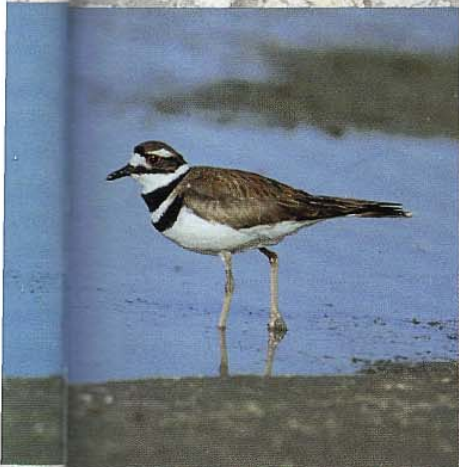




*Small alkaline lake near Lakeside in the western Sandhills.*



*Killdeer feeding on alkaline mudflat.*

Game fish including northern pike, largemouth bass, bluegill, yellow perch and bullheads are common in deep, slightly alkaline lakes. However, with higher alkalinities the water's capacity to store dissolved oxygen is reduced, and fish populations are limited. The fathead minnow is the only fish found in Sandhills waters with alkalinity greater than 2,000 mg/l. Tiger salamanders are common in many Sandhills lakes too alkaline to support fish, but they cannot tolerate alkalinity greater than 10,000 mg/l.

A diversity of invertebrates, including small crustaceans such as water fleas, small shrimp, rotifers, snails and insect pupae and larvae inhabit slightly to moderately alkaline wetlands and lakes. In hyperalkaline wetlands and lakes, invertebrate diversity decreases substantially, although brine fly larvae, brine shrimp and rotifers can be abundant. Those invertebrates are a key component of the wetlands food chain.

Nesting shorebirds that remain in the western Sandhills through spring and summer, such as American avocets and Wilson's phalaropes, and a variety of shorebird species migrating south through the region in late summer, are drawn to the alkaline wetlands to feed on the abundant brine flies and brine shrimp. During peaks in brine fly populations, large numbers of waterfowl forage on Sandhills alkaline waters. Many species of waterfowl and shorebirds have evolved nasal salt glands that rid their blood of excess salts, evidence that alkaline wetlands, such as those in the western Sandhills, have long been an integral part of their life cycles.

# Sandhills Alkaline Wetlands

The Nebraska Sandhills, North America's largest dune field renowned for its extensive freshwater aquifers, also contains some of the world's most alkaline wetlands and lakes. Some 98 percent of the Sandhill's hyperalkaline lakes are in the "closed basin" region of Garden, Sheridan and Morrill counties in the western Sandhills — an area of poor drainage and few outlet streams. Among the "hottest" is Sand Lake in Garden County. Its alkalinity was once measured at 136,000 milligrams/liter (mg/l). For comparison, the freshwater Pelican Lake on the Valentine National Wildlife Refuge has an alkalinity around 250 mg/l.

In the Sandhills, wetlands and lakes form in interdunal basins and valleys where groundwater seepage from aquifers below the dunes is abundant. Alkaline wetlands and lakes typically develop in basins with no outlet streams and poor subsurface drainage, preventing salts from escaping through outflow and seepage into subsurface waters. Over time, surface water evaporation increases the salt concentrations.

The most abundant salts in Sandhills alkaline wetlands and lakes are sodium and potassium carbonates. Common but less abundant are calcium and magnesium carbonates. The salts commonly accumulate as evaporite on shorelines, aquatic vegetation and at times, as a thin film on the water surface. With decreasing temperatures, the water's ability to suspend soluble salts decreases and precipitates often form and settle, covering the lake bottom with whitish ooze.

An interesting piece of Sandhills history involving these salt precipitates is the mining of potash (potassium salts) from Sandhills alkaline lake bottoms for use as agricultural fertilizers. The first serious attempt to mine the Sandhills' potash was undertaken in 1912, when the Potash Reduction Company was established on the shore of Jesse Lake five miles northwest of Antioch. At peak production, 10 companies were mining 100 tons of potash per day in and around southern Sheridan County. However, soon after World War I, the availability of less expensive German potash brought an end to the Sandhill's short-lived potash industry. Remains of several old potash plants can still be seen in the Lakeside and Antioch area.

The diversity of plant and animal life in the strongly alkaline Sandhills wetlands and lakes is low compared to the region's slightly alkaline and freshwater wetlands and lakes. The salt-tolerant emergent plants inland saltgrass, chair-maker's rush (*Scirpus americanus*) and hardstem bulrush (*Scirpus acutus*) and the submergent plants widgeon grass (*Ruppia maritima*) and sago pondweed are often the only plants growing in the highly alkaline wetlands. The submergents usually cannot survive in waters with alkalinities greater than 10,000 mg/l, and hyperalkaline wetlands are often totally devoid of plant life.



Wilson's phalaropes, yellowlegs and long-billed dowitchers on a Garden County wetland.

