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REPORT ON KYANITE BEARING SCHISTS

by

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Kyanite

Wisconsin Conservation Department
Forest Protection Headquarters
Tomahawk, Wisconsin

REPORT ON KYANITE BEARING SCHISTS
By John W. Ockerman

The following report is the result of a careful survey of Sections 28, 29, 32 and 33, Township 42 North, Range 4 East, Iron county. Mr. J. J. McDonald from the Land Office and Mr. G. T. Owen, geologist, assisted in this survey.

The map of kyanite bearing schists accompanying this report shows the only deposits located in these sections. Two large outcrops, designated as outcrop "A" and outcrop "B" for convenience of description and sampling, were found in the SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 28, and NE $\frac{1}{4}$ NW $\frac{1}{4}$, Section 33. Scattered and isolated outcrops were found in the NE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 32, and NW $\frac{1}{4}$ NW $\frac{1}{4}$, Section 33.

The major part of the outcrops examined is made up of medium coarse grained biotite schists with a fairly uniform distribution of kyanite crystals. This schist is dominantly quartz, biotite and feldspar, with garnet and kyanite crystals disseminated through it. The kyanite usually occurs as long blade-like crystals with no tendency to any definite orientation, either with the schistosity or normal to it. The superior hardness of the kyanite sets it out in marked relief on weathered surfaces. (See photographs) The strike of the schistosity is about N. 45° E. on the average, and this bearing was used as a guide to determine if rocks were in place or erratic.

A very small per cent of the formation is a fine grained biotite schist that is high in plagioclase feldspar and low to lacking in kyanite. These fine grained zones are localized and do not constitute any considerable part of the formation.

In places the schists become strongly gneissic in character, with banding of minerals and strong contortion. These contorted zones usually show a slightly higher percentage of kyanite crystals. (See photograph)

In addition there are a few scattered pegmatitic dikes and quartz veins and intrusions. The pegmatites are small in extent, as observed in the outcrops, one in outcrop "A" ranging up to four feet in width. There is no kyanite on these intrusions, quartz, feldspar and muscovite being predominant. The fine striations on the large feldspar crystals suggest that they are albite. The quartz intrusions vary from thin stringers to large circular areas ranging up to three feet in diameter. There is a marked increase in the abundance of kyanite crystals in the periphery of the quartz intrusions (see photographs) and adjacent to the pegmatitic intrusions.

Outcrop "A" is part of the large outcrop area in the SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 28, and the NE $\frac{1}{4}$ NW $\frac{1}{4}$, Section 33. For convenience in description, and sampling outcrops "A" and "B" were designated but mineralogically and structurally they are undoubtedly parts of the same outcrop, separated by erosional saddles. The map of the outcrops shows this condition. The dashed line, for the limiting line of the surface evident of bedrock, encloses both "A" and "B". Beyond the dashed line one encounters low swampy ground with no rocks showing, either in place or erratic. The area within the dashed line that is not cross-hatched is low lying outcrop generally covered with a thin mantle of earth, with bed rock showing in places.

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Outcrop "A" is about 345 feet long and 210 feet wide with an average height of six feet. It is predominantly the medium coarse-grained biotite schist with localized areas of the fine-grained biotite schist and a few pegmatite dikes and quartz intrusions. (See photographs)

Outcrop "B" is made up of a series of outcrops with erosional saddles separating the several parts, the major outcrop being T-shaped with a maximum length of 560 feet and maximum breadth of 375 feet and average height of eight feet. The several parts are similar to the main outcrop in being predominantly the medium coarse-grained biotite schist with kyanite crystals disseminated throughout the mass. The strike of the schistosity is about the same in the several units of "B" being N. 45° E. on an average. Small pegmatitic intrusions and quartz stringers and intrusions are scattered throughout the outcrops.

The following isolated outcrops were examined and sampled:

1. Small glaciated outcrop 15 feet by 20 feet averaging about 3 feet in height. Biotite schist with kyanite crystals evident in weathered surface. Percentage of kyanite seems small. Hand specimen #1.
2. Small outcrop 30 feet by 15 feet, averaging about 4 feet in height. Biotite schist with plane of schistosity striking NE very similar to outcrop one in the amount of kyanite present. Hand specimen #2.
3. Low, rounded outcrop of biotite schist 65 feet by 30 feet, from one to three and one-half feet in height. Moderate showing of kyanite crystals on weathered surface. Hand specimen #3.
4. Low, rounded outcrop of biotite schist with moderate amount of kyanite crystals showing on weathered surfaces. The ledge is 40 feet by 12 feet and averages 3½ feet in height. The schistosity strikes N. 45° E., suggesting that the exposure is in place rather than erratic. Hand specimen #4.
5. A low, rounded ledge bearing N. 20° W. and about 100 feet long and 30 feet wide with a maximum height of 10 feet. Kyanite crystals moderately prominent on weathered surfaces. Schistosity strikes about NE as in other exposures. Quartz intrusions, more or less circular and up to two feet across, are present with richer mineralization in the periphery of the intrusions. Very similar to those described and photographed at outcrop "A". The kyanite crystals are larger near the intrusions than in the main mass of the schist. Hand specimen #5.
6. Two low ledges of biotite schist trending NW - SE. The SE exposure, 30 feet by 18 feet, with a maximum height of six feet. Generally uniform fine-grained biotite schist with moderate amount of kyanite crystals showing in weathered surface. Strike of schistosity about NE indicates that the rock is in place. The NW exposure is a large mass which appears to have been moved a short distance by ice. It is 25 feet long, 10 feet wide and 12 feet

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high. The rock is a biotite schist with a low per cent of kyanite crystals and shows considerable contorted flow structure. Hand specimen #6 taken from SE portion of exposure.

7. Low, scattered outcrops, apparently in places, covering an area of 75 feet by 30 feet and averaging four to five feet in height. The schistosity strikes NE in conformity with the general trend in the outcrops. The rock is medium fine-grained biotite schist with a moderate amount of kyanite crystals showing on the weathered surface.
8. Outcrop eight is similar to seven in character and kyanite richness and is made up of low scattered exposures over an area of 60 feet by 25 feet and averages only about 2 feet in height.
9. A very small outcrop on a small knoll in the swamp. Its schistosity strikes N. 50° E. and appears to be in place. It is medium fine-grained biotite schist with a rather low per cent of kyanite crystals. The high ridge to the SW shows no evidence of rock core and is apparently a glacial hill overlying the bed rock.

Description of Samples

- A-1 Granite dike in outcrop "A".
- A-2 Medium fine-grained biotite schist - typical kyanite distribution.
- A-3 Pegmatite dike - less coarse portion.
- A-4 to A-17 Medium to fine-grained biotite schist. Representative sampling over outcrop "A."
- B-1,2 South end of outcrop "B" - average material with average kyanite concentration.
- B-3 Fine-grained zone of biotite schist - localized and probably represents less than 1% of total rock mass.
- B-4 Gneissose zone in biotite schist, highly contorted, slightly higher in kyanite content.
- B-5,6 Average biotite schist.
- B-7 North end of outcrop "B" - typical.
- B-8,9 East end of main outcrop "B" - average mineralization.
- B-10,11 Slightly finer grained with kyanite well disseminated through the mass.
- B-12 Fine-grained biotite schist. Outcrop "B" just north of road.
- B-13 Richer kyanitic zone four feet from sample B-12.

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B-14 SE end of outcrop "B" at road. Average material.

Hand specimens - see description of outcrops by numbers.

Summary

Outcrops of kyanite bearing biotite schists as shown on the accompanying map were the only rocks of this nature found definitely in place in a thorough search of Sections 28, 29, 32, and 33, Township 42 north, Range 4 east, Iron county.

The larger outcrops were carefully sampled to give a fair representation of both the kyanite rich and kyanite lean formations. Hand specimens were taken at several of the smaller isolated outcrops.

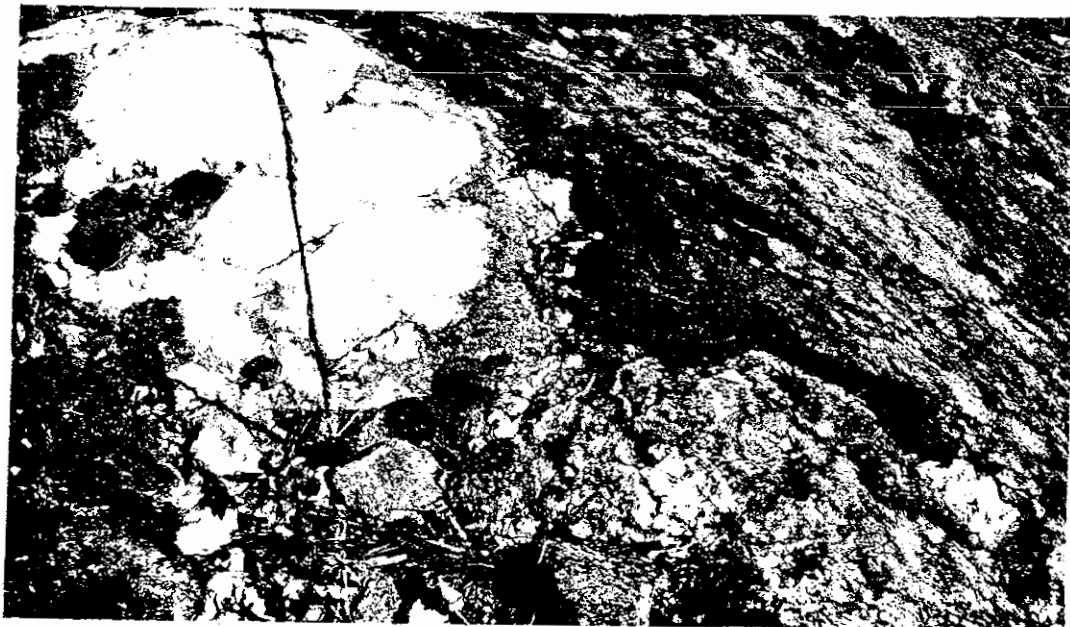
The map indicates not only the outcroppings of this formation, in cross-hatch, but the general boundary of the rock close to the surface. There seems to be evidence in the character of the formations and strike of schistosity that the several outcrops are really parts of one massive bed of kyanite bearing schist whose depth is indeterminate until core drilling over the area has been completed. Until that time any estimate of tonnage, using existent outcrops as a gauge, will be far short of actual mineable tonnage. The lands with the kyanite bearing formations are owned by the conservation commission and state of Wisconsin, as shown on the location map.

B15. Apparent peg with muscovite on N side of road.

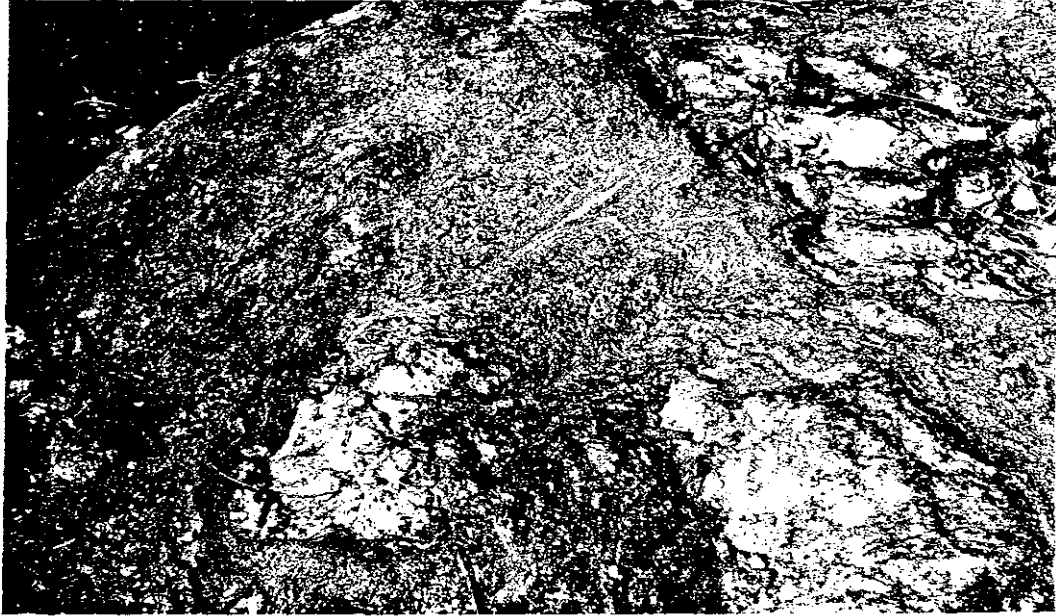
B16. Circular quartz-feldspar masses 6" in diameter, on N side of road.



*Outcrop "A" Looking N from road.
Note schistosity on exposure below hammer.*



*Circular quartz intrusion Outcrop "A"
Note zone of kyanite concentration in the periphery
of the intrusion. (Kyanite crystals in relief.)*



*Distorted gneissic zone Outcrop "A".
Note the strong deformation and the marked
relief of the resistant kyanite crystals.*