

## Addendum 1

# Fir Mountain Ranch

## Summary of Soil Coring at Fir Mountain Ranch Pond/Wetland

### Background

In August 1997, soil cores were extracted from nearly 40 sites throughout the Fir Mt. pond/wetland/grassland complex. This sampling expanded on the information gathered from the several backhoe-excavated soil pits created earlier in the summer, and helped determine the potential for pond or open-water wetland creation. Soil coring with a hand auger enabled soils data to be gathered at greater depths than possible with a backhoe, and allowed easy access to flooded areas. Soil cores were made to depths between 9 and 19 feet, and were placed systematically across the project area, as shown on the site map (see Drawing 1).

### Results

Based on soil corings in 37 sites surrounding the pond and adjacent wetland fringe areas, three general zones of soil profiles were delineated. Each of these zones, associated soils information, and implications on pond development are described below.

A. South of Pond The emergent wetland south and east of the pond (sites 24-35) is characterized by soil high in organic matter (a peat soil) extending from just below the soil surface to at least 19 feet deep. These soils are reddish brown to black in color, moist, and contain fragments of partially decomposed plant material. In addition to fine organic material, small fragments of wood and bark were found in samples excavated from depths of 8-20 feet. Towards the north end of the pond (near the "water hole") a distinct ash layer (horizon) was observed at approximately 9 feet. Except for this ash horizon, the uniformity of the peat horizon in this zone is notable especially in contrast to soil profiles in the other two zones.

Organic (peat) soils form under saturated conditions associated with marshes, bogs, swamps or ponds. Over time, the residues of associated plants accumulate under water, where their decay is inhibited. The fragments of undecomposed materials (including wood) found in these peat soils are particularly interesting because they provide a chronosequence of the dominant vegetation as the peat layers accumulated. The depth of peat also generates some interesting questions regarding the formation of entire pond/wetland area. For example, preliminary estimates suggest that peat soils 19 feet deep may be approximately 5,000-6,000 years old.

B. West Edge of Pond Twenty sites (1-16, 36 and 37) were sampled in the area between the west edge of the pond and the dry pasture zone further west. This area is generally characterized by a dark, heavy, clay horizon within the upper 3-5 feet, and a distinct volcanic ash layer at approximately 3 to 4 feet. Below the heavy clay, a thick layer of organic soil (peat) was generally observed to depths between 6 and 10 feet. In a few locations where deeper soil cores were attempted, a coarse-textured cobbly layer was found at approximately 12 feet. Considerable variation between sites make only generalizations about this area possible.

A dark colored, silty-clay dominated soil layer was found in the upper 4 feet of most coring sites in this zone is recognized as an "A" horizon. These mineral soils, especially when occurring in thicknesses up to 3 to 4 feet are characteristic of grasslands. Decomposed organic matter, which coats the mineral particles, accounts for the dark color. "A" horizons of this type tend to be heavy, and relatively impermeable to water. Nonetheless, these soils did exhibit conditions associated with a fluctuating water table, such as mottles - or marks of contrasting color. Beneath "A" horizons are "B" horizons and transitions between the two. "B" horizons are generally light colored because they lack the organic coating on mineral particles.

It is interesting to note the occurrence of volcanic ash deposits throughout "A" horizons, "B" horizons, and peat soils. Ash layers ranging from 0.5 to 8 inches were found scattered throughout this and other zones. The varying thickness and depths of ash soil are consistent with regional patterns, but make it difficult to associate specific ash layers with certain eruptions. Volcanic ash layers are typically gray in color, and may in time resemble clay in a number of important soil characteristics.

The variable depth to groundwater observed in the soil pits (and expressed by the vegetation) in much of this zone suggests that only limited pond expansion in this area is recommended. In general, the greater the distance from the west side of the pond, the drier the soils, and the lower the groundwater elevations.

C. South End of Pond The wetlands south of the south end of the pond (soil cores No. 17 to 23) are quite variable, especially at depths between three and eight feet. The upper 2-3 feet are characterized by dark "A" horizons. Between 3-5 feet a variety of soil types, including volcanic ash and "B" horizons, were observed. At 8-10 feet below the soil surface, this area is characterized by a rather impenetrable horizon of angular cobble, clay and sand.

The cobble layer is recognized as a "C" horizon, which is generally a transition between developed mineral soils above and consolidated bedrock below. Therefore, soil cores that reach this coarse textured cobbly layer may be approaching solid bedrock. However, in at least one instance a cobbly layer overlies a peat layer, suggesting that some type of historic sloughing or rockslide may have occurred.

### **Further Investigation**

The results from soil coring efforts provided enough information to proceed with pond development. However, as previously discussed, the soil core data, the particularly the deep uniform peat layer, and the scattered ash deposits generated interesting questions related to the development of this site that merited further investigation.

Thus, a paleobotanist was engaged to provide further analysis via a pollen analysis and subsequent soils analysis. The findings of these analyses are described in "Fir Mountain Ranch: The Paleobotanist's Review" (Addendum 2).