Mapping the Precambrian Bedrock Geology of Rusk County, Wisconsin

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Introduction

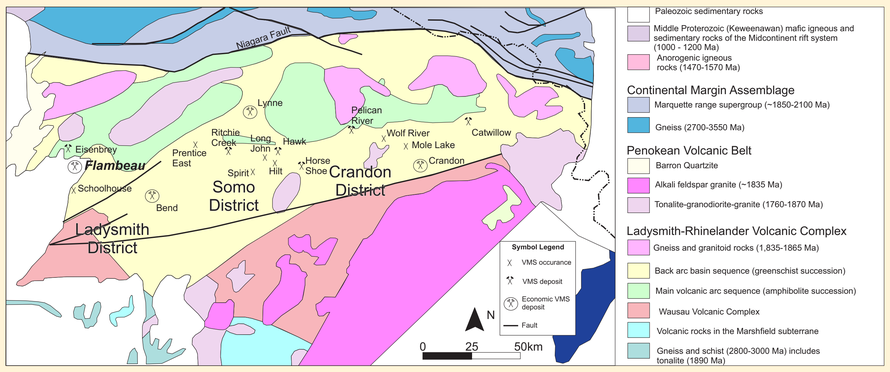


Figure 1: Precambrian Penokean Orogen of northern Wisconsin and Michigan showing the distribution of Cu-Zn-Au mineralization and major ore deposits.
The primary objective of this project is to create a new regional geologic map of Rusk County, Wisconsin, highlighting the characteristics of the Precambrian bedrock hosting the past-producing Flambeau Cu-Au mine and various other metallic mineral deposits in northwestern Wisconsin. These deposits are hosted in 1.8-1.9 Ga accreted volcanic arc terranes (DeMatties, 1994; Shultz & Cannon, 2007).

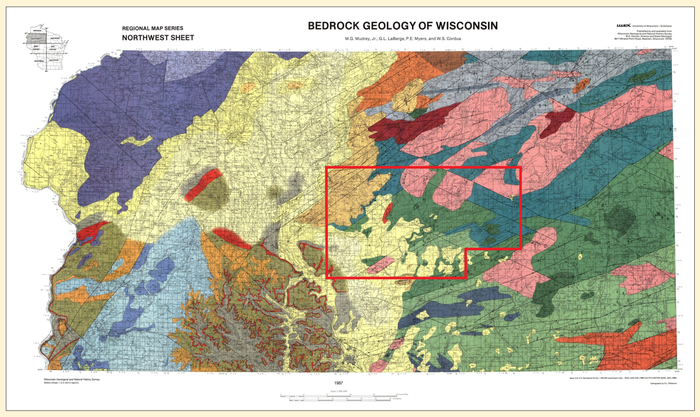


Figure 2: Existing regional geologic maps for northwestern Wisconsin
A historical bedrock geology map of northwestern Wisconsin (Mudrey et al. 1987) was used extensively throughout the development of the final map. This map was relied on during field mapping in order to find regions with bedrock exposures. Data from this map was integrated with additional datasets, such as geophysical data, geochemistry, to improved understanding of the geologic, tectonic, and metallogenic framework of the region.

New Precambrian Geology Map of Rusk County

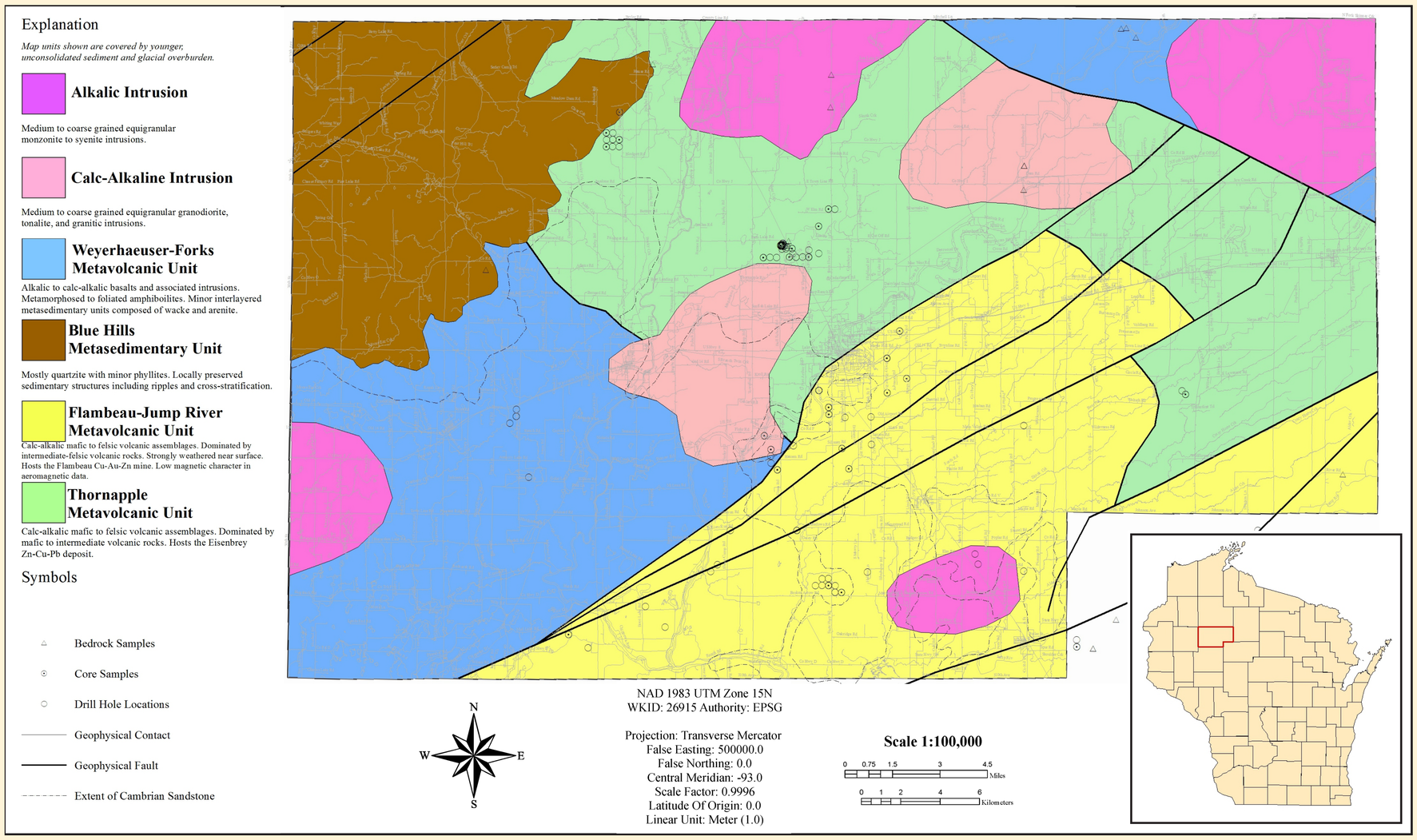


Figure 3: Preliminary Precambrian bedrock of Rusk County Wisconsin
Compilation of all data collected, new and old, was completed with the ESRI® ArcGIS software in order to produce a modern, re-interpreted Precambrian geological map. This new map recognizes four units of Precambrian bedrock differentiated by geochemical, magnetic, and lithological characteristics. Intrusive bodies were also differentiated based upon mineralogical and geochemical variation.

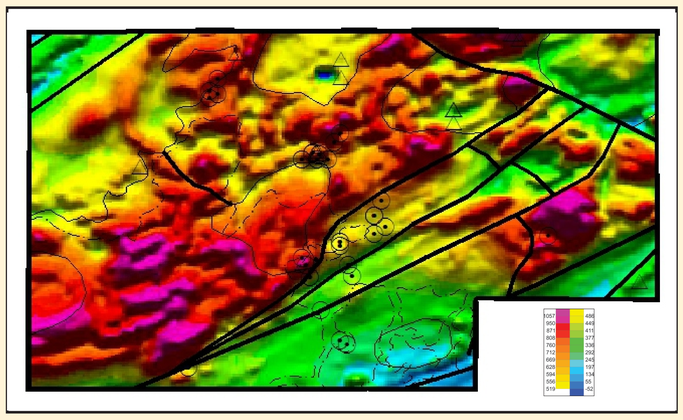


Figure 4: Composite aeromagnetic map of Rusk County
Aeromagnetic survey data for Wisconsin including total field and first vertical derivative magnetic data was obtained from the USGS (Daniels & Synder, 2002). These maps gave an added insight to the geology in areas where bedrock was not exposed and helped constrain contacts, faults, and the extent of intrusive bodies. This also aided in delineation of geophysically-distinct supracrustal units that had unique geochemical characteristics.

Figure 5: Summer field work
Over the past year, field mapping and sampling of Precambrian bedrock outcrops in rivers, road cuts, and quarries throughout Rusk County was completed. With the use of GPS equipment and historical maps, outcrop regions were targeted and sampled. In addition to field mapping, core were also examined in regions were bedrock was not exposed. Samples were analyzed using XRF and ICP-MS to reveal geochemical information regarding to the geologic and tectonic history of the rocks.

Unit Descriptions

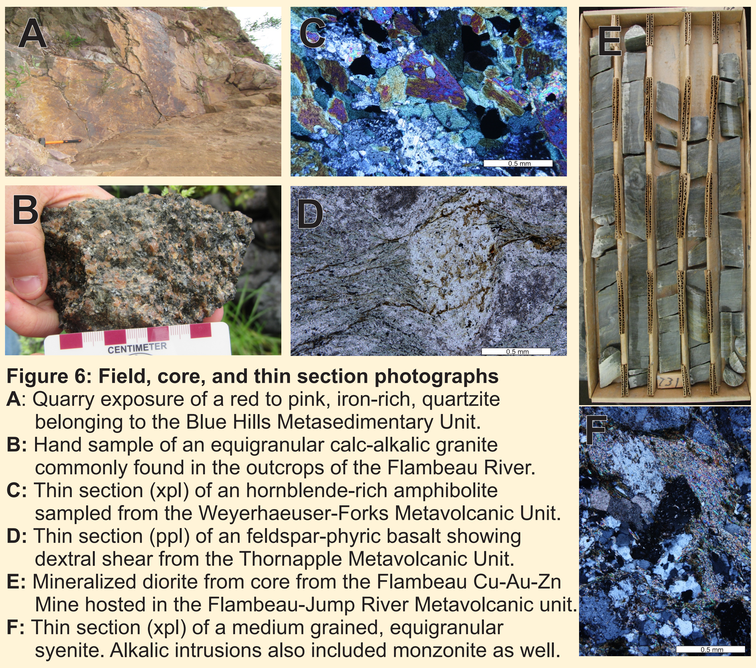
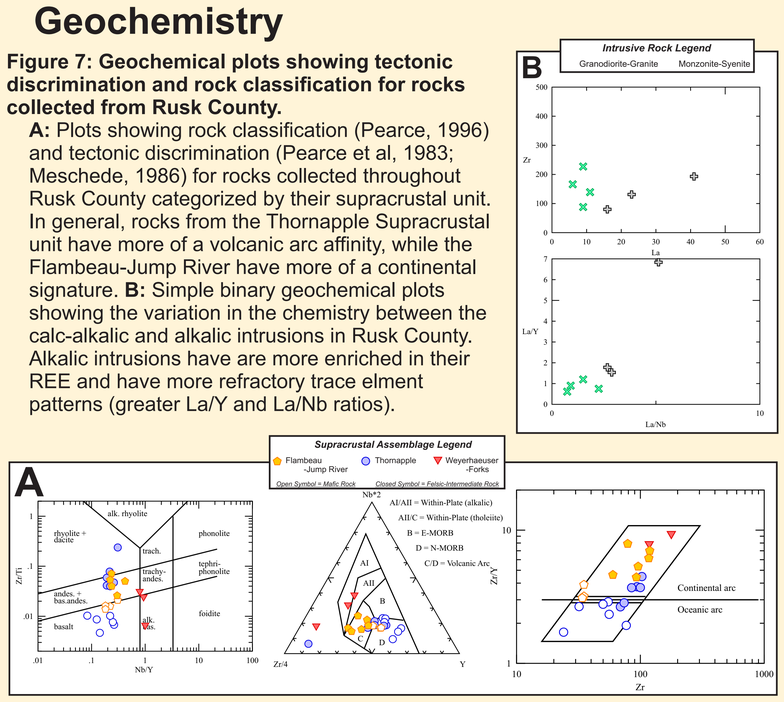


Figure 6: Field, core, and thin section photographs
A: Quarry exposure of a red to pink, iron-rich, quartzite belonging to the Blue Hills Metasedimentary Unit.
B: Hand sample of an equigranular calc-alkalic granite commonly found in the outcrops of the Flambeau River.
C: Thin section (xpl) of an hornblende-rich amphibolite sampled from the Weyerhaeuser-Forks Metavolcanic Unit.
D: Thin section (ppl) of an feldspar-phyric basalt showing dextral shear from the Thornapple Metavolcanic Unit.
E: Mineralized diorite from core from the Flambeau Cu-Au-Zn Mine hosted in the Flambeau-Jump River Metavolcanic unit.
F: Thin section (xpl) of a medium grained, equigranular syenite. Alkalic intrusions also included monzonite as well.

Geochemistry

Figure 7: Geochemical plots showing tectonic discrimination and rock classification for rocks collected from Rusk County.
A: Plots showing rock classification (Pearce, 1996) and tectonic discrimination (Pearce et al, 1983; Meschede, 1986) for rocks collected throughout Rusk County categorized by their supracrustal unit. In general, rocks from the Thornapple Supracrustal unit have more of a volcanic arc affinity, while the Flambeau-Jump River have more of a continental signature. **B:** Simple binary geochemical plots showing the variation in the chemistry between the calc-alkalic and alkalic intrusions in Rusk County. Alkalic intrusions have are more enriched in their REE and have more refractory trace elment patterns (greater La/Y and La/Nb ratios).



Conclusions

To understand the Precambrian bedrock geology of Rusk County, where bedrock exposure is extremely limited, different geologic methods needed to be utilized in order to reach our final goal. The process of integrating new geological and geochemical data with compilations of historic geological and geophysical datasets has proved to be a successful methodology to improve our knowledge of Precambrian geology of this economically significant region. This project is currently being prepared for publication with the Wisconsin Geological and Natural History Survey.

Acknowledgements
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