

WOLF'S EYE



Isle Royale Natural History Association

Fall 1993

Predicting Prehistoric Archeology Sites With the Geographic Information System

Humans have been visiting Isle Royale for over 4500 years. The first documented users of the island resources were archaic peoples who came to find copper, wild game, fish, and berries. All that remains of these earliest visitors are stone hammers and other tools, bits of bone from food, pottery, fire-cracked rock, and pieces of extracted copper.

For decades, archeologists have excavated and studied the remains of prehistoric habitation on the Island. A comprehensive five year archeological inventory of the shoreline and developed areas (campgrounds, trails and park administrative facilities) was completed in 1990. The study increased knowledge of early human activity and located occupation, mining and tool making sites. Undeveloped areas, including most of the Island interior, were not surveyed due to time and cost restraints. As a result, many sites remain undiscovered.

During the winter of 1992-93, Elizabeth Amberg, Cultural Resource Management Specialist, and Eric Gdula, Geographic Information System (GIS) Specialist, used the GIS computer to predict the location of additional sites. The project covered two periods of prehistoric archeology identified by the presence or absence of ceramic pottery and other objects and tool type; the Archaic, ca. 2500 to 500 B.C., and the Woodland, 500 B.C. to the 17th century when contact with Europeans began. Existing information about known sites was entered into the computer to make two models

of probability zones.

The Woodland model was developed from the study of 89 sites analyzed for soil type, solar aspect, slope, and distance from prehistoric mines. The study identified correlations between sites and some of these characteristics. A significant number of sites had a south east aspect and mild (0 to 10 degree) slope. Sites with these attributes are well suited for human occupation. People generally choose flat ground for camping or dwelling. A site with a south east aspect receives the most solar radiation, and therefore is the warmest, and the first to be snow free in spring. A greater number of sites were found close to prehistoric mines. Because it is likely that more mines will be discovered, this factor was not emphasized when working with the data.

Seventeen known Archaic sites were analyzed for the same factors with similar results differing primarily due to the higher lake level during this period. Lake Superior, then Lake Nipissing, was once 60 feet higher than it is today. The Archaic people knew the Island with a different shoreline, inland lakes and streams. As the lake gradually receded and the land slowly rebounded from glacial pressure, the Island took its present shape. The Geographic Information System used the Archaic lake level to replicate the ancient shoreline in the prediction model.

The results of the project indicate the Geographic Information System could be a useful resource management tool. Data programmed into the GIS produced two thematic layers, or maps, that predict the probability of undiscovered sites on the Island. These maps will provide park archeologists with a reference to help them

concentrate their efforts in the search for new sites. The maps will also be used for planning any future campgrounds, trails or facilities. Park managers can consult the maps to predict the presence of archeologic sites in proposed areas of development.

Elizabeth Amberg & Eric Gdula

The Saga of Melampyrum

Melampyrum lineare is an unobtrusive little plant that grows among the pines, oaks, or blueberries, sometimes in bogs, sometimes in a northern hardwood forest. Its pale yellow flowers seldom attract attention, and its small fruits hold only a few large seeds (about the size of a half grain of rice).

Its seclusive nature belies its intricate connections with organisms around it. Fungi, oaks, pines, blueberries, mice, ants, aphids, gaywings, the trailing arbutus, violets, mosses, and lichens all play a role in its success or failure. Surely there are more alliances we haven't begun to understand.

Melampyrum lineare, better known as cow-wheat, is a member of the snapdragon family (Scrophulariaceae). It is a strange form of life known as a **hemiparasite**, referring to its half ability to fix its own food through its own photosynthesis and half dependence on a host plant, such as oak, pine, and blueberries. It accomplishes the half parasitism using a fungus in a **mycorrhizal** relationship to connect its roots to those of a host plant. In this way it gains photosynthate (fixed energy) from a distant partner.

Parasite that it is, this little plant expends part of its energy to make an oily body called an **elaosome** on the end of its seed. Why does this energy-stealing parasite waste its energy on an elaiosome that serves no function except to attract ants that carry the seeds off to their nests? You can be sure there is some advantage in it for the cow-wheat.

The plant opens its capsules and exposes its seeds and their oily odor early in the morning. Ants are soon attracted and carry off virtually all the seeds. By evening, there is usually no seed left in the opened capsules. Suppose this had not happened and the seeds fell to the ground, or remained in the capsule until night-fall?

On the ground, the seeds soon dry and blacken, hence the name *Melampyrum*. These seeds will not germinate. By remaining in the capsule, they provide a tasty morsel for mice when other delectables are

scarce. In Maine and Europe, mice often include the seeds in their diet. Thus, any seeds not taken by industrious ants are soon eaten and destroyed in the guts of mice. Attracting ants saves the little seeds from sudden death, so of course it is beneficial to put energy in an elaiosome. But what could be worse than destruction by mice mandibles?

In the Keweenaw Peninsula of Michigan, mice seem to find other foods more desirable. Two mice that were starved and force-fed this delicacy soon died! Several years of feeding observations failed to reveal any *Melampyrum* connoisseur among the mice and their rodent relatives on the Keweenaw. Might there be another advantage to being carried off by ants?

These industrious ants do not return to a sandy mound of formic activity. They instead disappear quietly under the mosses and lichens within a radius of about 5 m., entering small underground tunnels where they eat the elaiosomes and deposit the seeds in a pile.

The pile of seeds sprouts a pile of plants, and these plants are crowded at best. But sometimes there is safety in numbers. Remember the relationship between fungi and host plants? If one tiny root branch of the host plant contacts a fungus, and another tiny root branch contacts another *Melampyrum lineare* root, a pathway is available from the fungus not just to one plant, but to many plants with interconnecting roots. So, in numbers, there is a greater probability that a fungal connection can be made.

How does this relate to the host plant? We are uncertain about the oak or blueberry but the pine often has an army of ants running up and down its trunk, tending aphids like shepherds with sheep. The tree suffers from a great abundance of these aphids that work as freeloading sap-suckers, grabbing sugars from the tree's phloem before it can travel to its roots, leaving behind a tiny hole where disease organisms enter. Aphids are not abundant all year and in

early spring, they are not there at all. So the ants require alternative food sources. Enter the **myrmecochorous** plants (those that have ant-dispersed seeds). *Epigaea repens* (trailing arbutus), and *Viola adunca* (violet), fruit in late May to mid July, then *Polygala paucifolia* (gay-wings) fruits in early June to early September, followed by *Melampyrum lineare* in late July until late September. This succession of elaiosome-bearing seeds presents continuous alternatives to the ants during times when the aphids supply is inadequate. One might conclude that the *Melampyrum* is detrimental to the tree by enhancing the aphid population, but it might also benefit the tree by warding off a variety of other seed eating insects that avoid contact with ants. The prevention of foraging by these insects may more than compensate for the loss to aphids.

Does this do anything for the *Melampyrum lineare*? The ants carry the seeds off to tunnels under lichens and mosses. In fact, the most preferred site of the seed piles is under the hairy cap moss *Polytrichum*. Lichens acquire the most seeds because their abundance is greater than that of *Polytrichum*, and litter acquires a large percentage, though less than in proportion to its own abundance. What is the advantage for these seeds to be piled under mosses and lichens? Our answer comes from Yellowstone, Isle Royale, Baraga, and other pine forests that sustain frequent forest fires. Because mosses and lichens retain considerable water, more than pine needles or oak leaves, they are safe sites during forest fires, resisting fire and insulating seeds from intense heat. The moist lichen also prevent the seeds from drying. On the Keweenaw Peninsula, experiments showed the survivorship of seedlings was greatest under lichens and usually least under litter. Since germination was highest in lichens, they may provide a better environment for seeds and young seedlings than the more abundant litter where seeds are randomly scattered.

ISLE ROYALE

NATURAL HISTORY ASSOCIATION

800 E. Lakeshore Dr., Houghton, MI 49931

A nonprofit membership organization that assists Isle Royale National Park by publishing and selling educational materials to park visitors. Gifts, bequests, memorials, and memberships are U.S. tax deductible.

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Melampyrum lineare seems to have a daytime dispersal of seeds by ants, perhaps driven evolutionarily to such timing by predation of rodents on ancestral relatives in Europe and New England. Its daytime dispersal ensures its deposit where conditions are favorable for seed survival, germination, and growth. Furthermore, *Melampyrum* maintains a community of ant-feeding plants that may help to maintain the pines that are protected from insects by the presence of ants.

Janice M. Glime Ph. D.

Michigan Technological University

From the Depths of Minong

The IRNHA is proud to offer its members a limited edition lithograph by 1992 Artist-in-Residence Ladislav Hanka. Each member will soon receive a brochure describing the work.

If you decide to purchase this beautiful piece, you should plan to protect and frame it with museum quality materials. Be sure to find a framing gallery that is experienced with archival framing. Ask to have rag or Alpha mat boards and T-hinges used in the mounting. Treat this quality piece with care. If damaged it will decline in value.

The print will sell for the \$260.00 including UPS shipping. To prevent the artwork from being damaged by acid in the cardboard mailer, it will be packaged with acid free barrier paper. If you would like to order this piece, learn more about it, or have any questions concerning its framing, please feel free to call Gayle at the IRNHA office.

Elfin Worlds

The IRNHA has just published *The Elfin World of Mosses and Liverworts*. Author Janice Glime introduces her reader to this world underfoot with an easy going and interesting style. The book is filled with excellent color photographs.

Ordering information is included in this newsletter.

Christmas Shopping

Done your Christmas shopping yet? The Isle Royale Gift Shop will be open for the Christmas season at the Copper Country Mall. This year we will occupy the vacated Spurgeon's store space with as much merchandise as we had last year. If you are in the Houghton area November 26th to December 24th, stop in to visit and look over our new publications, videos and apparel. We still give members a 10% discount on all their purchases. Come make this sales effort a success.

Membership News

Each year our membership continues to grow. We now have 990 current members! We are delighted in your confidence in our goal to aid Isle Royale National Park. Your dues help develop quality publications and purchase interpretative items that the park could not otherwise afford. Thanks for your support!

We thank the following for three or more years Supporting membership:

Stephen & Sheila Albrecht, Amherst, WI
Mark Anderson, Lansing, MI
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Thanks to the following for ten or more years of Supporting memberships:

Laurie & Joan Snell, Hanover, NH
Judy & Conrad Swanson, Brandon, FL
John & Phyllis Titmus, Hendersonville, NC

Special Thank You!

to Clark M. Woolley for his donation in loving memory of his wife Ellen and their happy times together on Isle Royale. August was their anniversary month.

Condolences to:

Park Naturalist Terry Lindsay and family, whose mother died in July, 1993 and to the family of Pat Morehead who died in September, 1993. Both suffered from cancer. Pat was the wife of Alaska NPS Regional Director and former Isle Royale Superintendent (1975-1980) Jack Morehead. A gracious hostess with a good sense of humor, she had a way of making everyone feel welcome in her home and at the park. Pat was actively involved in Island and Association activities. The Morehead family can be contacted at 10021 Eshamy Bay Dr., Anchorage, AK 99515.

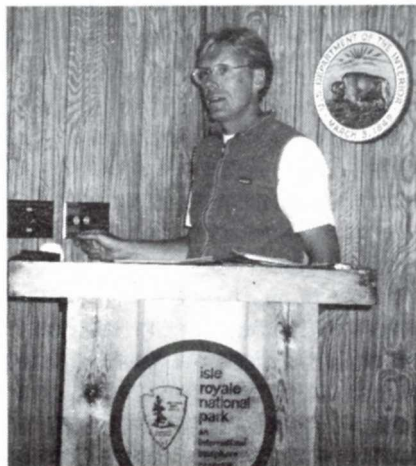
Welcome to NPS Employees

Superintendent Doug Barnard and family just arrived from Grand Teton National Park where he was Chief Ranger. Doug and Sylvia have two children; Jenny, a freshman at Michigan Technological University and David, a junior at Houghton High School. Doug was a seasonal ranger at Isle Royale the summers of 1964-66. He has worked for the National Park Service for 28 years at several locations including Yosemite and Grand Canyon.

Facility Manager John (Jed) Davis and family moved to Houghton in September from Ozarks National Scenic Riverway where he was Facility Manager. Jed and his wife, Nancy, have three children. Ben, 17, and Abe, 15, are students at Houghton High School. Elizabeth, 10, is a student at Houghton Elementary School. In his more than 20 years with the NPS, Jed has worked in many parks, including Grand Canyon, Yosemite, Glen Canyon, and Mount Rainier.

Summer Get-Together

The summer meeting of the IRNHA was well attended. Saturday, Bill Rose gave his geologic walk at Blake's Point followed by a Raspberry Island tour with naturalist Bob Janke Sunday morning. John Anderson of the Lake Superior / Baikal Connection was the speaker after the business meeting and charmed us with stories and slides of his expedition to Lake Baikal. All went well until the barbecue, when torrential rain descended upon the gathering. Luckily the Guest House was open and dinner was not totally lost.



Some hearty souls tried to weather the storm, but finally joined the unprepared inside. We had plenty of good food thanks to the outstanding job by the National Park Concessions. The rains allowed our members and guests to mingle a bit more than usual. It was a memorable evening.



Plans are in the works for the 1994 summer meeting. If you have suggestions for programs or speakers, please contact the IRNHA office at 1-800-678-6925. We hope to improve on the meeting each year and to do that, we need input from our members. We thank you for your support and send our best wishes for the winter ahead.

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