the old growth even when the flame was applied directly.

To determine the density difference between burned and unburned marsh area, a square-foot transect sampling was used. Samples indicated an 85% decrease in the density of the reed. Bulrush decreased in density by 60%. This does not imply that growth was controlled, but merely that fire removed the accumulation of dead vegetation built up on the marsh over the years. Visually one could see the difference between areas that had been burned the previous year and the unburned areas.

During the spring of 1966 waterfowl were observed using the areas burned in February 1966. An edge effect had been created and open water existed at least during the spring migration. In addition, the reduced density of the vegetation allowed space for waterfowl movement and activities during the summer and fall.

Presently the possibilities of controlling the water level on Ballards Marsh are being studied. This would greatly aid in our management of the marsh for wildlife. We have considered the use of herbicides but these appear too costly. Further investigation is needed to determine the best management on our Sandhill marshes and lakes. The instability of these habitats have stimulated this need. Burning appears to be one technique for initial restoration of such areas.