

The Teton flora, thus defined, is characterized by lack of endemism, the occupancy of immature, generally shallow soils of recent origin, accentuated patterns of primary succession, and frequently changing faciations reflecting changes in geology, soil, topography, macro-climate, microclimate, and fire. The vegetation is varied, characterized by an exceedingly high number of dominants, and the percent of ground cover is, for the rainfall belt, very low.

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Land and Freshwater Mollusks of Jackson Hole  
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Observations of the molluscan population of five ponds were conducted during the summer of 1960. Four of the ponds, Colter Bay, Jackson Dam, Pacific Creek No. 1 and 2 lie in the lodgepole forest. The fifth, Gros Ventre, is out on the plain along the Gros Ventre River. They are closed drainage basins, filled to a depth of a few feet by the spring runoff and underground seepage.

Colter Bay pond is surrounded by a sedge-grass ring and an outer fringe of aspen. The water surface is open except for a few emergent aquatics as Conium maculatum. The pH is 7.1. The dissolved salt content must be very low for the shells of the snails are fragile and thin, crushing easily. The basin lies in a morainal deposit, the bottom consisting of coarse gravel and silt. At its greatest extent the pond measures 106 by 60 yards and has a depth of  $4\frac{1}{2}$  feet.

On July 2 this pond contained a rather abundant population of Lymnaea jacksonensis and Sphaerium lacustre ryckholti. Five shells of Promenetus exacuans were found. No living material of this species was seen all summer, although a few shells were found in each survey. Measurements of the rate of growth of the shells was continued with each observation.

By August 27 the pond had shrunk to a small central area not exceeding one half foot in depth except for two tiny depressions. Where the water had receded carpets of Mentha arvensis were blooming. Most of the snails and clams were dead, their shells littering the area. A tiny island near the northeast edge of the pond protects that shore from the prevailing west wind off Jackson Lake. In its shelter the greatest quantities of snails were always congregated, and on this date the only living animals were to be found here.



No snails were found burrowing beneath the gravel. Perhaps this substrate was too difficult for them to penetrate. Newly laid eggs were deposited on the gravel and under sticks and decaying vegetation. A verbal report from a ranger stated that Colter Bay Pond had not dried in the past 14 years. The mollusks are probably able to overwinter as eggs or adults frozen in the ice. In the vicinity of Laramie, species of Physa and Lymnaea have been found frozen in the ice. The animals became active as soon as the ice thawed, crawling on the ice and feeding in the muck.

Irrigation demands on Jackson Lake at the end of August caused the lake level to be lowered considerably. By mid-September the pond had dried completely, according to a communication from Dr. Altmann.

Immediately south of the Jackson Lake Dam and on the moraine is a pond approximately one third the size of Colter Bay Pond. The basin is steep sided and is filled mainly by seepage from Jackson Lake. It is located in the lodgepole pine, but in 1950 had a stand of aspen around it. By 1960 the aspen had nearly died out. Grasses, shrubs and some cattails lined the sides. Nupha polysepalum covered a large part of the water surface. The pH is 7.0. The bottom is composed of coarse gravel and silt. Maximum depth of the water is four feet. Although conditions in the Jackson Dam Pond appear so similar to those of Colter Bay, different species of fairy shrimp, caddis fly larvae, and other insect nymphs were present. This pond lacks the back swimmers, diving beetles, tiger salamanders present at Colter Bay. Only one fresh water sponge was found.

In 1950 Lymnaea palustris wyomingensis and Sphaerium lacustre ryckholti were collected in this pond. In 1954 Planorbula christyi was established as a large population in competition with the Lymnaea. This is the southernmost record for Planorbula. In 1960 the three species were living in the pond in approximately equal numbers. For reasons not understood all of the shells are badly eroded; the tips of the spires are completely gone in the largest specimens. Toward the end of August, the pond, which occupied a smaller area than it had in 1954, shrank still further. Only a few snails were active at that time.

Two ponds occupy adjacent hollows in the Pacific Creek drainage. Although neither has a surface flow, probably there is some underground water flow. Pacific Creek No. 1 is the smaller of the ponds, being approximately 100 by 250 yards at its greatest extent. Willow clumps, about whose bases thick cushions of moss are matted, are spotted around the perimeter. Interior to these is a wide ring of sedge. The water is completely covered by Menyanthes trifoliata so that seen from the hill the pond presents the appearance of a meadow. Maximum water depth does not exceed two feet. The pH was not recorded, but the presence of a thick tan colloidal precipitate suggests an acid tendency.

On July 5 Helisoma subjectum disjunctum in fair numbers was browsing on the stems of Menyanthes and the bottom. Many water spiders, and a few diving beetles and insect nymphs were noticed. In the moss at the edge of the pond Gyraulus parvus, Prometetus exacuanus, Armiger crista, Valvata



lewisii, and Pisidium casertanum were found. Valvata is usually found in running water, and its appearance was not expected here.

The date of July 25 found the surface water nearly gone. One half to one foot of water remained in a small central area. The substrate was very wet, with the water just below a thin surface crust. The snails had retreated under the crust. Although the water had receded from the area, the fresh water snails in the damp moss were still active. They were never found out in the pond proper. Reexamination of the pond on August 13 showed no surface water visible. The pond bottom was now a quaking surface that could support the weight of a person. The Helisoma had entered aestivation and was concentrated at a depth of one half foot in the mat of roots and ooze. The mollusks in the moss were dead, but a land snail, Vertigo modesta was present.

Rain the 14-16 of August dampened the surface and built up small puddles. While this caused a renewal of activity among the land snails, it did not affect the freshwater forms. When Pacific Creek No. 1 was last visited August 26, the pond bottom was firm, and was beginning to display minor cracks. One inch under the surface the ground was still moist.

Pacific Creek No. 2, the largest of the ponds, has a shallow flat basin. At the lower end it overflows across a meadow and into a large aspen grove at the height of the spring runoff. This pond has a wide ring of aspen around it and an inner ring of willows, grasses and sedges. An island supports a tangled growth of willow, alder and sedge. Emergent aquatics as Conium maculatum and sedge form a cover to give the pond a meadow-like appearance. That this pond was once much deeper is shown by a long deserted beaver lodge. On the 5th of July water was standing  $1\frac{1}{2}$  feet deep under the aspen. Dead shells of Helisoma subjectum disjunctum and Lymnaea palustris were scattered abundantly about the meadow to mark the furthest advance of the water. Where the water still covered the meadow, plants characteristic of damp areas were commencing their growth. In addition to the large populations of Helisoma and Lymnaea, a few Aplexa hypnorum, Promenetus exacuens, and Sphaerium lacustre ryckholti were observed.

The pH tested at 8.0. The pond bottom consisted of a black mud. The water had shrunk to one third of its former size, and was only a foot deep by the 26th of July. Under the aspen that had stood in water there was almost no plant life other than the shrub, Rosa woodsii. The meadow was now in full bloom and small frogs were abundant. Live specimens of Aplexa and eggs were found under gunny sacks in the meadow. A few immature Physa had appeared along the shore. This pond was dry by August 13. Three small spots devoid of vegetation exhibited mud cracks one inch deep. Two to three inches under the surface, the soil was still moist. Helisoma and Lymnaea had burrowed to this depth. A visit on the 26th of August found the pond bottom dry six inches below the surface.



The Gros Ventre pond, one of a chain of ponds on the plain along the Gros Ventre River, probably receives water by seepage. It is no more than four feet deep. The water is saline and has a pH of 7.8. On the salt encrusted flats surrounding it, a sparse growth of salt tolerant plants occurs.

A high population of Lymnaea palustris, as well as one of the tiger salamander, Amblystoma tigris, was present in the pond. The Lymnaea crawling along the water's edge were so numerous that the opening of the pneumostomes was audible as a steady clicking. Five individuals of Aplexa hypnorum were seen. This pond was not revisited. A flight over it the last week of August showed the pond still containing water, and it is doubtful that it would dry because of its proximity to the river.

In response to the drought that existed, land snails in the Jackson Hole area began aestivation the last week in June. Eggs deposited in the upper leaf layers became desiccated. On August 14 rain began and continued intermittently for three days. The ground was still dry on the morning of the 15th under the top layer of leaves in the aspen grove at the junction, but snails were active. Four specimens of Vittrina alaskana and Succinea avara had climbed up tree trunks as high as eight inches. The ground in the spruce forest on the north side of Signal Mountain was still dry on the morning of the 16th. Below the first inch of needle debris, the rain had not yet penetrated. Snails were concentrated under old logs. The leaf debris under the willow along the Snake River was fairly moist on August 18. Both immature and adult snails were noticed in the litter. Newly laid eggs were numerous. The aspen grove at the junction was reexamined on the 19th. By now the forest floor was wet. Approximately equal numbers of adults and juveniles were present. Newly deposited eggs were numerous.

Effects of Sewage Effluent on the Ecology of Swan Lake,  
Grand Teton National Park, Wyoming  
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University of Wyoming  
Project Number 75

The study on this project during the past summer was continued on a somewhat restricted basis. During 1960 the following studies were made.

1. A general reconnaissance of the lake was taken by boat to determine changes in the submergent and emergent types from the preceding summer. The major differences noted were that pond lilies had continued to decrease in the lake adjacent to the sewage inlet. The cattails showed a definite increase in abundance. Duckweed and many of the submergent types of vegetation were more abundant than in previous years. Associated with a decrease in water lilies was a continued high infestation by leaf miners and target spot fungus. This damage was much more pronounced in the area adjacent to the sewage inlet. The increase in submergents and emergents could well be associated with a marked increase in the organic matter supplied with the effluent.