

WAS THE HIGH PLAINS A PINE-SPRUCE FOREST?

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Introduction

Twenty thousand years ago a sheet of ice more than a mile thick mantled the Northern Plains, the Midwest, and most of Canada. The ice sheet, called the Laurentide, was the last of several Ice Age glaciers that plowed through the north (Fig. 1). The cold climate that spawned the ice sheet also changed the distribution of plants and animals everywhere in the world. Ecologists speculated that the Great Plains prairies may have disappeared entirely, replaced by forests.

Far from the ice sheet, the Llano Estacado or High Plains of

comes from studying fossil pollen grains in peat bogs and lakes. Plants produce tremendous amounts of pollen. In the High Plains grasslands, range plants produce more than 120 billion pollen grains per acre every year (Hall 1990). Some pollen grains fall in playa lakes where they are entombed in mud. By recovering fossil pollen that was deposited thousands of years ago, it is possible to tell what plants were growing in the vicinity and what range conditions were like.

Between 1957 and 1959, an innovative project was sponsored by the Museum of New Mexico, Santa Fe, to determine the environmental history of the southern High Plains. Geologists examined sand dunes and playa lakes, and paleontologists studied fossil bones and snails and even fossilized remains of algae from the lake muds left behind in the Ice Age playas. During the project, studies of fossil pollen from the ancient and now-dry playas turned out to be of unexpected importance, destined to be cited for decades to come.

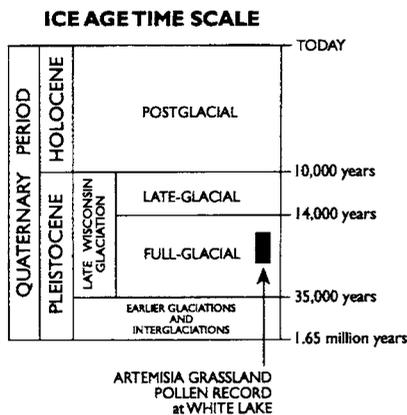


Fig. 1. Time scale of the Quaternary Period or Ice Age extending back 1.65 million years; the Laurentide ice sheet reached its maximum about 18,000 to 20,000 years ago.

Texas and eastern New Mexico was home to a dozen species of giant horses and bison, all extinct today and known only from their fossilized bones. Looking at their teeth, which are little different from the teeth of their modern descendants, we know that these extinct animals were grazers. It almost goes without saying that grazers and grasslands go together, yet for many years, despite the evidence from fossil Ice Age horses and bison, ecologists have believed that the High Plains was not rangeland but instead was a forest composed of pine and spruce trees.

In the 1950s and 1960s, the Ice Age history of North America was of special interest to ecologists because of the dramatic changes that had taken place. During the period of cooler glacial climate that prevailed over the continent, plant and animal communities in the north were displaced hundreds of miles by the Laurentide ice sheet (Fig. 2). While early ideas suggested wholesale southward movement of more-or-less intact forests, it was soon realized that Ice Age plant communities were very different from those that we see today. Now it is also recognized that, during periods of environmental change and stress, plant and animal species alike migrate independently of each other, not in groups or associations. As a consequence, the make-up of today's modern plant communities and biomes may have come about only recently.

Most of our information on Ice Age plant biogeography

"Pine-Spruce Forest"

The lake muds contained high percentages of pine and spruce pollen. The ecologist who studied the pollen stated, "the most probable interpretation of the high pine pollen values...is that the pine formed an open forest with a very scanty field vegetation" (Hafsten 1961, p. 84, his emphasis). In a later paper, he interpreted it as "a cold and wet period with open boreal woodlands of pine and spruce..." (Hafsten 1964, p. 414).

Although the interpretation of a "pine-spruce forest" on the High Plains had been accepted by scientists and range specialists, the original work left two unanswered questions.

1. The high percentages of pine pollen in the lake muds were too high; some of the mud contained 85 to 100% pine. Modern pine forests generally produce only 60% pine pollen, the remaining 40% represented by other trees, understory shrubs, and ground plants. The ecologist was aware of this, and worried about the lack of pollen from herbs, stating simply that there was "...a very poor field vegetation covering the Southern High Plains" (Hafsten 1961, p. 85).

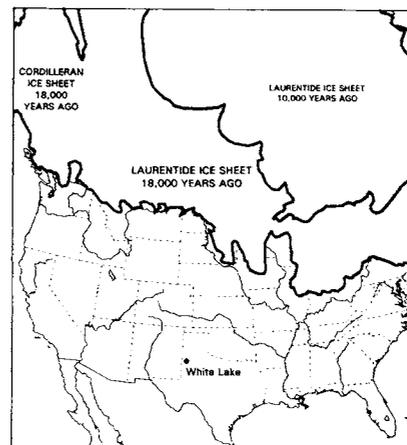


Fig. 2. Location of Ice Age playa deposits at White Lake, Texas, in relation to the Laurentide ice sheet.

