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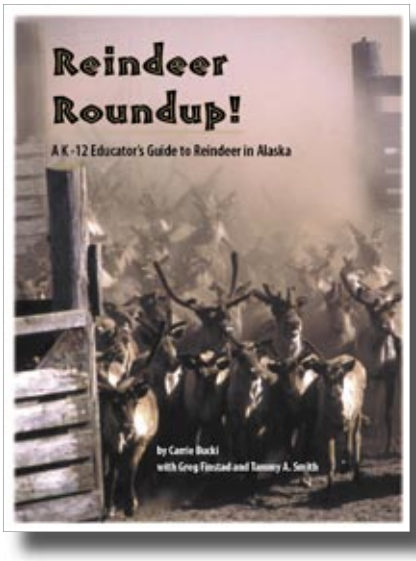
Wildlife Watching
Reindeer Inspire Teaching Guide
Birch in the Circumpolar North

School of Natural Resources and Agricultural Sciences
Agricultural and Forestry Experiment Station

University of Alaska Fairbanks



contents:

Dwarf birch, Betula nana, *in Togiak National Wildlife Refuge.*
—Photo by Jennifer Culbertson, Alaska Image Library, US Fish & Wildlife Service

About the cover: *"Inflorescence," a 4½' bronze sculpture given to the Georgeson Botanical Garden in 1992 as part of the University of Alaska's 75th Anniversary celebration. The sculpture was designed by Dr. Wendy Ernst and student artists Carol Desnoyers, Rachelle Dowdy, and Heather Wells.*
—Photo by Doreen Fitzgerald

Right: Orca in Resurrection Bay during the NRM 290 trip, 2004.
—Photo by Norman R. Harris

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UAF UNIVERSITY OF ALASKA FAIRBANKS

letter from the dean and the associate director:

This issue of *Agroborealis* hightlights the new directions we at SNRAS/AFES are taking, rather than our traditional pursuits in agricultural crops, livestock, and forest management research. Two new directions in research at AFES and SNRAS are in recreation management and forestry. Researchers predict that participation in wildlife viewing will increase faster than the population. Seventy-eight percent of Alaska residents and seventy-four percent of visitors want to know more about how to find and watch wildlife. Land managers are learning how to provide this information from our applied program in recreation management research. The relationship of pharmaceuticals and ecology is important as the worldwide search for new and useful chemicals from plants continues. We participate at both ends of the spectrum in our research involving Alaska's birch. We are investigating the pharmaceutical properties of Kenai birch and Alaska birch, and we are asking ecological questions, such as why moose browse one species and caribou another, and what the species effect of leaf litter is on soil.

We have brought you a few snapshots of how we fulfill our land-grant mission for the state of Alaska. Research results are only important if they reach the people who will be using the information. Our expanding outreach program brings this information to a variety of audiences. Our outreach program is diverse. Research conducted by the Reindeer Research Program was the spark that led to the development of *Reindeer Roundup!*, a new curriculum for grades K-12. Reindeer Research Program faculty and staff developed it with help from teachers in Nome and Fairbanks, and from the Kawerak Reindeer Herders' Association. It is an excellent example of how we work with the community to bring our information back to them—in this case using an important northern agricultural livestock species to teach science, mathematics, history, and culture.

The Georgeson Botanical Garden is a many-faceted Fairbanks community asset. It provides a participatory experience, from hands-on volunteering to simply enjoying the ambiance. Now it will be a learning center for children, thanks to the help of Walt and Marita Babula, who have made the Babula Children's Garden possible.

We hope you enjoy these new snapshots of our ongoing research and outreach programs. You can learn more about our programs, our history, and our mission and goals from our 2004 strategic plan. The theme is "Working for Alaskans: A Wealth of Knowledge." *SNRAS Strategic Plan 2004* is available as a PDF on our website at http://www.uaf.edu/snras/afes/pubs/misc/index.html.

Your comments and ideas are always welcome. Enjoy the Alaska summer, have fun at the upcoming fairs and community events. While you travel, be sure to visit us at our Fairbanks Experiment Farm and the Matanuska Experiment Farm.

Sincerely,
Carol E. Lewis
Dean and Director

G. Allen Mitchell
Associate Director

Reindeer Inspire New Teaching Guide

by Doreen Fitzgerald

When Elsa the reindeer first stepped into the classroom, handler Greg Finstad had no idea where that first educational excursion would lead. Now, five years later, the Reindeer Research Program (RRP) has published *Reindeer Roundup! A K-12 Educator's Guide to Reindeer in Alaska.* Development of the curriculum, complete with book, CD-ROM, and instructional kit, was supported by the National Science Foundation, the US Department of Agriculture Cooperative State Research, Education, and Extension Service, and the UAF College of Rural Alaska, with considerable support also coming from the SNRAS Reindeer Research Program.

"*Reindeer Roundup!* is our response to the countless requests we've had to take Elsa to classrooms and give presentations on reindeer," said Finstad, project manager for the research program. Finstad took Elsa to that first classroom visit at the request of his wife, Bev Finstad, a kindergarten teacher in Fairbanks.

"Kids need real life experiences to link to the information they are being presented in the classroom," she said. "What could be more real than a reindeer they can touch and observe up close? That experience makes the adaptations of arctic animals much more meaningful to the students. Of course," she added, "Greg had to think fast on his feet when the kindergardeners asked if Elsa could fly, and then he had to be very entertaining to get them over their disappointment when he told them only Santa's reindeer could do that." She also noted that because the reindeer industry in Alaska is rich in history, science, and culture, it offers a local vehicle for teaching many of the Alaska state standards in science, math, and social studies.

Greg Finstad, Reindeer Research Program manager, with Elsa visiting schoolchildren in class.
—Photo courtesy Reindeer Research Program

Interest by other teachers led to many such visits by Elsa to Fairbanks area schools, and the new curriculum will expand this outreach to Bering Straits, Fairbanks North Star Borough, and various Lower 48 school districts that will receive the book, CD-ROM, and a kit of support material related to reindeer anatomy and physiology. All but the support kit will be available on line for teachers everywhere to download.

"The curriculum was developed in part using lesson plans written by Nome and Fairbanks teachers who attended our reindeer education workshops," Finstad said. "We wanted to produce a unit that uses Alaska's reindeer industry as a working model for the management of a sustainable natural resource in a northern ecosystem, one that would broaden the curriculum and expose students to applied science. Reindeer are an excellent medium to study the characteristics of tundra ecosystems and adaptations of animals living in the Arctic."

Teachers were exposed to reindeer production and research through workshop presentations made by Larry Davis, Carl Emmons, Rose Fosdick, Dan Karmun, Knut Kielland, Heather Oleson, Kumi Rattenbury, William Schneider, Tim Smith, and Suzanne Worker. Tammy A. Smith, a teacher of the Fairbanks North Star Borough School District in Fairbanks, served as educational consultant to the project.

A three-week-old reindeer calf.
—Photo courtesy Reindeer Research Program

"The educators who participated in UAF Reindeer Curriculum Development workshops in Fairbanks and Nome developed many of the ideas and some of the individual lesson plans in the book. Their enthusiasm motivated us to incorporate many of their ideas," said Carrie Bucki, former educational outreach coordinator for the RRP and *Reindeer Roundup!* author.

"Although many excellent educational materials are available on caribou, *Reindeer Roundup!* is unique to the culture and history of Alaska," Bucki said. "We hope these materials will enable teachers to incorporate this regional knowledge into the Alaska curriculum."

Bucki said development of the curriculum materials benefited from university researchers and scientists working with local educators and from the help of community members who want to teach future generations about this rural Alaska tradition. She also credited the RRP staff for their support and especially their assistance with materials collection for the educational support kits: Rob Aikman, Darrell Blodgett, Robert van Buren, Randy Fulweber, Rhonda Wadeson, and Suzanne Worker.

The "Reindeer, People, and Land" section of the curriculum guide contains background information about reindeer and how they interact with their Alaska environment. It is an overview that can be used for some basic research. Topics include arctic ecology, reindeer history, biological adaptations, behavior, disease, current research, and applied programs.

The "Lesson Plans" and "Extensions" sections contain twenty-two activities covering a wide range of subjects and grade levels. While most lessons were written for elementary and middle school students, many can be used as introductory material with older students, or be enhanced and developed for more rigorous study. Each lesson contains information on grade level, subject, duration, and performance objectives. A cross-referencing index provides access to the desired grade level, subject, or topic. Each lesson correlates to Alaska state standards and Alaska cultural standards for students and educators. The lesson plan example on page 8 shows how the plans are organized.

Along with the lessons, extension activities, such as rangifer tag, thermal regulation and insulation, reindeer diorama, and recording herding culture are suggested. A glossary is included and the "For Further Study" section contains a list of adult reference books, children's books, videos, and other resources.

To augment lessons, or support teachers who want to create their own lessons, an array of other materials and props are

Lesson Plans

Reindeer Herding in Alaska
Website Scavenger Hunt
Reindeer vs. Caribou
History of Reindeer in Alaska
Reindeer Numbers
Traditional Uses of Reindeer
Eskimo Ice Cream
Velvet Antlers
What Do Farmed Reindeer Eat?
How Much Do Reindeer Eat?
Hair Identification
Reindeer Rumen
Building a Radio and Transmitter
Creating a Reindeer Brochure
Reindeer Alphabet Book
Reindeer Bingo
Creating an Arctic Food Web

Extensions

Rangifer Tag
Thermal Regulation and Insulation
Reindeer: Cattle of the Arctic?
Reindeer Diorama
Recording Herding Culture

Reindeer are gentle and easily herded.
—Photo courtesy Reindeer Research Program

provided on a CD-ROM and in the kit of reindeer-related physical materials. (See page 7 for a description of the props). The CD-ROM includes photos and slide shows which teachers can use as-is or integrate into related lesson plans. The RRP staff also will be available to assist teachers with presenting lecture material, developing advanced lesson ideas, coordinating live reindeer classroom visits, or planning a field trip to the Reindeer Research Program facility at the Agriculture and Forestry Experiment Station's Fairbanks farm.

The curriculum's audiovisual material (films and videos) include two films: *The Reindeer Queen* and *High Tech on the Tundra*. Three PowerPoint slide shows are provided. Fifty slides illustrate how reindeer are adapted to life in the Arctic. They show such characteristics as summer and winter foraging, flotation and gait, and travel through snow, and how hair coat, nose, metabolism, and other features are adaptations to the cold. The role of lichen in diet, functions of antlers, defense, reproduction, and herding are also covered. The "History of Reindeer in Alaska" slides cover five distinct periods, beginning with conditions before reindeer were introduced. The story continues through the introduction of reindeer in 1892, training of Alaska Native herders, mission reindeer, the first Native herd owners, use of reindeer by miners, reindeer stations in northwestern Alaska through 1977, and the story of people who were involved in the introduction and development of the industry. It also covers the Reindeer Act of 1937, range management, and permits. "Radio and Satellite Telemetry" by Suzanne Worker covers the basics of wildlife telemetry. It begins with VHF telemetry and how it works, then addresses satellite telemetry and how it differs from VHF telemetry. It is written in general terms but addresses reindeer-specific uses.

The guide includes other reindeer and education related resources (seven website links); the cross-reference section, with indexes to grade levels, teaching subjects, and topics; and the slide indexes, with descriptions and titles for each slide in the PowerPoint shows. The entire package includes the guide, educational kit materials, and the CD-ROMs *Reindeer Herding in Alaska* (UAF Jukebox series interactive oral history of reindeer herding in Alaska) and *Reindeer Visual Aids* (slide shows and images).

Unless noted, all photos and graphics in the guide were taken or created by the UAF Reindeer Research Program. The historical photos are from the following publications: *Arctic Exodus: The Last Great Trail Drive* by Dick North; *Where Did the Reindeer Come From? Alaska Experience, the First Fifty Years* by Alice Postell; *The Yukon Relief Expedition and the Journal of Carl Johan Sakariassen* edited by V.R. Rausch and D.L. Baldwin; *Longest Reindeer Herder* by Chester Seveck; and *Reading, Religion, and Reindeer: Sheldon Jackson's Legacy to Alaska* by Elizabeth Tower.

The *Reindeer Roundup!* materials are based on work supported by the National Science Foundation (project number OPP-9979473), the USDA Cooperative State Research, Education, and Extension Service (special project number 2001-38426-11488), and supported by the UAF College of Rural Alaska.

The Davis family reindeer corral near Nome.
—Photo courtesy Reindeer Research Program

Reindeer Roundup! will be available from the Reindeer Research Program in August 2004. For more information contact Rhonda Wadeson, Reindeer Research Program, P.O. Box 757200, University of Alaska Fairbanks; (e-mail) fyrrp@uaf.edu; (phone) 907-474-5449; (fax) 907-474-7175. The printed guide will be available on line at http://www.uaf.edu/snras/afes/pubs/index.html. The publication was edited by Deirdre Helfferich and Doreen Fitzgerald, AFES Publications Office, School of Natural Resources and Agricultural Sciences, University of Alaska Fairbanks.

you can visit the Reindeer Research Program at http://reindeer.salrm.uaf.edu/

Cow and newborn calf at the Fairbanks Experiment Farm.
—PHOTO COURTESY REINDEER RESEARCH PROGRAM

Reindeer Roundup! Educational Kit Materials

Each kit includes the book, *Reindeer Roundup!* and the following items:

Animal specimens

- Reindeer pelt
- Reindeer skull
- Velvet antler
- Bone antler
- 2 reindeer hooves (1 shovel shaped, 1 snowshoe shaped)
- 2 caribou hooves (1 shovel shaped, 1 snowshoe shaped)

Videos

- ***High Tech on the Tundra***, 20 minutes
- ***Reindeer Queen***, 28 minutes

CD-ROMs

- ***Reindeer Herding in Alaska***
  - UAF Jukebox series, an interactive oral history program
- ***Reindeer Visual Aids***

1. PowerPoint slide shows:

- Adaptations of Reindeer to Life in the Arctic
- History of Reindeer in Alaska
- Radio and Satellite Telemetry
- Eskimo Ice Cream

2. Images (see samples on the following page):

- Cartoon drawings of reindeer biology and behavior
- Graphs and maps
- History photos
- Reindeer photos
  - Fairbanks farm reindeer
  - Seward Peninsula reindeer and activities

Where do Reindeer Come From?

Reindeer and caribou share the same genus and species name, *Rangifer tarandus*. Reindeer are a semidomesticated subspecies of *Rangifer*. They were probably domesticated along the Russian-Mongolia border five to seven thousand years ago, and might have been first used as decoys to help hunters catch wild game. Once domesticated by the nomadic tribes of this region, they pulled sleds and supplied meat, clothing, and milk. Their domestication spread throughout Russia and Scandinavia, where raising and herding reindeer is still a way of life today. Reindeer did not arrive in North America until the 1890s.

Reindeer and caribou taxonomic chart:

Kingdom:	**Animalia**
Phylum:	**Chordata** (backbone with spinal cord)
Class:	**Mammalia** (milk producing)
Subclass:	**Ungulata** (hooved)
Order:	**Artiodactyla** (even-toed)
Suborder:	**Ruminantia** (true ruminant)
Family:	**Cervidae**
Genus:	**Rangifer**
Species:	**tarandus**

Different subspecies of reindeer and caribou exist throughout the Circumpolar North. The subspecies name is an additional name added to the genus and species name to further classify the animal. In Eurasia, reindeer are classified as either domesticated or wild. Only in North America are indigenous (wild) *Rangifer* referred to as caribou.

There are seven subspecies of *Rangifer:*

Rangifer tarandus tarandus: Eurasian tundra reindeer found in Alaska and in parts of Eurasia

Rangifer tarandus fennicus: Eurasian forest reindeer found in the forested areas of Russia

Rangifer tarandus platyrhyncus: Svalbard reindeer found on Svalbard Island

Rangifer tarandus granti: the caribou subspecies found in Alaska and the Yukon

Rangifer tarandus groenlandicus: Barren ground caribou found in Greenland and Northern Canada

Rangifer tarandus caribou: Woodland caribou found in Central and Southern Canada

Rangifer tarandus pearyi: Peary caribou found in the far northern Arctic Islands of Canada

4. History of Reindeer in Alaska

(sample lesson plan from *Reindeer Roundup!*)

Grade 5 - 9
Subject History
Duration 2 hours

Alaska Content Standards H.B.3, H.C.3
Cultural Standards for Students A.3, E.5
Cultural Standards for Educators B.3, B.4, E.5

Instructional Goal

Students will gain a historical understanding of the history of the reindeer in Alaska, explore various cultural lifestyles, and synthesize historical information in chronological order.

Performance Objective

Students will listen to or view an account of the history of reindeer in Alaska. Students will identify important events and complete a timeline.

Materials

PowerPoint slide show entitled ***History of Reindeer in Alaska*** (on the ***Reindeer Visual Aids*** CD-ROM)

Reindeer History Timeline worksheet for each student (photocopy master on page 60)

Video, ***The Reindeer Queen*** (included in this kit)

Background

By the late 1880s, there were reports of starving Alaska Native populations in western Alaska due to the decimation of marine mammals from the whaling industry and scarce numbers of caribou. Dr. Sheldon Jackson, a U.S. general agent for education and a Presbyterian missionary, lobbied for federal monies to assist Alaska Natives. He built mission schools and in the late 1800s introduced reindeer into Alaska from Russia as a source of protein and revenue. Reindeer were brought to Alaska on Captain Healy's U.S. Revenue Cutter, the *Bear*. Siberian herders and then Saami herders were brought to western Alaska to teach Native Alaskans how to herd reindeer. The reindeer industry grew until there were over 600,000 animals present in the 1930s. Mismanagement and losses to wolves and caribou sparked a dramatic decline to only 50,000 reindeer by the 1950s. The Reindeer Act of 1937 allows only Alaska Natives to own reindeer. Today there are approximately 30,000 throughout the state and 20,000 in western Alaska, with most living on the Seward Peninsula and in island herds.

Mary Antisarlook, or "The Reindeer Queen," was the first Native Alaskan woman to own reindeer.
—PHOTO FROM *WHERE DID REINDEER COME FROM?*, BY ALICE POSTELL, 1990, P. 33

Procedure

1. Show your class the ***History of Reindeer in Alaska*** slide show using the accompanying slide index in **Appendix B** on page 170 for assistance, or create your own slide show using the same pictures found on the ***Reindeer Visual Aids*** CD-ROM.

2. Pass out the **Reindeer History Timeline** worksheet and have the students complete it during the slide show presentation or afterward.

3. Discuss the historical significance of the events on the timeline worksheet.

4. Show the video, ***The Reindeer Queen***.

Extensions

1. View the oral history Jukebox CD-ROM, ***Reindeer Herding in Alaska,*** included in this kit. Assign groups of students different reindeer herders listed on the CD. Have each group summarize the herders' history and involvement in the reindeer industry in a short report.

2. Use the oral history Jukebox CD-ROM, ***Reindeer Herding in Alaska,*** in other ways for further study and research.

3. Have a reindeer herder or Native elder visit your classroom and discuss their experiences with reindeer and reindeer herding.

Assessment

Accurate completion of worksheet—see answers below.

Quiz—from the events on the timeline, choose five and record them out of order on a paper or the board for the students. The students must number them in chronological order.

Answers to the history timeline worksheet:

1892 – K

1894 – E

1900 – D

1901 – H

1908-1914 – F

1914-1929 – B

1930 – C

1937 – I

1950 – G

1968 – A

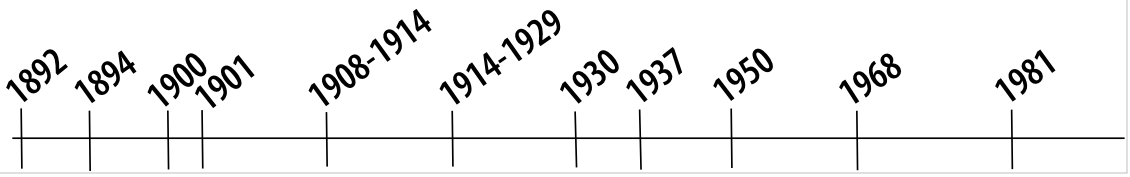
1981 – J

Reindeer History Timeline

Complete the timeline by placing the letter of each event below the correct year.

—Photo from *Where Did Reindeer Come From?*, by Alice Postell, 1990, p. 40

A. The Bureau of Indian Affairs takes over issuing range permits.
B. Lomen Brothers had successful reindeer business.
C. Over 600,000 reindeer in Alaska
D. Gold is discovered in Nome
E. Saami herders arrive in Alaska to assist Native Alaskan herders
F. Increase in Native reindeer ownership
G. 25,000 reindeer in Alaska due to wolves, caribou and disorganized herding.
H. Mary, the Reindeer Queen, has Alaska's largest herd.
I. The Reindeer Act is passed.
J. The Reindeer Research Program at UAF is formed.
K. Sheldon Jackson brings reindeer to Alaska.



Timeline shown at approximately 45 percent actual size in curriculum.

Susan Willsrud and Calypso Farm

by Deirdre Helfferich

Susan Willsrud is one of those people who radiates cheer and health: her vivacious demeanor and bright intelligence complement her easygoing, relaxed attitude. The tell-tale dirt under her fingernails and on her sandaled feet are hallmarks of her work as a farmer and gardener. She's also the mother of two children and a founder of an innovative agricultural education center. Willsrud, the programs director and president of the board of directors for Calypso Farm and Ecology Center, is a graduate of UAF. She received a master's in science in natural resource management from the School of Natural Resources and Agricultural Sciences (then the School of Agriculture and Land Resources Management) in 1998, having previously received a bachelor of arts in zoology and botany from the University of California Davis. Willsrud's background in sustainable agriculture, field biology, soil science, volunteer organizing, wildlife rehabilitation, and environmental education have served her well in creating and expanding the small but successful center. She and her husband, Tom Zimmer, the assistant director of Calypso, are the driving force behind this small farm near Fairbanks, Alaska.

Calypso Farm is a nonprofit educational farm about fifteen miles to the southwest of Fairbanks, at the 64th parallel. The farm is situated on thirty acres on a hill in the boreal forest (mixed birch, alder, aspen, willow, and spruce). About two acres so far are under cultivation. The mission of the center is to encourage local food production and environmental awareness through hands-on education in natural and farming ecosystems. Land was cleared in 1999 with the help of the Tanana Chiefs Conservation Corps, and the first crops were available in 2001. Willsrud manages the Community Supported Agriculture (CSA) program, where CSA members, or shareholders, pay at the beginning of the season for a share of the season's harvest. Shareholders receive a weekly basket of produce and a newsletter with recipes, gardening tips, and farm news and announcements. The vegetables, fruits, and herbs from the farm are grown without pesticides and in accordance with organic growing principles, and picked the day of distribution. There are currently about 40 shareholders. There are around six farms in Alaska that operate on Community Shared Agriculture principles, most of them in the Tanana Valley. As of 2000, there were over 1,000 CSAs in the United States. Calypso Farm is the first such CSA/educational center in the state of Alaska, and has inspired the development of other CSAs in the area.

Fennel stalks grown at the farm and waiting for pickup by CSA shareholders.
—Photo courtesy Calypso Farm & Ecology Center

Educational programs at Calypso include the Schoolyard Garden Initiative and Employing Alaskan Teens in Gardening (EATinG). These two programs

Opposite: The Calypso farm truck brings chives, spinach, and other freshly picked herbs, vegetables, and fruit twice a week to the nearby Ester Community Park, there to await pickup by shareholders.
—Photo by Deirdre Helfferich, AFES Publications Office

Left: terraced rows of vegetables on the farm. Aspens and spruce are in the forest beyond. A catchment pond helps keep the farm supplied with water.
—Photo courtesy Calypso Farm & Ecology Center

were created to provide hands-on educational opportunities for children and to highlight healthy, local food production in the community. The Schoolyard Garden Intiative goal is to create a network of school gardens that will function as experiential learning environments for teachers and students during the school year, and to produce food during the summer. The EATinG program employs high school students in meaningful work to maintain these school gardens during the summer. Howard Luke Academy, the pioneering school involved in this program, collaborated with Calypso Farm to establish a garden and employ students in 2003. The students will operate their own CSA program, which should help to ensure that the gardens are maintained during the summer and contribute to the financial well being of the program. If all goes well, by 2008 this program should expand to three school gardens in the Fairbanks North Star Borough School District, and will include elementary, middle, and high schools. Every summer the farm also has a oybkuc workshop series featuring such topics as garden planning, drip irrigation, composting, organic gardening, and soils. The farm staff conduct tours and field trips, and visit area schools. The center also maintains a resource library open to the public, and provides organic gardening consulting services.

Calypso Farm partners with the Interior Alaska Center for Non-Violent Living in a new program called Shares for the Shelter, begun in 2003. The center is a shareholder and benefits from the fresh produce. Shelter residents come to the farm every week during a twelve-week summer program to work on a special garden plot set aside for them. There is also a special children's garden for those staying at the shelter. The children participate in ecological games and lessons, as well as planting, tending, and harvesting the crops in their garden. The Stone Soup Café, a local soup kitchen, benefits from Calypso Farm, which delivers to the café produce shares donated by subscribers.

Willsrud did fieldwork on mosses while working toward her master's degree, and recalls the fascination she found in the microclimates and ecologies in which they grew. Her experience with them and local soils, she says, coupled with working on organic farms in California, provided a good background for planning Calypso.

you can find out more about Calypso Farm & Ecology Center by visiting their website at http://www.calypsofarm.org

for more information on Community Supported Agriculture, visit http://www.nal.usda.gov/afsic/csa/

THE WILDLIFE VIEWING CHALLENGE

by Doreen Fitzgerald with Peter Fix

Northern fur seals.
—PHOTO BY NORMAN R. HARRIS

In 1996 24 million Americans took 266 million trips primarily to see wildlife.

•

Recreation researchers predict that participation in wildlife viewing will increase faster than the rate of population increase, and that the Pacific region, which includes Alaska, will experience the highest rate of increase.

•

Nationally, birdwatching has increased 155% recently—growing more than any other outdoor recreation.

•

The opportunity to view wildlife already ranks second in importance to prospective Alaska visitors.

•

There is ample opportunity for growth in this aspect of Alaska's visitor industry. Thirty-six percent of Americans take trips primarily to view wildlife, but for Alaska visitors, wildlife viewing is the primary reason for only three percent.

•

Visitation at the Pack Creek brown bear viewing area has grown from about 100 people in 1981, to 1400 in 1997, despite a large increase in permit cost.

•

78% of Alaska residents and 74% of visitors surveyed want to know more about how to find and watch wildlife.*

•

Alaska's abundant wildlife and growing interest in wildlife viewing challenge public land managers to create opportunities for this recreation. Managers face many questions. Who wants to view wildlife; what experiences do viewers desire and expect; what information do viewers need? What are the social benefits of wildlife viewing; can people benefit; can wildlife benefit? What information is needed for planning; how can manager get it; how can they use it?

One concept available to managers is experience-based management (EBM), which was the subject of a two-day April workshop for Alaska land managers. Sponsored by the SNRAS Department of Resources Management, the Alaska Recreation and Parks Association, and the U.S. Fish and Wildlife Service, the workshop explored EBM in the context of wildlife viewing and engaged participants in dialog about the lands they manage and the people who visit them.

Public land agencies allocate access, manage the natural environment, and regulate the behavior of people who visit these areas. At one time, managing the wildlife component of public lands was primarily game management: managing wildlife to provide a supply of game for hunting, which was an important food-producing activity for a U.S. population that was primarily rural. Today, hunting is mainly a field sport for an urban population. With demographic and other changes, participation in hunting and fishing has declined, yet interest in wildlife hasn't waned, and interest in wildlife viewing continues to grow. The workshop focused on managing for nonconsumptive recreational wildlife experiences (activities other than hunting and fishing).

Workshop presenters were Michael Manfredo, editor of *Wildlife Viewing: a Management Handbook* and head of the Department of Natural Resource Recreation and Tourism at Colorado State University; Doug Whittaker of Confluence Research and Consulting in Anchorage, who has more than fifteen years experience conducting natural resources management research in Alaska; and Peter Fix, assistant professor of outdoor recreation management at SNRAS, who is involved in developing research programs with federal and state agencies throughout Alaska.

Workshop participants represented lands as varied as the "roaded wilderness" of the Dalton Highway; the Tongass National Forest, where most visitors are cruise ship passengers from urban areas; the White Mountains, where most visitors are local recreationists; the Tetlin National Wildlife Refuge, where most visitors have driven thousands of miles from outside Alaska for their trip of a lifetime; and the Gates of the Arctic National Park and Preserve and Arctic National Wildlife Refuge, where visitors seek roadless wilderness adventure in remote settings.

People who want to use public lands for nonconsumptive recreation are as varied as the land. In his paper "Understanding the market for sustainable tourism," researcher Paul Eagles identifies four types of outdoor recreation activity occurring in the natural environment: **ecotourism, wilderness use, adventure travel,** and **car camping**. "Ecotourism involves travel for the discovery of and learning about wild natural environments," he said. "Wilderness travel involves personal recreation through primitive travel in natural environments that are devoid of human disturbance. Adventure travel is personal accomplishment through the thrills of dominating dangerous environments. Car camping is safe family travel in the interface between the wild and the civilized." Eagles profiles these activities and looks at the participant motivations, environmental attitudes, social motives, as well as demographics and economics. When considering the differences between these profiles, it's interesting to note that a person interested in wildlife viewing as a primary or secondary activity might fit any one of them.

The EBM approach to recreation planning takes into account three elements: the activity (activity opportunity), setting preference (setting opportunity), and satisfactions (experience opportunity). "Using this approach, managers find out what kind of experiences their visitors value and look for ways to manage their areas accordingly," said Fix, "for example, whether or not to develop a visitor center, what type of information to provide, or what kind of limitations to establish."

Motivation and Management

What makes a person choose wildlife viewing for recreation? Human motivation is the basis for experienced-based management. Several motivational forces create the demand for satisfying experiences, including but not limited to: solitude, stress release, competence (achievement, improving oneself in some way), family, learning, nature. One assumption of EBM is that better management, and ultimately more benefits to society, can result from better knowledge about participant motivation.

Many managers at the workshop expressed the view that they needed more basic information about their visitors and the experiences desired. Is the goal viewing a particular species or general wildlife? Are visitors more concerned that the location is remote or natural? Are they on a camping or day trip? Are they more interested in isolation or social interaction (campground, tour, visitor center)? Did they want information about animals and habitat along with the viewing opportunity, or was seeing the animal enough? Some of the possibilities for gaining detailed information on wildlife viewers are agency-approved, scientifically valid surveys, the use of visitor journals, and wildlife viewing listserves.

In EBM, the viewing opportunity is seen as a conjunction of the activity, the motivation (individual experience desired), the setting (benefit opportunity), and management. The goal to is to combine these factors in such a way as to produce the desired experiences.

In the Denver area, for example, Manfredo and Larson investigated motivation for wildlife viewing, constraints on participation, preferred settings, and the responder's history

as a wildlife viewer. From the results they identified four types of preferred experience: high-involvement experience desired by people reporting such motivations as skill testing, nature study, solitude, and exercise; creative experience associated with motivations of tranquility, stress release, family experience, nature setting, and creative activity (photography, painting, etc.); generalist experience associated with scenery, relaxation, change of pace, escape, new experiences, family; and occasionalist experience marked by motivations of scenery, change of pace, family, new experiences.

Wildlife viewers differ in their preferred settings. In managing for high-involvement and creativity experiences, a manager would strive to enhance the process of experiencing wildlife, provide in-depth wildlife information (how and when to view), maintain a high degree of naturalness at the site, facilitate self-discovery, control or limit access (these people are willing to wait in line for something that's a little better). The manager could expect from these visitors the self-enforcement of appropriate behavior, and they will demand a high involvement with managers—attending meetings, writing letters, volunteering, etc. For visitors in the creative experience category, solitude is less important. They will want information on where and how, but be less demanding regarding the management process than the high-involvement category. Wildlife viewers in the generalist or occasionalist categories usually want easier access, more developed facilities, and are more likely to want social contact. Clearly, one size does not fit all, so the manager needs to assess current and potential visitors, as well as viewing opportunities.

Wildlife Value Orientation

Manfredo talked about how the wildlife viewing trend in the United States may result from value change, a hypothesis that provides a culture-based explanation for shifting values in society towards natural resources and wildlife. He described the results of a study that examines wildlife values in six western states, their association with wildlife viewing participation, and factors that are affecting values. He related the shift away from hunting and fishing to a shift in cultural values as our society has moved through the technology-driven phases of industrialization to post-industrialization; from a primarily rural, agriculture-based economy to a primarily urban, factory-based economy, to today's post-industrial, service-based economy. As technology, economy, demography, ideology, and environmental interactions change, so do cultural values related to the environment. In cultures worldwide, there is a trend towards the nonconsumptive enjoyment of wildlife viewing. For people in post-industrialized nations, viewing is or will become the primary means of association with wildlife.

Value orientation is important because it shapes how people think about a whole range of issues and affects both viewers and managers. Researchers have developed the concept of a wildlife-protection/wildlife- use continuum (Fulton et al., 1996). It is represented at one extreme by such attitudes as anti-hunting, wildlife rights advocate, anti-wildlife use (the ideal world for this camp is to be able to walk out the door and have wildlife all around). At the extreme wildlife-use end of the continuum, attitudes include pro-hunting and fishing, no animal rights, no regulations (the study was intended to represent the general population of the six states and thus is not representative of the Native American population).

During the discussion on values, one workshop participant pointed out that Alaska has a small group of extremists of the "shoot everything," utilitarian persuasion and a small group of extremists of the "kill nothing" persuasion, but that the majority of people are somewhere in between. For example, one might be a hunter, but oppose aerial shooting of predators or bear baiting; be an avid fisherman, but support catch and release restrictions.

Managers also have differing values, or philosophical orientations. According to Manfredo, traditional wildlife management has emphasized ensuring that healthy wildlife populations are present for either nonconsumptive or consumptive recreation, with hunting viewed as a tool used to controlling wildlife populations. He added that management for wildlife

Watching bald eagles.
—Photos by Norman R. Harris

viewing recreation has been driven by an 'impact intolerance rule'—viewing is all right if it doesn't affect the wildlife.

Managers' orientations to wildlife viewing recreation can range from high-protection values to high-service values. In one workshop exercise, participants answered a survey Manfredo designed to show responders where they stand on wildlife management. The goal was awareness of how a manager's academic tradition influences their approach to the job of recreation management. Responders fall into one of four categories:

1. **High protectionist** management philosophy: inconsistent with prevailing recreation management paradigm; common in people with training in one of the disciplines with a biological tradition.

2. **Slight protectionist** management philosophy: more moderate than group one; open to service view, but roots are in the protection area; reasonable candidates for blending service and protection philosophy.

3. **Slight service** management philosophy: leaning towards service philosophy, but more moderate than group four, the high-service management philosophy group; open to protection view; well-suited for developing recreation management programs that will rally the support of the public; good potential for bridging the protection-service gap.

4. **High service** management philosophy: well suited for developing management programs that will rally the interest of the public, but out of step with the prevailing protectionist paradigm; common in people trained in recreation, tourism, public administration, or business tradition.

Of the workshop participants, most were in group three, three were in group four, one was in group two, and none were characterized by group one.

"Provision of wildlife is not an end in itself, but a means to an end—there is nothing about the resource itself that tells us how to manage it—in the end the question is what will benefit people," Manfredo said. "The inputs considered are wildlife populations, people's expectations and motivations, educational materials, site development and management, visitor centers, interpretation. The outputs are personal and societal benefits. The biological situation facilitates and constrains the availability of opportunities and there are limits on what is acceptable. The management goal is to find the intersection between meeting demand, ensuring safety, and protection."

Opportunities, Indicators, & Standards

Although managers do not create visitor experiences, they manipulate conditions to create opportunities for experiences. A manager with the service philosophy orientation to recreation management wants to provide a range of experience types that are of high quality, which requires understanding and defining what wildlife viewing opportunities are possible and desirable for an area. Important to the process of defining opportunities is making a clear distinction between experience type and quality; the roadside view of a moose and the remote, solitude-oriented viewing experience are different, but neither type is inherently of higher quality.

Opportunities range from primitive to urban, a spectrum that drives management. Other important factors are demand and supply, budgets, and existing mandates about land use. One way to think of about developing opportunities is to look at people's desired experiences as falling along various continuums, such as the ones identified during workshop discussion: **solitude-remoteness** (number of people encountered-distance from roads and structures); **comfort-convenience** (self-reliance and risk); **scenic landscape-specific species** (desired viewing goal); and **self-directed learning-directed learning**.

Qualitative definitions can be developed for various opportunity types, and quantitative standards and impact indicators can be used to evaluate quality and make management decisions. Consultant Doug Whittaker introduced these concepts. An indicator is a biophysical, social, managerial, or other

condition (impact variable) that is important to managers and visitors for a given experience. A standard is a quantitative restatement of management objectives. The standard specifies the appropriate levels or acceptable limits for the impact indicators—how much of a given impact variable is too much. It includes limits for certain conditions, for example, number of other humans encountered, instances of wildlife flight, incidents of human-wildlife conflict. Whittaker used examples from his Alaska research as illustrations. One such study was conducted at bear viewing platforms at Brooks River in Katmai National Park. Study results suggested that the standard for number of people on a platform should be set somewhere between 25–40, depending on which platform and the time of year. Results also suggested that increasing capacity while maintaining high quality would require adding several smaller viewing platforms rather than a few large ones.

Workshop participants discussed whether or not standards were a good thing from a management point of view. Standards tie managers hands, or lock them into providing something, which was viewed by some as positive, by others as negative.

A workshop discussion on Alaska challenges and opportunities for wildlife viewing included these points:

Alaska isn't a statewide zoo; visitors are set up for disappointment when marketing leads them to believe they'll see everything in a few days (bear, caribou, puffins, moose…); visitors could be educated that wilderness areas are vast and wildlife doesn't play along the road; it makes sense to focus attention on Alaska's entrance points for visitors (cruise ships, visitor centers, etc.) to help them achieve realistic expectations for wildlife viewing.

Visitors often don't have the skills involved in wildlife viewing; we should respect where tourists are coming from rather than engaging in the "dumb tourist" syndrome.

Regional collaboration would be an opportunity to resolve the problem of "every place is everything to everybody" by making sure there's enough of each type of experience within the state.

We think in terms of facilities when it comes to attracting visitors, but **what people want is security or safety and close viewing** opportunities; although different visitors want different things, a strong attracting motivation for wildlife viewing is close encounters; management could increase proximity to wildlife and provide interpretation to make the wildlife encounter more realistic.

The **overall landscape is just as important** as the wildlife itself (seeing the wildlife in a landscape as close to pristine as possible). When wildlife viewing is taken in context and considered part of a bigger experience there is higher satisfaction than very goal-oriented wildlife viewing. Disappointed visitors are hunters who don't get an animal, climbers who don't summit the peak, wildlife viewers who want to see a particular animal up close.

Scenic views can be just as important to wildlife viewers as the animals that inhabit these landscapes.
—PHOTO BY NORMAN R. HARRIS

Satisfaction depends on whether Alaska is a destination or part of a larger experience (traveling to a lot of places and ticking them off a list); people are coming for shorter time periods to Alaska than they used to, which we can't fix, but we can tailor their experience better; people have egos and want to feel that they saw something special, which is why tour guides say "this was the best trip we've ever led" at the end of each tour. A solution might be to actually find something special in each trip and focus on the uniqueness of that particular thing.

Supply, Demand, & Economic Analysis

"There's more to EBM implementation than discovering people's motivations," said Fix, who focused his workshop presentation on taking the information regarding motives

Mountain goat and kid.
—PHOTOS BY NORMAN R. HARRIS

and determining the appropriate allocation of resources. "Planning involves defining experiences, assessing demand and supply, determining allocation, and implementation at the state and local level."

After desired experience is identified and defined, managers need to assess both what they can provide and the demand. "It's important to look at the available resources along with visitors' desired experiences," Fix said. "There's no point in building a lookout when there is nothing to look at. Assessing supply involves looking at both existing and potential resources to answer the question: in what ways can we combine the resources we have to produce the experiences people want? It also requires determining allocation and balancing recreational demand with what can be provided from a biological standpoint."

Demand can be determined from surveys of users and the general population. "Because demand exists at the site, local, and regional levels, you must first define a population to survey," Fix said. He also pointed out that research should be interdisciplinary and interagency.

In the article "Economic Considerations in Wildlife-viewing Planning," Fix and others explored two aspects of economics as a tool to assist in the allocation process: 1) economic impacts on communities, and 2) economic benefits to viewers. "Economic impacts are a measure of jobs and income supported by wildlife viewers," Fix said. "However, these economic impacts result from an expense to the wildlife viewer. The economic benefit to the wildlife viewer is the amount the viewer is willing to spend on the wildlife viewing trip, minus what is actually spent, which is defined as a consumer surplus. The appropriate analysis differs, depending on the geographic location of the study site and the goals of the program that is being evaluated."

Workshop participants also discussed the importance of looking at potential management actions in terms of their consequences. For example, if surveys show that many visitors to an area are elderly, a logical proposal might be to construct some stable trails or walkways. However, this could change the experience for the nonelderly, or change the way wildlife uses the area.

Other topics were interagency cooperation; the steps agencies, nongovernmental organizations, and outfitters could take to apply experienced-based management; and actions that could promote these management concepts.

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More Information

Alaska Department of Fish and Game: http://www.adfg.state.ak.us/

Alaska Wildlife News: http://www.wildlife.alaska.gov/pubs/wildlife_news

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Ursus arctos, *grizzly bear or brown bear, one of the top ten most popular animals to view in Alaska.*
—Photo courtesy Reindeer Research Program

WILDLIFE VIEWING TIPS

Choose your season.

Dawn and dusk are the best times to view most wildlife

Learn the feeding habits of your quarry.

Use binoculars or a spotting scope.

Move slowly and quietly.

Fade into the woodwork.

Look for animal sign.

Use field guides.

Ask an expert.

Be patient.

Viewing Ethics

Give wildlife plenty of space. Binoculars and spotting scopes allow you to view wildlife without getting too close. Approach wildlife slowly, quietly, and indirectly. Always give animals an avenue for retreat.

Try to view animals without changing their behavior. Avoid using calls or devices that attract wildlife. Resist the temptation to throw rocks to see a flock fly. Remember—harassing wildlife is illegal.

Be respectful of nesting and denning areas, rookeries, and calving grounds. Well-meaning but intrusive visitors may cause parents to flee, leaving young vulnerable to the elements or predators. Stay on designated trails whenever possible.

Leave "orphaned" or sick animals alone. Young animals that appear alone usually have parents waiting nearby.

Restrain pets or leave them at home. They may startle, chase, or even kill wildlife.

Let animals eat their natural foods. Sharing your sandwich may get animals hooked on handouts; it may even harm their digestive systems. These animals may eventually lose their fear of cars, campers, or even poachers.

Learn to recognize signs of alarm. These are sometimes subtle. Leave if an animal shows them.

ALASKA'S TEN MOST WANTED

Here are the ten species almost everyone would like to see, plus information about habitat and behavior, viewing tips, and where and when you're most likely to find them.

Bald Eagle *(Haliaeetus leucocephalus)*: Habitat: Throughout Alaska, except the Far North; especially plentiful along the coast in Southeast and Southcentral Alaska. Viewing tips: Eagles congregate around waterfront food sources, particularly in places where fish are spawning or schooling, and are most active in the early morning. Hot spots include the Chilkat River Valley (late October to December); the Stikine River Flats (spring); and Admiralty Island and Prince William Sound (summer).

Brown *(Ursus arctos)* and **Black Bear** *(Ursus americanus)*: Habitat: Black bears are found in forests; inland brown bears (commonly known as grizzlies) generally in open, treeless areas; coastal brown bears in forested and mountainous areas. Viewing tips: Bears are most commonly seen during evening hours, feeding on vegetation in late spring and fishing for salmon in summer and early fall. Look for them on beaches, in alpine tundra, and in lush subalpine meadows.

Caribou *(Rangifer tarandus)*. Habitat: Arctic tundra and alpine tundra near or above the timberline; taiga forests in winter. Viewing tips: Wildlife viewers can easily find small numbers of caribou to watch; viewing large numbers generally requires the use of aircraft, since Alaska's largest herds inhabit remote, roadless areas of the state. Hot spots are the northern section of the Dalton Highway, Denali National Park, the Denali Highway, the Richardson High way between Sourdough and Paxson Lake (August, September, October, and April); the Glenn Highway near Eureka (winter); the Alaska Highway between Tok and the Canadian border (November to March); and the Kenai River Flats (mid-April to mid-October).

Dall Sheep *(Ovis dalli)*. Habitat: Open, alpine ridges; meadows; steep slopes with rugged cliffs. Viewing tips: The best time to observe sheep is during May and June, when they descend to the snow-free slopes of lower elevations. Observe which way sheep are traveling and let them graze toward you. Hot spots include Denali National Park; Cooper Landing on the Kenai Peninsula; Sheep Mountain along the Glenn Highway; Atigun Pass on the Dalton Highway; and Windy Corner on the Seward Highway.

Humpback Whale *(Megaptera novaeangliae)*. Habitat: Nearshore waters along the southern coast of Alaska. Viewing tips: Look for the clouds of vapor humpbacks force from their blowholes as they surface and exhale, and listen for the explosive whooshing sound. When humpbacks dive, they often lift their flukes (tails) out of the water. In Alaska, the largest concentrations of humpbacks are in Southeast, in Prince William Sound, near Kodiak and Barren Islands, between Semidi and Shumagin Islands, in the eastern Aleutians, and in the southern Bering Sea.

Moose *(Alces alces)*. Habitat: Spruce forests; freshwater marshes; willow thickets; Interior river valleys. Viewing tips: Look for browsing areas in the early morning and at twilight, especially along highways where roads are close to rivers and ponds. Moose are commonly seen in the Mat-Su Valley, on the Kenai Peninsula, and in the Anchorage Bowl.

Muskox *(Ovibos moschatus)*. Habitat: Arctic tundra; grassy river valleys, lakeshores, and meadows in summer; wind swept hilltops and slopes where vegetation is exposed in winter. Viewing tips: Wild herds can be seen on Nelson and Nunivak Islands, on the Seward Peninsula, on the coastal plain of the Arctic National Wildlife Refuge, and occasionally along the Dalton Highway north of Atigun Pass.

Puffin: Horned *(Fratercula corniculata)* and **Tufted** *(Fratercula cirrhata)*: Habitat: Coastal islands and headlands during breeding season; marine waters in winter. Viewing tips: The best viewing is in summer. Look on steep, grassy slopes and cliffs near the top of established seabird colonies. Hot spots include the Pribilof Islands, Glacier Bay, the Kenai Fjords, St. Lawrence Island, Gull Island in Kachemak Bay , St. Lazaria Island, the Barren Islands, and Walrus Islands in Bristol Bay.

Sea Otter *(Enhydra lutris)*. Habitat: Shallow coastal waters from Southeast Alaska to the Aleutian Islands. Viewing tips: Look in protected bays and inlets, especially near kelp beds. Mothers often anchor their young in kelp while foraging. Check rocks in the tidal zone during low tide for hauled-out otters. Hot spots include Prince William Sound, the outside coast of Southeast Alaska, Kachemak Bay, Kodiak Island, and the Kenai Fjords.

Wolf *(Canis lupus)*. Habitat: A wide variety of habitats from the temperate rainforest of Southeast Alaska to arctic tundra. Viewing tips: Look in large, open river beds and tundra areas. Search for tracks in soft soil and snow. From mid-May through August, most wolves center their activities around den and rendezvous sites. They are usually active during the early morning and evening. Listen for wolf howls, especially during the breeding season in February and March. Hot spots include the northern mountains and foothills of the Brooks Range, the Alaska Range (including Denali National Park), and the Chugach, Wrangell, and Talkeetna Mountains.

"Alaska's Top Ten," "Wildlife Viewing Tips," and "Viewing Ethics" are excerpted from material found on the Alaska Deptartment of Fish and Game website **http://www.adfg.state.ak.us/**. It is reprinted courtesy of Watchable Wildlife, Inc. a nonprofit group organized to advance wildlife viewing as a viable economic and conservation enterprise for communities throughout Canada, the United States, and Mexico. Watchable Wildlife (**http://www.watchablewildlife.org**) is committed to helping local communities realize the economic potential of nature-related recreation while conserving native plants and animals in their natural habitats. Alaska is one of the organization's member states.

Taxonomy and Evolution of Alaska's Birches

by Edmond C. Packee

The quest for new and useful chemicals from plants is a worldwide one—a search in which the differentiation between similar plant species could be vital. For practical reasons, the intermingling of Alaska's three major birch tree species for lumber, engineered wood, composite wood products, or pulp is probably not a problem. However, in the developing phytochemical industry there may be serious species implications.

Currently, the pharmaceutical properties of the bark of *B. kenaica* and *B. neoalaskana* are being investigated by the University of Alaska Fairbanks School of Natural Resources and Agricultural Sciences in cooperation with the University of Minnesota Duluth Natural Resources Research Institute. This effort addresses two questions: 1) Is there a difference between the two species, and 2) How do the two Alaska species compare to Minnesota birch and Siberian birch in terms of chemicals present and their quantity per pound of raw material? This and additional information may shed light on such ecological questions as: Why do moose browse one species and caribou another? What impact does leaf litter of the species have on soil properties?

Birches are found throughout much of Alaska, throughout the Northern Forest and the wet and alpine tundra. They are sparse or absent from much of the Coastal Forest Zone east of the Kenai Peninsula, except from Glacier Bay to Taku Inlet of Southeast Alaska, on the Aleutian Islands, and on most of the northern Coastal Plain.

Alaska birches have value as a fiber species (lumber, veneer, furniture, cabinetry, pulp, fuel), browse (for moose, hares, insects); food (syrup, beer), pharmaceuticals, aesthetics, and as an important early successional species following fire. (See page 27 in this issue for information on the use of birch trees in the former Soviet republics.)

The birches belong to the genus *Betula*, a genus named by Linnaeus in 1753. The genus *Betula* belongs to the family Betulaceae, which includes the alders *(Alnus)*, the hornbeams *(Carpinus)*, hop-hornbeam *(Ostrya)*, and hazel *(Corylus)*. In Alaska, only the alders and birches represent the family Betulaceae, which is ancient; fossil ancestors date back to at least the late Cretaceous period, 89 to 65 million years ago. Alaska birch leaf fossils and petrified wood can be found in coal and associated rocks that date back to at least the Middle or Late Miocene (14 to 5 million years ago) (Ager 1997; Albanese and Goff 1987). Hopkins and other (1971) found remnants of a spruce-birch forest in the sediments under a 5.7-million-year-old lava flow south of Cape Deceit, Alaska.

During the Pleistocene, the most recent period of major glaciations, from 1.8 million years ago to 10,000 years ago, nine glacial periods are believed to have occurred in North America. At one time, these glacial periods were summarized into four major epochs, from most recent to oldest: Wisconsinian, Illinoian, Kansan, and Nebraskan. Today, only the last two are emphasized. The period since the end of the Pleistocene, from 10,000 years ago to the present, is referred to as the Recent; climatically it has seen some minor glacial advances, but has seen temperatures as great or greater than at present.

In Alaska and the adjacent Yukon Territory, there is evidence for four or five glaciations of Pleistocene Age (Hamilton 1994; Jackson et al. 1999), and there is strong evidence for the Wisconsinian (90,000 to 14,000–11,000 years ago), the Illinoian (200,000 to 132,000 years ago), and the interglacial (Sangamon) epochs. Before the Illinoian, the climatic record and surficial geology evidence is inadequate or lacking. During the Sangamonian Interglacial, the glaciers and permafrost all but disappeared from Alaska. The climate was considerably warmer (6° to 9° F.) and probably moister than at present (Jackson et al. 1999). Because of the warmer and moister conditions, as evidenced by the great amount of fern pollen, the boreal forest was greater in extent than now and included both tree and shrub birches. During the Recent period, with cooler and dryer temperatures than during the Sangamonian Interglacial, the birches were again present; they may have survived in Alaska in nonglaciated areas referred to as refugia.

Thus, birch species have been in Alaska for millions of years and evolved with the changing environment from warmer and moister to much colder and drier than present and warmer again at present. The birches have and continue to play an important role in the ecology of Alaska, with many ecosystem functions, processes, and structures highly dependent upon them.

The Species

Today, worldwide, there are thirty-eight recognized species of birch, with sixteen species native to North America (Furlow 1997). Until quite recently, taxonomists, who characterize and describe species, used morphological characteristics to do so. As more information is gathered, some species are split into two or more species, and some species are lumped together into a single species. All taxonomists do not agree; some have a different approach or perspective on what

constitutes a species. To further muddy the water, no two individuals within a species are exactly alike, unless they are clones.

A particular species of any organism has a common name and a scientific name. Common names can be specific to a particular species, a name applied to several species, or there can be many common names for the same species. Thus, use of only the common name can cause communication problems. Although each particular species should have only one scientific name, some species can have two commonly used scientific names because, as new information leads to changes in classification, there may be a dispute about accepting a particular name, or simply due to traditional use.

The scientific name consists of three or more components: the genus name, the species name, and the authority. The Latin genus and species names are always italicized. Thus, for paper birch, the full name is *Betula papyrifera* Marshall, where *Betula* is the genus name, *papyrifera* is the species name, and Marshall is the authority. The authority, in this case Marshall, is the taxonomist who first described the species accurately. When not confusing, the name of the authority is commonly abbreviated—hence, "Marshall" usually shows up as "Marsh." Occasionally, the scientific name may have a third or even fourth name added after the species name. Such names reflect variations from the normal of groups of individuals that are not sufficient to warrant species designation. Commonly, such groups are referred to as subspecies, varieties, or forms.

In the case of paper birch *Betula papyrifera* Marsh. in Alaska, the variety name is *Betula papyrifera* var. *commutata*, or western paper birch (Viereck and Little 1972). Note that the abbreviation, "var." precedes the variety name and is not italicized. Sometimes, an "x" occurs between the genus and species names; it signifies a recognized hybrid, for example, *Betula* x *sandbergi* is a recorded hybrid between *Betula papyrifera* and *Betula pumila* Linneaus. It is found eastward from the extreme southeastern Yukon Territory (Fralish and Franklin 2002).

Once the scientific name with the authority has been used, it is appropriate to drop the authority name. If there is no possibility of confusion, the genus name can be abbreviated to the first initial, e.g., *Betula papyrifera* Marsh. becomes *B. papyrifera*. Because of the common usage of similar or even the same common names, the discussion that follows, will use the scientific names.

Six species of birch occur in Alaska: Kenai birch (*B. kenaica* W.H. Evans), Alaska birch (*B. neoalaksana* Sarg.), water birch (*B. occidentalis* Hook.), western paper birch (*B. papyrifera* Marsh. var. *commutata* [Regl.] Fern.), resin birch (*B. glandulosa* Michx.), and dwarf arctic birch (*B. nana* L. ssp. *exilis* (Sukaczev) (Hultén) (Fralish and Franklin 2002; Furlow 1997).) Resin birch and dwarf arctic birch are typically shrubs, and water birch is commonly a shrub that locally reaches tree size.

Cody (1996) recognizes five of these as occurring in the adjacent Yukon Territory, where Kenai birch is absent. Viereck and Little (1972) state, "Alaska has two species of dwarf, shrubby birches both widely distributed, and three kinds of tree birches. These are variable and intergrade and hybridize wherever their ranges meet." They recognize the two shrubby birches, resin and dwarf arctic, and a single tree birch, paper birch (*B. papyrifera* Marsh.) for which they recognize three varieties—western paper birch (*B. papyrifera* var. *commutata* (Reg.) Fern.), Alaska paper birch (*B. papyrifera* var. *humilis* Fern and Raup [= *B. neoalaskana*]), and *B. papyrifera* var. *kenaica* (W.H. Evans) Henry [= *B. kenaica*]). They also make reference to *B. papyrifera* var. *commutata* as being the same as *Betula papyrifera* var. *occidentalis* and "not *B. occidentalis* Hook." Their terminology follows that of Hultén (1968); however, Hultén (1968), Cody (1996), Furlow (1997), and Fralish and Franklin (2002) recognize water birch (*B. occidentalis* Hook.) as occurring in the Northern Forest Region as far west as central Alaska. Viereck and Little (1972) considered *B. occidentalis* a hybrid, *B. glandulosa* x *papyrifera*.

Based on the range maps of Hultén (1968), Furlow (1997), and Cody (1996), the tree forms of *Betula* commonly occurring in the Northern Forest of Alaska are *B. kenaica*, *B. neoalaskana*, and *B. occidentalis*. The ranges of these three species overlap. Cody's (1996) range map for *Betula papyrifera* var. *commutata* suggests its possible occurrence in the extreme eastern portion of the Northern Forest Region in Alaska; this is not corroborated by Hultén (1968), Viereck and Little (1972), nor Furlow (1997), who indicate it is confined to coastal Alaska. Furlow (1997) states, "Birches are a difficult group taxonomically because of their high vegetative variability and frequent hybridization." Hultén (1968) states that *B. kenaica* and *B. neoalaskana* form hybrid swarms and suggests that *B. occidentalis* may hybridize with *B. neoalaskana*. Because of geographic influence and the lack of strong differentiation characteristics for the three tree birches, confounded by frequent hybridzation, Viereck and Little (1972) considered all three *Betulae* simply "as three geographical varieties of a single transcontinental species, paper birch (*Betula papyrifera* Marsh)."

The species descriptions below are based on a combination of Viereck and Little (1972), Cody (1996), Furlow (1997), and Fralish and Franklin (2002). Only where there are differences in descriptions are the authors referenced. It is important to recognize that certain differences between species are quite subtle and that the birches are without leaves for more than one-half of the year.

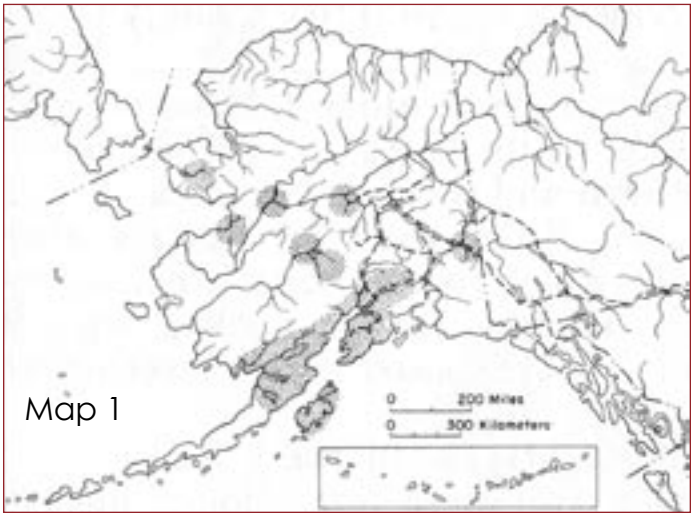
B. kenaica

B. kenaica is commonly called Kenai birch. It is also referred to as Kenai paper birch, black birch, and red birch (Viereck and Little 1972). Fralish and Franklin (2002) and Furlow (1997) indicate that it occurs not only in Alaska, but also the Yukon Territory. Furlow's (1997) range map shows it occurring in west central Yukon Territory. Viereck and Little (1972) state that it is "known only from Alaska." Cody (1996) makes no mention of it in his Flora of the Yukon Territory. In Alaska, *B. kenaica* is the dominant tree birch south of the Chugach Mountains and west of Prince William Sound and Cook Inlet and on the southern half of the Kenai Peninsula,

Figure 1. *B. kenaica*

Kodiak Island, Alaska Peninsula, and in the Bristol Bay area. In these areas, only one other birch occurs, *B. nana*—a low shrub rarely more than three feet tall (Viereck and Little 1972). If there is a tree birch in this area, it is probably *B. kenaica*. Elsewhere, however, things are not so simple. North of the Chugach Mountains and on the northern portion of the Kenai Peninsula and northward its range overlaps with that of two other tree birches. Absent from the Copper River Basin, it occurs locally north of the Alaska Range, where it is found in the Tanana and Yukon valleys. Map 1 shows the Alaska range of *B. kenaica* (from Viereck and Little 1972).

B. kenaica is a forest tree species that can reach heights of eighty or more feet and diameters of eighteen or (rarely) more inches. It occurs on a wide range of habitats, from wetlands and stream banks to ridge tops and southerly slopes with shallow soils. It is rarely found on sites that have annual summer flooding.



Map 1

Mature bark ranges from brownish or reddish to gray or white, often tinged with pink, and it naturally peels in very thin layers (often admitting considerable light). The naturally peeled bark is commonly much thinner than that of *B. neoalaskana*. Lenticels (raised pores in the bark) are black and prominent. Bark of twigs, seedlings, and small saplings is reddish brown to black, often with resin glands, and hairless. Spur shoots are ¼" to more than a ½" long. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish (Fralish and Franklin 2002) or dark brown (Viereck and Little 1972) and less than 3/8" long.

Leaves are oval to triangular in shape, 1½" to 2" long and 1 to 1¾" wide. Leaf margins are more-or-less doubly serrate (two sizes of teeth that point forward); the base is rounded to nearly flat; and the tip is not elongated. The margin has a fringe of whitish hairs. Figure 1 illustrates a typical twig with leaves; the lowest set of leaves are attached to a spur shoot. The female fruit is cone-like and about 1" long.

B. neoalaskana

B. neoalaskana is commonly called Alaska paper birch. It is also referred to as Alaska white birch, Alaska birch, canoe birch, paper birch, white birch (Viereck and Little 1972) and resin birch (Fralish and Franklin 2002; Furlow 1997). Fralish and Franklin (2002) indicate that it extends from Norton Sound, Alaska, eastward into western Ontario. In Alaska it is found as far north as the southern slopes of the Brooks Range, as far south as the Chugach Range, and the Turnagain Arm area, including the northern one-half of the Kenai Peninsula (Viereck and Little 1972). It is not found on the southern half of the Kenai Peninsula southward or in the Alaska Peninsula-Bristol Bay area. The rule of thumb for the Copper River Basin areas north of the Yukon lowlands is that unless the birch is shrubby (multi-stemmed and under twenty feet tall) it is *B. neoalaskana*; south of the Yukon River valley, on the Seward Peninsula it can be confused with *B. kenaica*. Map 2 shows the Alaska range of *B. neoalaskana* (from Viereck and Little 1972).

B. neoalaskana is a forest tree species that can reach heights of eighty or more feet and diameters of more than twenty-four inches. It occurs on a wide range of habitats from wetlands and stream banks to southerly slopes with shallow soils, and on ridge tops. It occurs on sites with permafrost near the surface and on sites where permafrost is absent. It is often found growing on cold soils of north slopes. It does not occur on the warmest, driest south-facing slopes, or on sites that have annual summer flooding. It occurs on all landforms and soil parent materials found in Alaska.

Mature bark ranges from red to off-white (yellowish, pinkish, grayish) to strikingly white that naturally peels in somewhat thick layers that admit little or no light. The naturally peeled bark is commonly thicker than that of *B. kenaica*, but on younger trees can be sufficiently thin to allow some light through. Lenticels are black and prominent. Bark of twigs, seedlings, and small saplings is dark reddish brown to

Figure 2. *B. neoalaskana*

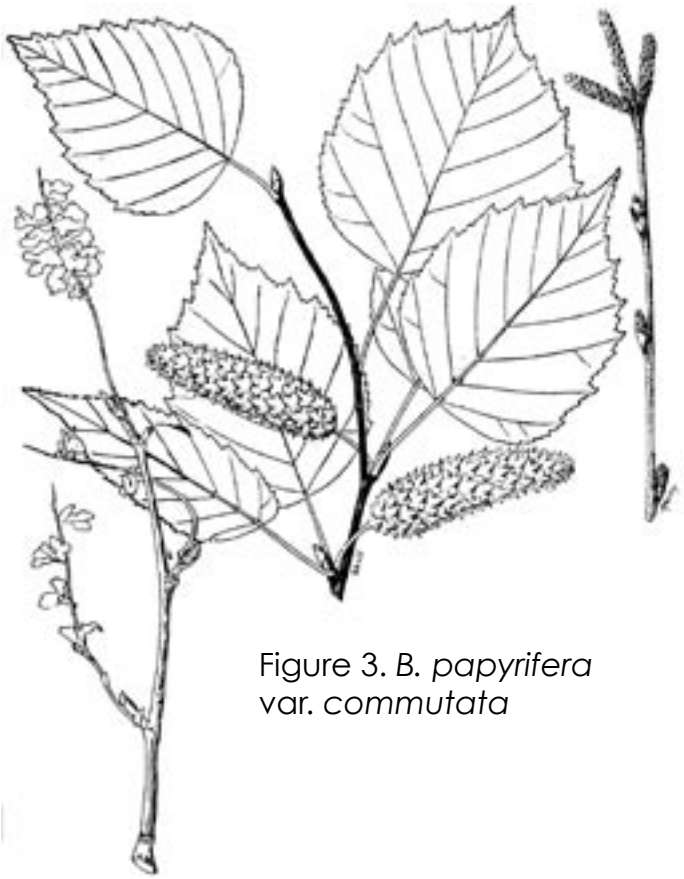
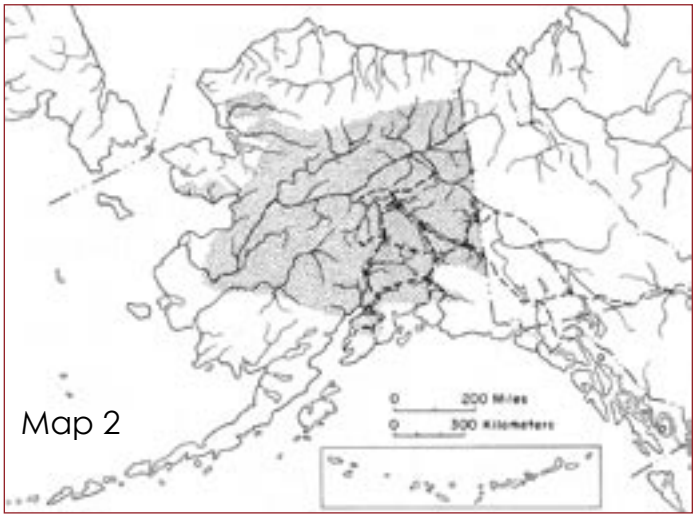
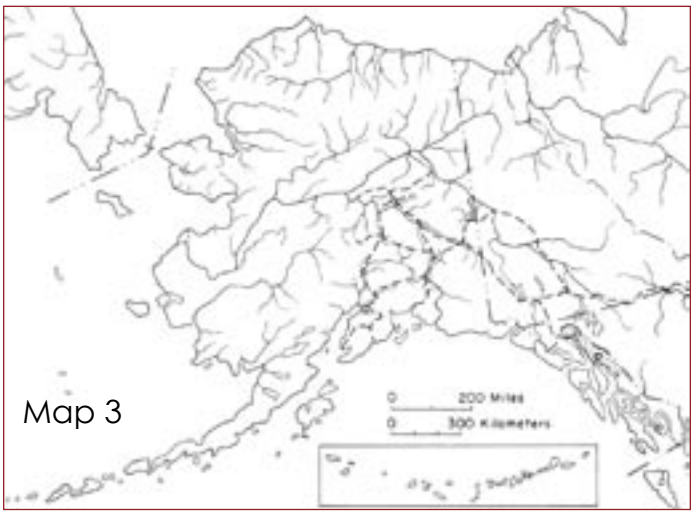


Figure 3. *B. papyrifera* var. *commutata*





nearly black, typically quite rough, covered with resin glands, and hairless. Spur shoots are ¼" to more than ½" long. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish (Fralish and Franklin 2002) or dark brown (Viereck and Little 1972) and less than 3/8" long.

Leaves are oval to somewhat triangular in shape, 1½" to 3" long and 1 to 2" wide. Leaf margins are coarsely, doubly serrate, the base is wedgeshaped to round, and the tip is elongated; the margin. The margin lacks hairs. Figure 2 illustrates a typical twig with leaves. The female fruit is cone-like and 1 to 1 3/8" long.

B. papyrifera var. commutata

B. papyrifera var. *commutata* is commonly referred to as western paper birch; other names are paper birch, white birch, canoe birch. The range of *B. papyrifera* extends eastward from northern Southeast Alaska to the east coast of Newfoundland and southward into Colorado in the west and Virginia in the east. The western variety is found in northern Southeast Alaska and then inland southward along the east side of the Coast Range in British Columbia and into Oregon and Montana (Furlow 1997). In Alaska it is the only tree birch found in Southeast Alaska, and then only in the areas of Glacier Bay-Skagway and Lynn Canal-Taku Inlet. Map 3 shows the Alaska range of *B. papyrifera* (from Viereck and Little 1972).

B. papyrifera var. *commutata* is a forest tree species that reaches heights of seventy feet or more and breast-high diameters

in excess of sixteen inches. Typically, it is found below 1,500 feet. It occurs on thin, rocky soils, the poorer sites, especially those sites disturbed by fire.

Mature bark ranges creamy or chalky white to pinkish brown to reddish. The naturally peeled bark is typically quite thick. Lenticels are black and prominent. Bark of twigs and seedlings is reddish, coppery, or purplish brown to nearly black, with or without scattered white resin glands, and slightly to moderately hairy. Spur shoots are ¼" to greater than ½" long. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish (Fralish and Franklin 2002) or dark brown (Viereck and Little 1972) and less than 3/8" long.

Leaves are oval to triangular in shape, 1½" to 3½" long and 1" to 2½" wide. Leaf margins are doubly serrate (two sizes of teeth that point forward), the base is rounded to nearly flat, and the tip is may or may not be elongated. The margin lacks hairs. Figure 3 illustrates a typical twig with leaves. The female fruit is cone-like and 1 to 1½" long.

B. occidentalis

B. occidentalis is referred to as water birch (Fralsih and Franklin 2002; Furlow 1997; Cody 1996) or Yukon birch (Viereck and Little 1972); other common names include river birch (Furlow 1997), black birch, red birch (Fralish and Franklin 2002) and western birch (Lauriault 1989). Furlow (1997) suggests its range extends eastward from the Cook Inlet area of Alaska eastward into central Ontarios and southward into southern California and central New Mexico. His range map shows its occurrence in coastal Alaska, including the Kenai Peninsula, Kodiak Island, and southcentral coastal Alaska to Skagway. Viereck and Little (1972) suggest that it is found primarily east of W. Longitude 153° (headwaters of the Kuskokwim River) and north of the Chugach Range to divide in the Brooks Range. Map 4 shows the approximate Alaska range of *B. occidentalis* (from Viereck and Little 1972).

Figure 4. *B. occidentalis*

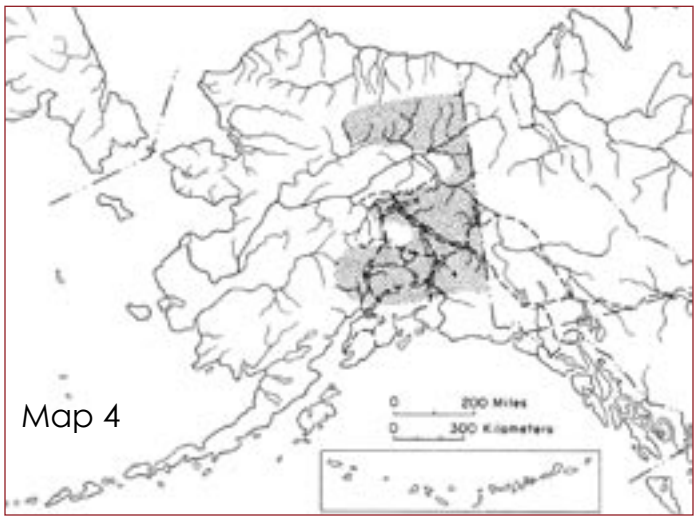
B. occidentalis is most commonly a multi-stemmed, spreading, tall shrub that occasionally reaches tree size in Alaska and the Yukon Territory, with heights of twelve (Viereck and Little 1972) to twenty feet (Cody 1996) and diameters of six inches (Viereck and Little 1972). It commonly occurs on dry ridges and slopes (Cody 1996), often near tree line (Viereck and Little 1972). Furlow (1997), Fralish and Franklin (2002), and Lauriault (1989) point out that it also grows along stream banks, in moist open woods, at edges of marshes, lakes, and ponds, and in wet swales, from which it has gotten its common name, water birch.

Mature bark is reddish black and does not peel naturally. Lenticels are grayish and not prominent. Bark of twigs and seedlings is shiny reddish brown to nearly black, often densely covered with reddish resin glands, and may or may not be sparsely hairy. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish and less than ¼" long.

Leaves are oval to triangular in shape, 1½" to 3½" long and 1 to 2½" wide. Leaf margins are doubly serrate (two sizes of teeth that point forward), the base is rounded to nearly flat, and the tip may or may not be elongated. The margin lacks hairs. Figure 4 illustrates a typical twig with leaves. The female fruit is cone-like and about ¾" long.

B. glandulosa

B. glandulosa is commonly called resin birch or dwarf birch (Fralish and Franklin 2002; Furlow 1997; Viereck and



Map 4

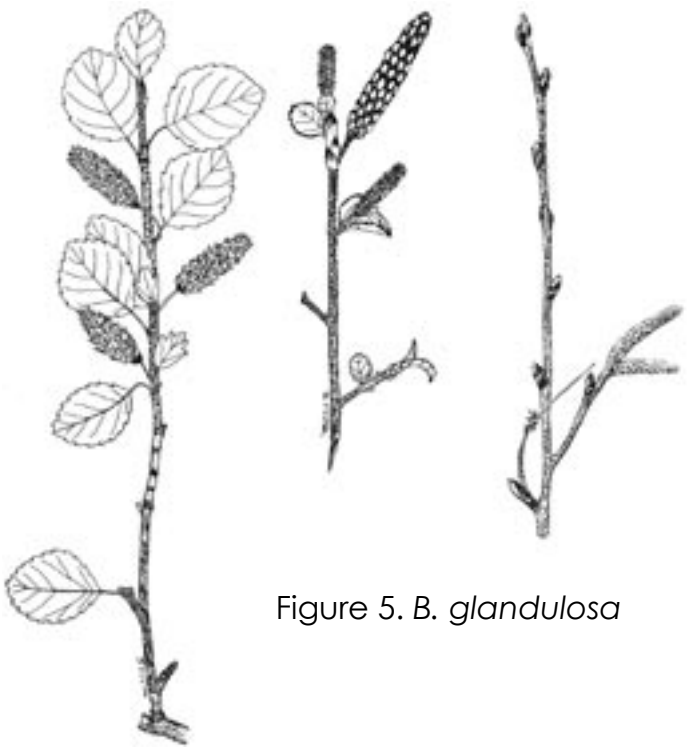


Figure 5. *B. glandulosa*

Little 1972); other common names include shrub birch, glandular scrub birch, ground birch, and bog birch. *B. glandulosa* extends eastward from the western tip of the Alaska Peninsula to the southern tip of Greenland and is found southward in the west into northern California and central Utah and Colorado (but absent from most of Southeast Alaska) and in the east into northern New York (Furlow 1997). Viereck and Little (1972) suggest that its range is more restricted in Alaska (absent from western Alaska and coastal Alaska, except around the northern tip of Cook Inlet and in the Taku Inlet-Lynn Canal area of Southeast. Map 5 shows the Alaska range of *B. glandulosa* (from Viereck and Little 1972).

B. glandulosa is a multi-stemmed shrub reaching ten to twelve feet, occasionally fifteen to twenty feet, with diameters of three to six inches (Viereck and Little 1972). Cody (1996) considers it a shrub that can be single-stemmed but typically is multi-stemmed and forms dense thickets. It is commonly found at higher elevations, often near tree line (Viereck and Little 1972), on tundra, woodland muskegs, bogs (Cody 1996), and along streams and lake and pond margins Fralish and Franklin 2002).

Mature bark is reddish brown to dark gray and smooth. It does not peel. Lenticels are pale and inconspicuous. Bark of twigs and seedlings is reddish brown and often covered with a gray, waxy substance and densely covered with resin glands. Spur shoots are ¼" to ³/₈" long. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish and less than ¼" long.

Leaves are oval or round in shape, ³/₈" to ¾" long and slightly less in width. The petiole is short, typically ¼" or less in length. Leaf margins are wavy-toothed, the base is wedge-shaped, and the tip is rounded. Leaves are thick, leathery, quite shiny, and often dotted with glands on both surfaces.

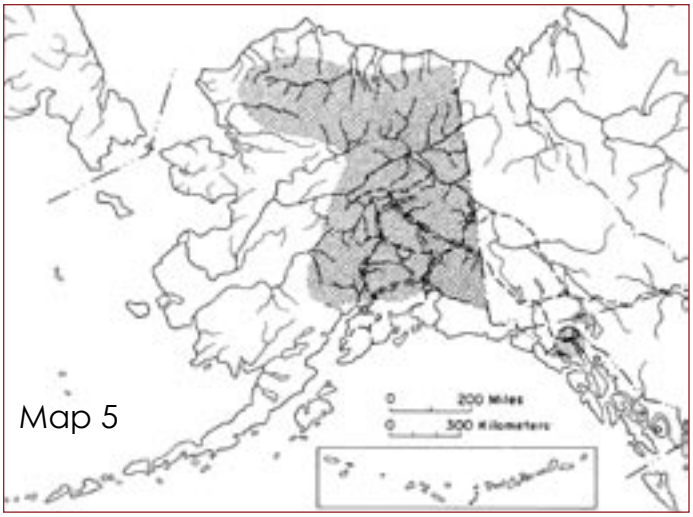


Figure 5 illustrates a typical twig with leaves. The female fruit is cone-like and ³/₈" to 1" long.

B. nana

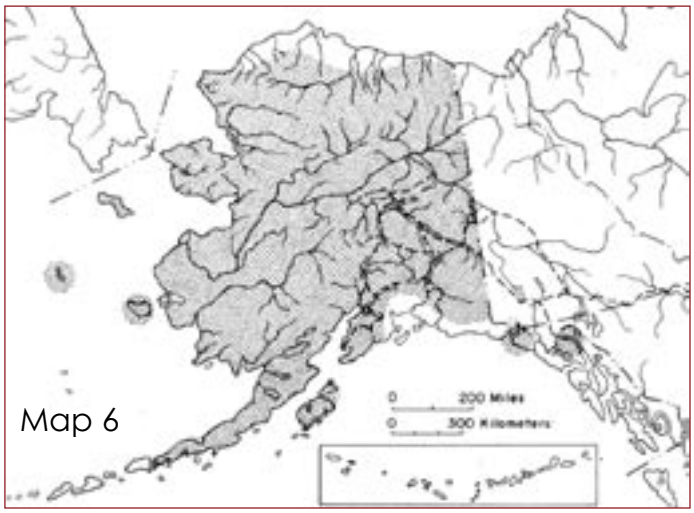
B. nana is commonly called dwarf Arctic birch (Fralish and Franklin 2002; Furlow 1997; Viereck and Little 1972); other names include dwarf alpine birch, dwarf birch, and bog birch (Cody 1996). Its range extends from the tip of the Alaska Peninsula eastward to Hudson Bay and then scattered in the Arctic Islands to northeastern Greenland; its southern limit is extreme northern British Columbia eastward to extreme northern Manitoba (Furlow 1997). It is found throughout Alaska, except on the Aleutian Islands, the north coastal plain, and most of coastal Alaska east of the Kenai Peninsula, except locally in northern Southeast Alaska (Taku Inlet-Lynn Canal area and Glacier Bay-Haines area) (Viereck and Little 1972). Map 6 shows the Alaska range of *B. nana* (from Viereck and Little 1972).

B. nana is a many branched, low spreading or sprawling to upright shrub commonly less than three feet tall (Cody 1996; Viereck and Little 1972). It occurs from the coastal plain upward into the alpine tundra of the mountains. Its sprawling branch pattern can create almost impenetrable, dense thickets that dominate portions of the landscape. It occurs on moist well-drained to poorly drained soils, in muskegs, bogs, tundra, and rocky alpine slopes.

Bark of main stems is gray to dark brown and quite smooth, with inconspicuous lenticels (Furlow 1997). Twigs are slightly resinous (Viereck and Little 1972) to covered with a thick resinous coating (Furlow 1997). Viereck and Little (1972) and Furlow (1997) state that twigs are hairless to slightly hairy with a few small warty glands. Cody (1996) states that the twigs are densely covered with glands and Fralish and Franklin 2002 state that resin glands are often dense. Spur shoots ¼" to ³/₈" long. Buds are borne on primary twigs or clustered at the ends of spur shoots. Buds are greenish and less than ¼" long.

Leaves are round to kidney-shaped, typically less than ½" long and often broader than long (to lightly more than

Figure 6. *B. nana*



½". The petiole is short—less than 1/16" long. Leaf margins are wavy toothed, the base is rounded to nearly flat or even slightly notched, and the tip is rounded. Leaves turn copper red in the fall. Figure 6 illustrates a typical twig with leaves. The female fruit is cone-like and less than ½" long.

Species knowledge of birches in Alaska is important ecologically and for management purposes. The latest information is provided above, but is most likely not the final word. The species descriptions (range, form, and finally the detail) provide essential information for separating the species. The greatest difficulty will be in separating *B. neoalaskana* from *B. kenaica* where their ranges overlap. The other species are quite distinct from all the other birches in Alaska due to range or form (especially size).

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Figures and maps used in this article are from* Alaska Trees and Shrubs*, by L.A. Viereck and E.L. Little, Jr.

Birch Use in the Former Soviet Republics

by Andriy Boyar

Note: This article is an abridged version of one Andriy Boyar prepared as an intern with Alaska Boreal Forest Council. He is a graduate student in the UAF Department of Economics and received his PhD in Economic and Social Geography from Kiev National University, Ukraine. The article is based on personal observations and information gathered from an Internet survey of Russian and English language websites. At SNRAS, research on the properties of birch bark and sap is being conducted by Edmond C. Packee and Glenn Juday.

When hundreds of human generations exist where environmental conditions are unchanged for thousands of years, we can expect culture, economy, and history to have some distinctive features related to that environment. In Central and Eastern European countries, as well as in Russian Siberia, one of these features is the relationship of people to the birch tree. Birch forests are a truly distinguished characteristic of the Russian, Belorussian, and Ukrainian landscapes. They are of national pride. Hundreds of songs, legends, and fairytales are devoted to birch. The Slavs learned to write and read using flat pieces of split birch bark when paper was unknown to them in early centuries. The beginning of spring is timed from the first appearance of birch leaves; the first spring month in the Ukraine is named Berezen, from the root word for birch.

There is an ancient Russian saying that calls birch "a tree of four important benefits." It reflects the main historical uses of birch in Russia: to warm and illuminate the house (firewood and splinters); to remove friction and noise from carriage and cart mechanisms (bark tar for lubricant); to treat and heal people; and to clean the yard and house (brooms and besoms from dense birch branches).

The industrial age hasn't much changed the importance of birch. Today Russian birch crafts are gaining world recognition. Birch wood, bark, and other materials are widely used in industry. All parts of the birch are commonly used for medicine for various ailments, from dandruff to cancer. Birch products may play important economic roles in rural households.

About 120 birch species exist worldwide, more than 64 of them in the post-Soviet countries. The deciduous species of Russia collectively make up nearly 20 percent of the forest resource, and the most significant is birch. Of the birch species, two are the most widespread and important: Silver birch *(Betula pendula)* and Flame birch *(Betula alleghaniensis)* [21].

Birch sap production in the former Soviet republics is important, with the average annual collection for mature trees about 5–10 tons per hectare of birch forest [20]. Eighty percent of birch sap runs in the upper layers of birch trunk between the bark (cambium) and wood [11]. The most valuable birch sap for medicinal purposes runs in the upper branches of a tree (more sugar components are accumulated in the sap on its way up). The higher point from which the sap is taken, the stronger its therapeutic qualities [7].

Birch leaves and buds contain essential (volatile) oils, resinous matters, flavor compounds, saponins, ascorbic acid, glucose, and phytocides. The macro elements present in those parts of birch are potassium, calcium, and magnesium; the micro elements are iron, manganese, copper, zinc, cobalt, molybdenum, chromium, aluminum, barium, and vanadium. Birch bark contains such substances as glucose, tanning agents, essential oils, and alkaloids. The main chemical components of birch sap are glucose and fructose (up to seven percent), ferments, organic acids, and vegetative hormones. It also contains such elements as selenium, nickel, and boron [6, 19].

One important birch product is tar produced by destructive distillation of bark and used for medicinal and household purposes [10]. Before oil lubricants were available, birch tar also was widely used for lubrication, and in Russia is still sometimes used for this purpose.

Birch sap and its derivative, syrup, are commonly used for nutrition. I remember the Soviet times when the shelves of the grocery stores were full of canned birch sap in one- and three-liter jars. Often the sap was combined with medicinal herbs (stinging nettle, etc.). Commercial production of birch syrup is uncommon in the post-Soviet nations. In Russia, home syrup production involves boiling birch sap and gradually adding sugar until the desired consistency is reached. Sometimes lemon or lemon acid is added [13].

Medicinal Uses of Birch Products

Absolutely everything in birch is useful for people, even the birch fungus (polypore or razor-strop fungus, in folk Russian, chaga). Tree parts with medicinal properties are widely used in both traditional and alternative (folk) medicine. Table 1 summarizes the therapeutic properties of birch and specifies what part of the tree (alone or with other ingredients) is used to treat particular ailments. The two last columns give the number of websites where the combination of words "name of the ailment," "birch," and "treatment" were found. In this way I identified the most popular treatments. On average, only about 20–40 percent of the websites found were relevant. Searches less than 20 percent relevant were not reported and are included in category ** (too many irrelevant discussions). There is more error in English searches because, for example,

Table 1. Medicinal Use of Birch Products

#	Ailment	Medication used (key below table)	# related online discussions (Russian)*	# related online discussions (English)*
1	Gout (podagra)	Sap1, Pol, BL, BB1, BB2	267	1,550 (11)
2	Arthritis	Sap1, BL, BB1, BB2	247	4,590
3	Edema (hypostases)	Sap1, BB2	340	1,720 (3)
4	Rheumatism	Sap1, BL, BB2	389	2,020
5	Hard wounds	Sap1, Pol, BB1	**	**
6	Ulcer	Sap1, BB2	509	839
7	Tuberculosis	Sap1, BB2	365	2, 070
8	Toxicosis, poisoning, disordered stomach	Sap1, CC	60/**/301	**/**/**
9	Quinsy (tonsillitis)	Sap1, Sap2	220	62 (276)
10	Bronchitis	Sap1, Sap2	304	2,310
11	Eczema	Sap4, BL, Tar, BB1	284	1,960
12	Psoriasis	Sap4, BL, Tar	155	1,170
13	Scrofula	Sap4, BB2	94	117
14	Blackhead	Sap4, BB1	**	**
15	Venereal diseases (scab, herpes, rash, fungus)	Sap3, Sap4, BL, Tar, CC, BB1	157/404/410/**	**/1,400/**/ **
16	Inflammation, mouth	Sap2	284	**
17	Chronic catarrh (coryza)	Sap5	277	265 (34)
18	Cancerous ailments	Sap+	974	240
19	Stones in urinary bladder and kidneys	Sap1, BL	213/436	689/866
20	Baldness	Sap++	181	**
21	Burns	CC	382	**
22	Stomach acidity	Pol, CC	124	**
23	Scurvy	Sap1	116	479
24	Callosity	BB1	79	27
25	Infectious	Pol	**	**
26	Dandruff	Sap++, BB2	40	607
27	Liver diseases	Sap1	633	7,580
28	Stomach cancer	BM	286	**

***** Key words used for searching in both languages were the name of sickness, (gout, arthritis, quinsy, etc.) birch, and treatment. Web-search systems used: in Russian – www.rambler.ru, in English – www.google.com.

****** Too large an error on search (number of irrelevant discussions is too large)

Sap1 – Drinking large quantities of fresh or canned sap for diuretic or sudorific purposes.

Sap2 – Gargling with warmed up fresh sap.

Sap3 – Drinking one glass of fresh or canned sap on empty stomach before the meal for 3-4 times a day over 2-3 weeks, keeping a milk-vegetarian diet.

Sap4 – Fresh sap washings and baths during sap season.

Sap5 – Drinking one glass of fresh sap each morning during the season.

Sap+ – Drinking mixture of birch sap with herb juice (yarrow, carrot, St. John's wort, meadowsweet) (for proportions see text).

Sap++ – Rubbing the sap-burdock alcohol extract into skin (see text above).

Pol – Nourishment of birch pollen-honey mix (see text).

BL – Drinking young birch leaves tea (decoction) or directly pressed juice.

Tar – Ointment with strong antiseptic properties.

CC – Birch charcoal – both internal (stomach ailments) and external (venereal diseases) use (more information in the text).

BB1 – Birch buds alcohol extract used to rub into skin or to make compresses.

BB2 – Drinking tea from birch buds.

BM – Birch mushroom (polypore or razor-strop fungus) (see text for recipe).

"birch" in English can be a person's name or a street name; for those meanings in Russian, the word has a different form; also, the word "treatment" in English has a much wider meaning than in Russian, etc. The quantity of Russian and English-language websites found are not comparable for a number of reasons (difference in the level of Internet accessibility and network development, population covered, etc.), but same-language results reveal the popularity of birch remedies for specific ailments. For instance, in Russian-speaking countries using birch products for treating cancerous ailments, liver, venereal diseases, and ulcers is much more popular than for treating dandruff, callosity, or scrofula. In English-speaking countries, treatment of arthritis, liver diseases, rheumatism, and tuberculosis is relatively popular, judging by noticeably more intensive online discussions.

Birch Sap—has therapeutic effects known from ancient times. During World War II and earlier, it was used for healing wounded soldiers. It contains many elements and minerals beneficial to blood quantity and quality, stimulates tissue regeneration, normalizes metabolism, stimulates digestion [7], and is used to remedy intoxication. Because the sap has diuretic and sudorific properties, it's used to treat such ailments as gout (podagra), arthritis, edema (hypostases), rheumatism, hard wounds, ulcers, tuberculosis, intoxication, liver diseases, quinsy (tonsillitis), bronchitis, colds, and even scurvy [9, 13]. Sap is also used to treat mouth inflammation, chronic catarrh (coryza), and to flush out kidney and urinary bladder stones. For the anti-stone effect, sap is combined with juice pressed from fresh birch leaves. This cure destroys the stones of phosphate and carbonic origin [9]. Sap is prescribed for cancerous diseases in combination with other medicinal herbs: birch sap (2 parts), milfoil (yarrow) juice (2 parts), carrot juice (2 parts), St. John's wort juice (1 part) and meadowsweet juice (1 part).

The patient drinks one tablespoon of this mixture twice a day (in the morning and in the evening) on an empty stomach. For better effect it is also recommended to drink milk with powder of licorice (1 gram per one time) afterwards [16]. For venereal diseases like scab, herpes, rash, or fungus, it is recommended to drink one glass of pure birch sap before each meal, three to four times a day during a two-to-three-week period, while at the same time staying on a milk-vegetarian diet [9]. The sap is used externally for severe eczema, psoriasis, scrofula, or blackheads [9, 13]. Shampoos produced with a base of natural birch sap are known for a positive effect on hair growth. For dandruff or balding, people wash their hair with birch leaf extract mixed with fresh or sterilized birch sap [10]. Mixing birch sap with different kinds of fruit and vegetable juices, or with extracts of medicinal herbs and berries (blackberry, bilberries, cranberries) is common. Many people consume these drinks in everyday life for prophylactic purposes.

Birch Pollen—In April and May people gather birch pollen, an almost invisible birch product with antibiotic properties. Taken internally, it destroys harmful microbes in the stomach and intestine, and is also used to treat infections and exhaustion. The best effect can be achieved when the pollen is used in combination with natural honey. I found an old recipe for treating these ailments in Russian online sources. It says the pollen should be consumed on an empty stomach (shortly before a meal). The normal portion for an adult is 20 grams per day (4 teaspoons); for children older than three, one teaspoon. When extending the treatment to one year (consuming the pollen-honey mixture for one month at the beginning of each season, thus four times a year), the recipe guarantees success [17].

Birch Leaves—Young birch leaves are usually harvested in May and June when they're very fresh, fragrant, and sticky. The leaves are best dried indoors, in a shaded, well-ventilated room. Besides birch tea, different extracts and decoctions can be prepared from the young leaves. They are commonly used as diuretics or sedatives [15]. The tea has strong diuretic properties, but doesn't irritate the kidneys, making it valuable and distinctive. Another great property of birch leaves is their bactericidal effect.

Birch Bark Tar—One traditional Russian remedy, less known elsewhere, is birch tar. Extracted from birch bark, it has strong anti-microbe, anti-parasite, and antiseptic properties. It is widely used to treat eczema, psoriasis, scab, herpes, rash, fungus, and different ulcers.

Birch Charcoal—also has medicinal uses: as an adsorbent for stomach acidity, pain, and some poisons; for treating herpes (after first massaging the sore with garlic and then for twenty to thirty minutes with a birch charcoal and burdock juice mix). Charcoal powder placed on a burn promotes fast cicatrisation [15].

Birch Buds—are usually collected by hand in late winter or early spring. The buds are dried by keeping them for two or three weeks in a well-ventilated room out of bright light. Dried buds keep for up to two years. Normally the remedy is prepared in the same way tea is brewed. The average per-day portion is two glasses. An alcoholic extract made from the buds is commonly made. Buds are ground, then mixed with alcohol in a weight proportion of 1 part buds to 5 parts spirits (or vodka); it's ready after standing a week. It is used as external preparation, which my mom characterizes as effective relief for joint pain or fatigue in the hands or legs. This extract is also used on wounds to prevent infection [17], or on sore places and varicose veins.

Birch Wood—is a raw material for producing vinegar and alcohol, and is a source of xylite. This useful product of wood hydrolysis is called "birch sugar" and is used by people suffering from diabetes, adiposity, atherosclerosis [10].

Birch Polypore or Razor-strop Fungus—normally grows on old or dead birch trunks. It is a very common treatment for stomach cancer or ulcer. The remedy is prepared by mixing equal proportions of crumbled fungus and dry snakeweed root *(Polygonum bistorta)*. The mix is watered with cooled-down boiled water for the night (2 tablespoons to 0.5 liters of water), then filtered. The recommended dose is a half glass three times a day taken an hour before meals until recovered [3].

Birch Beverages

Kvass—In its natural state birch sap can't be saved for more than one week, so it's normally made into other beverages. One of them is a fermented tonic called *kvass*, which when cooled can be preserved for a few months without damaging taste and quality. Kvass is a beautiful drink to slake thirst, and to energize and refresh you. It is extremely popular in the regions where birch is widespread. My childhood memories are overwhelmed with exciting early spring bike trips back and forth to the forest with big jars full of sap. Here is a simple recipe. Assemble the sap, sugar (glucose) and raisins or other dry fruits. Proportions are: 500 mg (0.5 liter) of sap, one teaspoon of sugar, and two or three clean raisins (dried plum, apple, pear, etc.). A few pieces of dry lemon peel can be added, too. Fill a clean dry container with the sap almost to the top, then add the other ingredients. The container is closed hermetically (airtight). It must be strong enough to hold the pressure of the gases, although in my own experience, kvass tastes amazingly good even without being sealed (I used an ordinary large kitchen pot with a lid). In several weeks it is ready for your enjoyment!

It's a fact that the first Russian alcoholic drinks were produced for home use from fermented birch sap, and using it to make wine and vodka is still quite popular. The first wine produced from birch sap was sold in the former Soviet Union after World War II in Sverdlovsk (now Ekaterinburg). Its recipe was taken from an ancient book: Dissolve a half pound of sugar (200 gr.) in 3 gallons of birch sap. Boil until reduced by two-thirds (one third is left). Skim foam from the top and filter. Place the slices of one lemon in a clean, dry wooden jug and add the filtered liquid. When it cools to the temperature

of fresh milk (30–35°C), add yeast and completely cover with a lid. In a few days the fermenting becomes more intensive. Skim the foam again and place the future wine into another clean, dry wooden jug. Carry the preparation to some cool cellar and leave. After two weeks, bottle the wine (with a reliable cork). The first sip can be taken in two more weeks. The finished wine keeps for several years [14].

30 Cosmetic Uses of Birch Products [5]

In Russian villages women used to go to the forest to wash their faces with birch sap for a fresh look and healthy skin. Today, although not so popular, the direct use of birch materials for cosmetic purposes still occurs. Birch also provides important raw materials for the cosmetic industry. Following are some traditional cosmetic uses of birch products found in Russian sources.

To help rid face of freckles, wash with a mixture of fresh (sterilized) birch sap and parsley extract (parsley leaves steeped for a day with warm boiled water). Use birch bud broth (one tablespoon of buds and a glass of boiled water) to prevent blackheads, pimples, and to treat little wounds. Many other recipes for clear skin exist, such as using face masks made from birch leaves (well-washed, cut, and boiled beforehand). Treat dry skin by washing it regularly with a cold-water extract prepared from birch leaves; steep leaves in warm boiled water for at least a few hours). Treat oily skin with a broth made from birch buds and leaves (1 part buds, 2 parts water and 2 parts leaves). For strong, healthy looking hair, rinse with birch leaf water extract. For tired eyes, or wrinkles around eyes, cosmetologists suggest making cold eye compresses from birch leaf water extract; use in the evening. Remove pigment spots on the skin as well as blackheads and other skin defects by regularly washing the skin with birch sap.

Other Household Uses

Since the birch tree is easily accessible and a cheap source of materials, in many post-Soviet countries it is widely used for household purposes. When you go to Russian, Ukrainian, or Belorussian villages you can frequently see someone cleaning a yard with a birch broom or besom, or in a city, a street-cleaner with the same tool. In my childhood I often enjoyed watching my grandfathers and father making this type of household tool. And I still remember how to make it myself!

Brooms are constructed from carefully selected lower birch branches. To get a nice-looking, comfortable, and practical broom, the branches should form a "bouquet:" highly dense on the top, straight and well-tied. The handle can be stuck in the upper part of the tool later on. Birch besoms can also be used to sweep yards, but their main use is in the traditional Russian sauna, called a bania. Birch besoms serve as a sponge there and also as a magic tool used to whip away the body and spirit's uncleanness. Of course, a bath besom is constructed differently and necessarily includes leaves (dried branches with leaves in winter).

Birch wood is widely used in carpentry, house construction, and woodcrafts. Before the era of electricity, burning birch wood splinters was the cheapest and most popular way to illuminate a house in Russia. In many rural households, birch firewood is still an important source of energy for home heat and cooking.

Birch bark basketry, decorative weaving, and carving are also important in Russian culture. Some hundred years ago it was quite common to see Russian villagers in the warm season wearing shoes made from birch bark. Even furniture and other household accessories were often constructed from this material. People skillful in these crafts were and are very respected in their communities. At present birch bark weaving is done as a cultural tradition and sometimes provides extra income.

In my own experience, yards and houses are sometimes decorated with birch branches or young trees for Ukraine Christian summer holiday celebrations, and is also often done for rural wedding parties. The first fishing float I ever made myself was constructed from feathers and birch bark. My grandfather used to make the floats for fishing nets and other fishing gear from this material, and I learned from him.

The birch tree populates the landscape of many world regions, including Alaska, and the aesthetic and ecological importance of birch is unquestioned. It is a local resource for different spheres of life in many communities. I hope this little study on the community of my origin will be useful for further birch resource use development for the welfare of hospitable Alaska.

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Heavenly Garden, Earthly Pursuits

by Doreen Fitzgerald

Over 30,000 people come each year to enjoy the work of the small staff and 300 volunteers who make the garden bloom at the Fairbanks Experiment Farm. Although based on research and horticulture demonstration projects, the Georgeson Botanical Garden (GBG) is in many ways a community project and asset—ideas and information for home gardeners, inspiration for artists, natural dyes for local spinners and weavers, lunch break setting and backdrop for weddings.

With the arrival of spring this year, work began at GBG on a special space for children, a three-year construction project funded by a gift from Walter and Marita Babula. Last year the Babulas met with GBG director Pat Holloway and experiment farm staff members to discuss the possibility of a children's garden. "Because their enthusiasm for the project was great," Walter Babula said, "we worked out theme, timing, and cost." A Fairbanks orthodontist, he has treated local children for thirty years. "We decided that now we'd like to do something special for the kids and positive for the community," he said. Walter started gardening as a child in Pennsylvania, made a home garden when he moved to Fairbanks, and became a master gardener through the Cooperative Extension Service. He and Marita created and help maintain a garden near his workplace, at the Denali Center long-term care facility.

The Babula Children's Garden will be a delightful mix of whimsy and learning opportunities: pioneer garden, native plants, water and weather features, willow tunnel, maze, and more. UAF staff and volunteers will complete some of the projects, while others will be contracted. Design of the interactive stream, tree house, and a composting toilet facility was adopted as a senior design project by UAF engineering students.

Support for the garden by the Agricultural and Forestry Experiment Station is augmented by volunteer labor, paid garden memberships, an annual plant sale, a gift shop, individual gifts, and fundraising events for special projects. Under construction now is a picnic shelter, gift of the College Rotary Club. Another project is a roof for the garden's Jim Drew amphitheater. To raise funds for engineering and construction, the UAF College of Fellows sponsors a summer fundraiser, "Goodies in the Garden." Along with desserts, the July event features garden experts, hayrides, and door prizes. The College of Fellows is a group of university advocates that support university fundraising and public relations efforts.

Other work at the garden includes maintaining plant specimens, conducting trials of vegetable and flower varieties, demonstration of growing techniques, and research on characteristics of native plants. Dr. Holloway was instrumental in creating the botanical garden and oversees its development. She is a professor of horticulture with the Department of Plant, Animal, and Soil Sciences in the School of Natural Resources and Agricultural Sciences.

Above: sunflower in the Georgeson Botanical Garden.
Left: Around fifty Rotary International foreign exchange students met their community service requirement by helping with chores at the garden this spring.
—Photos by Doreen Fitzgerald, AFES Publications Office

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Clockwise from above:
Beets grown at Calypso Farm and Ecology Center, founded by SNRAS graduate Susan Willsrud and her husband, Tom Zimmer.
—Photo courtesy Calypso Farm & Ecology Center

Historic photo of reindeer racing at the annual reindeer fairs on the Seward Peninsula, held during the 1920s and 1930s. This image appears in Reindeer Roundup! A K-12 Educator's Guide to Reindeer in Alaska, *published recently by the Reindeer Research Program, SNRAS.*
—Historic photo from *Where Did Reindeer Come From?* by Alice Postell, published in 1990.

Northern fur seals sunning themselves in Resurrection Bay, 2004.
—Photo by Norman R. Harris