

## *St. Lawrence and Jordan formations (Upper Cambrian) south of Arcadia, Wisconsin*

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### LOCATION

Composite section from outcrops and quarries located along Wisconsin 93 (Fig. 1) and extending from 1.8 mi (2.9 km) to 3.5 mi (5.6 km) south of its intersection in Arcadia with Wisconsin 95, in the W $\frac{1}{2}$ ,NW $\frac{1}{4}$ ,Sec.9,T.20N.,R.9W., Trempealeau County (Tamarack 7 $\frac{1}{2}$ -minute Quadrangle, 1973).

### SIGNIFICANCE

This stop is an excellent exposure of the St. Lawrence and Jordan formations (Fig. 2). It also illustrates one of the problems in the Upper Cambrian stratigraphy in Wisconsin, namely determining the limits and relationships of the Black Earth Dolomite and Lodi Siltstone members of the St. Lawrence Formation. This stop illustrates the contact relationship of the Lone Rock Formation with the St. Lawrence Formation and of the second and third cycles of sedimentation in the Cambro-Ordovician of Wisconsin. It also illustrates a major economic use of Wisconsin's dolomite formations.

### DESCRIPTION

Nelson (1956) studied these units in the upper Mississippi valley area. He defined the Black Earth as "... sandy dolomite and interbedded dolomitic siltstone and fine-grained sandstone. In the vicinity of Black Earth and Madison, and at localities along the Mississippi Valley, it generally is massive, brown to buff, slightly glauconitic ... (with) ... algal structures locally" (p. 173). The Lodi Member consists of "... siltstone, generally dolomitic, and dolomitic sandstone" (p. 173).

The fact that his definitions indicate that both the Black Earth and the Lodi can consist of dolomitic siltstone and fine-grained sandstone is the reason why it is commonly very difficult to distinguish the two members. Here Nelson assigned the lower 17 ft (5 m) of the St. Lawrence to the Lodi, the middle 12-ft (3.7 m) portion to the Black Earth, and an overlying 15-ft (4.5 m) section to the Lodi for a total thickness of about 44 ft (13 m). Close examination of the outcrop shows that if a Black Earth Dolomite occurs here, it is probably the 7 ft (2.1 m) of very silty dolomite in the interval from 19 ft (5.8 m) to 26 ft (7.9 m) above the base of the exposure. However, there does not appear to be any marked difference in lithology to suggest the presence of Black Earth rather than Lodi. The Wisconsin Geological and Natural History Survey recognizes the Black Earth as a medium to thick-bedded, medium to coarsely crystalline dolomite that is locally silty, sandy, and glauconitic, with fossil algae. With the possible exception of several thin beds, all of the St. Lawrence Formation at this exposure is assigned to the Lodi Member.

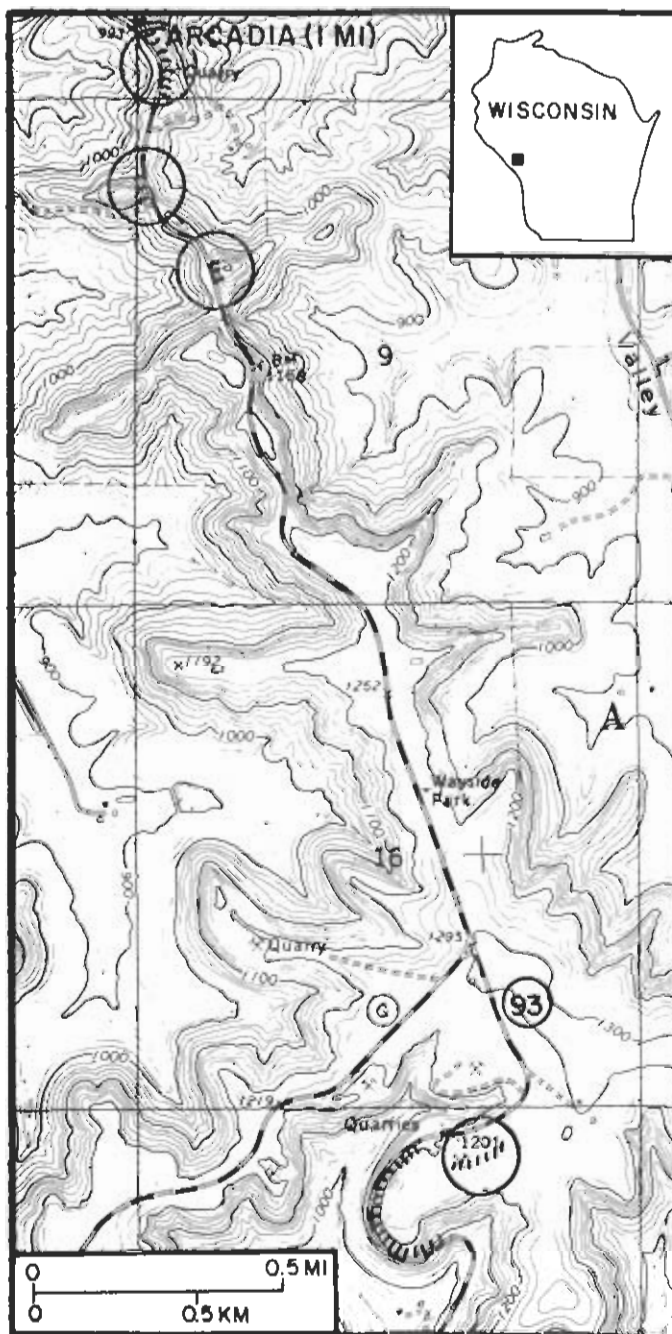


Figure 1. Map showing location of exposures discussed in text.

ONEOTA FM. (Upper part not described)

Stockton Hill Mbr. Medium-grained. Appears to be brecciated locally.

JORDAN FM.

Sunset Point Mbr.

Medium-grained, friable.

Medium-grained.

Fine to medium-grained.

Coarse and fine-grained. Few white siliceous bands.

Coarse and fine-grained.

Shale with little sand.

Fine-grained.

Fine and medium-grained. Some iron oxide.

Fine and coarse-grained. Friable.

Coarse and fine-grained.

Medium-grained. Friable.

Fine-grained. Carbonate & silica concretions.

Medium-grained. Scattered carbonate concretions.

Medium and fine-grained. Pea-size carbonate concretions at base.

Medium-grained.

Medium and fine-grained.

Medium and fine-grained. Some silica concretions.

Medium-grained. Abundant carbonate concretions.

Medium-grained. Friable, white & brown.

Van Oser Mbr.

Coarse and medium-grained. Pea-sized carbonate concretions near top grading to large masses toward base. Thick-bedded.

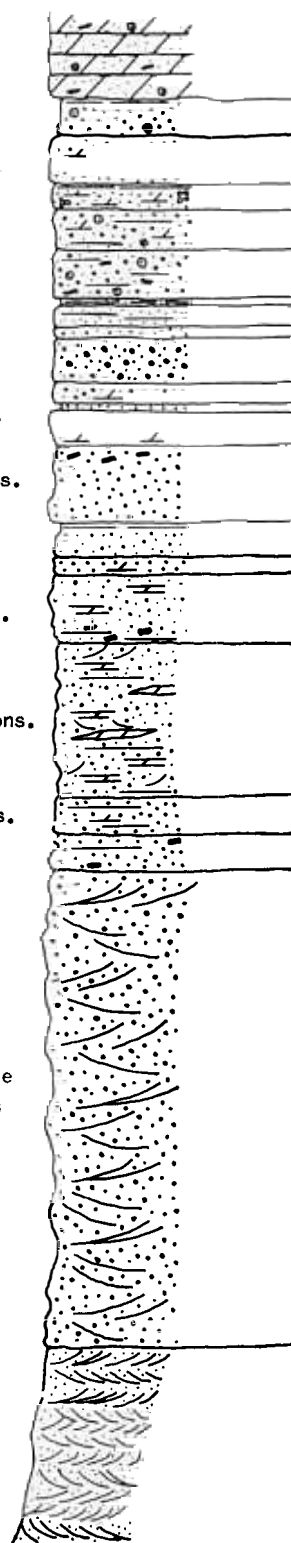
Norwalk Mbr

Fine and very fine-grained. Thick-bedded.

East →

Scale  
In Feet

160  
150  
140  
130  
120  
110  
100  
90  
80



Continued

Figure 2. Stratigraphy of Cambrian rocks exposed in NW¼, Sec. 9, T. 20N., R. 9W., Tamarack 7½-minute Quadrangle (Fig. 1).

↑  
Continued

Norwalk Mbr.

Fine and very fine-grained. Thick-bedded.  
Base uneven and sharp exposed at north end  
of first roadcut south of quarry and at west  
side of State Highway 93.

JORDAN FM.

ST. LAWRENCE FM.

Very silty. Mottled gray and buff.

→ Roadcut exposures to top.

→ Top of quarry.

Little very fine sand.

Medium to thin-bedded. Mottled with pale green  
clay. Appears to be bioturbaceous.

Fine and very fine-grained. Abundant  
trail markings. Thin and uneven bedding.

Fine and very fine-grained. Medium and  
thin-bedded.

Fine and very fine-grained.

Very fine-grained. Thin and uneven  
bedding.

ST. LAWRENCE FM.

LONE ROCK FM.

Very fine-grained.

Reno Mbr.

Thick-bedded.  
Fine-grained.

Fine-grained.

East →

80

70

60

50

40

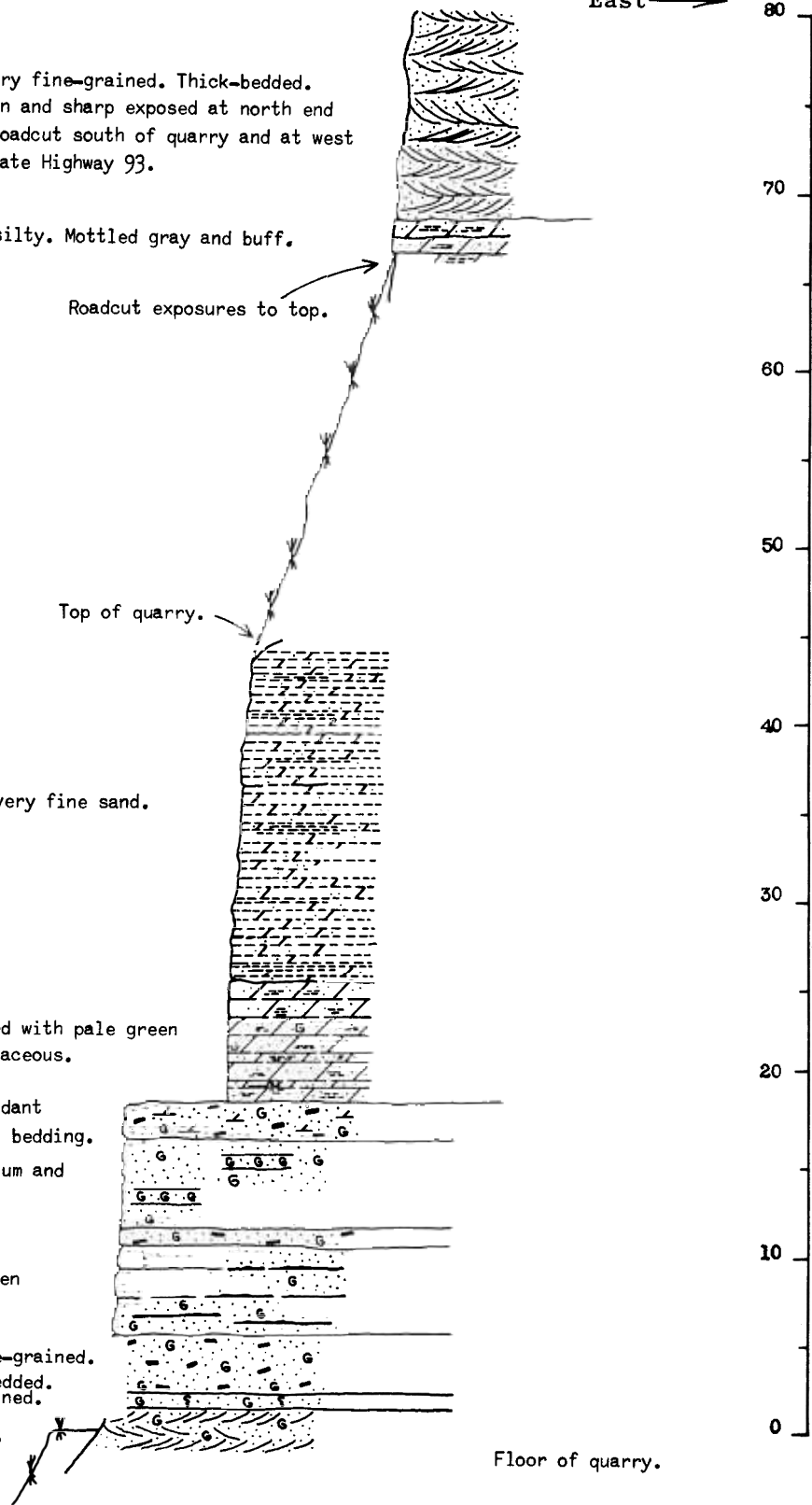
30

20

10

0

Floor of quarry.



The Norwalk Member of the Jordan Formation consists of very fine and fine-grained nonsilty sandstone, which is thick bedded to thin bedded. At this exposure it is separated from the underlying silty and dolomitic Lodi by a sharp and uneven surface interpreted to indicate post-Lodi erosion. At the majority of outcrops of this interval in Wisconsin, the contact appears to be completely gradational. The Norwalk and Van Oser members constitute a thick body of sandstone similar in character to the Galesville Formation(?) and other Cambrian and Ordovician sandstones of this region. This suggests that the Jordan probably had a similar origin, namely that it formed on an erosion surface by a process of coalescing of beach deposits in a transgressing sea. In at least this area, erosion was a minor factor.

The Van Oser Member of the Jordan Sandstone is characterized by medium-grained sandstone, with some coarse and a little fine. The contact of the Van Oser with the Norwalk is commonly, though not always, sharp. At this exposure the contact is slightly uneven. Contact relations of overlying beds are best examined elsewhere.

Field study by McGannon (1960) led him to propose the name Stockton Hill Formation for those strata between the Lone Rock Formation below and Jordan Formation above. The top of the Lone Rock is marked by 3 ft (1 m) of flat-pebble conglomerate overlain by 0.7 ft (0.2 m) of "wormstone," a burrowed, glauconitic, calcareous fine-grained sandstone. McGannon's Stockton Hill Formation extends 36.7 ft (11.2 m) upward to 6.4 ft (2 m) below the top of the quarried section. The lower 24.1 ft (7.3 m) are assigned to the Lodi Member; the upper 12.6 ft (3.8 m) to what he has named the Red Wing Member. The upper 6.4 ft (2 m), which he assigned to the Jordan Formation, contains from 28 to 50 percent carbonate and from 35 to 50 percent silt

and finer particles, although this does not conform to other descriptions of the Jordan. The contact with fine-grained Jordan Sandstone containing only minor carbonate and silt can be observed in the first roadcut above the quarry and west of Wisconsin 93. It is believed that this is the actual contact. The Wisconsin Geological and Natural History Survey retains the name St. Lawrence Formation for what McGannon proposes to call the Stockton Hill Formation and assigns all of the St. Lawrence at this exposure to the Lodi Member.

The Jordan Sandstone is divided on the basis of composition, texture, and bedding characteristics into three members: the lower Norwalk, the middle Van Oser, and the upper Sunset Point. These can be traced throughout southwestern Wisconsin and into eastern Minnesota and Iowa.

The Jordan Sandstone is overlain by the Oneota Dolomite Formation of the Prairie du Chien Group.

Quarries in the Oneota Formation are located along Wisconsin 93 south of the Jordan Sandstone outcrops and at the crest of the ridge that forms the Skyline Drive. The Oneota is a primary source of crushed stone used for construction throughout much of southern Wisconsin. This is a "portable operation;" the crushing and processing equipment is portable, as opposed to stationary.

## REFERENCES CITED

- McGannon, D. E., Jr., 1960, A study of the St. Lawrence Formation in the upper Mississippi valley [Ph.D. thesis]: Minneapolis, University of Minnesota, 355 p.
- Nelson, C. A., 1956, Upper Croixan stratigraphy: Geological Society of America Bulletin, v. 67, p. 165-184.