

1926

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Recommended Citation

Adams, John E. (1926) "Butler's Landing Outlier and Its Fossil Flora," *Proceedings of the Iowa Academy of Science*, 33(1), 177-178.
Available at: <https://scholarworks.uni.edu/pias/vol33/iss1/35>

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BUTLER'S LANDING OUTLIER AND ITS
FOSSIL FLORA

JOHN E. ADAMS

The early geologists who surveyed the state reported many small, scattered patches of Pennsylvanian sandstone north and east of the principal Pennsylvanian area in Iowa. The outliers along the Iowa River north and east of Iowa City were among the first to be described. Subsequently more complete descriptions of these and other outliers in Johnson and adjacent counties have appeared in the publications of the Iowa Geological Survey and in other scientific journals. References to these articles can be found in *Ia. Geol. Survey Rept. Vol. 22, 1912.*

The author's attention was first called to these Pennsylvanian outliers in eastern Iowa, by his discovery of some identifiable plant remains in the sandstone at Butler's Landing, two miles north of Iowa City. Here the Iowa River, which flows southward to this point, turns abruptly to the west, exposing a limestone cliff for some distance on the outside of the bend. The cliff is cut to river level at the bend, by a small stream flowing in from the south. The deposit of plant-bearing sandstone is limited to the west bank of this creek. The formation is exposed for about 200 yards along the face of the cliff and for about 100 feet back from the river, in the wall of the tributary valley. The rest of the deposit is covered.

Although the entire outcrop is overlain by Pleistocene drift, several partial sections are exposed in the walls of the main and tributary valleys. The lower portion of the bed grades down into a basal conglomerate of iron concretions and chert pebbles, underlain by a thin blue shale which probably represents the pre-Pennsylvanian soil. The material above the conglomerate varies from coarse to fine sandstone with a few layers of sandy shale. The sand contains many fossils and fragments from the underlying and adjacent limestone. The massive, irregularly bedded Pennsylvanian deposit dips a little to the south, away from the river, and lies unconformably upon the deeply eroded Devonian limestone. The east end of the outcrop rests upon the *Megistocrinus* beds near the level of the river, and the west end rests upon the Upper Lithographic limestone at the top of the cliff.

This outlier represents the remains of a deposit formed in the steep-walled valley of a small pre-Pennsylvanian stream. All other traces of the deposit have been removed or are covered by the drift. At some time during the Pennsylvanian subsidence the

advance of the sea checked the velocity of the stream so that the bottom of valley was filled with coarse sediments. By the time the deposit had reached a thickness of 8 to 10 feet, the current had been checked so that only fine material was deposited. Plant remains, which up to this time had been destroyed, could be preserved in the finer sediments; and above this level the beds contain abundant, although poorly preserved, plant remains. From the abundance of rush-like forms it seems probable that swamp conditions existed, and that swamp deposition continued until the whole region was covered by the Pennsylvanian sea.

The following plants were identified among the fragmentary fossils collected and studied by the author:

- Neuropteris rarinervis* Bunb.
- Lepidodendron aculeatum* Sternb.
- Lepidodendron* Sp.
- Cordaites* Sp.
- Trigonocarpon* Sp.

The specimens were sent to C. A. Noe of the University of Chicago for identification.

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