SILTING AND FOREST SUCCESSION ON DEEP FORK IN SOUTHWESTERN CREEK COUNTY, OKLAHOMA

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Deep Fork is a very crooked sluggish stream flowing from Lincoln County into Creek County near the southwest corner and meandering along the southern boundary line, crossing the line several times before finally leaving the county from near the southeast corner.

From 1912 to 1923, Lincoln County straightened the stream in that county. This increased its gradient which in turn increased its velocity and its capacity for carrying sediment; hence, during times of flood, the water heavily laden with sand, silt, and clay rushes down into Creek County. When this water reaches the crooked channel the current is slowed down and the water spreads over the forested flood plain. A large log jam extending several hundred yards has formed in the sluggish channel. This also helps to retard the water and divert it from its original course. As its velocity is decreased, the stream begins to deposit its sediment: first the sand near the channel, then the silt beyond the sand, and finally the clay between the silt and the foot hills. The mechanism of this deposition has been ably described by Harper (1938). The deposit varies in thickness from zero to several feet. In certain parts of this area, the depth of deposit is so great that the present soil surface lies up among the main crotches of the old dead tree tops (Figs. 1 & 2). Several excavations were made in an effort to determine the depth of the sediment. The excavation shown in Fig. 1 was made to a depth of seven feet down the trunk of the tree through sedimentary deposits without reaching the original surface or the base of the tree. Then with a soil auger a hole was made three feet deeper (10 feet in all) without reaching the original soil surface. This was the greatest depth to which tests were made. An ocular survey indicated quite an area covered to approximately this depth. Another excavation (Fig. 2) was made about two or three hundred yards east of the first. This was dug through seven feet of silt without reaching the base of the tree. This work was done during the dry season of the year but even at that time some of the excavations had to be abandoned because of the high water table.

The flood plain of the stream was originally covered with an oak-hickory forest composed mostly of *Quercus macrocarpa*, *Quercus borealis*, *Carya illinoensis*, *Ulmus americana*, *Populus deltoides*, and *Fraxinus lanceolata* with a predominance of oaks and hickories. These oak and hickory trees are characteristic of well drained bottom land. At the present time these trees are all dead except a few in places on the natural levees along the original stream where the soil is sandy and drains quickly after the floods pass. Sediment deposited around the trees has gradually shut off the oxygen supply. This alone would have killed the trees except in the shallower deposits. In addition to this, the water table in the entire flood plain has been raised above the roots of the original forest, thus adding another lethal factor. With the original forest destroyed and the water table brought near the surface, the place is ideal for the starting of trees more tolerant of water; hence, over a large part of this flood plain there now exists a young forest of *Fraxinus lanceolata*, *Populus deltoides*, and *Salix nigra*. These are roughly arranged with the *Fraxinus* on the higher sandier soil, *Populus deltoides* next, and the willows in the more moist places. A considerable part of the area is under water too much of the time to have any living trees at all (Fig. 5). The young trees now present have been able to survive by their ability to climb out of the sediment as it was deposited around them. The original root systems of many such trees have been killed by the rise of the water table and the accumulation of sediment, but the trees have been able to survive by sending out adventitious roots from the stem as the silt built up around them and are now entirely supported by these adventitious roots. One ash tree was dug out which had its original root system five feet below the present surface of the ground. Two other ash trees were found in which the original root system was fifty-two inches below the present surface. One of these trees (Figs. 3 & 4) had undergone some accidents which, when dated by ring counts, made possible four observations on the rate of silting. This tree had germinated when the surface was fifty-two inches below the present surface. That was in 1928. In 1931, something killed the main shoot, probably a surface fire. Whatever the accident, it occurred when the surface was thirty-three inches below its present level. The tree threw out a lateral shoot which took the lead; this shoot was burned at the surface in 1937 four inches below the present surface. It again threw out a lateral shoot; this shoot was killed by a surface fire in the spring of 1940, a short time before the tree was dug.

The ages of the trees in the young forest average about ten to twelve years. These trees have grown up between the dead trees of the old oak-hickory forest; thus we have two forests on the same area (Fig. 6), an old dead oak-hickory forest characteristic of a well-drained soil and a young growing ash-cottonwood-willow forest characteristic of a poorly drained soil. The trees of the dead forest are rooted on the original flood plain surface. The young live forest has originated on subsequent surfaces and has been able to climb out as the silt was deposited around it.

LITERATURE CITED

Harper, Horace J. 1938. Effect of silting on tree development in the flood plain of Deep Fork of the North Canadian River in Creek County. Proc. Okla. Acad. Sc. 18:46-49.

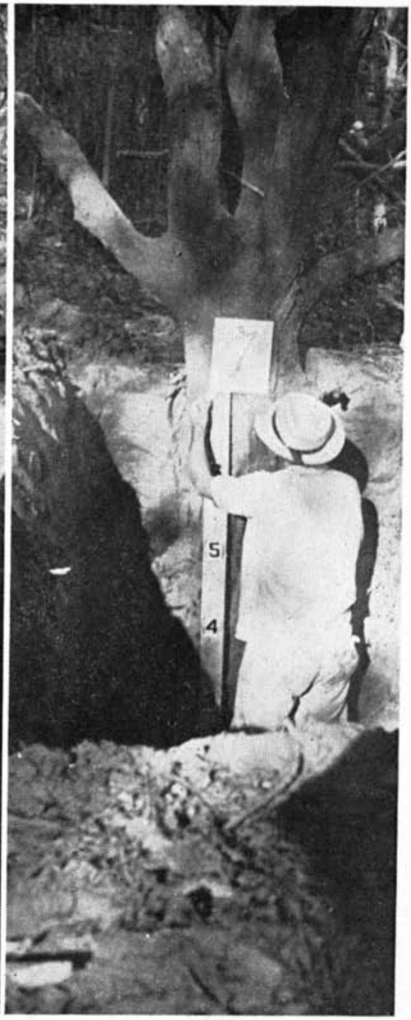

FIG. 1—Excavation seven feet deep down trunk of bur oak. Present surface near top of tree. Hole drilled from bottom of excavation three feet deep failed to reach the original surface. Location: S. E. ¼, Sec. 30, T. 14N., R. 7E.

FIG. 2—Excavation seven feet deep showing trunk of tree. Present surface just below top of tree. Location: S. E. ¼, Sec. 30, T. 14N., R. 7E.

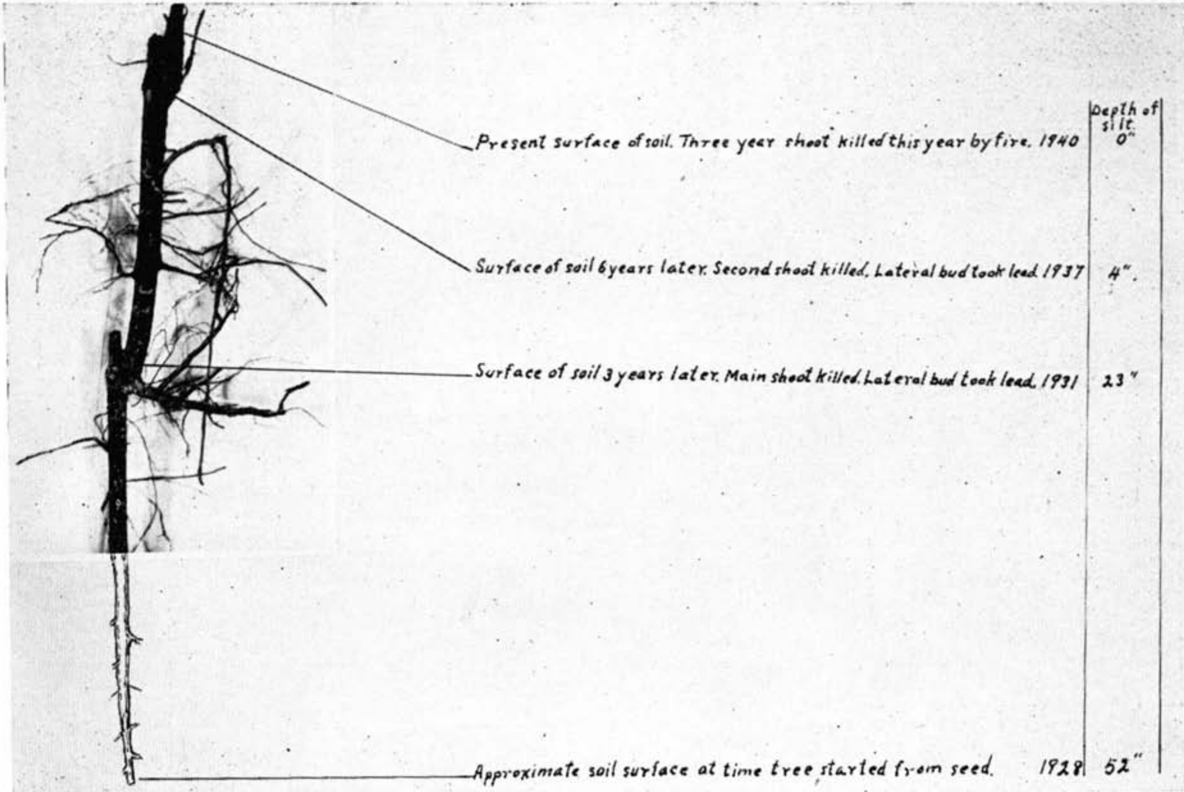

FIG. 3—Semi-diagrammatic chart showing rate of silting by ring counts. Location: N. W. 1/4, Sec. 33, T. 14N., R. 7E.

Fig. 4—Excavation from which ash tree shown on chart was dug. Note layers of sedimentary soil. Location: N. W. ¼, Sec. 33, T. 14N., R. 7E.

Fig. 5—Dead trees of old forest. Under water most of the year. Location: S. E. ¼, Sec. 30, T. 14N., R. 7E.

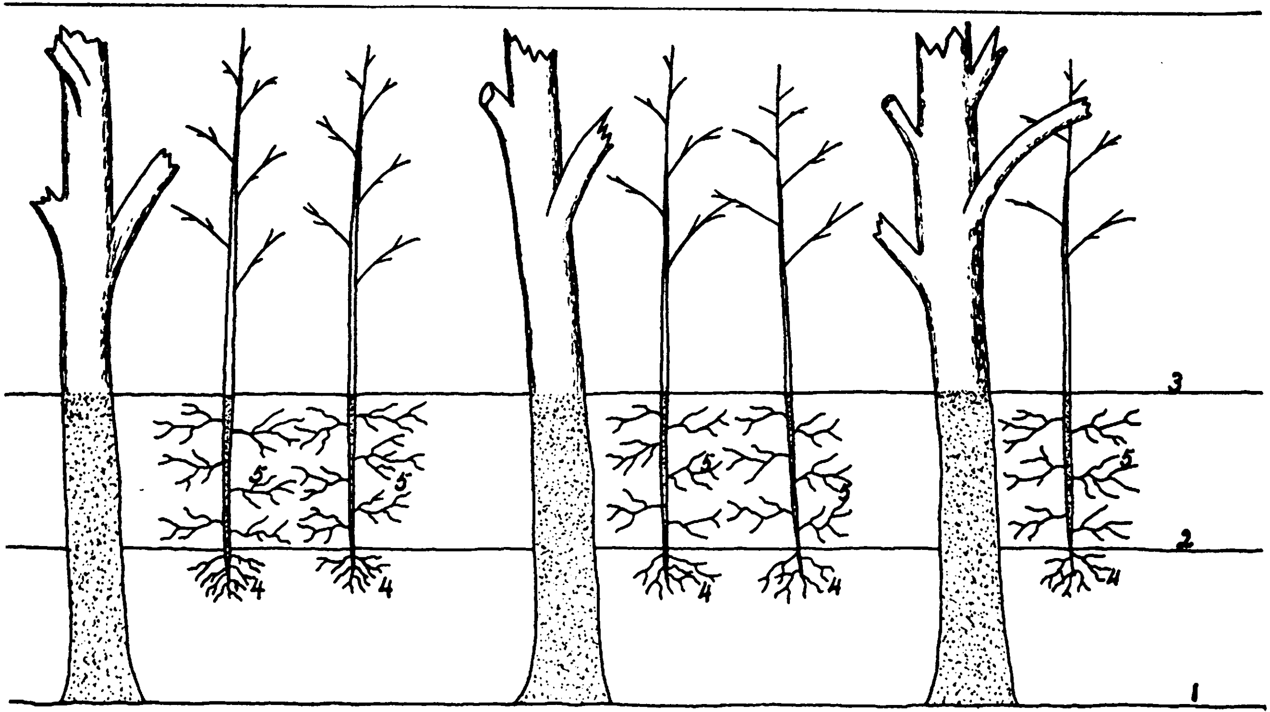

Fig. 6—Diagrammatic bisect showing relationship of young growing forest to old dead forest in the deeper silted area. 1. Original flood plain surface. 2. Present water table. 3. Present flood plain surface. 4. Dead primary root systems below present water table. 5. Live adventitious roots supporting the trees.