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INTRODUCTION
The North American Emerald Mine (NAEM), located in Alexander County, North Carolina, contains V-Cr-bearing beryl deposits that have produced the most valuable emeralds ever found in North America1, and is the first confirmed location of Cr-bearing spodumene, known locally as hidddenite2. These emeralds occur within hydrothermal quartz veins in open cavities, in one of four distinct cavity types identified by Wise and Anderson that run throughout the Inner Piedmont Belts of Western North Carolina1. This project further analyzes the NAEM through an analysis of the dense stream sediments sampled from the Wallace Creek and the South Yadkin River, which converge in the southeast and the border mine site. Stream sediments are an excellent source of indicator minerals, which serve to provide geologic context, as they consolidate high density minerals and allow for their convenient recovery2. In this application, indicator minerals are used to identify potential emerald cavity locations along the fluvial systems.

METHODS
• Samples were collected using sluicing methods to obtain dense sediments from Wallace Creek and Yadkin River 1/1/2018.
• Glass slides of each sample were prepared with 1.560, 1.600, and 1.650 indicator liquids for visual and optical analysis by SLM and PLM.
• Coated sample mounts and polished epoxy grain mounts were prepared for visual analysis by SEM and compositional analysis by EMPA.
• Polished epoxy grain mounts were further analyzed by compositional data by EMPA.

CONCLUSION
This work further characterizes the indicator minerals of the host rock and within the four cavity types present at NAEM site. Specimen location is correlated to previous research to determine presence of cavities in river path/deposition area.

• Quartz, assorted garnets, amphiboles, ilmenite, sillimanite, monazite, and zircon were found in all samples.
• Garnets vary with almandine, spessartine, grossular hybrids common throughout samples.
• Zircons vary in trace element presence throughout samples.
• Monazites (Ce, La, Nd, Th) had consistently lighter La and lower Nd (averaging 1.789 w/w%) relative to 1.9:1 ratio previously found in emerald cavities by Wise and Anderson3 throughout samples.
• Ilmenites with higher Cr and V present in Yadkin River.
• Tourmaline presence in sample 5 may indicate cavity presence which may have come from previously explored mine site.
• Rutile and tourmaline presence in 3 may indicate cavity presence along Wallace Creek north of mine site.

FUTURE RESEARCH
Research is ongoing. Future research may include:
• Continuing SEM and EDS analysis with a focus on detection of Cr/V-beryl and Cr-spodumene.
• Spinelle stage analysis of individual crystals to further confirm and determine indicator minerals present.
• Bulk phase analysis to determine relative mineral concentrations in the fluvial systems.
• Further EMPA analysis for more complete compositional data and comparative analysis.

REFERENCES

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