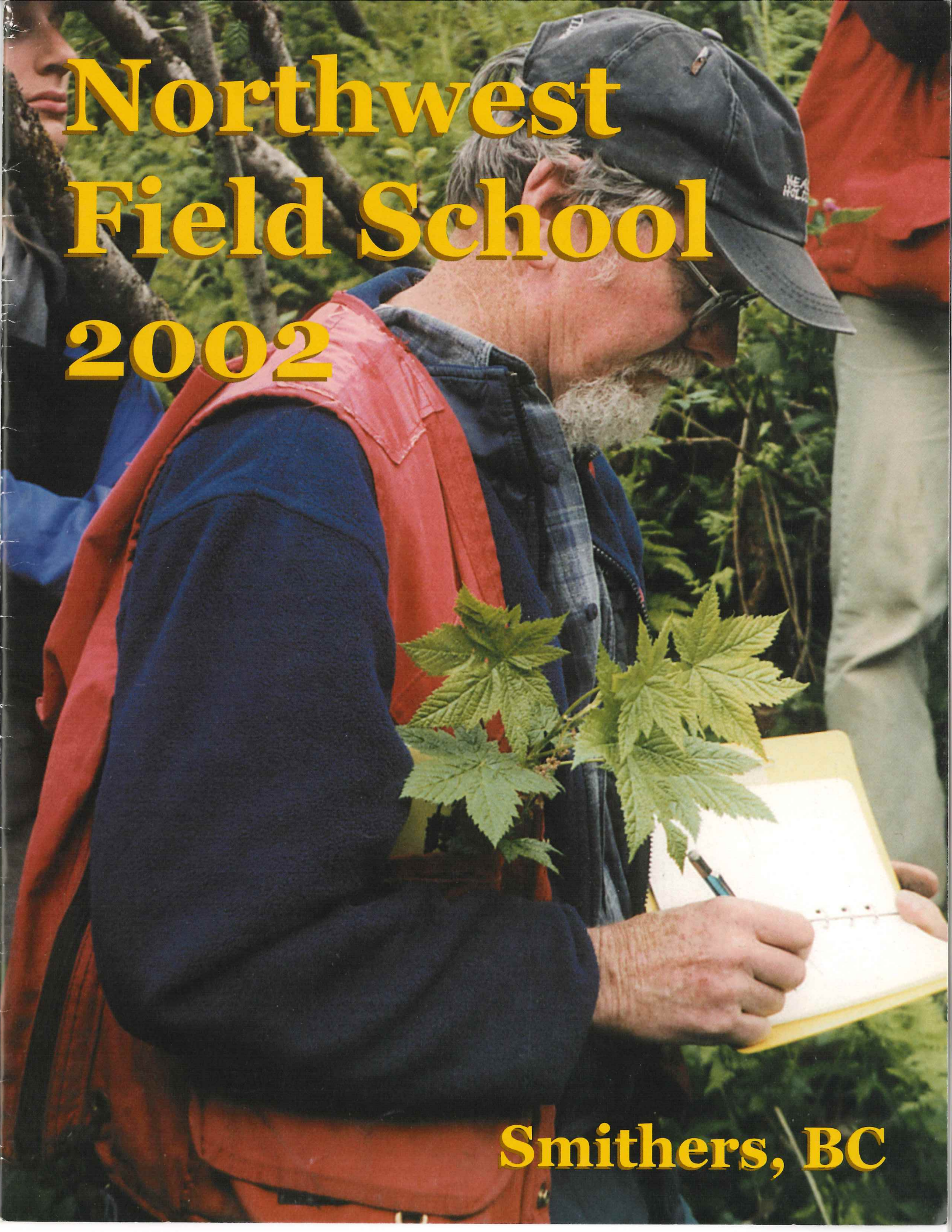
Northwest
Field School
2002
Smithers, BC

A Practical Guide to the Geology, Rocks and Minerals of the Bulkley Valley

Instructors: Paul Wojdak
Date: May 4 and 5, 2002
Location: Bulkley Valley & Area
Fee: $100

This two-day course will teach the techniques of rock and mineral identification and the geologic history of the Bulkley Valley. First, students will learn to identify common minerals, less than 10 in number, that comprise rocks of the area. Using local examples, students will next learn to distinguish sedimentary and igneous rock types and how to identify up to eight ore minerals.

The life forms represented by fossils found in the Bulkley Valley will be discussed and related to the Geologic Time Scale. The geologic evolution of the area will be explained - from volcanic islands of the ancient Pacific Ocean, to stream deltas and temperate coastal swamps, the uplift of mountains and finally, the faults that created the Bulkley Valley and continental glaciers that carved the mountains.

A half-day field excursion to the lower slopes of Hudson Bay Mountain and along the Bulkley River will illustrate some of the features taught in the classroom. This course will provide a good background for a following course, The Geology of Northwestern British Columbia.

Instructor

Paul Wojdak has been the Regional Geologist for Ministry of Energy & Mines since 1992. Paul previously worked as a mineral exploration geologist and as a mine geologist for Westmin Resources (11 years) and Cominco (7 years). He has worked in various locations (BC, Yukon, western US, internationally etc). He did his MSc thesis (1974, at UBC) on the Equity Silver deposit and BSc from McMaster (1971).

Course Agenda

Times 8:30 AM - 4:30 PM

Day 1
AM - Identification of minerals found in common rocks and local ores
PM - Sedimentary and igneous rocks found in the Bulkley Valley, geologic time scale

Day 2
AM - Identification of local fossils
Geologic history of Bulkley Valley
PM - Field excursion

Equipment, Materials, & Logistics

Students are asked to bring a pocket knife and rock hammer (optional). Students will receive The Practical Geologist by Dougal Dixon, published by Simon and Schuster (1992). Other suggested readings: Geology of the Northwest Mainland by Allen Gottesfeld, published by Kitimat Centennial Museum Association (1985). Copies will be made available during the course.

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The Geology of Northwestern British Columbia

This three day course will provide an introduction to the geology of northwestern BC through a combination of lectures and a field trip from Prince Rupert to Smithers. The course leaders include two geologists who have been instrumental in unraveling the geologic history of northwestern BC. The course will provide direct opportunities to learn about the geology of the area and about how northwestern BC evolved to become part of North America. Hands-on examinations and discussions in the class room and in the field on all aspects of the geology of the area, including glaciation, will make this course of interest to anyone wanting to learn more about the natural history of northwestern BC.

The first day will include lectures on the philosophy of geology with special emphasis on the processes that developed the geology of northwestern BC. Part of the day will involve travel to Prince Rupert by train. The last two days cover a field trip from Prince Rupert to Smithers. This field trip will start in the Coast Mountains (Prince Rupert to Terrace) and examine rocks that have formed at great pressures and temperatures within the earth's crust; the metamorphic and granitic rocks. The trip will finish in the Intermontane Belt (Terrace to Smithers) and investigate rocks that have formed at and near the surface of the earth; the igneous and sedimentary rocks. The transition between rocks of the Coast Mountains and the Intermontane Belt will be seen in the Terrace area. How to see rocks in the hand-specimen scale to regional scale will be emphasized. The glacial history and its deposits will be covered as the trip progresses.

Target Audience

The course is open to people interested in the geology of Northwestern BC at any level. The lectures and field trip are designed to educate anyone who wishes to learn and better understand the geologic setting of northwestern BC, be it for professional or personal reasons. Participants will gain insights on how to read and interpret geology with more comfort, not only for the Bulkley and Skeena River valleys, but wherever else they may travel.

Instructors

Dr. Tom Richards is a mineral exploration geologist who formerly lived in the Kispiox Valley. He has over 30 years field experience in the Smithers and Hazelton regions, first as a Research Scientist with the Geological Survey of Canada (1970 to 1978) and then as a mineral exploration geologist. He has also worked extensively elsewhere in BC and Argentina.

Hans Smit P.Geo. is a mineral exploration geologist living in Telkwa, British Columbia who has worked extensively in northwestern BC, as well as in other areas of the northern Cordillera.

Dr. Glenn Woodsworth has studied the origin and history of the Coast Mountains since 1965 and is the author of a number of maps and publications on the geology of northwestern BC. He was a Research Scientist with the Geological Survey of Canada (1974 to 1998) and is the author of the popular book "Hot Springs of Western Canada."

Course Agenda

Day 1: Lectures 9:00 AM – 1:00 PM
Lecture: The Geologic Metaphor or How to See Rocks
Discussing, with rock samples and slides, the general principles and philosophies of geology that were active in the evolution of the Geology of northwestern BC.

Lecture: Geology of Northwestern BC: The Geology of Central BC, east of the Coast Mountains
The Geology of the Coast Mountains

Train to Prince Rupert 1:57 PM

Day 2: *Road Travel from Prince Rupert to Terrace*

This portion of the trip crosses the Coast Mountains for most of the journey and ends in the Intermontane Belt at Terrace. The deep crustal geologic section of the Coast Mountains extends from Prince Rupert to the Shames River. The Coast Belt is underlain by metamorphic and granitic rocks that developed deep within the earth's crust at 10-20 kilometres depth and temperatures to 600°C, where rocks behave like hot plastic. These deep crustal, crystalline rocks formed from high temperatures and pressures that were

Instructors:
Dr. Tom Richards
Dr. Glenn Woodsworth
Hans Smit, P.Geo.

Dates: May 30 – June 1, 2002
Length: 30 hours
Fee: $450
Travel and Accommodation: $150

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The Geology of Northwestern British Columbia

caused by the collision of continents. Three separate metamorphic belts are recognized in the Coast Mountains along the Skeena River. How and why these separate belts can be recognized and their significance will be discussed and shown. At Shames, a 3 kilometre wide deep crustal fault zone that separates the metamorphics of the Coast Mountains from the sediments and volcanics of the Intermontane Belt will be examined. In the Terrace and lower Copper River area, the older stratigraphic and intrusive rocks (Paleozoic and Triassic) of the Intermontane Belt will be visited.

Day 3: *Road Travel Terrace to Smithers*

This portion of the trip covers the upper part of the Copper River and continues north from Terrace along Highway 16 from the Copper River Bridge to Smithers. The geology along this portion of the trip includes volcanic rocks of the Jurassic (200-160 million years ago) Hazelton Group that formed in a setting similar to the present day volcanic island Archipelago of Indonesia. These volcanic rocks and the older rocks around Terrace comprise a land known as Stikinia that was in the ancient Pacific Ocean, off shore from North America until about 160 million years ago. Rock units along Highway 16 from north of Big Oliver Creek to Hazelton will show sedimentary rocks (of the Bowser Lake and Skeena groups) that were deposited as the land of Stikinia became attached to North America. During this interval of sedimentation (some 70 million years) the area was a broad, flat lowland similar to the Gulf Coast in the lower Mississippi River. From Hazelton to Smithers, the rocks comprise younger volcanic and sedimentary rocks; mountains and valleys that are the upper crustal products of the events that created the deep crustal rocks of the Coast Mountains.

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Backcountry Botany and Birds

This is a hands-on course which covers the basics of how to identify native plants, especially wildflowers. By means of lectures, examination of fresh and dried specimens in the classroom, and many field trips, students learn the key features used in the identification of plants from all the major plant groups (lichens through to flowering plants). Special emphasis is placed on identifying flowering plants. Fascinating facts about flower structure, life histories (pollination, dispersal), unusual plant features, and how names are derived are included. Traditional uses of plants for food, medicine and technology are also covered. Participants gain the skills to identify plants using keys and popular plant guides.

Students study the key field characteristics to aid in the identification of major bird groups in the classroom and in the field and learn how bird behavior (flight patterns, songs, etc.) and habitat give clues to identification.

Equipment & Materials

Participants are responsible for providing their own field gear, beverages/snacks, and lunches, binoculars and arriving at designated times and locations. Participants must bring a copy of *Plants of Northern British Columbia* (Expanded Second Edition), and a good bird field guide. A complete book list is available upon request. All other equipment and references will be provided.

Instructor

Rosamund Pojar is a biologist who has over 25 years of experience introducing people to the plants of British Columbia. She has an MSc in Botany and is co-author of three popular guidebooks to the native plants of BC. Prior to becoming a full-time instructor at Northwest Community College, Rosamund worked for several years as a consultant doing research in forest ecology, ornithology and ethnobotany. She is an avid bird watcher and all-round naturalist.

Course Agenda

Day 1

Introduction to the course and discussion of expectations. Assignment of projects.
Lesson 1 - Features of all the major non-flowering plant groups (lichens through to conifers). Use of keys and guidebooks (lab)
Lesson 2 - Identification of non-flowering plants in the field

Day 2

Lesson 3 - The art of looking at wildflowers - key features of the main flowering plant families. Wildflower fascinating facts; use of keys and guidebooks (lab)
Lesson 4 - Flowering plant (wildflower) identification (field)

Day 3

Lesson 5 - Features of the main flowering plant families continued; traditional uses of plants. Looking at birds - the basics of how and what to look for (lab).
Lesson 6 - Field identification of more flowers; beginning to watch birds in the field; using plant and bird guidebooks.(field)

Day 4

Lesson 7 - Bird behaviour, listening to birds (classroom and field), and more about wildflowers!
Lesson 8 - Field identification of flowers and birds (field)

Day 5

Lesson 9 – Field – Bird Identification
Lesson 10 - Review and practice (field).

Instructor:
Rosamund Pojar M.Sc.
Dates: June 5 – 9, 2002
Times: 9:00 am – 5:00 pm
Length: 35 hours
Fee: $200

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Towards Excellence in Small Scale Forest Management

Dates: June 17 – 21, 2002
Times: 8:30 am – 5:00 pm
Length: 40 hours
Location: Bulkley Valley & Area
Fee: $350 (all 5 sessions)

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This is the second year for a week-long series of workshops for woodlot licensees and private forest landowners who wish to raise the caliber of forest management and make a buck too! Last year's Workshop evaluation comments were very positive and included: "lots of pertinent info clearly presented;" "woodlot licensees teaching up-to-date information to others;" "very good mix of theory and practice;" "provisions for sharing ideas between participants;" "excellent, easy to follow and made it fun!"

This year's workshops topics have changed and include the much requested "Stumpage Appraisals for Woodlot Licensees" training and "Tax & Estate Planning." Classroom and field sessions will cover typical economic, operational, and silvicultural issues faced by small-scale forest managers. Focussing on BC's interior, the material presented will include many practical and useful examples. Daily opportunities for informal discussion among participants have been scheduled. Very useful workshop take-away manuals will be provided each day.

There are limited billets available for accommodation in the homes of Bulkley Valley woodlot residents. Field trip transportation will be shared, utilizing participant's vehicles. Bring notebook, boots and rain gear.

June 17 – **An Introduction to Interior Stumpage Appraisals for Woodlot Licensees**
The workshop will provide an overview of the Comparative Value Pricing system; review the components of the basic stumpage formula; describe problematic issues like the "waterbed effect" and "cost creep"; and explore the most significant opportunities for stumpage management within the policy as it relates to woodlots. In short, the workshop is designed to help woodlot licensees better understand the stumpage policy and use it to their full advantage.
Instructor: Dean Daly, RPF.
Fee: $90

June 18 – **Logging Economics**
Overview of development costs; equipment limitations, performance, and costs; phase cost estimating; reducing total development costs; total chance planning concepts; and other topics related to logging economics. This workshop is intended to help woodlot licensees operate efficiently and cheaply.
Instructors: Dave Daust, MSc, RPF and Harold Reedy, AScT.
Fee: $90

June 19 – **Tax & Estate Planning for BC Private Landowners**
The goal of this workshop is to show participants the basic tax principles and strategies used in estate planning. Topics include business structures; business income tax, property tax, and logging tax; estate planning process, estate planning tools, and estate planning issues. The participants will work through a practical case study which is intended to put the concepts learned into a real life estate plan. This workshop will be beneficial for business owners and private landowners who have not planned for their estate. Freedom 55 or Freedom 85? This workshop will help answer that question.
Instructor: Colin Bruintjes, CGA.
Fee: $90

June 20 - **Silviculture Solutions - Obligations and Practices**
Site plans, scheduling activities, ordering trees & selecting stock types, site preparation, tree planting, surveys, brushing. Tour field sites and a local nursery. A great day learning the basics of managing the biological aspects, as well as the legal and financial aspects, of tomorrow's forests on your woodlot.
Instructor: Dave Weaver, RPF
Fee: $90

Evening BBQ
Great networking opportunities. (May be an additional cost per plate.)

June 21 – **Guided Tours of Bulkley Valley Woodlots**
Field tours and discussions with other woodlot managers. This year's tour theme will be riparian management techniques.
Fee: $30

Land of the Totem Poles: An Invitation to the Art and Culture of the Gitxsan Nations

This field trip is an invitation to the art and culture of the Gitxsan nation of the upper Skeena valley with an emphasis on the totem poles of the villages in the territory. You will witness the cultural richness of the Gitxsan people whose communities possess some of the oldest totem poles on the northwest coast. You will also meet some of the cultural leaders who continue to create totem poles and other treasures such as masks, blankets, rattles, and boxes for regalia. You will experience the Gitxsan cultural motivation for making totem poles and regalia and why Gitxsan people continue their cultural expressions.

The tour includes visits to five villages and the Ksan cultural centre. The field trip will end with a salmon barbecue. Participants are responsible for their own travel arrangements to Hazelton for the start of the course. Travel during the course will be by college van. Food and accommodation are not included in the course fee.

Facilitators

Bev Clifton-Percival BA Sociology / Anthropology MA First Nations Studies (In progress) is a wing chief of one of the houses of the Gitxsan nation. She is also an assistant Treaty Negotiator for the Gitxsan nation. She teaches Sociology and Anthropology at Northwest Community College and she has worked at Ksan as a curator.

Rocque Berthiaume BA History MA Anthropology is the Academic Head at Northwest Community College and he teaches Northwest Coast art at the University of Northern British Columbia. He has undertaken research with first nations and he is the author of *The Gitselasu: The People of Kitselas Canyon.*

Date: Friday – Sunday, July 12 – 14, 2002
Times: 9:00 am – 5:00 pm
Length: 24 hours
Location: Gitanmaax, Kispiox, Kitsequecla, Kitwanga, Gitanyow, 'Ksan Cultural Centre
Fees: $400

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An Introduction to Lichens and Bryophytes

Instructor: Patrick Williston, MSc. R.P. Bio
Date: July 17 and 18, 2002
Times: 10:00 am - 4:00 pm
Length: 35 hours
Location: Smithers
Fee: $125

Lichens and bryophytes (mosses, liverworts, and hornworts) are a major, though frequently overlooked component of the biological diversity of our forests. In fact, with over 1800 lichens and approximately 1000 bryophytes, British Columbia contains more than 75% of the species known to occur in Canada. They are also excellent ecological indicators for an array of environmental parameters including moisture, snow depth, forest antiquity, disturbance, and even air pollution. Lichens and bryophytes possess a remarkable array of symmetries and colours that attract the keen eye and that assist us in their identification.

This course is an introduction to lichens, mosses, and liverworts, and discusses their life histories, anatomies, and how they are identified. We will also cover the taxonomy and ecology of some of the common, and not-so-common lichens and bryophytes of the Smithers area. This course includes lectures, field excursions to neighbouring localities, and opportunities to examine specimens in the laboratory using microscopes.

Target Audience

This course is recommended to inquisitive naturalists and to practicing field ecologists and foresters who are interested in learning more about the biological diversity of their surroundings. No previous knowledge of lichens or bryophytes is required, however an eye for subtly is an asset.

Instructor

Patrick Williston is a botany consultant living in Smithers, B.C. who has spent the past 7 years studying lichen and bryophyte taxonomy and ecology, completing a master's degree on this subject in 1999. He has taught laboratory courses on flowering plants, algae, fungi, ferns, and lichens at the University of British Columbia. Patrick is currently working on several research projects relating to lichen and bryophyte ecology in northern British Columbia and has published a small book on a group of rare ferns known as the moonworts.

Equipment, Materials and Logistics

Participants are responsible for their own lunches and field gear. Raingear, a hand lens, collecting bags (paper lunch bags are best), a jackknife, and a notebook are recommended. Participants are encouraged to bring whatever field guides and/or identification keys to lichens and bryophytes, including general guides such as Plants of Northern British Columbia and/or Plants of Coastal British Columbia. Additional reference material will be available for use in the lab. Participants will be carpooling to the field excursions, which will be in the vicinity of Smithers.

Course Agenda

Day 1 - *Introduction, Anatomy, and Some General Principles*

Classroom
- introductions and definitions
- lifehistory and reproduction
- life forms and anatomy
- some common genera
- methods of collecting and curating

Field Trip
- recognizing lichens and bryophytes in the field
- substrate specificity
- methods of collecting

Day 2 - *Identifying Species and a few Ecological Insights*

Classroom
- using a dichotomous key
- lichen chemistry
- learning more of the common genera
- useful literature

Field Trip
- recognizing lichens and bryophytes in the field
- indicator lichens and bryophytes
- a few ecological case studies

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Gitanga'at: Living and Learning on a Gitxsan Territory

The Gitxsan Lax'skiik (Eagle Clan) has held their Xsu Gwin Ga'at territory on the west bank of the middle Skeena River for thousands of years. Today, clan Chiefs and members invite course participants into their community to share in their spiritual and resource use of the land and the river, and to learn of their plans for post-colonial development.

The three-day course will be based at the ancient village of Gitanga'at, accessible only by riverboat or railway. There, through songs and histories, painted crests and Gitxsan place names, participants will hear how the Lax'skiik hold and live in harmony with their land. Besides visiting the spiritual healing and fasting areas, guests will take part in a satxw — a sweat-lodge cleansing ceremony that connects the physical and spiritual worlds.

By travel on long-used trails, the Lax'skiik will demonstrate and show their resource gathering areas, including medicine plants, berries and mushrooms. There will be hikes into the territory's Coho spawning beds and low-elevation mountain goat habitat. Riverside cache pits indicate old salmon preservation technology, while at the same site; participants can see how smokehouses and canning are used today.

Course participants will view progress at the Gitanga'at village development. Here the log cabins and long house under construction will form the nucleus of a community of enterprises. These include an inland commercial salmon fishery, already underway for several years, an eco-cultural tourism venture, a hide tanning and manufactory and others. (During the course hide tanning may be underway.) The Lax'Skiik will explain how these developments are consistent with Gitxsan laws and society as well as with Gitxsan and scientific concepts of ecosystem-based planning.

Instructors

Art Loring has spent all of his life growing up on the Gitksan territories learning his grandfather and grandmother's way of life within his territories. He has learned not only the physical elements of his territories, but he has also learned the emotional, mental and spiritual aspects of being true Gitksan. He is knowledgeable in his traditional territories and thoroughly understands the laws of his people, the territorial boundaries of each clan within the nation, resource gathering areas and fishing sites. His Gitksan name reflects the true meaning he has of his territories: "A warrior looking down the bridge of his nose unwavering."

Simideeks: Chief Calvin Hyzims is the Head Chief of Gitwangak Village as well as a board member for the Gitksan Health Authority. He has trained with the Lax'skiik Chiefs and Forestry Technicians on the mapping and inventories of the Gitksan territories, which included landscape research, traditional ecological knowledge and a biodiversity study. With his experience and knowledge in the ways of his people, he is an avid teacher of his history and language.

Two certified wilderness guides who will assist with the course activities as well as the preparation of the meals will also accompany the three-day field course.

Equipment and Materials

All meals will be provided as well as lodging for 3 days at Gitanga'at in wall tents. Access to sites will be by trail and riverboat. Participants should bring their own sleeping bags, warm clothing, hiking footwear and appropriate raingear (waterproof jacket, waterproof pants, gators- not a requirement but nice to have).
Upon arrival at the site participants will be provided with a map of the area to use as general reference throughout the duration of the course. Participants are welcome to bring cameras and binoculars for nature viewing along the trails.

Target Audience

This course is of interest to the general public and professionals who are interested in learning about the history and practices of the Gitksan on their territory.

Instructors: Art Loring and Lax'skiik Chiefs
Dates: July 26 – 28, 2002
Length: 30 hours
Location: Xsu Gwin Ga'at (Fiddler Creek)
Fee: $350
Travel and Accommodation: $150
Minimum Enrollment: 12 people

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Course Agenda

Day 1 - 9:00 AM
Introduction to the Gitksan and the Lax'Skiik Ventures Society
The morning will be an orientation to the past and present history of the Gitksan Culture. A village tour and participation in a traditional sweat lodge ceremony will allow participants to focus themselves on the culture and the land through a connection to both the physical and spiritual worlds. During the afternoon session all participants will experience a cleansing ceremony through a sweat lodge. The ceremonial leader will give an in depth discussion on the use of spiritual and medicinal plants in the lodge.

Day 2

- Development of land and resource areas
- Discussion of cultural history
- Traditional methods of fish preserving and storing
- Tour of fish camp and fasting grounds
- Hike to the early European settlement of Doreen

The morning session will be spent teaching of the XSI GWIN GAAT traditional ecological knowledge with the aid of maps. Participants will learn of fishing sites, hunting grounds, berry picking, trap lines, medicinal and edible plants and the trails and camps that ran from the river front into the alpine. Participants may also have the opportunity to view the traditional tanning of a moose hide.

A short riverboat trip down river will show the harvest, preserving and ancient storing methods used for fish. Participants will also see cedar trees used for such things as baby cradles and ropes for weir's and pack boards, and fasting lodges where youth and adults today are using the ancient method of searching for their place and balance in today's world.

Day 3

- Morning hikes up the Fiddler drainage
- Learn of the resource gathering, wildlife and fish habitat of the area
- Traditional farewell feast

This trip will take you 4 km up into the XSI GWIN GAAT drainage to better understand the ancient infrastructure of the Lax'Skiik tribe. Participants will hike into coho spawning beds, low elevation goat habitat and other critical habitats being used by other animals.

We will discuss five-year forest development plans that will heavily impact small sensitive drainage systems through roads and logging blocks.

There will be discussion summarizing how the eco-cultural tourism project being set up will develop a house territory that will be sustainable and usable to both native and non-native communities.

Participants will then be put into one of the four tribes, Eagle, Frog, Wolf, and Fireweed for a traditional feast. This experience will show how the laws are transpired through the feast system and knowledge handed down through time as new leaders evolve.

Disturbance and Recovery in Northwestern Forests

This five-day field course will be conducted as a travelling road show from Prince George to Prince Rupert. Held immediately following the '4th International Workshop on Disturbance Dynamics in Boreal Forests' (Prince George, Aug. 10-14; http://www.res.unbc.ca/borealdisturbance/), this course introduces participants to the range of natural and human disturbances found in the diverse forests of Northwestern British Columbia.

Particular emphasis will be placed on examining differences in disturbance regimes from dry Interior to wet coastal forests, and identification of factors which result in long-term loss of ecological productivity, diversity and integrity. With an emphasis on botany and plant ecology, old-growth forests and many distinctive plant communities will be visited.

Naturally disturbed sites to be visited include those altered by volcanism, landslides, avalanches, flooding, wildfire, insect outbreak and windthrow. Human disturbances to be inspected will be those associated with roads, mining, and various forest management activities. Points of cultural and historical interest will be visited en route, and accommodation will largely be at rustic fishing lodges. Upon course completion in Prince Rupert, connections can be made to explore Haida Gwaii (the Queen Charlotte Islands), or return to Prince George by train or bus.

Facilitator

Dr. Phil Burton has taught silviculture, vegetation management and ecosystem restoration at the University of British Columbia for several years prior to establishing Symbios Research and Restoration in 1995. Phil has published numerous scientific papers on topics related to conservation biology and forestry.

Instructor: Dr. Phil Burton
Date: August 14 – 19, 2002
Location: Prince George to Prince Rupert
Fee: $550

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Introduction to Metal Leaching and Acid Rock Drainage

Facilitator: Dr. Bill Price
Date: Sept 16 - 20, 2002
Times: 9:00 am - 5:00 pm
Length: 40 hours
Location: Smithers and mines in the surrounding area
Fee: $950

Metal leaching and acid rock drainage (ML/ARD) are the major environmental and reclamation challenges faced by the mining industry. They may also be significant issues in dam and road construction. The objective of this course is to provide participants with a basic understanding of the factors contributing to ML/ARD and the practices used to prevent environmental impacts.

Case studies drawn from the instructors experience in this province and throughout the world will be used to illustrate both the generic and site-specific challenges, and the associated information and management requirements. Tours of mines in the area (Placer Dome's Equity Silver, Imperial's Huckleberry mine, Noranda's Bell and Silver Standard's Duthie mine) will allow participants to observe state of the art ML/ARD practices at a range of different sites. Simulated planning exercises based on the case studies and field tours will provide participants with practical experience in how a ML/ARD assessment is conducted and mitigation plans are developed.

Target Audience

The course is intended for personnel working for mining companies, in highway construction, for community groups, government or consulting companies. The course is also recommended to students or educators interested in environmental protection and mine reclamation work. No prior knowledge of the subject is required.

Instructors

Dr. Bill Price, British Columbia government's leading expert on ML/ARD, is the course organizer. Bill has spent the last ten years reviewing mines and is author of numerous publications including the Provincial ML/ARD Policy, ML/ARD Guidelines and Manual of Recommended Prediction Methods, documents which are used world-wide.

Mike Aziz will lead the Equity Silver tour. Equity has been an industry leader in ARD mitigation with its research work on soil covers, underwater disposal and drainage collection. Mike has published widely on that work and on methods to minimize ML/ARD risks.

Doug Johnson will lead the tour of the Huckleberry Mine and its facilities. Huckleberry will provide participants with an opportunity to inspect state of the art-practices in ARD at a site where prediction and prevention are an integral part of the mine plan.

Glenda Ferris is a community member who has been active in ARD review since 1986, assisting industry, government, community and First Nations groups. Her contributions are widely acknowledged.

Dr. Ron Nicholson, a hydrogeologist and geochemist with Beak International and Associate professor at the University of Waterloo, will present the section on mitigation. Ron pioneered the concept of soil covers as oxygen barriers and has 20 years experience in mine waste projects, including work with covers, underwater disposal and permafrost.

Course Outline

Basic Processes and Contributing Factors

- Geological Conditions (key minerals and rock types)
- Geochemical Processes (oxidation, dissolution, reduction and microbial processes)
- Hydrological Processes (contaminant transport, leaching and loadings)
- Environmental Impacts
- A Brief History of ML/ARD
- Regulatory Requirements
- Public Involvement

Material Characterization and Assessment

- Key Parameters and Concepts
- How to Characterize Exposed Materials
- Sampling and Sample Preparation
- Sample Analysis
- Kinetic Test Procedures
- Data Analysis and the Interpretation of Results
- Use of ABA Results
- Monitoring Drainage
- Techniques for Different Materials - waste rock, road cuts, tailings, soil materials
- How to Conduct an Assessment

Introduction to Metal Leaching and Acid Rock Drainage

Measures to Prevent Impacts

- Review of Current Practices - general considerations, information and design requirements
- Underwater Disposal - constructed impoundments, flooded workings, bulkheads and deposition in natural water bodies
- Blending - past practices, neutralization mechanisms and constraints
- Measures to Reduce Drainage - selecting the best disposal location, ditches, soil covers and liners
- Measures to Reduce the Oxygen Supply
- Drainage Treatment - chemical and passive treatment options and concerns
- Mineral Processing
- How to Develop a Mitigation Plan - selecting the best mitigation strategy, risk assessment, contingency planning, monitoring and maintenance, and geotechnical and hydrological considerations

How to Conduct an Assessment

- What Questions Must Be Answered and What Evidence is Required to Answer Them?
- Data to Collect
- How to Conduct a Field Inspection
- Drainage Monitoring Requirements
- Inspection of ML/ARD in a Road Cut

Tour of the Equity Silver Mine

- History of ARD Management at the Site
- Drainage Management
- Lime Treatment and Sludge Disposal
- Soil Covers
- Hydrogeology of the Waste Rock Dumps
- Underwater Disposal of the Tailings
- Flooding of the Pits
- Drainage Discharge and Effluent Monitoring
- Consultation with the Community

Tour of the Huckleberry Mine

- Mine History, Geology and Environment
- Material Characterization and the Separation of Different Waste Types
- Mitigation Options including the Present Strategy for Flooding ARD Generating Wastes
- Development of a Compatible Mine Plan
- Use of ARD and non-ARD Generating Wastes for Construction
- Tour of the Mill and the Laboratory Facilities

Tour of the Duthie Mine

- Mine History and Environmental Protection Requirements
- ML/ARD Potential
- Interpretation of Monitoring Results
- Proposed Mitigation Strategy
- Monitoring and Maintenance Requirements

Case Studies

Examples of mine and highway work in this province and other parts of the world including Eskay Creek, Kemess, Red Mountain, Snip and Sulphurets Mines.

Northwest Community College
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Prediction of ML/ARD: Theory and Practice

Instructors: Dr. Bill Price, Dr. Kevin Morin and Stephen Day, MSc. P.Geo
Dates: August 19 - 23, 2002
Times: 8:30 am - 4:30 pm
Location: Smithers and mines in the surrounding area
Fee: $950

One of the most challenging aspects of metal leaching and acid rock drainage (ML/ARD) work is the prediction of whether materials have a potential for ARD or significant metal release and what will be the resulting drainage chemistry. The goal of this course is to provide participants with a practical understanding of the contributing properties and processes, and current prediction practices. The course will bridge the gap between the basic science and its practical application using mines in the area and examples drawn from the instructors experience with mines throughout the world.

ML/ARD prediction is a multi-disciplinary subject, involving a large number of processes, each with demanding information requirements. It is also an applied science, with much of the current knowledge residing in company reports and with leading industry practitioners and regulators. Resources available in the Smithers area - both the mines and the personnel working here - provide a unique opportunity to present this information. Tours of mines in the area (Noranda's Bell mine, Imperial's Huckleberry mine and Silver Standard's Duthie mine) will allow participants to observe a wide range of generic ML/ARD prediction practices and site-specific issues. Simulated planning exercises based on case studies and the field tours will be used to provide participants with experience in determining what questions must be answered and what evidence is required to answer them.

Target Audience

The course is intended for professional/ technical personnel conducting environment work for the mining industry, community groups, government or consulting companies. The course is also recommended to students and instructors requiring experience in the practical aspects of ML/ARD prediction.

Instructors

Dr. Bill Price, British Columbia government's leading expert on ML/ARD, is the course organizer. Bill has spent the last ten years reviewing mines and is author of numerous publications including the Provincial ML/ ARD Policy, ML/ARD Guidelines and Manual of Recommended Prediction Methods, documents used through out the world.

Stephen Day (M.Sc.), Principal Geochemist at SRK Consulting's Vancouver office, has worked for 13 years on mine projects in British Columbia developing waste management plans that address ML/ARD concerns. Stephen was one of the principal MEND prediction researchers and is a member of the provincial government's ML/ ARD expert advisory committee.

Dr. Kevin Morin will present a number of case studies, including presentations on the prediction work done at the Bell Mine. Kevin has consulted extensively throughout the world, including recent work for Noranda, Rio Algom and Placer Dome. He is the author of Environmental Geochemistry of Minesite Drainage, in addition to numerous MEND reports and other scientific publications.

Doug Johnson will lead the tour of the Huckleberry Mine and its facilities. Huckleberry will provide participants with an opportunity to inspect state of the art-practices at an operation where ARD prediction is an integral part of the mine plan.

Course Outline

Introduction
- A Brief History of ML/ARD Prediction
- General Principles - potential contaminants and overall objectives

Weathering and Drainage Chemistry
- Important Reactions - oxidation, dissolution, reduction and hydrolysis
- Microbial Action
- pH Effects
- Iron Geochemistry

Designing a Prediction Program
- What Questions Must Be Addressed and What Evidence is Required to Answer Them
- Tool Box of Prediction Methods
- Prediction Steps
- A Phased Approach
- Pre-Mining, Operational and Closure Requirements
- Monitoring the Evolution in Weathering and Drainage Chemistry
- Considerations for Specific Site Components - waste rock, tailings, mine workings, ore and low grade ore, backfill, cemented backfill

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Prediction of ML/ARD: Theory and Practice

Static Test Procedures

- Acid Base Accounting
- pH Measurement
- Acid Potential - sulphur analyses, sulphide minerals, acid potential, galvanic effects, controls on reactivity, sulphate minerals
- Neutralization Potential - laboratory versus field NP, carbonate minerals, hydroxide minerals, silicate minerals, Sobek NP, modified NP, BC Research NP, carbonate NP, intepretation of static NP results, operational information requirements
- NPR and NNP
- Material Classification According to ABA Results
- Elemental Analysis - whole rock, strong acid digestion, analyses for soluble constituents
- Particle Size and Surface Area
- Mineralogical Analysis - visual description, petrographic examination, X-ray defraction, SEM/EDS, microprobe
- Data Presentation and Interpretation
- QA/AC Considerations

Kinetic Test Methods

- Humidity Cells - different methods, waste rock vs tailings, crushed vs sieved test materials, temporary storage, acceleration methods
- Leach Columns - different methods including MWMP, recirculation and subaqueous tests.
- Leach Pads - size, design, timing of setup.
- Full-Scale Monitoring of Seeps and Groundwater
- QA/QC Issues - analytical frequency, cost reduction options, dangers, parameter selection, reproducibility of tests, leachate analysis concerns, environmental concerns, laboratory mistakes, QA/QC reporting
- Characterization of Test Materials and Residues
- Scale Issues
- Mechanisms Occurring in Kinetic Tests - test and scale differences
- What Questions Need Kinetic Information? - Will it go acid? When will it go acid? What will basic, pH neutral or acidic drainage look like? How will the control option work?
- Design Considerations - environmental factors (geology, mineralogy, climate), development schedule, closure schedule, regulatory expectations
- Test Limitations
- How to Design a Kinetic Test Program - simulated planning exercise using data from Huckleberry and Kudz Ze Kayah

Will There Be ARD?

- What Site Conditions Determine Whether Something Will Produce ARD?
- How Can This Be Simulated Through Testwork?
- When is ABA Not Sufficient and Kinetic Testing Required?

When Will It Go Acid?

- Theory
- Design of a Test Program

What Will the Drainage Look Like?

- Important Parameters - pH, acidity, alkalinity
- What Controls Contaminant Concentrations
- Limitations of Kinetic Tests
- Kinetic versus Solubility Controls, Storage vs Release
- Mineralogical Controls
- Sources of Site Specific Information
- Use and Limitation of MINTEQA2
- Importance of Having Supportive Evidence

Mine Case Studies

- Use of Routine Drainage Monitoring at Island Copper - prediction of probable future range of different contaminants, laboratory and statistical analytical procedures, frequency of monitoring
- Onset of Acidic Drainage at Island Copper - what parameters are good indicators of change, influence of upstream hydrology
- Underground Drainage at Myra Falls
- Prediction of Wall Rock Drainage Chemistry - Minewall procedure, Island Copper, Myra Falls
- Low Sulphide Materials - Highland Valley, Endako, Brenda, Kitsault, Trout Lake, Boss Mountain
- Separation of Rock Types at the Kemess, QR Gold and Tulsequah Mines

How to Conduct a Field Inspection

- Sources of Background Information
- Data to Collect
- Indicators of Site Hydrology
- Drainage Monitoring
- Drainage and Weathering Colours
- Other Factors to Consider

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Tour of the Huckleberry Mine
- Location and Mine Plan
- Mine History, Geology and Environmental Requirements
- ABA Results (East Zone, Main Zone)
- Kinetic Test Results
- Predicted ML/ARD Potential
- Prediction Required in Support of ARD Mitigation Options - flooding ARD generating wastes, waste rock used for dam construction, use of ARD generating wastes for road construction, cyclone sand for dam construction
- Operational Material Characterization and the Separation of Different Waste Types
- Drainage Monitoring
- Data Compilation and Reporting
- Communication
- Inspection of the Laboratory Facilities

Tour of the Bell Mine
- Overview of Site
- History of ARD Management
- Rock Types and Mineralogy
- ABA Results
- Results of Kinetic Test Work
- Results of Modeling of Drainage Chemistry
- Predictions of Drainage Chemistry through Time
- Predicted and Subsequent Weathering of the Waste Rock and Tailings

Field Tour of the Duthie Mine
- Mine History, ML/ARD Potential and Environmental Requirements
- Mitigation Strategy
- Monitoring and Maintenance
- Issue Definition and Planning Exercise

Sampling and Sample Preparation
- Number of Samples
- Source of Material to Sample
- Sample Size
- Geological Considerations
- Considerations for Specific Site Components
- Particle Size and Surface Exposure
- Sample Preparation Prior to Analysis

Challenges in Prediction
- Site Specificity
- Common Errors and Omissions
- Modeling
- Time and Money

Equipment, Materials and Logistical Details

With the exception of field trips all days to be in the classroom, 8 hour classroom days, up to 12 hours for field trips.

The course is based in Smithers, B.C and mines in the surrounding area. Accommodation will be in Smithers and is the responsibility of the participant. Contact numbers for a range of hotel, motel, lodge and B&B accommodation can be forwarded with course materials on request. Travel to field sites will be by Northwest Community College vans, and is included in the course fee. Meals are not provided.

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Introduction to Forest Mushrooms

Forests of northwestern British Columbia are impressively rich in mushrooms. Mushrooms are a bewildering but fascinating array of shapes, colours, sizes and odours. Many people enjoy picking wild mushrooms for food, and we in the northwest have a number of species worth pursuing. The vast number of mushroom species is a bit daunting for beginners, and some basic training is essential to learn how to accurately identify our more common species.

This one and a half day course will introduce you to the major types of mushrooms, with an emphasis on the gilled mushrooms. We will compare mushroom types in the classroom, and work with keys to learn the basic taxonomy. The next day will be a field tour to look at more mushrooms in forests around Smithers, and hopefully collect good edible mushrooms as well.

Target Audience

The course is designed to introduce the basic taxonomy of forest mushrooms to beginners. No previous experience is necessary. People with some knowledge of mushrooms will also be able to build on their knowledge through working with keys and sharing new discoveries in the field. Anyone who spends time outdoors would appreciate the introduction to mushrooms.

Instructor

Marty Kranabetter has been a soil scientist with the Forest Service since 1991. He has undertaken research on forest mushrooms for the past 5 years, looking at issues such as partial cutting, stand age, and ecological habitat. He also enjoys pursuing the fine edible mushrooms of our region.

Equipment, Materials and Logistics

Participants will be given a handout for the basic taxonomy of gilled mushrooms. There will be some mushroom books made available as well for interested participants to examine. Transportation for the field day will be provided. Participants are asked to bring lunch and beverages for the field day, plus good rain gear and water-resilient footwear. Some plastic bags or a basket, plus a jack knife, would also be useful for collecting edible mushrooms.

Day 1 – Classroom
Introduction to Mushrooms
12:00 pm – 5:00 pm

- Explanation and demonstration of basic types of mushrooms
- Demonstration of spore colour and gill attachment as principal taxonomic features
- Practice mushroom keys with collected specimens and compare features across a range of genera.

Day 2 – Field Trip
Introduction to Mushrooms
9:00 am - 5:00 pm

- field tour of local forests, collecting and identifying mushrooms.

Instructor: Marty Kranabetter, MSc. P. Ag
Dates: September 14 & 15, 2002
Length: 12 Hours
Times:
Day 1 12:00 am – 5:00 pm
Day 2 9:00 am – 5:00 pm
Location: Smithers and area forests
Fee: $100

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Forest Ecosystem Management Conference

Conference Schedule:
Place: Field day organization - Northwest Community College, Smithers Campus Conference Meeting - Dze L K'ant Friendship Center
Date: October 2, 3, and 4, 2002
Times: 3 - Day Conference
Audience: Local Forestry Community: Professionals, Technicians, Interested Persons, Forest Licensees, Woodlot Licensees, College Forest Ecosystem Technology Students.
Fee: $150
$40 - Students

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How can it be applied in the Northwest?

Forestry communities are increasingly using the term "Ecosystem Management" during planning sessions, public meetings and policy statements.
So what does this really mean?
How would an Ecosystem Management approach affect the operation of major forest companies? How would this affect how a Woodlot Licensee operates?
Is this a term or management approach that works only in the Kootenays and Vancouver Island? Or is it a management approach that can work here in the Northwest – in Terrace, the Hazeltons, the Bulkley Valley and the Interior Plateau?
What Ecosystem Management approaches are presently being applied in the Northwest and are they consistent with practice approaches elsewhere?

The goal of this conference is to address these local community questions in a practical – field application conference – targeting local on ground solutions to a complex topic. Specifically the format will attempt to: Foster a clear and common understanding of the concept, definition and approach of Ecosystem Management – as defined and practiced in BC and the Pacific Northwest.
Assess and document the current in this region that are consistent with the principles of Ecosystem Management.
View, explore, share and discuss the best practices of Ecosystem Management presently employed on the ground and in the field.

Day 1
1/2 day in the Field
Afternoon Session - 12:00 PM to 6:00 PM
Concepts of Ecosystem Management – SBSmc2 Ecosystem Subzone

In 2 large groups, participants will be immersed into local ecosystems (McDonnell Lake and Telkwa River Areas) presently being managed for sustainable forest products and will be challenged to review and explore the fundamentals of this management approach. Undisturbed and managed site will be assessed.

Day 2
1 day in the Dze L K'amd Friendship Center Hall - 7:30 AM to 5:00 PM
Application of Ecosystem Management – Presentations, Local Status Report Paper, Panel Discussion on common Concepts and Poster Sessions.

Invited guest speakers who are leaders in BC and the Pacific Northwest will give short presentations on their best practices and the fundamental concepts of Ecosystem Management. Speakers are yet to be confirmed, but possible speakers from BC and the Pacific Northwest are planned.

Catered Lunch 12 noon to 1:00 p.m. – Poster Session

A commissioned paper will be presented that summarizes current practices in the region that are consistent with an Ecosystem Management Approach. Common local definitions will be presented and planning level approaches will be explained in order to benchmark the stand level stops for the field tour tomorrow. Local practitioners will present brief summaries of their approaches to help illustrate techniques used.
A panel discussion will end the session with a mix of local and invited guests from outside the region, to discuss the specific applications suitable to the local ecosystems in the Northwest.
Banquet 6:30 p.m. to 10:00p.m.
Guest speaker (to be announced) will present an overview of the challenges to implementing Ecosystem Based Management.

Day 3
1 day in the Field 8:00 am to 4:00 pm
Ecosystem Management Approach – Local Best Practices – ICHmc1 and ESSFmc Ecosystem Subzones

Participants will visit practices in two ecosystems. Local practitioners will facilitate the discussions and exercises at each stop (a total of 2 stops per Subzone ecosystem – 4 stops in all for the day are planned). Stops considered for the tours will be the McCully Creek area and the Blunt Creek area.

Introduction & Registration Information

Introduction

Northwestern British Columbia provides an unparalleled natural classroom for field-based learning activities. It is home to some of the world's remaining wild spaces, and it is a place where new and traditional residents interact with a rich diversity of ecosystems that sustain local economies from the interior to the coast. It is an area of challenge and opportunity, an area where there is much to be learned about natural systems and appropriate resource use. The natural features that support such an outstanding learning classroom also provide attractive professional and lifestyle opportunities for the many leading resource specialists who now make their home in the Smithers area. The Northwest Field School provides a forum where the area's unique blend of human and natural resources is made available through credit and non-credit field courses appropriate for professional, academic and general interests.

Registration Information

Early registration is recommended as we operate on a first-come-first served basis. Minimum class size is usually 10 participants; maximum is often 15. Classes will be cancelled if we do not have the minimum number two weeks before a class.

To Register

Complete and fax or mail the attached registration form along with the tutition fee - we accept personal cheque, Visa and MasterCard. Make cheques payable to Northwest Community College. Telephone registration is also possible with a credit card. When we receive your tuition we will confirm your registration and send you important course information, including what to bring, and where to meet.

Corporate Sponsorship

The Northwest Field School is also soliciting funds to defray costs for students or community groups wishing to participate. All courses in the Northwest Field School are run on a cost recovery basis and the high tuition reflects the true cost of course delivery. In an effort to defray costs for students, we are asking corporations and government organizations to provide sponsorship or grants. Please contact us directly if you have any questions regarding the above or would like to make a donation.

Cancellations

Any cancellations received 15 days or more before the start of a class will receive a full refund (minus a $25 processing fee). We are sorry, but we cannot provide a refund or credit for cancellations received less than 15 days before a class.

Academic Credit

Some of the field school courses may, by prior arrangement only, qualify for credit to a number of college/university degrees or diplomas, typically at a senior undergraduate or graduate level. For those seeking credit please contact us and we will direct you on how to proceed.

Food & Transportation

All courses are based in Smithers, BC, where local accommodation is the responsibility of the participant; contact numbers for a range of hotel, motel, lodge and B&B accommodation can be forwarded on request. Travel to field sites will generally be by Northwest Community College vans unless a specific course outline indicates by student car pool.

NORTHWEST COMMUNITY COLLEGE

Registration Deadline

15 days before course starts

Registration Form

Course Title Price

_____

_____

_____

Name

_____

Address

_____

_____

Phone

_____

Birth Date (day/month/year)

Method of Payment

☐ Cheque

☐ Invoice my Employer

☐ VISA

☐ MasterCard

_____

Name of Employer

_____

Card Number

_____

Signature

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