

Refuge Notebook

Volume 7 • 2005

This volume was compiled in 2016 by Jennifer Peura from the Kenai National Wildlife Refuge's archive of *Refuge Notebook* articles. Formatting has been improved, some hyperlinks (URI's) have been updated, and minor edits were made, but the articles have mostly been unchanged.

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2004 held many accomplishments for Kenai National Wildlife Refuge

by Robin West

As 2004 fades into history, I reflect on what the year held for Kenai National Wildlife Refuge, and I also look ahead to 2005 to begin planning what promises to be another challenging and rewarding year.

We started 2004 working aggressively on the mandated revisions to our Comprehensive Conservation Plan—holding scoping meetings in Soldotna, Seward, Homer, Cooper Landing, and Anchorage. We began drafting the updated plan in the fall and hope to have a draft plan out for public review and comment by summer 2005. We also completed a cabin management plan early in 2004, and began to implement it by summer. Eleven older cabins had renovations completed, and three new public use cabins were constructed. In 2005 many of the older cabins, and all of the newly constructed cabins, will be available for public use via a reservation system. Major improvements were also completed on many of the over 200 miles of Refuge trails in 2004 using a one-time Congressional appropriation. The loop for the Centennial Trail at the Refuge headquarters, and improvements to the Nordic ski trail system, were also completed in the fall. Visitors should start enjoying these easily accessible trails for year-round activities in 2005.

Other construction projects in 2004 included the upgrades to trail heads and camp sites along the Swanson River and Swan Lake Roads, completion of the riverbank protection and fishermen access project at Jim's Landing, and completion of the interpretive displays to greet visitors at the Kenai airport. In 2004 the State of Alaska agreed to relinquish the right-of-ways to the Refuge for Ski Hill and Skilak Loop Roads, and 2005 will see planning activities for upgrades to these two routes. Planning will also occur in 2005 to connect the Refuge headquarters facilities to the City of Soldotna water and sewer systems.

Cooperative ventures in 2004 included an agreement with the U.S. Forest Service to use data from their Forest Inventory and Analysis Program to help the Refuge with a long-term cost effective method to collect status and trend information for many plants, animals, and insects. We also signed a memorandum

of understanding with the Alaska Department of Fish and Game for collaborative efforts on moose research, and another agreement with multiple agencies in an "All Hands and All Lands" effort to address forest management, wildfire protection, and fuels treatment on the Kenai Peninsula in the aftermath of many years of spruce bark beetle impacts. In 2005 I expect substantial progress in implementing these cooperative ventures, and potential new partnerships to address long-term changes to fish and wildlife habitats on and adjacent to the Refuge.

The Refuge had 17 wildland fires in 2004, all but one human-caused fire. The most notable fire was the Glacier Creek Fire, first discovered on August 14, 2004 and declared out October 15, 2004. The fire burned approximately 6,000 acres over a several week period. Its only real threat was to remote cabins, which we were able to successfully protect. Concerns over smoke and the fire's potential were hot topics in the late summer, when fires were still a significant issue in Interior Alaska. The 2005 fire season will remain as speculation, until it has come and gone, but Refuge crews are completing necessary preparedness and training exercises this winter. Winter snows also provide some promise of moist soil and duff conditions in spring, reducing the probability of large fires early in the coming year.

A few other notable accomplishments of 2004 include: a record number of Refuge volunteers (setting a new high at 121 people and contributing 20,047 hours of labor); Refuge rangers were involved in over 500 law enforcement cases in 2004 and sentencing occurred for several significant cases, including a felony bear poaching case involving two Anchorage men; Refuge law enforcement also received a new staff member in 2004—a young black lab named "Samson"—this K-9 capability will assist officers in detecting a variety of wildlife species, common illegal drugs, and help with search and rescue activities for lost and missing persons in 2005 and beyond; 2004 saw new environmental education programs created at the Refuge and students now have eight different field trip options—1,179 stu-

dents participated in Fall 2004 Refuge education programs. We look forward to the completion and grand opening of our log environmental education classroom at our headquarters in 2005!

At the end of 2004 Refuge staff had just completed involvement with a couple of oil spills on the Refuge when the freighter Selendang Ayu went aground within Alaska Maritime National Wildlife Refuge near Dutch Harbor. As we prepare to help out with this event by deploying Kenai crews to the Aleutians, I am reminded that our work is never really done. Day-by-day, month-by-month, and year after year, there are continuing threats to Refuge resources, human and wildlife needs that must be addressed, ongoing requirements for maintenance and repairs, and all with an “emergency” thrown our way on a seemingly regular basis, but I never hear any complaints

from staff. They love their work and they are good at it. I am lucky to have the co-workers that I do, and even more fortunate because of the support we receive from the community. People on the Kenai Peninsula, with rare exception, care for the wild lands, clean air, water, salmon fisheries, wildlife and scenery that the Refuge provides. Such values are why many of our friends and neighbors choose to live here. So, at year’s end I not only want to thank the Kenai Refuge staff for a job well done, but also thank you, the Kenai Peninsula community for your help and support in 2004. Best wishes for 2005!

2005 will be the 10th year that Robin West has been the Refuge Manager at Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Where do the Bugs go in winter?

by Matt Bowser

As you enjoy the warmth of your home this January and the apparent absence of mosquitoes, have you ever wondered what the bugs are up to or how they are getting along out there in the cold? They lack the ability to make warm shelter as we do, and they are much too small to generate much heat and hold it in as birds and mammals do. Insects and other cold-blooded, minute animals make it through the long, cold winter in either of two ways: avoidance of cold or physiological adaptations to cope with the cold.

Some invertebrates are able to find warm places to spend the winter, such as streams, mammal nests and human houses. Most aquatic insects avoid freezing by spending the winter in water bodies where only the surface freezes. Many of them are active all winter under the ice. Lice, fleas, and ticks enjoy the privilege of snuggling up to their warm-blooded hosts during the cold months, where they can regulate their body temperatures by moving to colder or warmer parts of their host. Most of us are familiar with the surge of spiders, daddy long-legs, ladybird beetles, and others that filter into our homes in the fall as the frosts begin. These little invaders are seeking a warm, snug nook to hide in. Many of them, such as the ladybird beetles, are really not adapted well to living in human dwellings and usually die before spring. Some spiders and daddy long-legs, though, may be quite contentedly residing in your crawl space even now.

The majority of bugs do not have the luxury of a warm home and must somehow endure the long, cold, dry Alaskan winter. Many burrow into the soil where, insulated by a layer of snow, temperatures are milder and more consistent than the outside air, but they still must withstand sustained sub-freezing temperatures. Invertebrates cope with sub-freezing temperatures either by supercooling, where body fluids remain liquid below the freezing point of water or by freeze tolerance, where body fluids freeze without causing death.

As temperatures drop, those that supercool produce substances in their body fluids that act as antifreeze so that they can resist freezing, even at very low temperatures. Most of the members yellow jacket (“hornet”) nests die in the fall, but young queens leave to seek out a cozy place to nestle in forest leaf lit-

ter. As the nights become cooler, their bodies increase the concentrations of solutes in their body fluids, increasing their resistance to freezing. Under an insulating layer of snow, where temperatures are warmer and much more stable than the air temperatures yellow jackets can endure winter temperatures down to about 3° F before they freeze. Birch bugs, spruce bark beetles, and many other insects supercool similarly. If temperatures continue to drop, though, these supercooling critters will freeze and die. This is why extremely cold winters, especially when there is little snow cover, may significantly reduce some insect populations.

Some of the hardiest insects can actually withstand freezing of most of their body fluids. Our largest and most conspicuous darkling beetle, *Upis ceramoides*, lives under bark of dead hardwoods, where it presumably eats fungi. These beetles find small nooks under tree bark in which to spend the winter. As it gets colder, they produce substances that actually encourage the formation of ice crystals in their body fluids so that they freeze at relatively high temperatures. Most of their body fluids freeze solid, reducing their metabolism to almost nothing. In this way they can endure extreme cold. Repeated cycles of freezing and thawing, though, can be hard on freeze-tolerant insects.

A few of our littlest animals not only supercool, but even remain active in winter. Some springtails (a group of tiny insect-like animals) are busy much of the winter foraging on fungi in the soil and on tree bark. The dusky firefly, a common beetle here, is active in winter in Massachusetts, where it spends the winter out on the bark of trees, but its wintering habits in Alaska are unknown.

As with the dusky firefly, the winter doings of many insects are not well understood in Alaska, so the next time you find yourself wondering what the bugs are doing while the world outside is crystalline and quiet, poke around in your crawl space, peek under the ice in a creek, break open a log, or sift through some leaf litter. You will find little critters dealing with the winter in one way or another and you may just find out something new.

Matt Bowser is a seasonal biological technician at the Kenai National Wildlife Refuge. Previous Refuge

Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Winter recreation and you, winter fun in your backyard

by Nicole Johnson

“Are you open on the weekends?” is a common question we hear this time of year. Many people are amazed to discover that business continues as usual at the Kenai National Wildlife Refuge during the winter. This is also true for our community outreach and education programs.

We always have something going on and this February will be no exception. To beat the winter blues, the refuge is hosting the 4th annual Winter Family Fun Day on Saturday, February 5th. This event encourages people to discover, explore, and appreciate the thrilling world outside even though it’s not the long, sunny days of summer.

Family activities will take place from 10:00 am to noon at the Refuge Visitor Center in Soldotna on Ski Hill Road. This year, there will be indoor winter crafts, outdoor games, and snowshoe activities. Also, the Andrew Berg historical cabin will be open for people to learn more about Berg’s life and what it was like to homestead in Alaska. The guided snowshoe activities will be offered at 11:00 am and require pre-registration. The snowshoe activity is available to youth ages 9 and older with their parents. The Refuge will provide snowshoes. All activities are provided free of charge. Rather than spending another Saturday at home, come join the fun and don’t forget your warm, winter clothes and boots!

We don’t stop there. This time of year, many teachers and students crave a break from the confines of their classrooms. If you have a 4th–6th grade student in a central Kenai Peninsula school, they may be scheduled to come to the refuge on a winter field trip to the refuge. On their field trips, students will participate in outdoor activities and a snowshoe walk. The two

programs offered are “Wildlife in Winter” (4th and 5th grades) and “Winter Ecology” (6th grade). “Wildlife in Winter” focuses on how Alaskan wildlife adapts and survives winter and “Winter Ecology” focuses on environmental and human impacts on wildlife survival in winter. Last year we had 16 classes and a total of 795 students participate in these programs. We expect to see the same number, if not more students. The environmental education program is currently accepting registration for school groups.

If you haven’t found something that sounds right for you, we aren’t done yet! Have you wanted to learn about snowshoeing? If you are curious, please contact the refuge to sign up for a free adult snowshoe clinic. If we receive enough interest, the clinic will be scheduled for Saturday, March 5th. Space will be limited to 20 participants and snowshoes will be provided.

Last but not least, other winter opportunities include visiting the Kenai National Wildlife Refuge Visitor Center on the weekends for a variety of free films. Whether it is cross-country skiing, snowshoeing, or a simple walk, the trails surrounding the Visitor Center can provide hours of recreational opportunities.

To register for the guided snowshoe walk, schedule a winter field trip, express interest in a snowshoe clinic, or to learn about current trail conditions call 262-7021 for more information. And to answer the common question, “Are you open on the weekends?” the answer is a resounding “yes”. There are lots of fun, winter opportunities for you right here in town.

Nicole Johnson is the Education Specialist at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Tree-ring dates for the Victor Holm cabins

by Ed Berg

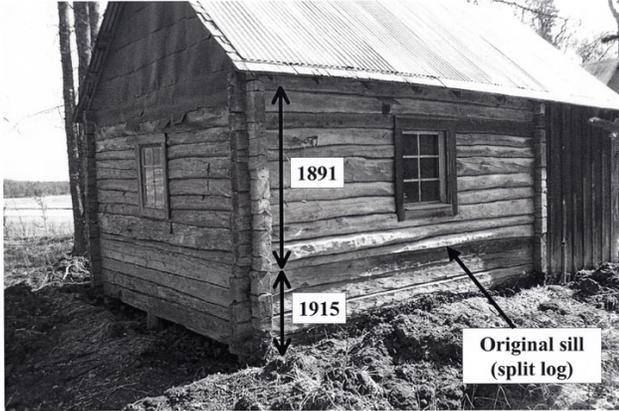


Photo of Victor Holm cabin near Kasilof taken prior to the restoration work. USFWS.

Have you ever noticed the low stature of most of the old homestead cabins around the Kenai Peninsula? One might think that our local pioneers of the last century were a bit sawed off and short, but even a big man like trapper Andrew Berg (at 6 feet 2 inches) built short-walled cabins and didn't seem to mind a low ceiling.

My theory on short-walled cabins is that the builders ran out of energy after the walls get above their heads. Log building is a slow process and winter was probably approaching, so they figured that it's time to put the roof on and be done with it. Add to this the economy of heating a smaller room volume with hand-sawn firewood, and you soon conclude that high walls are a cosmetic feature fine for city dwellers who can afford paid carpenters and central heating.

Kasilof Finnish immigrant Victor Holm may have been one such winter-pressed builder, or if not Victor himself, perhaps the builder of his cabin was in such ways pressed for time during the fall of 1891. The cabin was built with six foot walls. The flat ceiling would have seemed pretty close by modern standards, and as explained below, after 24 years somebody apparently got tired of the low ceiling, and decided to jack up the cabin and add four more courses of logs. The new logs brought the ceiling up to a commodious height of eight feet.

Victor Holm arrived in 1890 as a young man to help

build and work at the salmon cannery at the mouth of the Kasilof River. We don't know if he built the cabin on the south bank of the river that bears his name, but we do know that he patented the land in 1921 and lived there until he left for California in 1944. He was a solitary bachelor and a skilled furniture maker. He left virtually all of his possessions behind when he left, and it is unclear whether or not he planned to return to Alaska.

Last May a major restoration of the Victor Holm cabin was undertaken by the Kachemak Heritage Land Trust with assistance from the Kenai National Wildlife Refuge. Grant money was obtained for a workshop on log cabin restoration and 15 people each paid \$400 for a week of log hewing and good fellowship, after having traveled from around Alaska, the Yukon and as far as Georgia. Refuge historian Gary Titus instructed the students and guided the log work, assisted by the refuge cabin crew of Iven Sjodin, Temperance Taylor and Josh Hightower, and student volunteers Bill Nelson and Bryan Taylor. I introduced the students to tree-ring dating.

When the restoration work began we knew little about the age of the cabin, and Gary invited me to try to date the cabin with tree-rings, such as I have done with other old cabins in the Tustumena—Skilak area.

Gary had also noticed something strange about some of the logs, namely, that the fifth log up from the bottom on each side had been split, with the flat side placed downward (see photo).

Log cabin builders sometimes start a wall with a split half-log placed flat side down, especially if they are building on a foundation rather than on the ground. There would be no reason to use a split log higher in the wall. This odd arrangement of the logs suggested to Gary that the original cabin had been jacked up and four more logs had been inserted underneath.

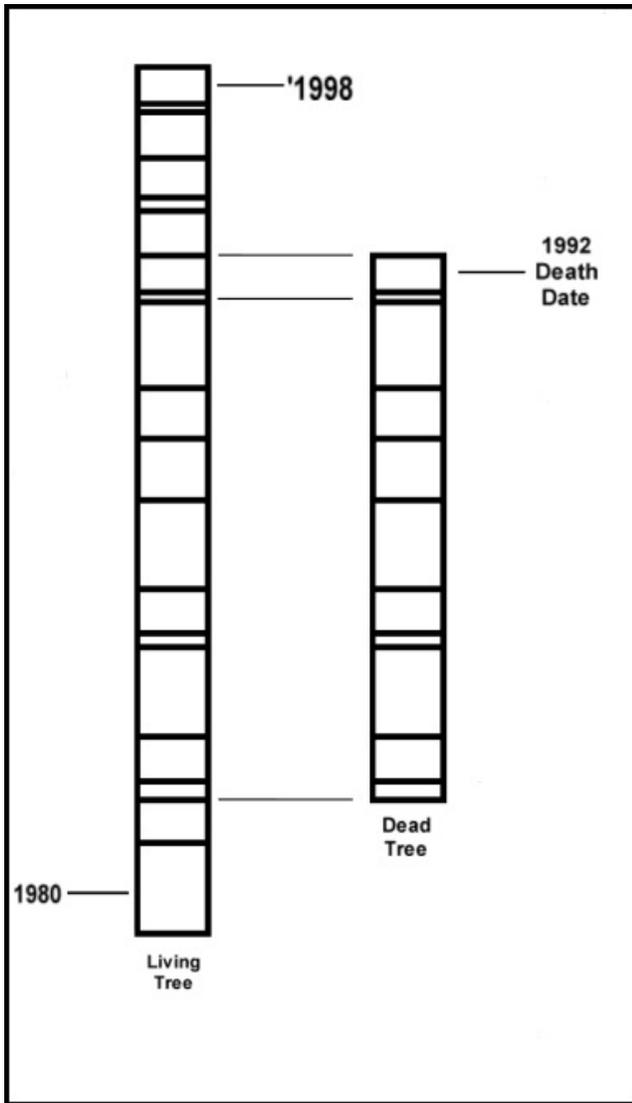


Diagram of tree ring dating

If Gary's hypothesis was correct, the lower four logs might well be younger than the upper logs, and this is where tree-ring dating is needed. Tree-ring dating is based on the idea of matching the ring-width patterns in wood of unknown age with ring-width patterns of known age, measured originally on wood from live trees where the date of the outermost ring is known with certainty. Basically, we line up the narrow and fat rings of the unknown sample with the narrow and fat rings of a known sample (see illustration).

The ring-width matching can be done by eye if there is a lot of variation in ring-width from year to year, as in the illustration. Practically speaking, in this area trees often grow quite steadily, especially near lakes and Cook Inlet, where the water acts as a thermal moderator for the climate. In this case we have

to measure the ring-widths in the lab (to an accuracy of 0.01 millimeter) and then use statistical computer programs to do the ring-width matching.

I and the students took 10 core samples from the logs of the Victor Holm cabin, using an increment borer, which is a threaded tube that we screwed into the log to extract a thin dowel-like core of wood. Each core is glued to a strip of wood and highly sanded so that the rings can be measured easily under a microscope.

Once I had the cores under the microscope I was surprised to see that some of the logs were birch, in addition to the normal white spruce of the area. The cabin logs are weathered and gray, and partially hewn, and we had not noticed that some of them were birch.

As a standard of known age for dating I usually use a "chronology" based on an average of 90 trees from the Tustumena Benchlands, whose oldest trees date back to 1609. If I can get 100 years of good rings, I can date most old white spruce wood in the central Kenai accurately to the year with this chronology. But as I said, there has to be enough year-to-year variation in the ring widths; if the rings are very similar in width (which is called "complacent"), one match is as good as another and dating is impossible. Unfortunately the Victor Holm spruce logs were pretty complacent and I had to do a lot of statistical massaging and head scratching to get some consistent dates. As a further check I also used a white spruce chronology from the Tote Road area, six miles north of the cabin, and got the same dates.

Fortunately, the unusual presence of birch logs provided an independent check on my spruce dates. To date the birch logs I used a chronology of 45 birch trees from the Bufflehead Lake area north of the Swanson River oilfield and the Headquarters Lake area. The Victor Holm birch logs had more year-to-year variation and were easier to date than the spruce logs.

There are some definite limitations of tree-ring dating that should be kept in mind. First, a tree-ring date only tells you when the tree died, not when the cabin was built. The builder could have used a dead tree, or he could have let the logs cure for a period of time before he put them up. Like I said at the beginning, the old timers were usually in a hurry, so they probably put up green logs. In that case the date of the outermost ring would be the date of construction, assuming that the trees were cut during the summer after the new ring had begun to form. The Victor Holm logs were hewn flat on two sides with a broad-

axe, which can only be used effectively with green wood, so this would suggest that builder was dressing the logs and putting them up during the same year that the trees were cut.

Second, weathering can erode the outer rings. To avoid this, it is best to core through the bark, if any bark remains. If the log was completely peeled, as with most of Victor Holm's logs, the outermost rings may be missing and there is no good way to assess this. In dating a cabin we generally try to take as many cores as possible without defacing the logs, and choose the youngest date as the earliest possible date of construction.

Most of the upper logs of the Victor Holm cabin dated from 1882 to 1891, so I would choose 1891 as the earliest date of construction. The pre-1891 dates are probably too old because of erosion of the log surfaces and loss of outer rings. The four birch logs dated from 1885 to 1890.

Most interestingly, the "new" logs on the bottom four courses dated from 1907 to 1915, which indicates 1915 as the earliest year for the remodeling operation. Thus, the cabin was apparently jacked up and the new logs added 24 years after the original construction. The style of log notching at the corners was the same, which suggests the same builder.

There is a second, larger cabin on the Victor Holm site. The logs in this cabin dated from 1907 to 1915, and as usual we would pick the youngest date of 1915 as the earliest possible year of construction, which is the same year that the smaller cabin appears to have been raised.

It is entertaining to speculate about why smaller cabin was raised 24 years after it was originally constructed. Local old timers remember Victor Holm liv-

ing in the larger building in the 1930-40s, and using the small cabin as an auxiliary building. Perhaps Victor Holm or whoever was originally living in the small cabin finally decided that more space was needed.

Having gotten into the building frame of mind, the owner spent the summer of 1915 putting up the larger cabin and decided to raise the small cabin at the same time, while he was set up for carpentry and log work. If so, it appears that a second builder was brought in for the larger cabin, because the corner joints use a much more complex, dovetail style. The builder of the small cabin would have been at least in his 40s, if he did indeed build both the lower and upper parts, as we propose. Such dates would fit Victor Holm's age as best we know it, so it is possible that Victor turned again to work on his small cabin and relinquished the building of his new and larger home to a more experienced logsmith.

At this point, we simply don't know the answer to these puzzles, but, perhaps, the answer might be lurking in some old letters, diaries or photographs tucked away in a local attic. If you are the keeper of such old treasures, please give us a call at Refuge Headquarters (262-7021) before you purge the attic.

In the meanwhile, Gary Titus and his crew have been taking more wood samples from old cabins and remnants thereof, and at last count we have wood from 29 cabins waiting in the lab to be dated. When we have these samples dated, we will publish the results in a historical journal so that they will be part of the permanent historical record for our remarkable area.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

What the interagency All Lands/All Hands agreement and action plan mean to the Refuge

by Doug Newbould

Last November, seven agencies with land management responsibilities on the Kenai Peninsula agreed to work together to implement the All Lands/All Hands Action Plan for Fire Prevention & Protection, Hazardous Fuel Reduction, Forest Health Restoration & Rehabilitation, and Community Assistance. The Kenai Peninsula Borough, the Alaska Division of Forestry (Kenai-Kodiak Area Office), the National Park Service (Kenai Fjords National Park), the U.S. Forest Service (Chugach National Forest), the Bureau of Land Management, the Bureau of Indian Affairs, and the U.S. Fish & Wildlife Service (Kenai National Wildlife Refuge) have collaboratively developed a comprehensive strategy to mitigate wildfire impacts and restore healthy forests on the Kenai Peninsula.

This action plan is the logical offspring of previous interagency planning efforts such as “An Action Plan for Rehabilitation in response to Alaska’s Spruce Bark Beetle Infestation” (Kenai Peninsula Spruce Bark Beetle Task Force, 1998) and individual agency project plans to reduce forest fuel hazards in and around the wildland-urban interface such as the Refuge’s Funny River Road hazard fuel reduction project (initiated in 1999).

While those former plans implemented fuels treatments on public lands, with a perspective of protecting communities from the outside—in, the guiding philosophy for the All Lands/All Hands plan is “from the back porch out”. This philosophy has its roots in the national Firewise Community Action Program, which is based upon an individual homeowner’s responsibility to make his/her home and property defensible from wildfire.

The Firewise Program also provides guidance for communities where the potential for wildfire exists. The goal of Firewise is to help communities mitigate the catastrophic impacts of wildfire through collaborative planning by individual homeowners or groups of homeowners, local governments and fire departments.

Firewise principles have been accepted by virtually every fire management agency and at-risk community in the United States and are now being incorporated

into community protection plans and land management plans everywhere. The National Fire Plan “NFP” (2001) and the Healthy Forests Restoration Act “HFRA” (2003) both provide federal direction and funding to federal land management agencies, in part for the implementation of Firewise activities. The four goals of the All Lands/All Hands Action Plan come directly from the NFP and the HFRA:

- Goal 1 – Fire Prevention & Protection
- Goal 2 – Hazardous Fuel Reduction
- Goal 3 – Forest Ecosystem Restoration
- Goal 4 – Community Assistance.

In keeping with the “from the back porch out” philosophy, the All Lands/All Hands plan seeks to accomplish the fourth goal first—by helping 20 Kenai Peninsula communities develop Community Wildfire Protection Plans (CWPPs) per HFRA direction. These CWPPs will identify defensible space and hazard fuel reduction needs in the wildland-urban interface (Goal 2), including more than 17,000 private land parcels with structures.

Other proposed firewise activities under Goal 2 in the All Lands/All Hands plan include infrastructure protection (fuel reduction along 641 miles of power line rights-of-way) and access/egress protection (fuel reduction along 222 miles of highways and roads). Existing land management agency plans to complete hazard fuel reduction projects within and outside of the wildland-urban interface would continue under the All Lands/All Hands plan. However, project prioritization and coordination would become an interagency task.

Goal 3—Forest Ecosystem Restoration—comes directly from the HFRA. To meet this goal, the plan proposes the restoration of forest cover on almost 200,000 acres of the Kenai Peninsula. The essence of Goal 1 (from the NFP and the HFRA) is to improve interagency capabilities to conduct wildland fire prevention and protection activities on the Peninsula.

The accomplishment of any one or all of the proposed activities in the All Lands/All Hands Action Plan will depend on three elements: community participa-

tion, interagency cooperation and adequate funding. Of these three elements, community participation and funding levels are unknowns. Interagency cooperation is already well-established through years of practice.

How this plan will affect the Refuge remains to be seen. Refuge fire management projects are funded through the National Fire Plan, not the HFRA. So those NFP projects will continue to be accomplished as NFP funding permits. As an interagency cooperator, the refuge will assist other agencies in the implementation of the All Lands/All Hands plan by providing equipment, tools, personnel and expertise whenever possible.

If I could propose another goal or desired outcome of this planning process—an outcome that would benefit the refuge and the fire-dependent ecosystems of

the Peninsula—it would be that every at-risk community on the Peninsula would become a Firewise community, so natural wildland fires could be managed for resource benefits and natural processes could be maintained in wilderness.

It's a lofty goal, I know, and some might say—a pipe dream. But if we, the interagency community and we, the citizens of the Kenai Peninsula all do our parts, then the All Lands/All Hands Action Plan can help us defend our lives, our homes and our businesses from the devastating effects of unwanted wildfires. And natural fires could be allowed to do what natural fires should do—maintain healthy ecosystems.

Doug Newbould has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

I love nature

by Mari Reeves

“I love nature.” It’s what my field crew and I have been saying to each other all summer. “I love nature,” as the eye-level spruce branch thwacks abruptly into my waiting face. “I love nature,” as I pull the bug net down around my neck in response to the sharp pricks on my shoulders and the never-ending buzz in my ears. “I love nature,” as my foot punches through the bog mat into the untold depths of unstable peat moss and water below, hip wader filling with brown muck and heaven forbid, leeches. I yank it back up, recovering concentration on my path with a start. I love nature.

I work in nature. I’m a biologist.

Nature can be a difficult place sometimes, especially in Alaska. I often think of our state as possessing the soul of a manic depressive woman. First she lures you in with her mystery and beauty and maternal abundance, then she threatens you with a landscape bigger than you are and the dangers of residing in the dark near, but beneath, the top of the food chain.

Alaska’s lure lies in everlasting pink and gold sunsets. It shines from snow-capped green mountains with cracked ice-blue glaciers in their crooked elbows. The vast tracts of wilderness sing their siren song, untouched and untrammelled by mankind. There is incomparable beauty in the never-ending light of the three-month long arctic summer, and the mystical dark of winter dances with flickering, colored northern lights. I have flashes of gratitude for the beauty, which I call Alaska Moments.

Nevertheless I said bipolar for a reason, as the more unsettling moments exist, too. In the summer, the rivers fill with glacial water running fast and there are moose and grizzlies in the alders. In the winter the light never intensifies beyond the golden pink hues of early morning and the twilight blues of late afternoon. The slopes rising thousands of feet above tree line threaten unspeakably large avalanches. The sting of winter cold, while exhilarating, carries with it the unspoken threat of life on the sidelines of our warm and cozy civilization. The dangers that lurk in the Alaskan woods, extreme cold, everlasting dark, large avalanches and wild animals make me more nervous outdoors here than I am in other, gentler, places.

In our quest for biology to research, we are stand-

ing at the edge of one of the lakes on the far southwest end of the Swanson River Canoe Route, in the Kenai National Wildlife Refuge, a four-hour paddle and portage from the trailhead. We’re tired from portaging the canoe and all of our camping and field gear, yet because of the compressed timing of biological events during the Alaskan summer, we press on to survey a few ponds after setting up camp.

We point our compass in the direction indicated by our weathered topographic map in its ziploc bag. The bearing points us into a dense thicket of two-inch diameter spruce spaced one to three feet apart. We should see our pond in about half a mile. The twelve-gauge shotgun we shoulder for bear protection catches and hangs up on the spruce boughs we squirm through. The mosquitoes and black flies buzz in the sheltered woods. The moss and lichen beneath our feet crunch with uncharacteristic dryness, the result of three atypically dry summers in a row, themselves the result of a changing global climate.

Tired though we are, we follow the compass arrow diligently, not wanting to stray from our course through the forest. An edge of anxiety rides on my shoulders, I am pushed just that tiniest bit beyond my comfort zone in these woods, being too tired in this situation. I channel the nervous energy into bear avoidance and dredge any snippets of college fight songs from my memory to shout them at the top of my lungs to the woods at large. When I fade off, my coworker rallies with her own tunes. Our nervousness seems to be good for something, as today we don’t see any bears.

After surveying our last pond, we pull out the map to navigate back, and my tired mind blanks briefly on compass skills. As I stare at the colored paper and the spinning circular object, the pang of fear returns. I’m freaked out by the tiredness, the dark spruce forest, and the disorientation. We pull it together eventually and get back on track to the canoe and to camp.

Moments like these, when I feel disoriented and just a little bit scared, are the moments during which I understand some of the impulses of prior generations of humanity. It made good sense to cut the forests, and fill the swamps, and dose the mosquitoes with

fast acting fogs of DDT. Humans generally prefer human habitat to the wild. Nevertheless, when cooped up in the car stopped in traffic, or speeding along in a subway train, or stuck in front of my computer in my fluorescent-lit office for hours on end, I wonder how well suited to this engineered human environment we really are. I am more at peace with the world when I can at least think about the nature that I know is still there; nature in all its uncivilized, buggy, catch-as-catch-can glory. Its mere presence makes me feel better.

Which is why I do love nature. I love that its rivers and oceans wash away life's stresses and give me peace. I love the quiet of the lake at the end of the day and the lonely, wafting cry of the loon in the late dusky arctic evening. I love the blankets of snow

that cover this place in the winter and quiet the land. I love the fact that I have to turn around on trail runs because a moose and her two calves stare unflinchingly from the woods ahead. And I accept the bugs, the dense spruce, and the swamps because without them we wouldn't have the moose, and the birds, and the frogs (although I do sometimes like to kill mosquitoes). I love nature because it takes me out of my comfort zone, makes me grow, teaches me humility, and offers me peace.

Mate Reeves is a contaminants biologist with the US Fish and Wildlife Service in Anchorage. She has been studying wood frog deformities on the Kenai National Wildlife Refuge for the past several summers. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Moose Range Meadows conservation is a challenging but worthwhile “work in progress”

by Rick Johnston

If you like to do some salmon fishing in the Soldotna area, you’ve probably heard of the Moose Range Meadows subdivision on the Kenai River. Maybe you have fished off the Refuge’s fiberglass boardwalks on the north bank, or maybe a law enforcement officer has asked you to pack up your fishing gear and leave what you thought was a public river bank. Or maybe you are a riverbank property owner who either fumes about government restrictions against a desired dock or gazebo, or who enjoys the more-or-less “wild” view when looking up and down the river from your property. If your riverbank property in Moose Range Meadows is an investment, you may well appreciate the extra appraisal value that non-development restrictions can add to your property.

All of the above situations relate to the three mile federal easements along both banks of the Kenai River through the Moose Range Meadows subdivision. Most homeowners are familiar with utility easements which give utility companies the right to dig up the lawn and service the wires and pipes to the house. Similarly, a road right-of-way easement gives the highway department the right to widen the road in front of your house. As the owner, you still own the property, but other parties have a legal right to use it for their purposes, whether you like it or not.

In the Moose Range Meadows, the Federal Government holds easements for a strip of land that includes the river bank and back as much as 140 feet, in some places. The public can walk on this land much of the year, but property owners cannot build any kind of structures on this land, except removable boardwalks for habitat protection, with a special permit.

The easements provide a scenic buffer, bank stabilization, and a corridor for wildlife movement up and down the river. They provide public access to the river, and they seek to preserve some of the wild look of the river. These are the goals, but what is the reality? To understand the reality, we need to step back and look at the history of this unusual federal-private ownership of the Kenai River bank.

Originally all of Moose Range Meadows was

within the Kenai National Wildlife Refuge, or more precisely, within the Kenai National Moose Range, as the Refuge was originally called. Under the Alaska Native Claims settlement Act, Congress in 1979 granted native villages and groups the right to select certain Refuge lands. In a separate agreement, the Salamatof Native Association, who had not been included in the 1979 Act, was given the right to select lands along the Kenai River as part of their land claims settlement. In 1984 Salamatof began subdividing its claimed land as the Moose Range Meadows Subdivision and selling the attractive riverfront properties to ready buyers.

These riverfront properties, however, came with some strings attached, in the form of two separate federal easements. The first easement gave the public the right of access to the first 25 feet of riverbank; this was a concession to fishermen who had been fishing these banks since the Moose Range was established in 1941. The second easement was a “non-development” easement that was negotiated between the Refuge and Salamatof Native Association when Salamatof needed gravel to build roads for its new subdivision. Both easements were firmly in place before any subdivision lots were put on the open market.

The non-development easement was specifically designed to preserve wildlife habitat along the river and to retain undeveloped vistas up and down the river. This non-development easement is generally wider than the public use easement, extending back to the base of the main floodplain terrace, which was typically 50 to 100 feet back from the water’s edge, but can be back as much as 140 feet. The non-development easement is actually quite restrictive. It bars construction of any buildings or structures; it requires that no gravel, topsoil, peat or organic matter be removed or disturbed, that no trees or shrubs be disturbed, and allows no fires or motor vehicles.

As bank fishing and related tourism exploded in the Soldotna area in the late 1980s and early 1990s, fisherman became aware of the guaranteed public access in the Moose Range Meadows and of the good fishing along the banks. Parcels sales within the pri-

vate subdivision were brisk. New residents seeking scenic river frontage, the protective guarantees of the non-development easement, and good fishing in their backyard eagerly snapped up the riverbank lots and began building new homes.

A classic conflict soon developed between public fishermen “loving the banks to death” and private owners who could not legally deny the public access that was causing the bank damage. State and federal managers were in general increasingly concerned about bank damage along the Kenai River and specifically in riparian shoreline zones in places like Moose Range Meadows.

In response, the Refuge established regulations that close the public use easement seasonally (July 1 - August 15) each year to protect riverbanks from trampling by the general public, but still allow property owners and their guests to fish and otherwise enjoy their private property. The remainder of the year (August 16 - June 30) the easement remains open to the public at large.

To mitigate the loss of public riverbank access during the July 1 - August 15 closure, the Refuge purchased several riverside parcels and constructed fiberglass boardwalks that provide good fishing access while protecting the riverbanks from trampling. Exxon Valdez Trust Funds purchased a large unsubdivided block off the river for wildlife habitat, which has been re-incorporated into the Refuge, along with the boardwalk parcels.

Managing the non-development easement has proven to be a “high maintenance” task for the Refuge staff. Everyone enjoys the relatively uncluttered, forested vistas along the river, but some owners have tried to build stairs, gravel paths, and various other structures within the easement, and we have required them to remove these encroachments, at their own expense. On the other hand, we have assisted a number of property owners with permits for boardwalks that must be seasonally removed, which has been especially valued by people with disabilities.

We like to say that the Moose Range Meadows private land—federal easement relationship is a “work in progress.” Basically, the easements are accomplishing the original goals of preserving a bit of wild nature amidst a riverside residential development, as well as providing some public access for traditional fishing activities. It has taken time to educate both fishermen and property owners about the rights and restrictions of the easements, but all-in-all we feel that this rather unique experiment in public-private partnership is turning out remarkably well, and that the moose, salmon and human folks are all benefiting from it.

Rick Johnston is a Ranger/Pilot for the Kenai National Wildlife Refuge. He handles permits and enforcement issues for the Moose Range Meadows easements. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Why doesn't it grow here?

by Ed Berg

As a forest detective, I often spend my time investigating why specific things happen on the landscape, such as a spruce bark beetle outbreak, a particular fire, the drying of a wetland, or the presence of a plant in an atypical habitat, such as treeline-specialist mountain hemlocks on the Kenai lowland. These are interesting puzzles, and they at least generate lively discussions, if not definitive answers.

I find it equally instructive to look at things that haven't happened, at least not yet, or things that are missing or rare or changing. For plants, the basic ecological question is, why is this particular plant growing right here, in this particular spot? What is it about the plant's properties, the soil, moisture, light, seed sources, and competitors that allow this plant to grow here? And conversely, for plants that aren't growing here, we can ask how these same factors might prevent or limit the plants.

For many temperate and tropical plants, our cold climate sets a pretty tough hurdle. Many southern plants are simply not frost tolerant; their cells don't dehydrate in the winter, and ice crystals tear up the cell membranes and kill them. As our winters continue to warm, however, more plants with marginal frost-tolerance are able to survive here. Gardeners in Homer, for example, have gotten away with planting various USDA Plant Hardiness Zone 4 shrubs in recent years, instead of conservatively sticking with tougher Zone 2 or 3 plants, according to Homer News chief gardener Rosemary Fitzpatrick. An unusually cold winter can still toast Zone 4 shrubs (such as azaleas and rhododendrons) but this is increasingly unlikely with our warmer winters.

In case you haven't noticed the warmer winters, consider that both Homer and Kenai average December temperatures have increased by 4°F and January temperatures by 6°F, ever since the North Pacific sea surface temperatures warmed in 1977. Summer temperatures are warmer too, but only by about 2°F.

Occasional low summer temperatures on the Kenai keep plants like corn, tomatoes, and peppers from reproducing, even though these plants can grow to maturity here. Mitch Michaud of the National Resources Conservation Service (NRCS) tells me that corn needs

to have the summer minimum above 50°F to produce ears, and tomatoes and peppers need 55°F. Summer weather in the 40's will derail fruit production in these plants.

Another life-cycle bottleneck for plants is seed germination and seedling establishment. The thick sod of native bluejoint grass (*Calamagrostis*) keeps the soil cold and makes it difficult for even native tree species like spruce and birch to germinate and establish. Cold soil however is a local condition, and there are warm sites such as south-facing slopes, so soil temperature is probably not as definitive a barrier as climate for a plant species to live somewhere in this area.

Intense browsing by moose would certainly stop many shrub and tree species from setting up shop on the Kenai. Just about any kind of non-native shrub or tree that you might ever want to plant in your yard will most likely be browsed by the moose before the first winter is over. Moose are probably new on the Kenai in the last 130 years, at least in large numbers, so this would explain how 18 species of their favorite food—willows—have been able to establish before the moose got to them. It's safe to assume that no new shrub or tree species have established since the moose began to prosper, probably as a result extensive fires on the Tustumena Benchlands starting in the 1870s.

On the Kenai it appears that many creatures—both plant and animal—simply haven't gotten here yet, at least on their own hook. Some of this retardation is due to our almost island-like peninsula structure, which probably restricts animals more than plants. Lodgepole pine for example grows in the Yukon at several degrees latitude higher than the Kenai; it certainly grows well here if properly tended. Since the end of the last major glacial period, lodgepole pine has moved steadily northward from southern British Columbia, averaging 10 miles/century—a rate that would require another 50 centuries to bring it to the Kenai.

Aspen appears to be moving south on the Kenai but has barely made it to Kachemak Bay. Aspen seeds are tiny (nearly invisible in their wind-blown cotton) and are only viable for a few weeks at best; they require wet mineral soil to germinate, such as created by severe mineral soil exposing fires. This is not a

recipe for an aggressive colonist. Aspen is well established north of Tustumena Lake, but it is very rare south of the Caribou Hills. Prevailing winds are from the southwest in the spring when aspen cotton is dispersing, so the seeds have to disperse against the wind to get to Kachemak Bay.

Once established, aspen propagates with a remarkable vengeance with clonal root sprouts (suckers). In Utah a single clone (named "Pando," for "I spread" in Latin) covers 107 acres with 47,000 individual stems, and weighs 6 million kilograms. Clones like this probably established after the last glacial period 8-10,000 years ago, and may be among the largest and oldest living organisms. Each clone starts from a single tiny seed and is one genetic individual.

Birch is more of a puzzle. Birch seeds disperse effectively in early winter over the snow and germinate during the next spring or summer. This is a much more effective system than aspen's same-season, short-lived seed mode. Nevertheless, birch is extremely patchy in some areas of the Kenai, such as the south side of Kachemak Bay. In a study that we did in Seldovia Bay, we saw no birch or aspen, nor any sign of moose or snowshoe hares, for that matter. Alders however were abundant. Like aspen, birch likes to germinate on mineral soil, and fire is the fastest way to get mineral soil exposure. The south side of Kachemak Bay has probably never burned in the 2200 years that it has had spruce forest, so the rarity of birch (and aspen) may simply be due to the chronic lack of a good fire-generated mineral soil seedbed.

The acidic soils of the Kenai prevent plants from settling here that like a sweeter soil. Gardeners know well that it is necessary to generously lime the garden in order to get most domestic plants to thrive or even grow at all on the Kenai. This acidity is due to the ultimate volcanic origin of our soils, either directly from volcanic ash or from glacial till and wind-blown loess that is derived from greywacke sandstone in the mountains, which is itself mostly derived from volcanic basalt. There is very little limestone in the Kenai mountains, which could have neutralized our soils. Most Kenai plants are probably rooted in the loess cap that blankets our hills and valleys, and typically has an acidic pH in the low 5s; most agricultural plants like a higher, less acidic pH around 6.5, according to soil scientist Doug VanPatten, recently retired from the NRCS in Homer.

When I first came to Alaska from Wisconsin in the 1970s, I was appalled to see what passed for a "hay"

crop up here. In Wisconsin we got three cuttings of fine alfalfa hay per season, whereas on the Kenai we get one cutting of mixed grasses and horsetails. I was told that alfalfa didn't overwinter well here. Mitch Michaud points out, however, that alfalfa grows well in the Interior, where the soils are not so acidic and the summers are warmer. It could take many truckloads of lime to make a good alfalfa field on the Kenai, so cost-wise hay farmers are probably right to stick with the grass.

In addition to acidic soils, the needle litter of spruce forests produces a soil that is toxic to many plants. There are very few plant species that grow on the floor of a spruce forest. From the point of view of species diversity, a mature spruce forest is like a desert.

In theory, the opening up of the Kenai's beetle-killed spruce forest could provide habitat for new plant species that can't tolerate spruce-contaminated soils. Most of this new habitat, however, is being rapidly taken over by *Calamagrostis* grass, which creates a tight sod and cold soil, that is as inhospitable to new plants as spruce soil, and is its own brand of botanical desert.

I have recently completed an extensive fire history study of the central and southern Kenai, and have found that fire has been a relatively minor player in the upland spruce forests south of Tustumena Lake, at least over the last 2500 years for which we can find adequate charcoal in the soil for radiocarbon dating. The average time-since-fire is about 600 years, and west and north of the Caribou Hills we found stands that haven't burned for 800 to 1500 years. Spruce bark beetles on the other hand infest these stands every 50 years on average, at least to the extent that surviving trees show detectable growth pulses due to reduced competition.

The lack of fire in our southern Kenai forests means that mineral soil doesn't get exposed very often in the uplands and that nurse wood (rotten logs or stumps) is the primary germination site for baby plants. Spruce germinates readily on nurse wood, birch much less so, and aspen probably not at all. The stilted roots typical of spruce trees on the southern Kenai show that these trees germinated "up in the air" on nurse wood, in a fire-free environment.

When you go north of the Kasilof River into the lake and black spruce muskeg country, fire has been much more abundant, and spruce tree roots spread out from the base of the trunks, indicating that the trees germinated in mineral soil, not on nurse wood. The

fire-return-interval in the lowland black spruce forests is about 90 years, and is about 300 years in the surrounding upland mixed white spruce, birch and aspen forests. The diversity of plants is greater in this mosaic of forest ages and vegetation types than in the southern Kenai monospecific white/Lutz spruce forests and the Calamagrostis grasslands. Wildlife as well is much more diverse and abundant north of the Kasilof River. Fire may be the curse of homeowners, but it's a great benefactor of the plants and the animals on a landscape scale.

To sum up, a cold climate, acidic soils, island-like geography, and extensive spruce forests with little fire have kept a lot of plants off the Kenai in the past. Now that the climate is warming, we can expect more fires in drier forests, sparked by more human sources of ignition. This will allow new plant species to colo-

nize and thrive on the Kenai, as well as new animals. We may not want some of these newcomers. Things like Russian thistle and purple loosestrife are downright nasty, even if they look nice in gardens. Concern about invasive plants is rising in Alaska, and now is the time to think carefully about what plants we don't want and to be a bit more careful about what might escape from our gardens. There are lots of mistaken introductions in the Lower-48 that we would do well not to repeat in our warmer Alaska.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will be teaching his "Geology of Kachemak Bay" course at the Kenai Peninsula College in April in Soldotna (Tuesday eves) and Homer (Thursday eves). Call 260-2812 for more info. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Ecologist will use computer maps to track Refuge landscape and wildlife

by Lee O'Brien

We were on a ferry christened with the same name as the largest lake on the Kenai Peninsula: The Tustumena. A crew member had told us that the seas can be a bit “chippy” crossing the Gulf of Alaska. My wife had spent six weeks living and working on a 125 ft sailboat, so she knew what she was in for. I had never been on the open ocean. I thought, “How bad could it be?” The swirling started in my head and slowly worked its way down to my stomach. Sitting down didn’t make things better. Lying down was the only way to keep hold of your lunch. So, we spent the better part of two days with a view of the ceiling over our bunks. We arrived in Seward to dark and freezing rain. My first time in Alaska.

Growing up in Missouri, my family had a farm in the Ozarks where I learned to hunt, fish, canoe and appreciate the outdoors. Since then, I spent the last 25 years living in various places in the western U.S., where I became acquainted with many different landscape types from open grasslands to desert shrublands and montane forests to alpine tundra. But I had never experienced anything like Alaska. Everything seems bigger here. The lakes are bigger. The rivers are bigger. The fish are bigger. The animals are bigger. Fishing for trout and bow hunting for elk seem now like child’s play when I see the size of the moose here and the salmon mounts around town. And realizing that you can as likely be the hunted as the hunter brings a sense of awe and humility in the face of the wildness of this place.

I came here as a landscape ecologist and new geographic information systems (GIS) manager for the Kenai National Wildlife Refuge. One of my idols, Aldo Leopold, wrote, “The key to intelligent tinkering is keeping all the pieces.” What I do in my work is to try to keep track of all the “pieces” of a landscape... how many there are... where they are... what condition they are in. That way when things change, there exists a map of how things were put together and how they functioned.

Landscape ecology involves looking across large areas and trying to understand why things are where

they are and what their role is in the systems that produce and sustain landscapes. Why are ptarmigan found in upland tundra and not in lowland fens? Why do redpolls stay here for the winter while tree swallows head for Mexico? And what processes cause the patterns that we see? There are often fascinating interactions between the players in landscapes. Spruce bark beetles kill trees, which burn, allowing alders and willows to establish. Moose change their patterns and move into burned areas; bears may follow and distribute berry seeds which eventually grow into shrubs that bring in waxwings, while martens move away to areas of denser forest, fully recovered from earlier fires. So, bark beetles can determine where waxwings, moose and martens live, and the condition of forests in Mexico can control the number of mosquitoes on the Peninsula, by affecting how successfully tree swallows over-winter. Studying the changing patterns and the interactions among the pieces in landscapes can teach us what impacts tinkering may have.

GIS is a computer map tool used to keep track of where things are and how they change over time on the landscape. By monitoring how things have changed in the past and how rapidly things are currently changing, predictions can be made about how the landscape will look in the future. GIS can be used to explore different scenarios that occur when different pieces are tinkered with. This is useful when management decisions have to be made that will affect the future state of the refuge and its biota. Do you let a fire burn or put it out? Do you let dead trees stand or cut them down? Do you put a road in here or over there or nowhere? What effects will increasing development have on the borders of the refuge? If wetlands begin to dry up, what ripple effect will that have throughout the landscape?

I have used GIS to monitor the home ranges of kit foxes in the California Central Valley, and to determine the best areas to reintroduce black-footed ferrets in Utah. I have used GIS to simulate trapping small mammals in different size grids to determine how many traps and how long you’d have to trap to

find out how many and what species live in an area. The trapping grids were then tested on the ground in Yellowstone. I used GIS to model the habitats of all the land animals in Colorado (over 1000). And most recently, I was the Colorado State Coordinator on a five-year project that covered five states in the Southwest, mapping the vegetation and habitats of all species occurring there. These computer maps were then used to determine which areas may be sensitive or contain rare “pieces” of the landscape that should be taken into account when planning for different land uses (“tinkering”).

I have also just completed a master’s degree thesis which assesses the accuracy of predictions made by GIS simulations. It is important for users of this type of information to know how reliable the predictions may be.

Although I’m new to Alaska and the Fish & Wildlife Service, I hope to bring some of my experience to bear on keeping the Kenai National Wildlife Refuge healthy and productive for generations to come.

Lee O’Brien has a Bachelor of Science degree in wildlife biology from Colorado State University and in two weeks will defend his Master of Science thesis in landscape ecology. He moved here with his wife, Barbara, at the end of November as a wildlife biologist/GIS specialist at the Kenai National Wildlife Refuge. Barbara is pursuing a career as a science writer. Lee also has a 14-year-old daughter who visits from Colorado during her school breaks and thinks Alaska is “pretty cool.” Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Do long tails tell the tale? Reported mountain lion sightings once again in the news

by Ted Bailey

Editor's note: In view of the recent reported sightings of a mountain lion in the Homer area, we are re-running this 2002 article by Ted Bailey on mountain lion sightings on the Kenai Peninsula. In this article Ted writes that scientists are by nature and training skeptical of such reports until backed up with physical evidence in the form of identifiable tracks, photographs, DNA evidence from feces or hair, or the ultimate and unquestionable evidence—a carcass. But he also acknowledges that it is difficult to dismiss the periodic descriptive observations of mountain lions by sincere local observers.

In the summer of 2001, two seasonal staff members on the Kenai National Wildlife Refuge were together driving down Swanson River Road. Suddenly, on the road ahead of them appeared an unusual animal. After crossing the road, it paused in the vegetation at the edge of the road long enough for them to get a good look at the animal, which they described as a large, long, brown cat with a long tail. They claimed that it definitely was not a wolf, coyote, or lynx.

Was this merely a mistaken identity of a common animal from persons unfamiliar with Alaska wildlife? Then what about similar reports from long-time residents?

A number of years ago a 30-plus-year peninsula resident—someone familiar with bears, wolves, coyotes and lynx—also reported seeing a large, long, brown, cat-like animal with a long tail crossing Skilak Loop Road. And from his house, another long-time peninsula resident, also familiar with the area's wildlife, watched an unusual-looking animal at the far side of an open field for more than 10 minutes through a spotting scope. The description he gave was of a large, long, cat-like animal with short ears that periodically switched its long tail back and forth.

In yet another incident, a man reported that his dog rushed up to his house obviously frightened, barking and looking behind. At the edge of the forest nearby the man reported seeing crouched a large, brown, cat-like animal with a long tail, which then got up, turned broadside, and walked away.

These are several of the best reports to which I personally listened during my years as supervisory biologist at the Kenai National Wildlife Refuge. I have heard of other reports, but did not interview the observers.

The people I talked with had several characteristics in common. First, they were not seeking publicity or fame, did not want their names mentioned for fear of ridicule, and they appeared to me to be telling the truth.

Second, they usually said, "You're not going to believe this, but I know what I saw," and they were convinced that they had seen an animal out of the ordinary.

Third, with the exception of the two seasonal refuge staff members who were not Alaska residents, but were competent observers, most observers were residents of the peninsula familiar with area wildlife. One said it was a "mountain lion," another said it "looked like a mountain lion," and yet another person said, "It was a very large, long, brown cat, definitely not a lynx." What are these people seeing? Is it possible that mountain lions could naturally reach the Kenai Peninsula?

Mountain lions are slowly expanding their range northward in Canada. Not too many years ago, the northern limit of the mountain lion was in British Columbia and Alberta. However, an updated distribution map now shows the mountain lion in a small area of the southern Yukon, and there is a verified record of a mountain lion in the Kluane Lake area.

There are even occasional reports of mountain lions in the southern part of the Northwest Territory.

On November 25, 1989, the first confirmed mountain lion in Alaska was shot in southeastern Alaska four miles from Wrangell. A second mountain lion was found dead in a snare on southern Kupreanof Island in Southeast in late December 1998. In 1999, the Juneau Empire newspaper reported that two Alaska Department of Fish and Game employees had seen a mountain lion at close range in 1992 in broad daylight on a road near Yakutat.

Mountain lions—usually subadults—are certainly

capable of dispersing over long distances. A Canadian research biologist said he had seen their tracks crossing glaciers and icefields in mountains in Canada and had occasionally known radio-collared mountain lions to disperse to unknown areas.

Another possibility is that someone could have accidentally, or intentionally, released a captive or “pet” mountain lion on the peninsula.

Could a mountain lion survive on the Kenai Peninsula? Mountain lions in southeastern Alaska could probably prey on deer, but they can also prey on moose, the most abundant wild ungulate on the peninsula.

Ian Ross, a Canadian biologist who conducted research on mountain lions in Alberta, is one of the few researchers who have studied mountain lions in habitat occupied by moose as well as by elk, white-tailed and mule deer and bighorn sheep. In 1996, Ross reported in the journal “Alces” that in the winters in his Alberta study area, moose were important prey of mountain lions. Fourteen percent of 312 kills of mountain lions that he examined were moose. All of the moose killed by mountain lions were young moose less than 20 months old—calves and yearlings—and more than a third were in very poor physical condition, based on the fat content in their bone marrow. No adult moose were killed by mountain lions, but the lions scavenged from the carcasses of four already dead adult moose.

Both male and female mountain lions, and subadults, killed young moose despite the fact that many young moose appeared to be accompanied by their protective mothers when they were preyed upon. The defensive behavior of the cow moose was not enough to thwart the attacks.

Ross found that moose contributed 30 percent of the biomass consumed by mountain lions in winter.

But because of the poor condition of the moose killed by mountain lions, he concluded that mountain lion predation on moose appeared to be “compensatory,” meaning that the chances were high that the moose that were killed by the mountain lions would have died anyhow.

Finally, the climate on the peninsula would not appear to be a limiting factor for mountain lions. Mountain lions inhabit areas as cold or colder and areas with

greater snow depths than we normally have on the western Kenai Peninsula.

So, do we have a mountain lion on the peninsula? Do we have a breeding population of mountain lions on the peninsula? Scientists remain skeptical until they are confronted with hard, preferably physical, evidence from a trusted observer. This could be a good clear, close, authentic photograph, casts or photographs of tracks in the snow or mud, scats (feces) or hair confirmed by DNA analysis to be from a mountain lion, or the most conclusive evidence—a carcass.

I became familiar with mountain lion tracks in the snow, having observed them in previous studies in Idaho and Montana. I have seen hundreds of tracks of lynx on the refuge over the years but have never observed what I thought was a mountain lion track.

During most years of the 1990s, we captured many lynx for research purposes on the refuge with trained dogs. These same dogs were previously trained to trail and tree mountain lions for research purposes in the state of Washington, but we never encountered a trail of a mountain lion on the refuge while using the dogs.

So what do I think? I do not believe that there is a breeding population of mountain lions on the peninsula—there have never been reports of females with kittens—but I also find it difficult to just outright dismiss the periodic descriptive observations of some apparently sincere peninsula residents. Therefore, I would not be terribly surprised some day if someone provides the hard evidence, in whatever form, that may confirm that a mountain lion is—or was—present on the peninsula.

Added note: Ian Ross the Canadian wildlife biologist mentioned above, who discovered that moose were an important prey of mountain lions in his study area in Alberta, was killed in an aircraft accident in Kenya in June 2003 while radio tracking African lions.

Ted Bailey is a retired refuge wildlife biologist who has worked on the Kenai Peninsula for more than 25 years, with a special interest in lynx and other large felines. His book “The African Leopard: Ecology and Behavior of a Solitary Felid” first appeared in 1993 and will be republished by Blackburn Press within next several months. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Invasive Plants: An ounce of prevention...

by Caleb Slemmons

Maybe it's a little early to start thinking about summer landscaping projects and gardening. Nonetheless, here is something to consider when you slip on your gloves and knock the dirt off your gardening tools. Many invasive plants that now wreak havoc in natural settings were introduced as ornamentals or for gardening. For example, garlic mustard (*Alliaria petiolata*) was introduced as a salad green by European settlers and now poses a serious threat to ecosystems and native plants throughout much of the lower 48. A localized population was even discovered near Juneau in 2001 and may now have spread beyond control, despite early removal attempts. Other invasives such as bird vetch, ox-eye daisy and orange hawkweed have already been sighted on the Kenai Peninsula. As such, the Refuge is currently planning to survey disturbed sites for exotic and invasive flora this summer.

So what exactly is an invasive species? No easy answer here but generally, invasives are characterized by their tendency to spread aggressively making removal a struggle, in the best case, and an impossibility in others. They are species that often do substantial environmental and economic harm. Few exotic plants, or those that have not historically been part of the species assemblage of a particular habitat, are actually invasive. Most are content to propagate in small patches on marginal, disturbed habitats.

Although many invasive plants thrive from disturbances, such as timber harvest or soil excavation, some species are even able to invade intact habitats. Once established, invasive plants often form a monoculture by replacing native vegetation. Why is that such a problem? Plants serve as the foundation of a food chain and replacement of native vegetation with invasive, non-native plants can have many negative effects on wildlife that rely on native vegetation. Researchers at the University of Alaska Fairbanks are concerned that invasives, such as European bird cherry, may do just that. Competition with native species such as cottonwoods and willows could potentially threaten preferred winter browse for moose and other wildlife. Other unknown effects may also result such as alteration of hydrology, nutrient cycles and fire regimes.

Still, it's early in the game for Alaska. Many feel

that Alaska has a unique opportunity to be proactive in managing exotic, invasive and other injurious plants. As a combined result of unique climate conditions and fewer population and land use pressures, only 144 (10%) plant species in Alaska are considered exotic with viable wild populations. About 15 invasive species (over half of the known invasive flora for Alaska) have been recorded on the Kenai Peninsula. For comparison, my home state of Ohio has over 700 established exotic species statewide, about one-quarter of which are invasive! It isn't simply a question of aesthetics. Invasive species can inflict tremendous economic harm. In fact, invasive species have the potential to undermine much of Alaska's resource base and industry including fishing and tourism if left unchecked.

This summer the Kenai Refuge will begin surveying disturbed areas for the presence of exotic and invasive plants. This effort will help to guide future monitoring and management. The importance of catching emerging infestations can't be overstressed. Many invasive species produce hundreds of seeds per plant, which may be viable for 20 years or more. In fact, invasives are often armed with a battery of adaptations that allow them to spread, including spreading underground via rhizomes and exuding root chemicals that inhibit the growth of other species. The time and cost for removal and revegetation projects for infestations of these species can be staggering. The best thing to do is be proactive and the immediate results of the summer survey will be a crucial element for Kenai Refuge in this task. Look for an update this summer in the Refuge Notebook.

What can you do? The old adage "an ounce of prevention is worth a pound of cure" seems to ring true when it comes to managing invasives. Invasive plants can come from a variety of sources ranging from bird feeder seeds to landscaping plants. Learn about what plants are non-native and may have invasive tendencies. Avoid using birdseed and "wild-flower" mixes with unknown components. Remove known invasives from your property and use native plants for landscaping, which are already adapted to local soil types and conditions and are consequently

easier to maintain. Remove seeds from your boots and socks between hikes so you don't transport invasive plants from one area to the next. You can even participate in local invasive control efforts such as "weed pulls." Invasive plants are also commonly introduced and spread via animal forages. Use certified weed-free forages, which are becoming increasingly available in the state. To find out more about weed-free forage, native landscaping and volunteer opportunities visit <http://www.cnipm.org> on the web and contact your local UAF Cooperative Extension Service or

Soil and Water Conservation Office. Do your part, protect Alaska's diverse flora and prevent the costly mistake of introducing problematic plants.

Caleb Slemmons is an intern working with the Kenai Refuge. He is completing a Masters Degree in Environmental Science at Miami University in Oxford, Ohio. Caleb will be surveying exotic and invasive flora on refuge lands this summer. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Looking beyond the snow berms, there are new things to see

by Leah Rigall

Another day of forecasted snowfall, and it is tough to believe that some Kenai Peninsula residents are singing about spring. It may be easier to notice the potholes and rock chips, or the dirty berms of snow still lining the highway, but close your eyes and listen carefully, and you, too, might hear these spring songs, and see why they are being sung. The black-capped chickadees flitting around the birch trees here at the Kenai National Wildlife Refuge headquarters have started their spring songs. Listen a little more and you can hear the distant drumming of a hairy woodpecker. After the relative silence of our winter forest, these subtle sounds catch my attention, and make me forget, if only for a moment, the chilly wind still blowing across the parking lot.

There is another remarkable event happening right now. It is another sign that winter is coming to an end and warmer, longer days are just around the corner. A flight of over 10,000 miles is preparing for arrival on the Kenai Peninsula, and it's not landing at any regional airports. The landing location is, instead, the islands and coastlines of Alaska, and the long-distance travelers are arctic terns. These birds migrate between the Arctic and Antarctic each year, enjoying the sun year-round while we shovel our driveways, put on studded tires and bundle up in winter parkas.

Now, while shedding our coats and taking off our ice cleats, we are preparing for the arrival of another migration. This human migration brings RVs and rental cars to town, and many visitors to the Refuge. Looking forward to their arrival, summer activities are being planned, campgrounds will soon be cleared of winter debris, and if I listen carefully, I can hear the first sounds of boats being brought out of storage.

What other signs of spring do you notice when you look a little closer? Have you seen a caribou out on the Kenai Flats yet? Have you seen grasses peeking out of the snow along the roadsides? Have you watched the icebergs along the beach shrink, little rivulets running from these gray monoliths out to Cook Inlet? Instead of seeing the muddy waters of break-up, I watch the Kenai River flowing open again and nearly ready for the summer salmon runs. Crunching over the thin ice of melt water puddles, I look out at the pussy willow buds, the bright blue sky and after just a few minutes of looking at these changes, it is easier to believe the chickadees and join them in welcoming spring.

Leah Rigall is an Environmental Education intern at Kenai National Wildlife Refuge. She has worked at the Refuge since May 2004. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Wildland fire behavior prediction is both science and art

by Doug Newbould

Predicting wildland fire behavior is somewhat like predicting the behavior of a wild animal. Wildlife biologists or behavioral scientists may study a species or observe the individual activities of an animal over a period of time, and become somewhat proficient at predicting behavior.

Likewise, a wildland fire behavior analyst is skilled at gathering fuels and topographic information, collecting fire and weather observations, and then using mathematical models to make predictions about how a wildfire is going to act.

My dictionary defines 'behavior' for both humans and animals as 'observable activity' or as 'the aggregate of responses to internal and external stimuli.' A more general definition of behavior is 'the action or reaction of any material under given circumstances.' Similarly, wildland fire behavior may be simply defined as the responses of a fire to its environment.

What is missing from all of these definitions is the element of unpredictability that is inherent in anything classified as 'wild.' We all know or should know that wildlife and wildfires, by nature, are somewhat unruly and unpredictable. Wildness is the reason why a tourist in Denali or Yellowstone should never smear honey all over their child's face—to entice the cute bear to kiss the kid for that one, unforgettable photograph. And wildness is why wildland fire behavior prediction is as much an art as it is a science.

Wildland fire science is well established in America, both in our university system and within the national wildland fire management community. Colorado State University (my alma mater) and the University of Montana are two of several major universities with renowned fire science/research programs. There are also a number of federal fire research facilities and programs including the fire science laboratory at Missoula and the USDA Forest Service, Pacific Northwest Research Station in Seattle. At these facilities and others in the United States and Canada, the science of wildland fire behavior analysis and prediction is constantly advancing.

But where is the ART of fire behavior prediction taught? The answer to that question is the School of Hard Knocks. To be qualified for the position of

Fire Behavior Analyst (FBAN), one must successfully complete a series of wildland fire behavior training courses developed by the National Wildfire Coordinating Group (NWCG), complete a number of trainee assignments to gain experience, and be fully qualified as a Division Group Supervisor (DIVS). A fully-qualified DIVS is someone who has graduated from the School of Hard Knocks—having received years of formal training and wildland fire experience on large wildfires.

Division Group Supervisor is a leadership position in the Operations section of an incident (wildfire) management organization. A DIVS is responsible for making tactical decisions about the safe use of firefighting resources during wildland fire suppression. So, you could say the Fire Behavior Analyst must possess both brawn and brains, since an FBAN must be trained and qualified to fight fire as a DIVS (brawn) and be able to use mathematical models to predict fire behavior (brains). But, again, how does the FBAN become an artist?

Interpretation and calibration are the tools of the trade for the FBAN artist. A good FBAN must be able to understand how fire reacts to different fuels, weather and topography, collect accurate information for input to predictive models, interpret the outputs/results from those models, then calibrate or adjust the models using real-time fire behavior and weather observations. As you may have guessed, often the most challenging and unpredictable element of fire behavior prediction is the weather. And that is why most FBANS are also budding meteorologists, again with beaucoup experience in the School of Hard Knocks.

I began learning about the fire environment and the fire behavior triangle (fuels, weather and topography) in 1976, when I attended fire school (basic wildland firefighter training) in Jackson, Wyoming. There I completed S-190, an Introduction to Wildland Fire Behavior course. After many years of wildland firefighting throughout the western U.S., I completed the Intermediate Fire Behavior (S-390) course in Montrose, Colorado in 1988. There I first learned to use mathematical models to make simple fire behavior predictions.

After many more years of firefighting and pre-

scribed fire experience I attended Prescribed Fire Planning and Implementation in Mandan, North Dakota (1998). There I learned to work backwards from a set of desired outcomes or objectives, and using fire behavior modeling tools—develop prescriptive parameters and a prescribed fire plan that would accomplish those objectives. That course qualified me as a trainee prescribed fire burn boss. Many more years of prescribed and wildfire experience and training brought me to my current qualifications of Type 2 Burn Boss (RXB2) and Task Force Leader (TFLD).

Last week, Dianne MacLean (the Refuge's Assistant Fire Management Officer) and I successfully completed S-490, Advanced Wildland Fire Behavior Calculations in Fairbanks. It was by far the most challenging (and rewarding) NWCG training I have ever attended.

But, Dianne and I still have a couple more rungs to climb on the ladder to be an FBAN: we would have to pass the S-590 course (Advanced Fire Behavior Interpretation) and achieve full qualifications as Division Group Supervisors.

In my mind, I think I have the brawn and brains to be a Fire Behavior Analyst. But I know in my heart I still need to develop the artistic abilities necessary to interpret and calibrate fire behavior models. I'm just not there yet. I guess I'll have to go back to my old school—Hard Knocks, for some post-graduate pounding.

Doug Newbould has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Refuge ecologist visits Costa Rica

by Ed Berg

A visit to the tropics is as close as ecologists ever get to heaven during their mortal lifetimes. Only in the tropics can you see the full splendor of plant and animal life—the brilliant birds, the flowers, the little frogs and lizards, and amazing bugs of all sizes. And of course only in the tropics can you find yourself hosting the greatest variety of microorganisms that you would just as soon leave inside the medical textbooks.

I recently returned from a 12-day tropical ecology fieldtrip in Costa Rica, where I journeyed with three professors and their students from Binghamton University in New York. We traveled in three vans and stayed at various biological field stations and modest hotels, like pilgrims to a biological Holy Land. We covered a wide variety of forest types, from beaches and mangrove forests on the Pacific coast, to mountain cloud forests at Monteverde, and the dwarf alpine (paramo) forests of the Sierra de la Muerte at 11,000 feet elevation.

I have traveled quite a bit in Central America, but never with a group of such expert birders. The professors have been making this trip for 13 years, and have a remarkable command of the birds, by both sight and sound. We got up at dawn every day, when the bird singing shifts into high gear for an hour or so. Sometimes we would hear the rumble of howler monkeys bouncing from one heavily forested mountain slope to another. Once the sun was up, the bird vocalizations subsided and we retreated to breakfast in preparation for the day's activities. By the end of the trip we had seen and identified 282 species of birds, out of the roughly 850 species known for Costa Rica.

One of my favorite activities in the tropics is watching the long lines of leaf cutter ants. These ants cut half-inch pieces of leaves, which can weigh as much as 12 times their body weight. They carry the leaf fragments over their heads along well-trodden paths to underground borrows, where they have a labyrinth of chambers occupying several cubic yards of soil. They deposit the leaf fragments in these chambers and inoculate them with a fungus, which they subsequently eat. The ants are thus actually farming fungus gardens and are not eating the leaves.

A colony of leaf cutters is founded by a single

queen, who mates with four to 10 males on her nuptial flight. The queen can lay millions of eggs over a period of 10-20 years, using the original sperm stored from this single flight. The worker ants of the colony are all sterile sisters or half-sisters from this queen. The queen also produces a few fertile females for future queens as well as some fertile males.

We all agreed that the outstanding bird sighting of the trip was the mating of three-wattled bellbirds. The male bellbird had a white head with three black wattles (strips of skin) hanging down from the base of his beak; the wattles are about three inches long and perhaps an eighth-inch wide. The male was perched on a high treetop, displaying himself by opening his large mouth (which is all black inside) and swinging his wattles. Presently a rather drab-looking female landed on a branch near him. The male hopped on top of her, made a quick thrusting motion, while uttering a single loud "Bonk!" after which the female flew away. Soon, however, she flew back, and the ceremony was repeated. The humor of the male's victorious "Bonk!" could not escape us, and our howls of laughter made it hard for us focus our binoculars, as we watched this cycle repeated fully eleven times.

The bellbird mating of course generated a discussion about the mechanics of birds mating, of which we were all a bit unclear. Visiting the Internet upon returning home, I learned that most birds do not have a penis and there is no penetration involved in mating. Birds have a cloaca under the tail feathers, which doubles as both an anus for excretion and a reproductive port. The male's sperm duct ejaculates into the cloaca near the opening, so that during mating the cloaca is moist with sperm. When the male mounts the female he must twist his tail under the female's tail so that his cloaca presses against her cloaca, and sperm is transferred. The female's vagina is connected near her cloacal opening, and the sperm must travel into the cloaca and up the vagina to the uterus to reach the egg for fertilization. When the egg is ready to be laid, it must pass down the vagina and out of the cloaca.

In our travels around Costa Rica we observed that much of the land has been deforested for cow pasture. Costa Rican cows must be pretty athletic, to

judge from the steep treeless slopes that have been cleared for them. The hillsides were frequently contoured with more-or-less horizontal paths created by cows trying to avoid going up or down these declivities. Patches of wild forest still cover the steepest areas, ridge tops, and ravines, and other areas considered uncow-worthy. These wild patches are small refuges for biodiversity, especially for birds that move from patch to patch.

We visited an interesting experiment in reforesting steep pastureland near Dominical, in southwestern Costa Rica. In the early 1990s a small group of Northamerican conservationists purchased 350 acres of mostly steep pastureland that had been grazed for about 20 years. They wanted to see if this barren land could be restored to forest, in an economically practical manner, and called the project “The Tropical Forestry Initiative.” One of the founders was Carl Leopold, son of Aldo Leopold whose “A Sand County Almanac” is a well-known bible of conservationist philosophy. They have planted a variety of local trees, some with good forestry potential, and some for wildlife habitat.

The soils in this area are relatively young volcanic soils and are fairly rich, by tropical standards, despite the typical red clay appearance with little organic content. In less than ten years many of the new trees have grown to more than 50 feet in height and diameters of six to eight inches; the canopy is closing and a new, secondary forest is well underway. Further up the steep ridge there is uncut primary forest with huge buttressed trees with thick vines, and a many-layered canopy structure. The difference between the original primary forest and the new secondary forest was of course striking, but even more striking was the rate at which the new forest was catching up with the old forest.

This experiment at least shows that steep deforested slopes can be reforested fairly quickly with fast growing tree species, and much of the forest value for wildlife can be restored, perhaps within a few decades. For forestry purposes, however, the trees would probably have to be skidded out with horses to avoid destroying the new growth and gullying the slopes. Industrial foresters would probably never be convinced by this example, but it does represent a promising possibility for sustainable small-scale local forestry.

Sustainability is a big issue in the tropics. We saw extensive plantations of teak and oil palms, planted in neat rows with very little growing between them.

The teak is cut on a short rotation of 20-30 years, and the oil palms must be killed off with herbicides and replanted every few decades to keep up productivity of the oil-rich fruits. After a few cycles the soil will be depleted, and it will be necessary to add expensive petroleum-based fertilizers, which is only practical in a world with cheap oil.

Our last night was spent at Hacienda Baru National Wildlife Refuge, which is another remarkable conservation experiment. In 1972 this area along the Pacific coast was a cattle ranch with 150 cows on 800 acres, managed by a young American named Jack Ewing for some Tennessee investors. The ranch hired three people full-time, and maybe another dozen during the rice harvest.

Jack told us how one of his cowboys had killed a beautiful ocelot, and Jack—an experienced hunter—for some reason felt bad about this killing. He started putting up “No Hunting” signs and hired guards to keep out poachers, which did not contribute to his popularity with the locals. The wildlife populations increased substantially, however, which did not go unnoticed.

In 1986 the road was paved and truckers with guns began shooting animals along the road. A local group was formed to stop this practice, and a particularly flagrant poacher was jailed. Other towns joined the anti-hunting group, and worked to set up a string of mostly private wildlife refuges called “The Path of the Tapir,” which now protects a corridor of 15,000 acres. In the 1980s Hacienda Baru abandoned cattle ranching and the land was allowed to return to forest, and was subsequently reorganized as a wildlife refuge. Today Hacienda Baru is funded solely by ecotourism (15,400 visitors last year) and employs 33 people housing, feeding, and guiding visitors through the lush forests. The beautiful beach with vigorous surf is a further drawing card, as are the canopy tours with ropes and aerial platforms.

The Costa Rican government has taken some very good steps to prevent further deforestation and has recognized ecotourism as a major economic force. Over 20% of the country is in some kind of protected status, and this is drawing ever more tourist dollars into the national economy. Legislation has been passed recently to pay forest landowners for the ecosystem services of their forests, such as watershed protection. Water users downstream from uncut forests, such as hydroelectric utilities, are being asked to pay a water tax that will go to the forest landown-

ers. When the forests are removed, the quality of watershed ecosystem service is severely degraded: rainfall tends to decrease (when the water transpired from the trees is lost), and the streams discharge quickly in floods of muddy water.

The Costa Rican government also recognizes that forests remove carbon from the atmosphere, so there is a gas tax which is used to finance the planting of new trees to offset the CO₂ emissions from burning gasoline. These are impressive, ecologically aware steps for a small under-developed country, and it would be nice to see such ideas implemented in the U.S..

Costa Rica is a friendly country for travelers, and I can see why it has become a popular retirement destination for Americans. It has no army, and you don't see a lot of bored, heavily armed soldiers standing

around, such as in other Central American countries. As in Alaska, ecotourism is a fairly benign growth industry, compared to cattle ranching or resource extraction industries. I find it heartening that the government of Costa Rica views ecotourism as a sustainable industry for the future, and is taking concrete steps to protect the natural resources that tourists come to see. It is a lesson that should not be lost on Alaskans.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. He would encourage readers interested in visiting Costa Rica to enjoy Jack Ewing's new book, "Monkeys are Made of Chocolate," available at <http://www.haciendabaru.com/>. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Harvesting spring—clamming at Ninilchik

by Mari Reeves

There will be some good minus tides for the next few mornings on Cook Inlet beaches. Here's an adventure story that should remind readers of the joys of pursuing the ever-vanishing razor clams.

Dusty spruce trees guard the edge of the newly-thawed Sterling highway. Dirt bikes and four-wheelers on roadside tracks race each other, leaving quarter-mile trails of dust in their wakes. The ice thaws off ponds in the mid-April sun. Moose have calves. The geese are back, and the greenery begins again to produce oxygen. It's the end of winter, the advent of spring and the beginning of new life, growth, and hope. After a particularly dreary and rainy winter, it's a relief to welcome back the sun.

We pull into the campsite in Ninilchik. It's a private deal owned by a middle-aged couple from Anchorage who flies down each weekend in their single-prop airplane to open the place up for overnight camping and halibut charters. We locate the spots we occupied last year in the campground, a large graveled area with an alder woods to the south and a bluff overlooking the ocean to the west and north, and find our friends who have come down this morning. More people are arriving this evening, so we claim several additional sites and stake out our area. We let the dogs loose to socialize with each other and roam from campfire to picnic table in their rambunctious dog pack.

As Friday slowly comes to an end, we nestle in by the campfire with cold bottles of beer and the friends who had been clamming since morning. We eat potatoes, onions, and carrots wrapped in aluminum foil and roasted slowly, buried in ash-covered coals. We sample the clams that the foraging friends harvested, sautéed in white wine and garlic butter. We spear bratwurst sausages on sticks and grill them, splitting them open in the slow-burning heat at the edge of the flames. We take in never-ending spring sunset views and tell stories embellished by beer until late in the evening, as the sun and the mercury slowly but certainly descend. Finally, we take refuge from the freezing night by curling into our warm down sacks and inviting our contented dogs to curl up in the tents and truckbeds beside us.

We awake between 7:30 and 8:00 the next morning to a crystal spring day. Only small white cumulus clouds clutter the expanse of sky beyond the ocean and above snowy Mount Redoubt. Jordan orchestrates the creation of a big breakfast of coffee and French toast, bacon, and scrambled eggs with cheese. We pile together four friends, rain gear, and Animal the dog into the truck and head down to the beach. The Russian Orthodox Church presides in green, white, and gold over the old Ninilchik village, atop the hill overlooking the ocean.

As we pile out of the car onto the dirt road, a couple of ten-year-old boys walk by us, covered from head to toe in fine, silty mud. Adequately warned of the conditions, we don rain gear and hip waders, then duct tape heavy-duty kitchen gloves to the sleeves of our slick plastic raincoats. We pull our hats down over our eyebrows to protect our pale faces from the newly-returned sun. We secure our sunglasses with retaining straps. We tromp happily over the rip-rapped edge of the road and onto the mudflats. Everyone's glad the sun is back in power in this land again, ushering in a new season with its associated freshness and growth.

The four of us slog out onto the clamming flats. We encounter boot sucking mud, silt, and clay layers covered by a thin sheen of water; all that is left behind as the ocean chases the new moon. I recall those stories of people who get stuck in the mudflats around Turnagain Arm and are lost to the Cook Inlet tides. I hurry to keep up, sticking a little closer to my friends in case any of us get stuck.

We work our way about 200 yards out beyond the high tide line. Rivulets of salt water dance toward the receding sea, glinting over slick waves of mud in the morning sun. Having never been clamming before, I solicit a lesson in technique. I'm told to look for a small dimple in the sand. This spot indicates that the clam is still moving seawater in and out through its siphon, and it leaves a small indentation about six inches above where it is hiding out. It's difficult to see the dimple, when the sand lays in ripples. If you get the sun to your face you can see the dimples more easily in the reflection of the sunlight off the sand. The silty areas are a tradeoff between easy dimple viewing and boot suck-

ing mud. I learn to dig with my ditch-witch on the ocean side of the dimple, or make use of the clam gun with criminal exactitude.

Fast, fast, those razors clams run! I didn't believe the tales of fleeing bivalves, but now I do. Sneak up on the dimple. Dig, Dig, drop the shovel, drop to hands and knees, and dig with hands. Feel the water seeping in around the duct tape, down the arms to the fingers. Feel the cool breeze in your hair and the sun on your back. Realize your hat is dropping into your eyes and messing up your technique. Put it in the muddy raincoat pocket; it is covered in mud anyway. Dig, Dig, Dig! Feel the rounded rocks, the crumbly sharp coal beds, then finally the pulsing touch of the clam, as it scurries away from your fingers left grasping at grains of quicksand. Grab it with thumb and two fingers, miss. Feel around in the hole frantically, as the collapsing sand settles around you. Dejectedly, realize your hands are now stuck, and the clam is gone. The priority at this point is to get your hands out of the hole before it fills in any more, and you get stuck in that hole along with your fingers.

Once standing, I hunt around for another dimple. Shovel, shovel, quicker this time, realizing the urgency of the clam's flight really does affect my ability to catch it. Dig, dig, scoop, scoop, grab: A solid grip this time. I have four fingers hooked underneath the foot of the organism, preventing its escape. My other hand scoops around the back of the clam. I am up to my triceps in the mud. Face in the hole, I pull with belly muscles, back muscles, thigh muscles. I wriggle hands and forearms, fingers gripped tight on the clam. With my nose to the sand, I realize the clean ocean mud smell (unless I have hooked a black dripping clam that is rotten, which this time I have not). Finally, with a tribal yell, I succeed and pull the clam out. I hold it up to my friends, a four-inch razor clam, and whoop and holler and dance before dropping it into the watery bucket. I see its siphon re-emerge in the cool water and the foot trying to dig itself out of the way. Nevertheless, that clam is now on the dinner menu, and I, with the fever,

begin the search for dimples more.

It's mid-afternoon when we arrive back at camp. I am coated from head to toe with mud. I visit the bathroom for a change of clothes, after which, Hamm's beer in hand, the process of shucking begins. Friends sit around the table and talk. Snippets of different conversations float on the spring air towards the bowls of warm cleaning water on the picnic table. We work with the glint of steel knives—cut the adductor muscles, open the belly, the siphons, remove the grit. I squeal embarrassingly, yet uncontrollably, when the siphon spits water or the foot moves when I go to clean it. New pots of hot water get easily grimed by the guts and dirt, and we have to change them often.

Once shucked, we dip the brand new clams in seasoned bread crumbs and sauté them in butter in iron skillets on the green Coleman cook-stove. We share the harvested meal together before heading out of camp, our separate ways.

Time has come to leave as the sunshine wanes. The light stretches again into the long tendrils of Alaskan summer dusk. Without the pressure of imminent dark or cold, track of time is too easily lost. We stash our booty in Ziploc bags in the cooler and tell everyone good-bye as we pack up for the drive home.

The four-wheelers still race back and forth on the dirt trails scattering their dust into the evening. The alpenglow on the snowy Chugach peaks lets our souls feel nothing but hope. I let it wash over me then, basking in the afterglow of the season's first sunburn, the glimmer of a returning spring sun. As I melt tired into the car seat for the drive home, I savor the peace and the joy of these friends and this experience. I welcome the promise of renewal that this season holds.

Mari Reeves is a contaminants biologist with the U.S. Fish and Wildlife Service in Anchorage. She has been studying wood frog deformities on the Kenai National Wildlife Refuge for the past several summers. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Merlins and fidelity—it's not what you think, Merlins and witches' brooms

by John Morton

About this time last year, I had a pair of merlins make their home on the vacant one acre-lot behind my house. Merlins are small falcons that mostly eat small birds. Called "pigeon hawks" by falconers, they are found worldwide, breeding from about the 40th parallel to the arctic tundra.

Three subspecies are recognized in North America: the taiga merlin, which inhabits the boreal and northern forest regions, the black merlin, which inhabits coastal conifer in the Pacific Northwest, and the prairie merlin, which is found in the northern prairies and aspen parklands of the northcentral U.S. and Canada. The pair terrorizing chickadees in my backyard was certainly of the taiga variety.

Long before I found their nest, I heard their "ki-ki-ki-kee" as they defended their air space from gulls, ravens, and even bald eagles. It took me a while to find the nest because the grayish male was everywhere but at the nest, as it defended its turf. I occasionally saw the reddish-brown female, but she was sly about giving away the nest location.

At least a couple of weeks past before I spotted her banded tail sticking out of a witches' broom about 45 feet up a large white spruce. She was clearly incubating and I continued to watch the nest for another week or so. Although the literature indicates that the male will share in incubation, I never saw him on the nest. The nest failed to produce any young. I suspect that a pair of resident ravens eventually got to the eggs.

Well, what prompted me to write this story is that the merlins are back again. Same spruce, same witches' broom, same nest. This is a phenomenon that biologists have labeled "high site fidelity." Mariana crows, which I studied for years, exhibit high site fidelity, sometimes nesting in the same group of trees for years. It got me to wondering if merlins, like these tropical crows, showed other similar behaviors like, pairing for life.

Merlins are, in fact, generally monogamous but only for a season. They apparently pair each season. Since the male arrives on the breeding grounds first, I am assuming that the male in my back yard is last year's male with a new mate. Hopefully this new mar-

ital arrangement will result in the successful rearing of a family this summer.

Merlins lay three to six eggs. They are good parents, investing a lot in their family: a month of incubation, a month of chick rearing and perhaps six weeks of teaching their fledged young to hunt. So if they start laying eggs in mid-May, I should probably expect them to continue chasing my juncos and sparrows until September if all goes well.

The literature also suggests that merlins typically nest in abandoned crow or hawk nests, rarely using the same nest in consecutive years. So the event in my backyard is unusual on two counts: they are using the same nest and the nest is a witches' broom.

Witches' brooms are caused by the spruce broom rust, *Chrysomyxa arctostaphyli*. Rusts are obligate fungal parasites that have a complex life cycle, generally requiring two hosts. The yellow-orange color of the witches' broom (the "rust") is produced by spores in new branches that die later that winter. However, because the disease goes systemic in the spruce tree, new needles in an established broom produce the yellow-orange spores each year. The alternate host for spruce broom rust is kinnikinnick (bearberry). Some of the larger witches' brooms can provide quite well-disguised nesting sites for a variety of critters.

Although widespread across North America, we really don't have a handle on the health of merlin populations. Merlin populations are difficult to monitor because they are difficult to identify (especially to subspecies), they breed at low densities and they are difficult to detect later in the summer when most bird surveys are conducted. I consider myself lucky to have merlins breeding so close, especially when I know my neighbor will be building a house on his lot in the next year or two. Knowing that the male merlin will inevitably have to take up residence elsewhere despite his site fidelity, makes this year's breeding effort that much more special.

John Morton is the Supervisory Fish & Wildlife Biologist at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

A story about a caring family and a boat rescue

by Clay McDermott

In my four years experience in law enforcement I have run across every type of person imaginable. Whether serious criminal or menial violator, I've met them all. However, every once in a while another type of person comes along and leaves a distinct impression—the caring person. I had the opportunity to meet a family of caring people last October, and it's a shame that this family's recognition took so long to come about.

October 9, 2004 was a gray, chilly day with winds gusting 15 to 20 knots. A few people were out enjoying late fall fishing, while others were considering whether or not to go out. On Skilak Lake, swells and whitecaps were rolling and the wind was howling. At Upper Skilak boat launch, Doug Morris and his son Kraig were contemplating taking their boat out and heading toward the upper Kenai River.

While on the boat launch and scanning the lake, Kraig notice some objects in the water about one mile southwest of their position. Kraig could tell that the objects were moving, and initially thought it was a dog or some kind of animal. Kraig and his father Doug braved the weather and motored in the direction of the objects. As they approached, they were able to determine that the flailing objects in the water were people. In fact children!

Doug and Kraig pulled four children (ages 7, 8, 10, and 14 years) from the frigid waters of Skilak Lake. All the children had life vests on. All the children were cold and approaching hypothermia. It was determined they were in the water for approximately 2 hours. Doug asked the kids if there was anyone else in the water, and the oldest told them her father tried to swim to shore, about one mile away. Doug and Kraig located and pulled aboard an exhausted and hypothermic adult male. Exhausted as the father was, both Doug and Kraig guessed he would not have made it to shore. If he had, he would have been too cold to do anything to help the children, or himself. The father also wore a life vest.

Doug and Kraig Morris returned to the boat launch and tried to take care of the victims until help arrived. They knew they had to get them out of the wet clothes and into a warm environment. The family truck was

started and the children and father were given what dry clothing the Morris family had with them. In addition, Doug's wife Marne brought clothing and blankets from their home in Sterling.

I think it goes without saying that anyone would rescue stranded boaters floating on the sunken hull of a vessel. But after pulling them out of the water and bringing them to a warm environment, Doug and Kraig returned for the submerged vessel. They spent the time and effort to locate it, to search for and find almost all of the personal belongings on the vessel that went into the lake, and to tow the vessel back to the launch. OK, so maybe that is something some people would also do. However, Doug and his family were not finished, and I think their continuing actions distinguish the Morris family from others.

The Morris family stayed and continued to support the victims of the accident. They bailed the boat, and help load the boat onto the trailer and the packs, fishing poles, and bags into the back of the pickup truck. Most importantly, the Morris family never asked for anything in return, never spoke a bad word about a potential tragedy caused by lack of judgment, and never complained when the tragedy their heroism prevented wasn't reported in the local paper. The Morris family went out of their way to comfort, support, and assist perfect strangers in a time of need. And after my brief period of interaction with the Morris family, it was clear to me that this is the type of people they are—caring, supportive, and willing to help others.

As I said, I've met all kinds of people in my short career in Law Enforcement, and I have seen things that never cease to amaze me or cause me to wonder, "What were they thinking?" But every once in a while an event takes place when people either step forward and help out without care for their own safety, or else simply stand by and make criticisms.

The most memorable moments in my career have not been the day-to-day encounters with uninformed perpetrators who do something incredibly unintelligent, but rather the caring actions and personalities of the Morris family and other like them. It's a rewarding experience to meet people like the Morrises and it's nice to know such caring families still exist.

The Morrisses should be praised and lauded for their unselfish actions, as well as thanked for averting a potential tragedy with the loss of five lives.

Clay McDermott is a Law Enforcement Officer at the

Kenai National Wildlife Refuge. He is a graduate of Soldotna High School. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Spring is a great time to get out and see Wildlife

by Robin West

As I look out my office window I am pleased to see the snow gone, leaves starting to emerge, and the grass starting to turn green. The real joy, however, is getting out and taking a walk through the woods. I just returned from a 45-minute stroll around Kenai National Wildlife Refuge's Keen-Eye and Centennial Trail loop and thought I would share the experience in prose. The trail is dry and the whole surrounding area is alive with the sights and sounds of spring. Most enjoyable is that those sounds do not yet include the buzzing of very many mosquitoes!

A loon greeted me with a mournful yodel as I walked down the hill and past Headquarters Lake. Soon I walked past a large cow moose, browsing a short distance from the trail in a willow patch, her belly heavy and swollen with what are certain to be twin calves to be born within the next several weeks. A short distance ahead I heard the hammering of a three-toed woodpecker, seconds before I saw him fly out from a beetle-killed snag. The resonating sound of his bill penetrating the hard tree trunk made him sound as though he should be the size of an elephant, rather than having a body no larger than my fist.

As I walked quietly past a small seasonal pond from melted snow on the muskeg, I noticed first the green iridescent head of a male mallard, then the drably colored female hiding close by in the weeds. Overhead, high in the air, a male snipe was circling producing his loud winnowing courtship call of, "who who who who who." A vole scrambled across the trail in front of me, hesitating for a moment beneath a piece of birch bark and then disappeared in nearby grass.

I walked for another few minutes listening to the mix of calls from thrushes, chickadees, and nuthatches. The call of the red-breasted nuthatch is

one of my favorites. While the bird is readily visible throughout much of the year at bird feeders, it seems rather shy in the forest, preferring to live high in the tree canopy. Its call, however, a high nasal, "yank, yank, yank" can be heard over long distances and reminds me of many enjoyable outings as a youth hunting and hiking in the Cascade Mountains of Oregon. The nuthatch call was a telltale sound of the pine and fir forests there.

Swinging back towards the office and Refuge visitor center I disturbed a male spruce grouse on the trail ahead. He flew up and landed on a limb in a nearby white spruce tree and rocked back and forth for a few moments before becoming still and allowing me to walk by. The last encounter with wildlife before I ended the walk, back at the Refuge parking area, was with a pair of bald eagles, one sitting on the top of a tree while the other soared overhead making its shrill cackling sound. The perched bird lifted off the spruce tree and joined its mate. They are likely the pair that return to nest year after year at the Refuge headquarters area, and are a welcome sign of spring.

I love the cool mornings of autumn, ripe berries, and a light frost on brightly colored fall leaves, but there is probably no better time to get outside and enjoy wildlife than in early spring. The forests literally come alive with new life; animals are trying to attract mates or preparing to give birth to young. Why not get out for a hike this week? If you don't want to travel far from Soldotna, why not try the trail system right behind the Refuge office?

Robin West is the manager at Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

The up's and down's of dandelions

by Candace Ward



Photo of dandelion.

One of the first signs of spring is the prolific bloom of bright yellow dandelions along roadsides and in our lawns. As a child, can you remember the joy of blowing dandelion seed heads into the wind? As an adult do you dread uprooting hundreds of these weeds with your root fork each spring?

Like so many things in life, there is an “up” side and a “down” side to dandelions. If you enjoy eating dandelion greens and drinking dandelion wine, the dandelion is a beneficial plant in your life. If you would rather have fireweed and Jacob’s ladder, attractive Alaska native plants, along our roadsides and in our meadows instead of dandelions, you start to see the “down” side of dandelions.

Dandelions were introduced plants from Eurasia. They spread and grow aggressively in clearings, meadows, and even in open areas of the forest. Dandelions are not the only non-native, invasive plant that is “problem” plant in Alaska.

Over the last 20 years in Alaska, the growing season in our state has lengthened and summers

have grown warmer. These conditions allow many temperate-climate, invasive plants to establish themselves here. One such plant is foxtail barley whose sharp seeds cause sores in the eyes, noses, throats, and ears of wildlife and pets. Other invasive plants include oxeye daisy, “butter and eggs,” and common tansy, originally sold as ornamentals that later escaped from our gardens into the wild. These plants are not only mildly toxic to wildlife, but they out compete native plants that wildlife need for food.

Local Kenai Peninsula residents and Alaska resource agencies are becoming increasingly concerned about non-native, invasive plants and their negative effects on native plants and wildlife. To act on this concern a local event, Dandelion Sundae, will be held at Kenai National Wildlife Refuge on Sunday, May 22, from 1 – 4 p.m.

If you bring a plastic grocery bag full of dandelions or any invasive plant to the Refuge Visitor Center, you will be rewarded with a free ice cream sundae. This event is designed to reduce invasive plants and map their locations. Participants will also have an opportunity to learn more about invasive plants from plant experts Janice Chumley of the Cooperative Extension Service and Caleb Slemmons of the Kenai National Wildlife Refuge. For more information, including suggested locations to gather invasive plants, you can contact the event sponsors: Kenai National Wildlife Refuge at 262-7021, Cooperative Extension Service at 262-5824, and the Kenai Watershed Forum at 260-5449.

If you are interested in learning more about Alaska’s invasive plants, stop by the Refuge Visitor Center and pick up a free pocket field guide, *Selected Invasive Plants of Alaska*. For more information on invasive plants in Alaska, check out the following websites: www.uaf.edu/coop-ext, www.cniipm.org/index.html, and www.fs.fed.us/r10/spf/fhp

Candace Ward is a park ranger in the Visitor Service Program at Kenai National Wildlife Refuge. She enjoys searching for Alaska’s wildflowers and native plants while hiking and canoeing throughout the Kenai Peninsula. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Snipe—the true harbingers of spring

by Ted Bailey

Although some consider the sight of a robin to be one of the first signs spring has arrived, my favorite harbinger of spring is a bird that I often hear before I actually can see it circling high overhead. Although it may take a moment of carefully scanning the sky I eventually can locate the bird with its long bill circling high overhead. Its characteristic winnowing sound is a sure sign spring has finally arrived. I am describing the territorial display sound made by the common snipe as it circles climbing and diving around its territory over and over again, especially in the late evening hours.

This characteristic sound produced by the snipe is known as “winnowing” and sounds like a tremulous “hu-hu-hu.” The sound is not produced by the snipe’s vocal cords but instead is made as the snipe dives steeply in the air and briefly extends its outer tail feathers. When the snipe’s diving airspeed reaches about 37 miles per hour, the air rushing by the outer tail feathers produces the winnowing sound. Most male snipe usually arrived on the Kenai Peninsula by April 30 and are followed 10 to 14 days later by the females. The male selects an attractive area of wetlands—bogs, fens and swamps—and circles over it again and again, driving away other males and possibly attracting females to his area with his highly conspicuous display.

My wife and I are fortunate to live near wetlands because wood frogs, yellowlegs, snipe and other birds annually serenade us. If you do not live near wetlands, you probably miss out on the snipe’s comforting sounds that insures us that winter indeed is finally over. This year we heard our first displaying snipe near our home on April 23. Four days later, I watched one snipe aggressive escort another—presumably another male—out of its territory. On April 28 and 29 I observed the male as he sat at the top of a black spruce tree periodically giving his vocal “chipper” breeding

calls. And on May 5, I flushed two snipe that remained close together—presumably a male and female—and I assume she will be building a nest nearby.

Snipe have several unique characteristics. Their eyes are set so far back on their heads that they have binocular vision behind them; it is virtually impossible to sneak up behind a feeding snipe. Like other shorebirds snipe have long bills with sensory pits near the tip for detecting invertebrates underground. Their beaks are very flexible and the tip can be opened and closed while it is thrust underground with no movement at the bill’s base. Their food is mainly insect larvae of the fly family (crane flies, deer flies, etc.), but also includes damselflies, dragonflies, ants, beetles, earthworms, small snails and other small prey.

Usually four eggs are laid in a nest built solely by the female in or near wetlands. Only the female tends the eggs and young while they are in the nest, but when the nestlings are ready to leave the nest, the male will care of the first two that hatch and the female cares for the remaining hatchlings: no further contact is made between the adults.

Snipe begin to migrate south in August. In Eastern and Central North America snipe spend winters in the southern United States, Central America and northern South America. Snipe breeding in Alaska may spend the winter along the Pacific Coast from Kodiak Island to Cordova, southeast Alaska and along the coast of British Columbia. Come spring, snipe are one of the earliest migrants to arrive on the Kenai Peninsula—true harbingers of spring.

Ted Bailey is a retired Kenai National Wildlife Refuge wildlife biologist who has lived on the Kenai Peninsula for over 27 years. He is an adjunct instructor at the Kenai Peninsula College and maintains a keen interest in the Kenai Peninsula’s wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Wildlife Refuge has first annual Clean-Up, Green-Up Day

by Ted Bailey

On May 20th, about 50 dedicated community volunteers helped the employees of the Kenai National Wildlife Refuge kickoff our first annual Spring Clean-Up, Green-Up Day. The cooperative work project focused on gathering more than 2 tons of debris from roadways, parking lots, campgrounds and trailheads within the refuge boundaries.

For sometime now, refuge employees have recognized a need to conduct a spring clean-up day to prepare for the summer busy season. Many out-of-area visitors travel to the refuge to enjoy the bountiful recreational opportunities that our road-accessible facilities provide. We want to ensure that their experience is a favorable one. We also want to show the public that we care deeply for the refuge and take our stewardship responsibilities seriously. So this year we stooped over and picked up what some not-so-caring others left behind.

On one stretch of local roadway, we picked up sixty-eight bags of discarded beer bottles, soda cans, cigarette boxes, fast food containers, auto parts, dead house pets, grocery bags, juice boxes, and seemingly just about anything else you could throw out the window as you drove through the lovely landscape of this great land we call our home. At a gravel pull-off at mile 63 on the Sterling Highway, with a spectacular view of the Kenai Mountains, another thoughtful soul left a toilet bowl. I'm certain they were thinking that this popular roadside "pit stop" could use a modern porcelain fixture. Besides the toilet bowl, a virtual snowstorm of toilet tissue was gathered up from this and another popular rest stop a mile or two down the road. Now I'm not one to deny a person's need to answer the call of nature, but has anyone ever heard of a shovel?

As you might have guessed I'm not in the particular best of moods as I write this message. You see, I just returned from a patrol out Funny River Road, where someone apparently didn't like the mundane appearance of a green roadside. So, they decided to "borrow" about 200 soda and beer cans from the transfer station and decorate the roadside. Nice touch.

Alaska—a land of dichotomies! Inarguably the most beautiful real estate God created anywhere on earth. An abundance of natural resources, wilderness, and awe-inspiring beauty that attracts throngs from every other part of the world. Yet, of all the places I've worked and lived, I find it unconscionable how some people treat this place. Now before you blame it on the "outsiders," remember this was a spring clean-up, for the refuse left behind during the winter's travel to and from our homes. This particular trash isn't a Lower-48 problem. You can't blame this one on tourists. The responsible parties are Alaskans. Littering has to be the ultimate act of lazy disrespect, as it serves absolutely no legitimate purpose. It is just an insult to everyone else who cares.

Over fifty community volunteers dedicated their day to help us spruce things up so that those who bring their families, and their wallets to our beautiful community find what they are looking for. School children and retired folks all pitched in and demonstrated their concern. UNOCAL, the Kenai Refuge Employees Association and the Alaska Natural History Association treated them to a picnic afterward at Upper Skilak Campground as a small token of our appreciation. Believe me when I say we are grateful.

And that leads me to my main point. How much do you as a resident care about any of this? Which camp are you in? Are you a litterer who could care less? Or, are you one that cares enough to get involved? Are you willing to take down a license plate and call refuge headquarters or trooper dispatch when you see the car ahead of you littering the road? Can you spare a few hours to pick up after those who just don't get it?

You know, I don't expect to reach many litterbugs with this article, but I do hope this "shot" will ruffle some feathers. We are so blessed here on the Peninsula. Let's not let a few rob us of that blessing.

James Neely has been a Law Enforcement Officer at the Kenai National Wildlife Refuge since 2003. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Refuge planning effort continues to progress

by Robin West

As we approach the end of the second year of Kenai National Wildlife Refuge's efforts to revise its Comprehensive Conservation Plan, I'm pleased to report that our interdisciplinary planning team has made substantial progress.

After completing a three month long public scoping process designed to identify management issues and concerns, the team drafted nine goal statements and more than 100 wildlife and public use objectives which will guide Refuge management efforts for the next 15 years.

The team also developed a reasonable range of management strategies, which present a variety of ways to address five significant issues identified during public scoping. The team is currently conducting research and compiling data, which will lay the foundation for what will inevitably be a lengthy environmental impact analysis of the proposed management strategies. We will continue working on the draft plan throughout the summer and into the fall, and I anticipate having the draft ready for public review this winter.

For those who have followed Kenai Refuge management issues for some time, there is likely to be few surprises. Many of the issues raised during the 1985 planning process have re-surfaced: habitat management, Kenai River crowding, snowmobile access, etc.

As with any complex natural resource management program, there are many ways to manage the land and address management issues. Such actions are often viewed either positively or negatively depending on personal values and experiences. This is certainly true at the Kenai Refuge and it is reflected in many of the compromises we have in our current management program. For the most part, however, the public has endorsed current management, and responses received so far from those who commented on our range of alternatives have said that the proposed range is acceptable.

The issues that seem to be of most interest are crowding and increased public use along the Upper Kenai River, and the future use and management of industrial areas, such as the Swanson River and Beaver

Creek Oil and Gas Fields and the ENSTAR Pipeline corridor/Mystery Creek Road, once these facilities are no longer necessary for industrial purposes.

For current industrial use areas, should the areas be restored as wildlife habitat, managed for public uses similar to what has evolved in these areas over time, or should improvements be made to enhance public use, once industrial use ceases?

Should additional restrictions be placed on guiding? Should the Refuge ever consider limiting use by the general public? Should restrictions on camping beside the Kenai River be considered? These are just a few of the questions being examined, which address the issue of crowding along the Upper Kenai River.

All these issues generate interesting discussions, and are ripe for comprehensive planning exercises like the one we are currently undertaking. I'm of the opinion the planning team has done a fine job identifying a range of management strategies that address these questions. I hope you agree.

If you haven't been involved in our planning process, but want to contribute your ideas, it's not too late! You can add your name to our mailing list by contacting Rob Campellone, Kenai Planning Team Leader by mail at: U.S. Fish and Wildlife Service, 1011 East Tudor Road, MS-231, Anchorage, AK 99503-6119; phone: (907) 786-3982.

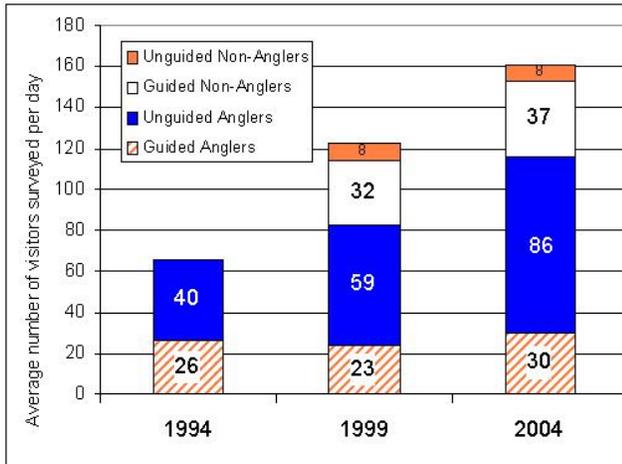
Also, I personally welcome your thoughts and comments anytime. You can submit comments on the proposed range of management strategies via an on-line comment form at: <http://alaska.fws.gov/nwr/planning/pdf/KenaiPlanUpdate3.pdf> or if it's easier for you, contact me at the Refuge at (907) 262-7021, or better yet, stop by for a visit.

Planning is not particularly fun, nor does it happen quickly, but it is incredibly important. If you have an interest in how the Refuge is managed in the future, please consider getting involved in the process. Many thanks!

Robin West has been the Refuge Manager at Kenai National Wildlife Refuge since 1995. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Heading out to wet a line on the Upper Kenai River? You're not alone

by Julie Laker



Kenai River Visitation 2005.

The world-class fishing and scenic boating opportunities on the upper Kenai are no longer a secret. Crowds at the confluence of the Russian and Kenai rivers have long been the norm, as anglers battle elbow to eyeball for sockeye. And any fishing guide will tell you the upper Kenai is getting more crowded in other areas too, as more people try their luck chasing rainbows and Dolly Varden, as well as salmon.

If you boated on the Upper Kenai last summer, perhaps you met one of the Fish & Wildlife Service survey technicians at Jim's Landing—someone recording which boats were guided, whether visitors were fishing (and for what) and which boats continued into the Kenai River Canyon. Last summer's surveys were the latest in a series of visitor interviews at Jim's Landing. The objective of these surveys was not to count every boat on the water but to develop an index to reveal trends over the years. Information collected in 1994, 1999, and 2004 shows an increase in the numbers of boaters on the Upper Kenai River.

Kenai River Visitations 2005 in 31 survey days last summer, 6,473 visitors in 1,723 boats were recorded. Most of these visitors (66%) were anglers. Guided and unguided visitors were evenly split, with 51% guided. Of the total, 15% of the visitors entered the Kenai River Canyon. Those who did were generally guided and generally scenic boaters.

Survey technicians also asked boating parties about their residence. Almost half of the parties were Alaska residents (49%), with 9% residing on the Kenai Peninsula and 40% residing elsewhere in the state. Non-residents constituted 22% of parties. Eighteen percent of the boats were filled with visitors hailing from multiple locations; most of these were a mix of non-local Alaska residents and non-residents. The residence of the remaining 11% was unknown; most of these boats floated past Jim's Landing into Kenai River Canyon so they could not be interviewed.

The average number of visitors surveyed per day on the Upper Kenai River has increased over the last ten years. The most dramatic increase has been observed with unguided anglers, which have more than doubled since 1994. Scenic boaters were not recorded during the 1994 survey, but have increased in the last 5 years. The total number of visitors surveyed per day on the Upper Kenai increased from an average of 122 in 1999, to 161 in 2004. Future management plans for the Kenai National Wildlife Refuge will take these numbers into consideration.

So if you're planning to fish or float the Upper Kenai, you are in for a memorable experience—with spectacular scenery, beautiful fish, and plenty of company.

Julie Laker is a biological technician at the Kenai Fish and Wildlife Field Office. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Aphids by the bucket form “oil slick” on Cook Inlet waters

by Dominique Collet and Ed Berg



Winged aphids on tide rips on Cook Inlet looked like an oil slick. Photo by Dominique Collet.

On June 1st Erik Huebsch and Dr. Stephen Okkonen spotted what appeared to be an oil slick a few miles offshore from the mouth of the Kenai River in Cook Inlet. Dr. Okkonen, a University of Alaska Fairbanks physical oceanographer, was returning from a routine survey of the Inlet water temperatures and salinities between the Forelands.

Closer examination of the “oil slick” revealed that it was actually a quarter-inch thick floating mat of insects collected in a tide rip. Conservatively, Dr. Okkonen estimated the mass of insects to be about two to three feet wide and more than a mile long, which computes to a volume of between eight and 12 cubic yards! A jar of insects was collected and brought to the Kenai Watershed Forum, who in turn passed on this story to us.

What insects could accumulate in such a mass and where are they coming from? Specimens were sent to an aphid specialist, Dr. R. Footitt, with Agriculture and Agrifood Canada, who identified them as a winged form of the alder aphid *Boernerina occidentalis*.

Early May was warm and sunny, and aphids were busy tapping the abundant and nutritious spring sap with their hollow needle-like mouthparts. By the end of May, aphids were numerous on the stems and leaves of alders, leaving behind their shiny sticky “honeydew” secretions, which are fed upon by ants, bees, and

wasps, which in turn help protect the aphids from predation.

Aphids have both winged and wingless phases; the wingless phases are commonly seen on house plants, much to the annoyance of plant lovers, whereas the winged forms are less noticeable.

We speculate that the wind picked up a few days prior to the “oil slick” discovery. This wind lifted up the winged aphids and kept them suspended en masse in mid-air, turning the weak fliers into “aerial plankton” that was blown out over Cook Inlet.

Because surface-feeding insectivore, such as petrels, sea ducks and sea gulls are in low density on the murky waters of Cook Inlet, most of the aphids were not eaten when they landed on the water surface. Currents and winds concentrated the floating carcasses into the tide rip.

Such an astounding mass of carcasses of one type of insect in one location is quite extraordinary; nevertheless, probably only a fraction of the local aphid biomass ended up in the Inlet.

On June 2nd Ed Berg and Matt Bowser observed numerous bodies of winged aphids, possibly the same species, covering snow patches at treeline in the mountains north of the Skyline Trail. Upvalley winds had probably blown the aphids up from alder patches on the mountain slopes.

Southern peninsula residents may recall the massive flights of spruce bark beetles in the mid-1990s at about this time of year. One resident described a dark cloud that moved down the Anchor River valley one spring, which he at first thought was a small rain-squall, until it rolled over him and left him covered with bark beetles.

These events provide graphic testimony of the usually invisible but huge biomass of terrestrial invertebrates all around us.

It is common for large numbers of terrestrial insects to end up in rivers and lakes, where they are quickly dispatched by hungry fish. Terrestrial invertebrates, in fact, constitute a sizeable portion of the diet of juvenile fishes. The foliage of trees and shrubs leaning over the riverbanks is more than shade and shelter to young fishes: it also provides a generous shower of

terrestrial invertebrates.

At least eight cubic yards of aphids floating in the rips of Cook Inlet! Enough to fill the back of a full-size dump truck. That is impressive!

Dominique Collet is a naturalist working with the

Kenai Watershed Forum on a guidebook for insects of southcentral Alaska. Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

When the family from Georgia comes for a visit

by Bill Kent



East fork of the Moose River, in the Skilak Wildlife Recreation Area. USFWS/Bill Kent.

My older brother, the minister from Georgia, brought his new wife for a visit last month. He has come to see our family at least twice before, and now believes himself an expert on Alaska and how best to visit the Last Frontier. My parents' rule of never arguing with my brother resurrected itself, and I prudently avoided correcting his inaccuracies on various topics. I certainly did not miss playing the travel agent role. The best part of their visit was watching my new sister-in-law taking in everything; this was her first time in Alaska, and the sheer size of our state and its wonders were nearly overwhelming for her.

You could see the near disbelief when my sister-in-law saw what my wife and I have taken for granted for so long. She wasn't shy, and asked lots of questions. Many of our answers were a strain for her to grasp, as the immensity of Alaska is often overpowering for

the newly arrived visitor. My wife and I have fallen into the same trap as many who live in Alaska—we are guilty of not seeing the forest for the trees. But, with every one of my sister-in-law's questions, more and more of the forest became visible once again; it sometimes takes watching another person trying to come to terms with the abundance of Alaska to regain one's perspective.

Although I am desk-bound more than I ever expected to be when I began working on national wildlife refuges in the late 1970s, I continue to enjoy speaking to visitors whenever I get the opportunity. For one thing, these conversations remind me how proud I am of the Kenai Refuge and of the National Wildlife Refuge System in general; there is no other system of lands like it anywhere in the world. My wife and I have lived in some of the most beautiful parts of this country, and we have been able to hunt, fish and observe wildlife at each of these stops along the way; those activities were available because there was a local National Wildlife Refuge nearby. In many cases, these refuges were the only areas where you could enjoy a natural landscape for many miles around.

Here in Alaska, I hear people complaining that there is too much land in refuges, parks, and national forests. A couple of trips to the Lower 48 might cure that view. As human development continues its exponential growth down there, less and less land is available when we visit to enjoy the hunting, fishing, hiking, boating or other recreational activities that we pursue so handily here in Alaska. Have the folks complaining about too much public land fallen victim to the "not-seeing-the-forest-for-the-trees" syndrome?

For me it only takes a visit by someone coming to Alaska for the first time to be reminded that we live in a most magnificent land. A land that, because of the protection afforded by refuges, parks and state and national forests will remain available for our use and enjoyment for many years and hopefully forever. Thanks, sister-in-law, for reminding me of how lucky we are to live in the Great Land, with all of its still beautiful land.

Bill Kent has been the Supervisory Park Ranger at Kenai National Wildlife Refuge since 1991; he and his

family live in Sterling. Earlier in his career Bill worked at Okefenokee, Merritt Island, Parker River, and Klamath Basin National Wildlife Refuges. Previous Refuge

Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

A sordid affair: shorebird mating systems

by Toby Burke

On a recent outing to Skilak Lake my kids discovered several medium sized shorebirds while walking along the lake's cobble shoreline. The birds were approximately seven to eight inches long, brown above, and white below with bold black spotting. They constantly bobbed their tails or "teetered" while they foraged along the lakeshore. When flushed they flew low over the water and shoreline with stiff shallow wing beats and soft weet, weet, weet vocalizations could be heard as the birds cavorted about. With this information in hand we could readily identify the birds as Spotted Sandpipers.

The Spotted Sandpiper (*Actitis malularia*) is a fairly common yet often-inconspicuous breeding shorebird of the Kenai Peninsula typically encountered along the shorelines of local rivers, lakes, and ponds where it forages and breeds. While it has the distinction of being the most widespread breeding shorebird in North America its greatest renown is due to its unique mating system—polyandry, where one female commonly mates with two or more males, sequentially in the Spotted Sandpiper's case. Polyandry is an uncommon mating system occurring in less than one percent of bird species worldwide.

Shorebirds as a whole are notable for the variety and often-complex mating systems they exhibit. Among the 73 species of shorebirds recorded in Alaska, as with the majority of bird species worldwide, the most common mating system is monogamy, where one male mates with one female and forms a pair bond. The majority of oystercatcher, plover, godwit, curlew, and sandpiper species are principally monogamous.

There are a variety of nonmonogamous mating systems employed by shorebirds. Of these the most common breeding system is polygyny, where one male mates with two or more females. White-rumped, Curlew, and Sharp-tailed Sandpipers, for example, are polygynous. The counterpart to polygyny is the uncommonly exhibited polyandry, which is occasionally observed in Red, Red-necked, and Wilson's Phalaropes and nearly universally in the Spotted Sandpiper. Polygamy is where both polygyny and polyandry occur together in the same species. This occurs most frequently in Snowy Plovers.

Promiscuity is where males and females, often in groups, consort briefly, mate, and do not form pair bonds. It occurs regularly in Pectoral and Buff-breasted Sandpipers as well as Ruffs. The male simply fertilizes the female's eggs and she rears the offspring without the male's assistance. In other mating systems the male may contribute in one or more ways such as nest construction or defense; mate, territorial, or resource defense; incubation of eggs; or brooding, feeding, or defense of young.

It must be noted that in an otherwise monogamous species it is not uncommon to have a regularly occurring minority of polygynous males and conversely there will be a regularly occurring minority of monogamous pairs among otherwise polygynous species.

Often a single individual may employ several mating systems during the course of their breeding life or even within a single breeding season depending on environmental conditions. For example, Snowy Plovers east of the Rocky Mountains are monogamous, both male and females attend the nest and together produce one brood of young per breeding season. West of the Rockies Snowy Plover females will desert their young a few days after hatching while the male remains with the brood until they can survive independently. After deserting the first brood, a third of the females will reneest with a new male to establish a second brood. And after rearing their first brood, half of the males will reneest with a new female to establish their second brood.

Likewise, Phalaropes, contrary to popular belief, are monogamous the majority of the time. In fact some populations have no documented cases of polyandry. But in other populations a minority of females, usually less than 15%, may be polyandrous if there is a surplus of available breeding males. Interesting enough in years where climatic conditions are favorable and the breeding season is protracted many males may also mate a second time with a new female after rearing their first brood.

Thus while populations of Snowy Plovers and all three species of phalaropes commonly employ monogamy as their principal mating system, they are also known to employ polyandry, polygyny, and

polygamy as opportunities permit. While these four species may seem exceptional, with shorebirds there are many exceptions to the rule.

Toby Burke is a refuge biological technician who is

intrigued by the status and distribution of Alaska and Kenai Peninsula birds and enjoys birding with his wife and family. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Researchers are a valuable asset to Kenai National Wildlife Refuge

by Rick Johnston

One of the most rewarding aspects of working at Kenai National Wildlife Refuge is the opportunity to interact with the many scientists, academics, and other researchers that visit the Refuge during the summer field season. Each summer we have seasonal staff, volunteers, and visiting scientists investigating and studying everything from geology and glacial retreat to wildland fire history. Many aspects of the biotic community are under investigation from well known terrestrial wildlife like brown bears to genetically distinct invertebrate populations on the Harding Ice Field, as well as invasive species.

Research at the Kenai involves visiting researchers from a variety of Universities, government agencies, local researchers both on the Refuge staff and other agencies such as the State Department of Fish and Game (ADF&G) are also busy on the Refuge. ADF&G for example is prolific in the quest for information to manage fish and wildlife populations. In 2005, they will have almost a dozen different working projects, from fisheries research to Brown Bear population status research. The Refuge, since its earlier days as the Kenai National Moose Range, has always been a popular and rewarding place to conduct research on unanswered resource and wildlife questions of Alaska and global scale as well as questions of local interest. The universities, institutions and individuals that have been involved with the Kenai are an integral part of the fabric, history and management of the Kenai. From well known local research institutions such as the internationally known Moose Research Center targeting individual species, to more global climate research and social science research questions of human behavior and crowding sponsored by national foundations, the Kenai has been a living laboratory for investigators and scientist of all stripes.

Many resource and wildlife management questions related to Alaska were first pondered here on the Kenai Peninsula. The adventures and mis-adventures of these field investigators are both the subject of fact and legend and continue to unfold annually. The first Refuge Manager Dave Spencer honed new moose

counting strategies that are still used today. Spencer also recognized the relationship between land development politics and research when helping to establish the Andrew Simons Research Natural Area which is now the core of Kenai Wilderness.

Spencer's recognition of the Kenai as a place where Alaska resources and expanding settlement would have to co-exist and that resource knowledge was the only way to do so, was recognized by congress in 1980. Indeed, the Alaska National Interest Lands Conservation Act (ANILCA) uniquely established research and training as one of the Kenai Refuge's five major purposes. To be sure, other federal and non-federal conservation units receive research interest aplenty, but congress singled out the Kenai for special recognition in this regard. Refuge purposes include: "(iv) to provide... opportunities for scientific research, interpretation, environmental studies education, and land management training."

Being a Refuge pilot for twenty years, I probably get to interact with a wider variety of scientists and researchers than the average staff person. In Alaska often times pilots are enlisted to help with a variety of research jobs since "you're here anyway... might as well put you to work". I look forward each year for the opportunity to interact with different experts, you know the type... the ones that were getting straight A's in high school when I was pulling C's. Within the last week, I've had an opportunity to radio track brown bear, count swans, scoop mud samples from lake sediments, ferry researchers to Lake Clark Park Preserve and administratively review several proposals for new research. Generally, I have always held scientist and resource investigators in high regard. Not necessarily for their advanced degrees and vast knowledge on a subject area, but for their patience and tenacity in pursuing a particular area of study and more importantly, for the information they provide to solve problems. Many researchers can be boring to talk to on subjects other than their area of interest, and they hardly ever appreciate good humor and my jokes about lost data. But collectively, they enrich the intellectual and

cultural atmosphere that pervades the Kenai National Wildlife Refuge, particularly in the summer. In a single day I may meet staff and visiting scientists from six different states, universities and backgrounds. I enjoy hearing their take on their individual projects, resource issues in general, and their Alaska experience.

Many types of wildlife and land management research involve two to three years of data gathering and then the inevitable write up and peer review. Other research involves methodical data gathering over many years. The information has often proven invaluable in wisely managing Refuge resources. Annual gathering of Trumpeter Swan nesting, brood and rearing success over 30 years has proved to be critical guide to gauge the tolerance of certain wildlife species for development and disturbance both on and off Refuge lands. Researchers and academics themselves are as diverse as the types of studies being pursued. Some will never be personally involved in the final product... with final analysis many years in the future. A body of research related to a geographic area like the Kenai, often provides the foundation for related or continued research continually adding to the information and cumulative body of knowledge. Delayed gratification is usually essential for researchers.

In any case, the Kenai has been on the cutting edge of wildlife and resource information gathering techniques. Retired Biologist Ted Bailey's past use of lower 48 hounds to tree and live capture lynx is one example of innovation that has been used here. Current biologist are using computer technology and field plots to model all types of wildlife population information.

Although classically trained in social scientist research, methodical research was never really a fit for me. I personally prefer a little faster and more antidotal quest for knowledge such as... if you don't see many Swans nesting on lakes surrounded by residential development... then Swans must not like barbecues, barking dogs, motor boats and inquisitive kids with sling shots... or if your waiting in line for 30 minutes to get through Soldotna... it must be July and the highway from Anchorage must be open, the American economy is robust and gas prices are only a foot

note to the pursuit of salmon... If you have to increasingly run for cover from thunder and lightning, or if you must land your airplane to wipe away little green bugs from your windshield you in fact have evidence of "global warming" here on the Kenai.

I've tried, however, to use my antidotal observations and truisms to prove a point or otherwise squelch an opposing view point at an important planning meeting and I can attest that with a few exceptions it doesn't work well. However, referencing a well documented and peer reviewed body of research to prove a point works almost every time to win converts to a line of thinking or equally important, to gain funding for a particular problem.

The Kenai Refuge is currently involved in an updated comprehensive planning project where the course of future management will be set and many problems and issues are being addressed. In such a planning and decision making forum, information and knowledge are everything. During planning discussions there seem to be as many unanswered questions as there are references to existing research. Certainly, future scientific discovery opportunity for those grade schoolers knocking down straight A's and perhaps a pilot job or two for the other guys.

The Kenai National Wildlife Refuge, like any other institution, is made richer and more effective by a wide variety of ideas and knowledge and those who prospect for unanswered questions. Here's to all of those individuals, scientists, universities and others who help gather information, acquire knowledge and share their ideas with us and, for my part, ride in my airplane, let me hand them clipboards, and help the quality time fly by.

If you would like information about ongoing research projects or if you would like to bring your future scientist to a Refuge visitor program contact Kenai National Wildlife Refuge Headquarters at 262-7021 for information. Rick Johnston is a Ranger/Pilot at the Kenai National Wildlife Refuge. He has worked on Kenai Wildlife Refuge since 1979. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Trumpeter swan cygnets shipped to Iowa for swan restoration program

by Liz Jozwiak

Some of the most interesting wildlife observations are reported to us by residents from the local area. We welcome the calls that are received year-round about a rare bird sighting along the Kenai River, the albino moose, or the report of a chickadee with a deformed billed. Many times the calls report injured birds or wildlife that are in peril, or have been unintentionally harmed by humans (electrocutions, vehicle strikes). At times there is little we can do, and the outcome is not always favorable. Yet on June 18th with the help of several concerned citizens, we were able to turn a bleak situation into a happier ending.

On that day I received a call from a local resident about an interesting and rarely witnessed interaction between several Trumpeter swans on his lake. This interaction resulted in the death of one of the nesting adults, and the abandonment of the brood of young swans (called cygnets).

I was very interested in this resident's report since this lake, along with others on the Peninsula, has been surveyed annually for Trumpeter Swans since the 1960s. This was a lake that historically had been very successful at producing cygnets, and has likely been occupied by the same pair of nesting Trumpeter swans for many years.

I was told that the two adult swans returned to the lake this spring, nested, and hatched a brood of five cygnets around the first week of June. Then another pair of swans landed on the lake and decided not to leave. Nesting Trumpeter swans will vigorously defend their lake from intruders. Most of the time the nesting pair is successful at driving away any visiting swans that land in their territory. This is apparently what the nesting male swan (also known as the cob) tried to do; his wing was broken as a result of these repeated confrontations and it did not survive the attacks.

Now with one of the nesting adults out of the way, the intruding pair of swans began to harass the female swan (known as the pen) that had stayed with the cygnets. The lake resident witnessed the intruding swans forcing the pen off the lake and into the woods,

causing her to abandon the cygnets. The pen was seen departing the lake on June 17th; the fate of the 10-day-old cygnets was unknown.

I arrived the next day to collect the dead male swan as a study specimen. I found the cob dead along the shoreline with multiple injuries to its body and wing. At this point I thought it was very unlikely that the young cygnets would survive on their own as they are unable to dive to avoid predators.

We found three of the five young cygnets still alive. These little cygnets were about the size of my hand, and they had paddled their way that night about 1 mile across the lake to a little cove. I found evidence that avian predators probably killed the other two cygnets.

As wildlife biologists, we are trained to let "nature takes its course" especially when Trumpeter Swans here in Alaska are both healthy and thriving. I however, found this to be an opportunity to help supplement one of the three ongoing Trumpeter swan restoration projects in the lower 48 states where Trumpeter swans are still considered to be rare in many parts of the United States.

Trumpeter swans from Alaska are especially sought as they can provide the genetic diversity needed for the establishment of healthy Midwestern swan populations. Also, Alaskan swans have proven migratory instincts that will enable Midwestern stock to develop migratory traditions.

Both Ron Andrews and Dave Hoffman, coordinators of the Iowa Department of Natural Resources Swan Restoration Project were very willing to acquire these cygnets for rearing and release in Northern Iowa. Iowa's Trumpeter Swan Restoration Program began in 1993. To date, Iowa has released 572 Trumpeter swans. Its banded swans have been reported in 15 states and two Canadian provinces.

The three cygnets were collected and transferred to Cindy Sherlock, a local wildlife rehabilitator who, along with several others individuals, took excellent care of them until we were able to coordinate a transfer on June 28, 2005 to Iowa. These three cygnets will later join another Trumpeter swan brood arriv-

ing from Washington State for rearing and eventual release in Northern Iowa.

For additional information on Trumpeter Swan Restoration efforts in Iowa, see the following web sites: <http://www.iowadnr.com>, the ISU Trumpeter Swan Committee <http://www.stuorg.iastate.edu/swan/>, and the Trumpeter Swan Society <http://www.trumpeterswansociety.org>

Liz Jozwiak is a wildlife biologist at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Climate warming brings alders and spruce bark beetles to mountains across Cook Inlet

by Ed Berg



Kenai Refuge employees examine recent spruce bark beetle damage to a tree along the lower Tlikakila River near Lake Clark. USFWS/Amy Miller.

I have just returned from two weeks of fieldwork in big country across Cook Inlet. This is like a visit to the Kenai fifty years ago. Virtually all travel is by small aircraft and boat. The local bush pilots are among the best in the world, but bad weather and steep topography have left a history of crash sites that sometimes aren't located until 10 or 20 years after the planes went down.

The rugged mountains near the coast are a textbook example of recent glacial geology and climate change. The glaciers are melting back as the climate warms, leaving fresh unvegetated rocky moraines in their wake. Away from the coast, however, the mountains are more rounded and covered with long talus slopes that suggest a much older topography that escaped the last glacial cycle, perhaps owing to their location in the rainshadow of the coastal mountains.

The warmer summers have brought an aggressive alder invasion up the mountain slopes in recent decades. Photos from 1912 show treeless valleys north of Lake Clark that are now thickly blanketed with alders. National Park Service pilot Lee Fink has observed this "alder rise" during his 15-20 years of flying in these mountains. A new tree-ring based recon-

struction of summer temperatures since 1769 by Will Driscoll of Wooster College shows a general warming of the growing season since the 1940s and an accelerating warming of 5°F since the 1970s, which is probably responsible for the new alder growth.

Another barometer of climate change in this area is the recent spruce bark beetle outbreak, which has heavily hammered the coastal forests, as well as some interior sites including the upper Tlikakila River, southwest of Lake Clark Pass. Coastal forests around Tyonek experienced a substantial beetle outbreak in the 1970s, and the late 1990s showed heavy beetle kill down the west side of Cook Inlet from Anchorage to Tuxedni Bay.



Dendrochronologist Rosemary Sheriff, University of Hawaii takes an increment core sample from a tree to look for evidence of past spruce bark beetle outbreaks. USFWS/Amy Miller.

When massive insect outbreaks occur, land managers often want to know if such outbreaks have occurred in the past and what they can expect in the future. There is no cure for spruce bark beetle outbreaks, but knowledge of past outbreaks and forest recovery can provide a framework for management decisions concerning timber harvest, fire suppression and wildlife habitat.

On the Kenai and in the Yukon we have successfully used tree-ring analysis to study bark beetle outbreak patterns over the last 250 years. At the invitation of the National Park Service (NPS), my assistant Matt Bowser and I joined Amy Miller, a NPS ecologist, and Rosemary Sherriff, a dendrochronologist from the University of Hawaii-Hilo in a study of bark beetle disturbance history in Lake Clark National Park and Preserve.

To study past bark beetle outbreaks, we look at tree-rings for growth pulses caused by thinning of the forest by beetle kill. This method depends on the fact that spruce bark beetles kill the larger trees and spare the smaller pole-sized trees. When the smaller trees are released from competition, they grow faster for 60 to 80 years until the canopy re-closes and competition again slows their growth.

To assess growth releases quantitatively in a forest stand, we take samples from about 100 trees, using a threaded steel tube that we screw into the center of a tree. The resulting pencil-sized core sample is glued on a wooden block and polished with a belt sander. We then measure the width of each tree-ring quite precisely (to 0.01 millimeter) with an electronic micrometer connected to a computer. These measurements generate thousands of numbers that we analyze statistically to see if there are consistent patterns of growth releases, that indicate regional thinning of the forests by bark beetles.

In this study we sampled seven forest stands in Lake Clark National Park and Preserve, and two stands at Pedro Bay, on Iliamna Lake. Sites in the Park included Two Lakes, Telaquana Lake, Lachbuna Lake, the lower Tlikakila River and Currant Creek, both near the shore of Lake Clark, and Chinitna Bay on the coast of Cook Inlet. In 2000 I had sampled a stand at Polly Creek, approximately 35 miles north of Chinitna Bay on the coast, which will be included in the present study.

In contrast to conditions on the Kenai, the interior stands (Two Lakes, Telaquana, Lachbuna, and sites on Lake Clark) showed little or no current spruce bark beetle presence, but many live trees exhibited infestation by some kind of engraver beetle (*Ips* sp.). Engraver beetles are common on the Kenai and are less potent cousins of the spruce bark beetle (*Dendroctonus*). They are often revealed by little piles of sawdust and pitch on top of a freshly downed spruce trunk. *Ips* typically live in the upper, sunnier part of the tree, and usually doesn't kill the tree. In the stands we ob-

served, however, *Ips* were present all the way down to the ground and had apparently killed a small percentage of the trees. More study is needed to see if this is a more aggressive species of *Ips* than the *Ips* *peturbatus* we have on the Kenai.

Generally, in the stands we visited the trees have grown very slowly in recent decades (as shown by narrow, closely spaced rings), which indicates that they are stressed, and hence susceptible to disease and insect attack. The slow tree growth is probably due to a combination of drought stress due to warmer summers and normal maturing and crowding of the trees. In any case, slow growth does not bode well for the future of these forests. In all likelihood the trend of warm summers will continue as part of global warming, and the forests not yet hit by spruce bark beetles will be attacked in the next few years.

At Pedro Bay on Iliamna Lake we found thousands of acres of dead spruce trees - a situation all too reminiscent of the Kenai. Forest Service aerial surveys show that this outbreak began in 1990 and peaked in 1996, and has since declined because most of the mature trees have been killed, as on the Kenai. We could still pull solid wood cores from the dead trees, and we saw few of the redbelt sapwood rot fungus conks that are so visible on dead spruce on the Kenai. The forests we sampled had an abundance of trees of every age, and it was heartening to see that the younger trees had survived and are thriving.

The presence of young trees in all the stands we examined contrasted strongly with many southern Kenai stands, which have only mature (and now dead) trees and no live "children" waiting in the understory to be released. These "old-age" Kenai stands were heavily thinned by bark beetles in the 1870s and experienced very little subsequent seedling recruitment. They are now converting to savanna-like grasslands dotted with birch and alder, and will need fire or tree planting if continuous forest is to be regenerated.

We saw no obvious stand-wide patterns of growth releases in our tree cores, suggesting that if bark beetles have been present in these stands in the past, the attacks would have been at low intensity. On the southern Kenai we often see strong visible growth releases in the rings dating to the 1870-80s and 1970s, but we have needed statistical analysis to find more subtle growth releases in the 1760s, 1810-20s, and 1910-20s, for example. Statistical analysis will definitely be necessary to detect any past outbreaks in our new cores, and it is entirely possible that spruce bark beetles have

not seriously impacted the interior stands in the past.

The Polly Creek stand on the west side of Cook Inlet that I examined in 2000 showed a strong release in the 1870-80s. The motivation for visiting this stand was an 1899 report from ships of the Harriman Alaska Expedition, which described the dead forests around Iliamna volcano and in Kachemak Bay. It is likely that spruce bark beetles killed the trees in the mid-1870s, and standing snags were still visible in 1899. In 1904 forester William Langille described generally impoverished forests on the Kenai, and specifically described the standing dead forest between Homer and Anchor Point, with young limby, open-grown trees growing up among the snags.

The next stage of this study will be to mount all of the cores and measure the tree-rings, which will be done in Rosemary Sherriff's laboratory at the University of Hawaii. This will provide the numerical data with which we can make a careful comparison of the spruce bark beetle outbreak patterns in the Lake Clark area with those of the Kenai Peninsula, and also of the Kluane area of the Yukon.

It took many helping hands to bring this study together and we would like to thank everyone very much. The National Park Service's Inventory and Monitoring Program, Southwest Alaska Network, provided financial and logistical support. Pilots Leon Alsworth and Lee Fink from Lake Clark National Park and Preserve, Rick Johnston from the Kenai National Wildlife Refuge, and Glen Alsworth of Lake Clark Air skillfully shuttled us around the countryside. National Park Service ranger Shay Hurd took us by skiff to two sites on Lake Clark, and volunteer ranger Jerry Mills skiffed us twice across Telaquana Lake. In Pedro Bay, Lisa Jacko helped us select sites on Pedro Bay Native Corporation land; Norman Jacko took us by skiff to Don Shepherd's homestead on Lonesome Bay, and Verna Kolyaha kindly transported our huge pile of gear around town.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

The Carpathian Mountains: A refuge for wildlife and a “paradise” for the people of Slovakia

by Ted Bailey

Although the fireweed was in bloom and brown bears, wolves, lynx roamed the surrounding forests; we were not hiking on the Kenai Peninsula or even in Alaska. Despite the similarities we were thousands of miles away in Central Europe’s Carpathian Mountains in eastern Slovakia. My wife, daughter and I had traveled here in July to find four little villages where my grandparents lived over a hundred years ago before they emigrated at a young age to America in search of a better life. We eventually found the villages as we traveled by car throughout the eastern regions of Slovakia known as Spis and Zemplin. Spis is a mountainous region that borders the southern boundary of Poland. Zemplin has wide valleys separated by mountainous ridges that border the western boundary of the Ukraine.

The Carpathian Mountains extend in a wide arc from Romania in the east northwestward through the Ukraine, Slovakia, southern Poland to the Czech Republic and the eastern tip of Austria; they cover more of Slovakia—seventy-one percent of the country’s area—than any of these other Central European countries. Geologically speaking the Carpathians are relatively young mountains that were formed less than 65 million years ago during the early Tertiary Period. Although they are mainly composed of flysch formations—alternating layers of sandstone and shale—they also contain regions of limestone deposits known as ‘karst’ that contain numerous and deep caves. They are relatively low mountains with only about five percent of the mountains extending above timberline.

Visiting Slovakia was an enjoyable experience. The countryside we traveled in was picturesque with gently rolling to rugged topography covered with forests and fields. Tiny villages clustered around churches with colorful tall spires. In some places we felt like we were in Alaska, in other places we felt like we were in the hardwood forests of the eastern United States because over forty percent of Slovakia is forested.

Slovakia is a relatively small country only about

half the size of state of Kentucky. It is also a relatively new country having gained its most recent independence a mere twelve years ago after the collapse of the Soviet Union. And Slovakia joined the European Union in 2004 only a year ago. The huge, stark, tall and gray housing complexes built in the country’s largest cities of Bratislava and Kosice during the communist era contrasted with the beautifully restored old city centers where Gothic cathedrals and old palaces are attractions for visitors.

One day we hiked a trail into the Slovensky Raj, one of nine national parks and fourteen protected nature territories in Slovakia. The park was the first protected nature area established in Slovakia back in 1964 when the country was still a part of the Czechoslovak Republic. Slovensky Raj was established as a national park in 1988 and was recognized as an important area of biodiversity in Europe in 1994. Although brown bears, wolves, lynx inhabit the park; we did not expect to be so fortunate to actually see one of these most endangered large carnivores in Europe. And after conducting studies on lynx, wolves and brown bears on the Kenai Peninsula, I also knew the chance of observing such elusive carnivores while hiking a highly used public trail was low.

In most of Europe, with the exception of the boreal forest regions of the Scandinavian countries and Russia, the large carnivores—brown bears, wolves and lynx—had been driven to extinction or extreme rarity long ago primarily to protect livestock as the human population expanded. These carnivores were even extirpated from the rugged Alps Mountains areas of Europe. But brown bears, wolves and lynx continued to survive in the countries within Central Europe’s Carpathian Mountains region including Slovakia.

Despite the vast distance, the Eurasian brown bears in Slovakia were the same species, *Ursus arctos*, as those living here on the Kenai Peninsula. Brown bears along with many other species of animals and plants are a circumpolar species, which means brown bears are the most numerous of the three large European carnivores. Their population is currently es-

timated at around 8,000 in the Carpathian Mountain region. Except for problem individuals, brown bears are protected throughout Slovakia and the country currently supports the second highest population of brown bears, about 700-800, in the Carpathian Mountain region; Romania supports most of Europe's brown bears. In the fall, brown bears feed on beechnuts and acorns. According to one report I read brown bears have never killed a human in Slovakia during the past 100 years.

The Eurasian wolf is also the same species of wolf, *Canus lupus*, which we have on the Kenai Peninsula. It is also the second-most abundant large carnivore and is widespread throughout the Carpathian Mountain region numbering an estimated 3,900 individuals; Slovakia supports an estimated 300-450 wolves. Wolves in the Carpathians feed mainly on red and roe deer and wild boar. They are now considered a game animal and are regularly hunted except in the nature reserves. The wolf population in Slovakia is believed to be declining from overhunting and poaching but there is currently an effort to educate the public about the ecological value of wolves and use trained guard dogs to prevent wolves from attacking livestock.

The lynx inhabiting the Carpathian Mountains is the Eurasian lynx, or *Lynx lynx*, a much larger species than the North American lynx, *Lynx canadensis* that inhabits the Kenai Peninsula. The Eurasian lynx commonly weighs around 40 pounds and often has large spots on its pelage. It preys on roe deer—a small European deer, as well as other small game species. There are about 400-500 lynx in Slovakia, and Slovak lynx have been used for reintroduction purposes in Slovenia, Italy, France, Switzerland, Austria, Germany and the Czech Republic. Some now believe that lynx in the Carpathian Mountain region are the most vulnerable species of the three large carnivores (brown bears, wolves and lynx) because of over hunting, poaching, and decreasing populations of natural prey.

In addition to these large carnivores the Slovensky Raj park supports a diversity of plants and other animals. Forests cover 90 percent of the park in three elevation zones: oak forests are found in the lowest, fir forests in middle, and fir-spruce forests at the high-

est elevations. There are over 930 plant species in the park including 35 protected species and six endemics (species that are found only in Slovensky Raj park). The park's brochure said there are over 4000 species of invertebrates, including an amazing 2000 species of butterflies, 400 species of beetles and 150 species of mollusks in the park. There are also 200 species of vertebrates including bear, fox, wolf, wildcat, deer, boar, and marten. A total of 165 protected or threatened animals live in the park.

The English translation of the park's name Slovensky Raj, means "Slovak Paradise". Carthusian monks first used the Slovak word for "paradise" to describe a secluded monastery they built in this peaceful region in 1543. Today the park is indeed a "paradise" for the Slovak people and other Europeans who converge on the park primarily to seek peace and solitude by hiking its extensive system of trails and viewing its beautiful scenery.

We never saw a brown bear, wolf, or a lynx while hiking in the park but as we were leaving a dark-brown mammal with a bushy tail dashed across the trail in front of us. I wanted to believe it was a European pine marten but my wife and daughter convinced me that it was a squirrel, probably the Eurasian tree squirrel. But like hiking the trails on the Kenai National Wildlife Refuge, it was gratifying just to know that brown bears, wolves and lynx may have been watching us from their secluded hiding places as we hiked along the trail. And after traveling through the wooded countryside of eastern Slovakia I was struck by the thought that perhaps my grandparents who left this area so long ago probably felt right at home in the rural and wooded landscapes of North America where they eventually settled and lived for the remainder of their lives.

Ted Bailey is a retired Kenai National Wildlife Refuge wildlife biologist who has lived on the Kenai Peninsula for over 29 years. He is an adjunct instructor at the Kenai Peninsula College and maintains a keen interest in the Kenai Peninsula's wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Let the school times roll!

by Nicole Johnson



Photo of Nicole Johnson & Leah Rigal. USFWS/Robin West.

Local youth are groaning and it is music to my ears! Why? Not because I am a mean person, but as the Education Specialist at the Kenai National Wildlife Refuge, I look forward to this time of year for many reasons. However, this fall is especially near and dear to my heart.

After years of planning and construction, we will be holding our first field trip season based out of our Environmental Education Center! If you have walked the Keen Eye trail or been in the parking lot at our Visitor Center, you may have noticed signs of construction during the last year. Now we have a new sign and it says we are open and ready to teach! The new building is constructed of large logs and is a beautiful work of art.

While the majority of the staff is catching their

breath from our busy summer season, our busy season is just beginning. Last fall in only 21 days we had 1,179 contacts with local youth! No wonder we are always catching our breath in October.

This year we hope to see the same number of students if not more. We currently have six environmental education programs for youth ranging from kindergarten to sixth grade. If your children came on a field trip once each year while in elementary school, they would learn about “Animals and Their Senses” (kindergarten), “Amazing Animals” (first grade), “Habitat Is Where It Is At” (second grade), “Role of Predators” (third grade), and we don’t stop there. When they are in fourth grade they would learn about “Wetlands and Wildlife.” And before they went to middle school, they would also learn about “Fire Ecology” (fourth or fifth grade) and “Leave No Trace” (fifth or sixth grade).

Over the years we have worked hard to provide high quality, hands-on environmental education programs to local schoolteachers and their students. Many teachers return year after year even when they change the grade they are teaching. However, I know there are teachers that still do not know about us and what we have to offer.

So, if you have come in the past, are new to the area as a teacher, or have never checked us out, you are in luck. It is as easy as a phone call. To schedule a field trip please contact the Kenai National Wildlife Refuge’s Environmental Education Center at 262-7021. Let the school times roll!

Nicole Johnson is the Education Specialist at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

A volunteer intern from Hawaii studies invasive plants on the Kenai

by Sadie Purinton

My three-month internship with the Fish and Wildlife Service in Alaska flew by in a heartbeat, yet I am thoroughly impressed when I look back on everything that was achieved in that brief period. I arrived at the Kenai National Wildlife Refuge in the last week of May, having flown in from Hawaii the week before. The first two weeks were devoted to learning the rules and regulations of the refuge, aviation safety, CPR, and firearms training, as well as an introduction to the facilities. During this time, I moved into the bunkhouse, where I would be living for the next three months along with seven other volunteers like myself.

After this initial introduction I dove into my primary project for the summer: assessing the exotic and invasive flora on the refuge. Our survey was the first systematic study done by the refuge to determine the severity of invasive and exotic flora on the refuge. Given vastness of the Kenai refuge—two million acres of forest, field, mountain and wetland habitat—we chose to limit our study to the areas most likely to have exotic and invasive plants, i.e., the human-altered “anthropogenic footprint” on the refuge. This 56 square-mile footprint, with trails, seismic and power lines, roads and oilfields scattered across the refuge, hosts over 500,000 visitors each year. These visitors could be bringing in plant seeds on their clothing or in mud on their vehicles, for example.

As a newcomer to Alaska, born and raised in New Hampshire, I was unfamiliar with the state’s plant life. Needless to say, over the course of this summer, I have become all too well acquainted with the exotic plants of the Peninsula. I was surprised to find that I recognized many of the non-native plants from my home back on the East coast, such as oxeye daisy, dandelion, plantain and clover, which can be found along most Peninsula roadsides.

Though Alaska—unlike lower 48 states—has relatively few exotic species, they are still pose a potential problem for native flora and fauna. For instance, we found twenty-one exotic plants in 194 of the 208 random sites we sampled on the anthropogenic footprint this summer. While our sampling sites concen-

trated on areas of high human impact where invasive and exotic plants are most likely to be found, in some places we found that they have spread well the off beaten paths. For example, on a recent mountain bike trip along the Resurrection Trail, I encountered a fairly large colony of pineapple weed around a cabin nearly ten miles from the road, at a site accessible only by foot, horseback or bike. Though the trail itself is not on Refuge land, the pineapple weed showed me the invasive potential of a common weed found on the majority of Refuge sites we sampled this summer.

When I came to this project at the beginning of the season, I wasn’t sure about the significance of my work. In college I chose to study Biology because, ever since I was a child, I wanted my life to in one way or another impact the world for the better. When I learned, at a young age, that many of the world’s plants and animals were becoming extinct, it became my goal to protect and preserve these species. In my mind, it is unrealistic to think that we can maintain all of Alaska as untouched “pristine” habitat. I do think, however, that we should assess the impact we humans are having on the ecosystem and what can be done to limit that impact on regions that are not yet part of the anthropogenic footprint.

Having recently graduated from college with a Bachelors degree in Biology, I am faced with the realization that I need to find a career to support my future family and me. I have goals of pursuing a graduate degree in Wildlife Biology, and finding a job, possibly with the U.S. Fish and Wildlife, where I can apply this knowledge. After long rides down washboard roads, rough climbs through post-fire blow-down, and many rainy transects along the Sterling highway, I have taken a closer look at some of the human impact on the native Alaskan landscape. And now, as I finish the last week of my internship, I hold no doubt that my work, through raising biological awareness, has in a small way contributed to the preservation of the native Alaskan ecosystem, a place to which I hope to return in the near future and perhaps one day call my home.

Sadie Purinton is a volunteer Biological intern at the Kenai National Wildlife Refuge. She is a recent graduate from Keene State College in NH, with a Bachelor's degree in Biology. She spent her senior year on the Big Island in Hawaii through the National Student Exchange program, and will be returning in late Au-

gust. Sadie plans on pursuing a graduate degree in Wildlife Biology in the near future, and hopes to return to Alaska to visit or possibly find a home. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Long road to the Kenai: wanderings of an itinerant biotech

by Toby Burke

As a newly hired biological technician (biotech) for Kenai National Wildlife Refuge and the U.S. Fish and Wildlife Service my main duties are to provide support to the refuge biological program. Specifically, I execute field studies designed to accurately and efficiently assess the biological resources of the refuge. In short, I am the eyes and ears of the biological program in the field, principally conducting vegetation and wildlife surveys.

A biotech develops their powers of observation through years of study and field experience. Most have acquired their field experience by serving as itinerant field assistants working on a variety of seasonal biological projects often wherever their interests or necessity led them. I am no exception.

After college with an education in forestry I went to work for Klamath National Forest in the southern Cascade Mountains of northern California. I worked as crew boss of a forest thinning crew on a timber stand improvement program. Later I became a timber cruiser and marker preparing forest units for various silvicultural operations. It was during this time that I assisted with pre-harvest raptor surveys and my interests started to shift from forest management to wildlife management.

Accordingly, I followed my wildlife management interests to Great Smoky Mountains National Park straddling western North Carolina and eastern Tennessee. I trapped exotic European wild boar on an ambitious control project.

Having worked out west and back east I thought it was high time I went north. I accepted a position with Alaska Peninsula and Becharof National Wildlife Refuges located in southwestern Alaska. While there I conducted waterfowl, seabird, marine mammal, ungulate, and bear surveys. One of our more interesting projects was assessing the effectiveness of bear hazing devices used to frighten away brown bears when coming in conflict with biotechs. I later spent considerable time fishing the Alaska Peninsula's largest lakes and their tributaries for an Arctic grayling study.

I next went to work for Alaska Maritime National Wildlife Refuge eradicating exotic Arctic foxes in the Aleutian Islands and conducting seabird and marine

mammal surveys. After a few years I returned to the Alaska Peninsula and Becharof National Wildlife Refuges to work on an array of bird projects.

From there I went to work for Togiak National Wildlife Refuge monitoring large walrus and harbor seal haul-outs as well as migratory seabird, waterfowl, shorebird, and passerine populations. I then went to work for Wrangell-St. Elias National Park and Preserve. I performed forest stand examinations and wildlife inventories in the boreal forests of the Copper River Basin in the midst of a spruce bark beetle epidemic.

After spending seven years as a biotech in Alaska I followed work back south. I went to work for Klamath Basin National Wildlife Refuge Complex and Sacramento National Wildlife Refuge Complex working on fall and spring staging geese in California's and Oregon's Klamath Basin and wintering geese in California's Sacramento Valley.

I then traveled back east where I found employment with Assateague Island National Seashore monitoring nesting Piping Plovers. After completing that assignment, I went to work in the nearby Chesapeake Marshlands National Wildlife Refuge Complex. Here I trapped large aquatic rodents known as nutria and assisted in developing methods for the control of the exotic pest.

From there I returned to my forestry management background and went to work for a sugar maple research station run by Cornell University in northern New York. I worked within the Adirondack State Park developing improved growing stock and developing best management practices for the area's sugar maple forests.

This is basically what I did as a biotech prior to coming to work for Kenai NWR. I deliberately left out a several biotech jobs and quite a few projects. The point I want to make is my experience as a biotech is not unique! The field of wildlife management has legions of journeymen biotechs exactly like me. Well... maybe not exactly like me since very few journeymen biotechs have a wife and children. I guess I forgot to mention I married a fellow biotech I met on Kodiak National Wildlife Refuge a few years back. As you can

see we've been very busy living, working, and moving all over North America while simultaneously raising a family.

Toby Burke is a new biological technician at the Kenai National Wildlife Refuge. His wife Laura for-

merly worked for Kenai National Wildlife Refuge as a biotech before she met Toby. They hope to settle down on the Kenai Peninsula with their six small children. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

The 2005 Kenai Peninsula fire season is another for the record books

by Doug Newbould

Whew! I don't know about you, but I'm sure glad the 2005 fire season is over (knock on wood).

Now I can get reacquainted with my family and friends, and try to catch up on the other aspects of life I set aside these past several months. I know that's probably a futile goal, but I'm an optimist by nature so I'm going to give it the old college try.

The 2005 Alaska wildland fire season has been a notable one—in many respects. So far, 600 wildland fires have burned more than 4,395,000 acres in Alaska, the third-highest total acreage since records have been kept. Of course, last year set the standard for total acreage at nearly 7 million. One interesting aspect of these two consecutive record years is that the national pre-season forecasts did not predict above average fire seasons for Alaska.

There are still 80 active fires in the state, all in “monitor” status—meaning the fires are unstaffed and periodically surveilled, usually from the air. Three of the active fires are here on the Kenai Peninsula and all three are in the Refuge: the 10,131-acre King County Creek Fire #344, the 925-acre Irish Channel Fire #416 and the 26,300-acre Fox Creek Fire #450. As of last week, all three were producing limited smoke, occasional short flames and almost no forward spread. This smoldering fire behavior is typical of late season fires burning deep in duff or moss.

The Refuge System in Alaska (16 Refuges) as a whole, experienced a record year in 2005 with 59 fires for a total of 1,534,081 acres. Lightning accounted for the vast majority of Refuge fires, which is normal for interior Refuges such as Yukon Flats, Kanuti, Tetlin, Koyukuk, Nowitna and Selawik. Humans typically ignite more than 90% of the unwanted wildfires on the Kenai Peninsula and within the Kenai National Wildlife Refuge. But this year was different.

On the Peninsula, there were 53 fires this year for a total of 42,814 acres. Lightning ignited 22 of these or about 41% of the wildland fires. The Refuge had a total of 12 fires in 2005 and all were caused by lightning. These are unusual statistics. The total number of fires is less than the average, but the total acreage is

far greater. In fact, the total acreage for the Peninsula and for the Refuge is the highest since 1969 and the third highest since fire statistics have been recorded.

Even more unusual is the number and percentage of natural ignitions (lightning). The lightning detection system in Alaska barely reaches the Peninsula, and not all ground-strikes are recorded, but close to a thousand lightning strikes were recorded this year and that is unprecedented, at least as far as we know.

Another unusual aspect of this fire season for the Refuge, the Kenai Peninsula and for Alaska was its duration. The fire season began in April and lasted into September. Average fire seasons in Alaska last three or four months. But, the last three years in a row we have experienced extended fire seasons of up to six months. It could be argued this is a cyclic phenomenon and not a long-term trend, but there is mounting evidence that global warming is producing fairly drastic climate change in Alaska. So longer, more dramatic fire seasons could become the norm, rather than an anomaly. I guess, we shall see.

But the unusual weather we experienced this summer was not limited to the number of lightning strikes. The most unusual weather phenomenon in my mind was the funnel cloud sighted over the central Peninsula in early July. I was out in the middle of the King County Creek Fire when I heard chatter on my handheld radio about a funnel cloud. The firefighters with me started joking that the firefighter who was reporting the funnel was eating too much smoke and hallucinating due to a lack of oxygen in the brain. Moments later, we all stopped laughing and stood dumbfounded when we saw the funnel for ourselves off to the north.

We've seen an increase in thunderstorm activity on the Peninsula since I moved here in 1991. And I have been amazed both by the frequency and the intensity of thunderstorms this year. The cells have been larger, more numerous and more frequent this year than I have witnessed in all the years I've been here. The first thunderstorms appeared in May and we had lightning again last week.

Before I moved to Alaska, I lived in the Rockies and

on the Great Plains where lightning, thunder and hail were routine. And I know this is weird, but, I have always enjoyed thunderstorms. So when we moved to the Kenai, we were more than a little disappointed by the lack of thunder-bumpers and I know I told my wife on more than one occasion that I missed them—not anymore.

So what is causing this ‘sudden’ increase in thunderstorm activity on the Peninsula? Well, I have a suspicion it’s the result of warmer ocean surface temperatures in the northern Pacific and Cook Inlet and more potential energy in the atmosphere. But, we will have

to wait a few years to see if a trend develops and if lightning fires begin to dominate the fire regime here.

The most rewarding aspect of this fire season for me was the lack of human-caused ignitions on the Refuge. My hope is that it’s due to our wildland fire prevention activities and to the diligence of our citizens to practice fire safety. But again, we’ll have to wait to see if a trend develops.

Doug Newbould has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Shrub invasion shows recent drying of ancient Kenai peatlands

by Ed Berg



Photo of plug of sod. USFWS/Ed Berg.

A major shrub invasion is underway on the wetlands of the Kenai Peninsula, presumably due to warmer summers. Wetlands that used to require rubber boots can now be navigated in sandals and sneakers, but the scratchy shrubs may require long pants.

The shrub invasion is not as noticeable as retreating glaciers or drying ponds—both of which we have in spades—because there is no visible reference for comparison, like a glacier front or exposed shoreline. The shrubs have been steadily invading for at least the last several decades, but unless you have been hiking local wetlands for these decades, you may not have noticed the change. The change, however, is easily demonstrated with the aid of a “geoprobe,” otherwise known as a stout shovel.

To see the shrub invasion, you must venture

out into a local muskeg covered with dwarf birch, Labrador tea, crowberry, blueberry, sweet gale, and other woody shrubs. Apply the geoprobe and cut out a plug of sod about a foot deep. Here is what you will typically find: live sphagnum peat moss (with tiny cabbage-like tops) will form a green layer several inches thick at the top. Below the live moss will be a brown layer of partially decomposed peat moss. This layer will grade downward into fine-textured pure sphagnum peat, which if you keep digging, may extend downward more than 20 feet, representing thousands of years of wet peat bog growth.

Now here is the clincher: the woody shrub roots are all at the top of your sod plug. The roots run all through the layers of live moss and partially decomposed moss, but you won’t find them down in the deeper peat proper. Furthermore, most of the roots are alive and attached to the shrubs growing up above the surface. There is no zone of old dead roots. This means that the shrubs are new on this landscape; this is a “first-time” mini-forest of shrubs.

Well now, you say, perhaps shrubs have always lived in these muskegs but they have simply died and rotted away, like shrubs on normal upland soils. You don’t find old shrub roots when you spade up the backyard for a garden, so why expect to find old roots in muskegs?

Muskegs are basically peatlands, and peat is usually very wet. Nothing rots in a wet peatland. Human bodies are occasionally found in the famous peat bogs of Ireland, completely mummified and thousands of years old. (The early Irish did have normal cemeteries, so these peat bog mummies probably represent untimely endings and clandestine burials.)

Sphagnum peat has been used for thousands of years for wound dressings, diapers and menstrual pads because it is both very absorbent (a dry ounce of sphagnum can hold a pint of blood) and because it is antiseptic, i.e., human bacteria don’t like its acidity. It is the waterlogged condition of peatlands, however, and not the acidity, that preserves dead wood in a peatland, if wood ever grew there. In Ireland for exam-

ple old corduroy roads of logs are occasionally found, buried in many feet of peat. Indeed, whole farmsteads have been unearthed, which were overrun by blanket bogs during wet periods several thousand of years ago.

So, when I don't find old wood of any kind in Kenai peatlands (be it logs, stumps, or shrub roots), I conclude that trees and shrubs never grew in these peatlands in the past. The shrubs (and trees) now moving into our muskegs are newcomers, pioneers on a drying landscape. The fact that their roots are alive means that these woody plants are first generation immigrants. The fact that the woody plants are thriving in muskegs for the first time in 8-14,000 years means that the muskegs are changing quite radically.

These conclusions come from my studies of the history of Kenai peatlands over the last several years. In 2003 Edward Mitchell (a wetlands specialist then at University of Alaska, Anchorage) and I cored five peatlands in the central peninsula area. We took peat cores by repeatedly driving a two inch tube deeper and deeper into the peat, taking about a meter of core per drive, until we hit mineral soil. One of our cores, from Merganser Creek on Swan Lake Road, was almost seven meters (22 feet) long. In each core it appeared that the woody roots were confined to the top six to 12 inches of the core. I submitted samples of peat from the bottom of the cores to a laboratory for radiocarbon dating, and obtained basal dates ranging from 7690 to 18,480 years old.

I then sent three cores (from Merganser Creek, Headquarters Lake, and Marathon Road near the Kenai airport) to Paul Glaser, a peat specialist at the University of Minnesota. Paul made a layer-by-layer analysis of the peat composition and texture, its magnetic properties, and described the layers of sand and volcanic ash in the peat. His colleague Jan Janssens identified many of the moss species, using well-preserved moss leaves extracted from the peat. In all of the 23 feet of peat examined, woody roots were only found at the top of the cores, confirming our original visual impressions when we first extruded the peat samples out of the coring tube in the field.

The next step was to figure out how long the shrub invasion has been underway in our peatlands; is this a matter of five years, 20 years, 50 or hundreds of years? This first generation of shrubs is still alive, but how long do shrubs typically live? The biggest shrub—dwarf birch—can have stems an inch thick; it has annual growth rings and is probably the easiest shrub to date with tree-rings. Dwarf birch has been dated with

147 rings (years) in Greenland, so it probably has the longevity necessary for dating the shrub invasion process on the Kenai. The annual rings are tiny and must be stained purple with phloroglucinol and hydrochloric acid, and counted under a compound microscope at 40- to 100-power.

One difficulty in dating dwarf birch is its sprawling, indeterminate clonal growth form. When you start digging up dwarf birch shrubs, you often find that several bushes are connected by underground roots. If you trace the roots backwards, they sometimes all narrow down to nothing, and you feel confident that you have dug up the entire plant with all its above-ground bushes. Sometimes, however, you reach a point where the root has rotted to the point where it is brittle and hard to recover. In this latter case you don't know if you have gotten the original (oldest) bush, or perhaps the original bush has long since died and rotted away. This means that the ring ages counted on the shrubs are "apparent" ages of the entire plant, but these ages might be too young, if the original part of the plant has disappeared.

My assistant Matt Bowser dug up and counted the growth rings of 157 dwarf birch at the three sites where we had analyzed peat cores. The average apparent age was 14 years, with the oldest bushes being 32 years. Matt found very few dead shrub roots in his excavations, so it appears likely that in most cases he found the original plant and that his apparent ages are close to the true age of the whole plants. If there had been abundant ancestral plants that generated the current crop of shrubs, either clonally or by seeds, they should have left some trace of themselves behind in the form of dead stems and roots, and we simply do not see such traces in any significant amounts.

Even given some uncertainty about the true ages of the shrubs, we are confident that the dwarf birch shrub invasion has occurred within the last several decades, and not the last several centuries. This invasion represents a profound change: extensive areas that were stable wet sphagnum peat bogs for 8-14,000 years have dried out in the last several decades and are becoming shrublands. You can also see young black spruce trees advancing into these muskegs, and in another 50-100 years many of these wetlands will be continuous black spruce forest with a shrub and moss understory.

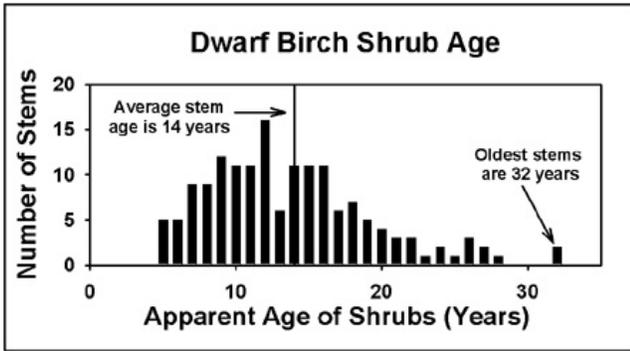


Chart of Dwarf Birch Shrub Age. USFWS/Matt Bowser..

The climate story behind the shrub and tree invasion appears to be the increased evapotranspiration accompanying our dramatically warming summers. The annual water balance (precipitation minus potential evapotranspiration) declined almost 50% after the drought of 1968-69 and has never fully recovered, due to warmer summers. It is likely that drying of the Peninsula began at that time, and it appears to have accelerated in the 1990s, as shown by recently

dried up ponds and fallen water levels of closed-basin lakes.

Aerial photography studies of the Copper River basin and western Alaska have shown extensive loss of shallow lakes and shrinkage of larger lakes, so the drying landscape is not limited to the Kenai Peninsula and it appears to be an expression of the general warming climate in the northern latitudes.

My peatland studies are revealing some other interesting stories, which I'll save for future Notebooks. I didn't expect such dramatic testimony about very recent climate change from mucking around in peatlands, but we live in interesting times, as the Chinese say.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will be teaching his 1-credit "Cycles of Nature" course at the Soldotna and Kachemak Bay campuses of the Kenai Peninsula College, starting October 4 and 6, respectively. Call 260-2812 for a course description. Registration is now open. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Celebrate new Environmental Education Center at Kenai National Wildlife Refuge!

by Candace Ward

This year we are proud to dedicate our new Environmental Education Center. For those of you who hike the Keen Eye & Centennial Trails by our visitor center, you have watched this beautiful log building progress from its ground breaking in spring 2003 to completion in fall 2005. For new visitors, the center will come as unexpected surprise.

The Kenai National Wildlife Refuge will host an Open House for the Kenai Peninsula community to dedicate the Environmental Education Center on Saturday, October 1, from 11 a.m. - 2:00 p.m.

Open House Schedule of Events:

11 a.m. – Ribbon Cutting & Dedication of the Environmental Education Center

11:30 a.m. – Lunch - Come enjoy hot dogs, chips, cookies and drinks as long as they last.

11:30 a.m. - 2:00 p.m. - All Day Events:

Kid's Activities - Go on a scavenger hunt and win fun prizes! Enter door prize drawings for wildlife books, games and toys.

Andrew Berg Cabin – Visit the historic cabin that

community volunteers and Refuge staff relocated from Tustumena Lake in 2000 to the Refuge Visitor Center. Refuge volunteers, Bill Nelson and Bud Crawford, will host the cabin.

Environmental Education Center – See the new center and find out how it benefits the community.

Visitor Center – Learn about wildlife from our exhibits, watch wildlife movies from noon to 2 p.m., visit our bookstore, and find out about recreational opportunities on the refuge.

We look forward to seeing you and your family at this special celebration!

Candace Ward is a park ranger, who leads the refuge information and education program. After 21 years working in refuge education programs, she is delighted to see the new Environmental Education Center completed and staffed by Environmental Education Specialist, Nicole Johnson, with assistance from park ranger, Michelle Ostrowski, and Student Conservation Association staff, Leah Rigall and Kate Navarro. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Aerial swan survey evokes memories and visions of change on the Kenai

by Ted Bailey

I recently participated as an observer on an aerial survey of trumpeter swans on the Kenai Peninsula. The survey was part of a larger statewide aerial survey that the U.S. Fish and Wildlife Service conducts throughout Alaska for trumpeter swans every five years. Trumpeter swans were first identified in Alaska in 1954. Although they were removed from the National Endangered Species list in 1968, the Fish and Wildlife Service still has responsibility for coordinating the conservation of this largest and most majestic species of waterfowl in North America, along with other migratory birds that fly across international and state boundaries.

I was invited by U.S. Fish and Wildlife Service waterfowl biologist Bill Larned to accompany him as a volunteer flying over the numerous lakes, ponds, beaver ponds, and small streams of the Kenai Peninsula. My task was to look for swans from my side of the aircraft and to record our data on a computer via a touch screen mounted on the cockpit instrument panel. This was a sophisticated system that constantly kept track of our aircraft position and plotted our travel route on a detailed topographic map showing the lakes and streams on the Kenai.

The noise reduction headsets were a special pleasure to wear during the long flights.

This swan survey was vastly different from the first aerial trumpeter swan survey I helped conduct on the refuge back in the 1970s. I had just recently begun working for the refuge; I was not yet adapted to tightly circling in small aircraft and was unfamiliar with the names and locations of many of the lakes on the peninsula. I sat in the back seat of a Supercub with a huge roll topographic map on my lap as the pilot, the late Vern Berns, circled numerous lakes and ponds. My job was to look for swans and accurately record our observations on the topographic maps with a pencil. Vern would shout into my headset over the noise of the engine, "Two adults and four cygnets on a small lake about one mile southwest of Hook Lake." I had no idea where Hook Lake was back then and by time I found it on the correct map, we were already tightly

circling another lake depicted on another map. I soon developed a case of airsickness looking for unfamiliar lakes on numerous maps, scanning the swiftly passing lakes below us for swans, and trying to remember where the horizon was the last time I was fortunate enough to see it. Vern never let me forget that first swan survey we flew together.

As we flew this year across the Tustumena Benchlands I thought of my former neighbor and past refuge manager John Hakala. John once told me about his first view of the then Kenai National Moose Range. At that time he was a young pilot flying a B-25 Mitchell bomber during the early years of World War II. Stationed temporarily in Anchorage before going out to the Aleutians, he was told one day to conduct a test flight on a B-25 that needed checked out. John remembered that in 1941 President Franklin Roosevelt had established the Kenai National Moose Range, so he chose to conduct his B-25 test flight over the new Moose Range. Flying low over the Benchlands in his B-25, John was impressed with the pristine, wilderness landscape and the large numbers of moose he saw from the air. He vowed that if he survived the war, he would someday return to the Kenai Peninsula. John survived the war despite many dangers he encountered flying from the stormy Aleutians Islands and later from air bases in the Southwest Pacific. After going to college in Michigan and the University of Alaska at Fairbanks, John eventually returned to the Kenai Peninsula to become one of the early refuge managers. John now lives in Fairbanks.

When Bill and I flew over a remote, small, unnamed pond in the northern refuge I remembered how Ed Bangs and I spent one night in an inflatable canoe on the pond trying to capture a flightless, molting trumpeter swan with a salmon net in order to replace its old, fractured and deteriorating neck band. This particular swan had not only been documented returning to the same pond on the Kenai Peninsula year after year, it was also regularly seen on its wintering grounds in the Skagit River Valley north of Seattle, Washington. Using the cover of darkness that didn't

begin until about midnight we paddled back and forth across the pond in pursuit of the adept-swimming swan and finally captured it about 3:00 AM in the morning and successfully replaced its neckband. Ed Bangs later transferred to Montana where he led the U.S. Fish and Wildlife Service program to reintroduce wolves into Yellowstone National Park.

As we flew over Pollard Lake, I thought of George Pollard who as a young boy had come to the Kenai with his father in the 1930s. George has had many unique opportunities since then to observe trumpeter swan behavior at close range on an almost daily basis on the lake bearing his family name. Still active today he has witnessed the many changes that have occurred on the Kenai National Wildlife Refuge and the Kenai Peninsula in his lifetime.

Some of these changes have affected the whole Kenai Peninsula and are related to the warming climate; changes that I also witnessed during the past nearly thirty years. These include the rapid retreat of Skilak Glacier and other smaller glaciers and the margins of the Harding Icefield. Snow no longer remains on some mountaintops during the summer. Other changes include the shrinking of lakes, ponds and wetlands with sedges, grasses, shrubs and young trees replacing what was once water. Vast forests of formerly dark-green spruce trees are now gray with dead trees after outbreaks of spruce bark beetles have taken their toll, triggered by warm temperatures and drought-stressed trees.

An aerial perspective, unlike our daily ground-based perspective, also provides vivid evidence of the rapid expansion of human activity on the Kenai Peninsula. Where perhaps less than fifty cabins existed in the Caribou Hills on lands adjacent to the refuge in the 1970s, there are now literally hundreds resembling a spread-out suburb connected by numerous ATV

trails rather than roads. Roads and houses now exist where there was once unbroken forest adjacent to the refuge in Sterling Corridor and North Kenai areas. And in contrast to the 1970s there are relatively few areas along the banks of the Lower Kenai River that are free of houses or cabins. Fortunately this development stops at refuge boundary. From the air, the distinction between the “undeveloped” and still mostly pristine refuge lands and adjacent “developed” lands is increasingly and vividly apparent.

With perhaps the exception of a diminishing number of “old pilots” few of us on the Kenai Peninsula get a chance for a birds-eye view of the rapid changes occurring on the landscape around us. One does not gain the same perspective of our more and more human-dominated landscape while driving along roads because such development is often screened from our ground-based view by trees. When my private pilot license was current, I enjoyed flying high above the refuge to look down on its serene lakes, forests, mountains and glaciers and thinking, “This was what the entire Kenai Peninsula probably looked like not that long ago.” And I was then, and still am grateful that we can still experience untouched nature either on the ground or high above the refuge. My hope is that people will continue to treasure the uniqueness of the refuge, its fish and wildlife, and its pristine wilderness and beauty on our rapidly changing and increasingly human-dominated Kenai Peninsula.

Ted Bailey is a retired Kenai National Wildlife Refuge wildlife biologist who has lived on the Kenai Peninsula for over 29 years. He is an adjunct instructor at the Kenai Peninsula College and maintains a keen interest in the Kenai Peninsula's wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Daddy long-legs of the home, garden, and mountains

by Matt Bowser

Fall is the time of year when, like them or not, we have to deal with daddy long-legs. As the weather cools, they seem to magically materialize around and in our homes, sometimes in alarming numbers. They can be a nuisance in this way, but whether or not the offending animals should be immediately squished, ignored, or gently transferred back to the garden should be considered.

The name daddy long-legs is sometimes used for crane flies or some long-legged spiders, but here I am referring to the familiar spindly-legged arthropods of the order Opiliones. These are not spiders, but like spiders, mites, and scorpions, they have eight legs and they are arachnids. Spiders and daddy long-legs can easily be distinguished by the shapes of their bodies: the body of a spider is divided into two main parts separated by a narrow constriction; the body of a daddy long-legs appears to be one broadly oval part. Females, especially when full of eggs, are stouter than the smaller-bodied, longer-legged males.

Daddy long-legs have neither fangs nor venom, so they cannot bite people. Instead, they have tiny pincers that they use for grabbing and cutting up their food. These are much too small to be harmful to people, at least in our Alaskan species. Most daddy long-legs are generalist scavengers and predators, eager to eat just about any kind of minute animal. Some also eat small amounts of vegetable matter. Most of them hide by day and prowl about at night. They repel potential predators by exuding foul-smelling, distasteful secretions from their scent glands.

We have at least five kinds of daddy long-legs on the Kenai, each with different habits. The daddy long-legs most often noticed by people is *Phalangium opilio*. This is the large, mottled gray to brownish variety that is often abundant in gardens, driveways, and yards. They are often active out in the open during the day. Like the cockroach, the house fly, and the silverfish, *Phalangium* is associated with humans in many parts of the world. It is native to the Old World and is probably introduced in Alaska. It is not a pest, though. In the garden, it is a beneficial animal, eating many small, soft-bodied pests including aphids, caterpillars, grubs, and slugs.

Nelima paessleri is the daddy long-legs that can gather in the thousands in crawl spaces, basements, and well houses. They are mostly burgundy to red-brown with banded legs. *Nelima* is found in much of the boreal forest, where they live secretive lives until the fall, when they seek out warm, damp nooks to spend the winter. They concentrate in particular places because they are all looking for the same kind of situation. No one knows for sure, though, why they gather into dense clumps that can comprise thousands of individuals. The most likely reason is a principle called amplification, where a signal becomes more potent or “louder” by concentration. In this case, the odor given off by a single *Nelima* when disturbed may not be especially noticeable and might not deter a hungry predator, but the stench given off by a mass of a thousand upset daddy long-legs could not be ignored and would repel all but the most desperate of predators.

Leiobunum exilipes is also common around houses. It is a small, black, forest-dwelling species.

At the seashore, *Leptobunus borealis* can be found by day in rock outcrops and under driftwood, stones, and debris. They are small, mottled gray, relatively short-legged daddy long-legs.

We discovered a previously unknown, alpine species of *Leptobunus* near the Skyline Trail this summer. It is a delicate, dark brown species that lives in cracks of alpine bedrock outcrops by day and walks about out on the faces of the outcrops by night. At this point, we do not know whether it is a rare species that lives only in that particular area or whether it has a broader range and has only been overlooked. We hope to learn about the range and behavior of this species next summer.

The household varieties of daddy long-legs are plentiful, so squishing a few should not harm any population. It is wiser, though, to let them live outside the home and devour pests. A daddy long-legs found in the house may be caught by herding it into a butter dish or simply picking it up, then releasing it in the garden. A mass of *Nelima* already in the crawl space may be left alone so that they can exit in the spring. Entrance of daddy long-legs into the home is best prevented by a well-sealed structure.

For pictures and an excellent fact sheet about *Phalangium opilo* as a biocontrol agent, visit the following web page: http://www.nysaes.cornell.edu/ent/biocontrol/predators/phalangium_opilio.html

For a research paper documenting large aggregations of *Nelima paessleri* and attempting to answer the question of why they aggregate, download the pdf

file: http://www.americanarachnology.org/JoA_free/JoA_v12_n2/ arac_12_2_0195.pdf

Matt Bowser is a seasonal biological technician at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Sign, sign, everywhere a sign

by Dave Kenagy

When I began work at the Kenai National Wildlife Refuge, over 22 years ago, I had the envious job of patrolling the backcountry. I made trips on the canoe system, hikes into remote backcountry, and explored the newly-designated Kenai Wilderness.

However, there were some very unglamorous parts to this envious job of mine. I had to pick up the trash that backcountry visitors left behind. I had to cut out windfall trees from trails, often with a handsaw. And, I had to put up signs. This article is a rambling about signs.

Long before I came to the Refuge, employees had been putting up signs. And, not just signs that say “Do This,” or “Don’t Do That.” We have always put up informational signs, too. These might say, “Welcome to the Kenai National Wildlife Refuge,” or “Kenai Canoe Trails” (with an appropriate directional arrow, of course). As a new employee, I became part of this “sign tradition.”

One of the first sign projects I had was to replace small, often missing, wooden signs on the Canoe System with foot-square aluminum signs. I placed these signs at the portages. Each canoe trip I made, I’d take along a dozen or so of these metal signs. I’d always thought aluminum as one of the lightest of metals, but the weight in my pack said otherwise. But, light or not, they eventually graced each and every portage and waterway.

The new signs did the job. They could be seen easily from out on the lakes, were easy to slip into my portage pack, and were durable. Most of the signs I installed are still out there, attached to sturdy birch or spruce trees.

The new signs were garish, graphic, and bold. The old signs, the wooden ones, were warm, woodsy, and charming. They were smaller than their metal cousins, at about four by twelve inches. They were all hand-routed, made of cedar. The craftsman who made them had carefully painted the routed groove with lemon-yellow paint to make the lettering stand out, but not too garishly. They were a product of the forest, and they looked at home in the woods.

The wooden signs were made, I believe, by Bud Marrs. Bud came to the Refuge in the early seventies,

and though he did many things in his early years here, he eventually settled into making high-quality signs of clear cedar and (gasp!) redwood. If you travel around the Refuge on any road, you will see Bud’s signs. Some of them are huge, made of multiple planks bound together. They are all works of art. Bud retired from the Refuge this past summer. I for one, will always think of soft-spoken Bud (with his slight Tennessee accent) working patiently in the woodshop on one of his beautiful signs.

Signs come in many sizes and shapes. There are all the regulatory signs—STOP signs, NO PARKING signs, and the lot. There are campground signs, and boat ramp signs, and trailhead signs. But, if you’re willing to stretch your imagination a bit, you can also imagine bulletin boards as signs.

By the time I came to the Refuge, there had already been a long tradition of bulletin boards. Basically, they consist of panels, on one or two upright posts, covered by a little roof. Yes, we still have these, but let me tell you about the “old days.” Then, rangers would cut out photos (often pictures of wildlife, flowers, or scenery from magazines), add a “handbill” of Refuge regulations, and maybe draw a map of the local area. These they would staple or thumbtack to the panels.

The bulletin boards were a hodge-podge collage. Maybe even a montage. Actually, they were kind of cute in their own way. But, they were often confusing, contained irrelevant information, and were a real chore to maintain from year to year.

Wow, have things changed! In part, it is because we now have computers with neat little graphics programs that can “cut and paste” documents, maps, photos and any graphic into a layout, and print it all on one huge piece of paper—one printout per bulletin board. In part, it is because we have a graphics printer that can make such big printouts, and a laminator that can encapsulate them in plastic.

But, mostly, it’s because of a very talented ranger here at the Refuge—Michelle Ostrowski. Michelle has transformed our bulletin boards into easy-to-read displays that would make Goldilocks happy. You know—everything “just right.” When I say “just right,” I mean it. Michelle goes over each display with a fine-tooth-

comb to assure that all information is precise, correct, and necessary. Next time you're out and about on the Refuge, take a good look at Michelle's handiwork.

I have just scratched the surface when it comes to signs on the Refuge. Biologists put up signs about loon nesting areas, backcountry rangers and their crews put up boundary signs and trail signs, maintenance folks put up regulatory signs and some of those huge highway signs made of "lightweight" aluminum, and even I get into the act. I make ski trail signs and bulletin boards, and some of the interpretive wayside exhibits. At one time or another almost everybody here at the Refuge has made or put up signs. Hats off to all.

Let me take you behind the scenes to wrap this all up. I said that Michelle tries to do everything "just right." To tell you the truth, we all do. We don't make signs, bulletin boards, and displays for ourselves, we do it for you. We want you to know where you're going, what the rules of the Refuge are, and we want all the information we give you to be absolutely accurate. When we slip-up, you folks always let us know.

We are so precise, in no small part, due to a "sword of Damocles" hanging over our heads. The sword is named Candace Ward or Bill Kent, depending on the

project. Bill is responsible for the entire "Visitor Services" program at the Refuge. Candace is in charge of interpretive activities, exhibits and displays, campgrounds, visitor centers, brochure and publication development, and on and on...

Both Bill and Candace have worked with Refuge visitors for many years, and both understand how important it is that information, whether on signs, bulletin boards, or any printed format, be totally accurate. They are not cruel taskmasters, but they do demand the best of us. To them, "it ain't right 'til it's right."

You may thank them for signage that is kept to a minimum and that is easy to read and understand. You may also thank them for the great improvement in signage and interpretive displays during their tenures at Kenai National Wildlife Refuge.

If you see signs that need improvement, or places we should have signs that we don't, or have any comments at all, please let us know. We are always happy to hear from you.

Well, I must "sign-off" for now. Happy trails.

Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Jays making a “Steller” appearance at local feeders

by Todd Eskelin

On the first frosty morning this fall, I set up a bird feeder at my new house. I have established many new feeding stations over the years and in most cases met with limited success. It often takes a fair amount of time before the local birds find your feeder and make it part of their routine. The lifestyle of a job-seeking birdwatcher is not conducive to maintaining a long-term birdfeeder. I was hopeful that with a little vigilance and lots of black-oiled sunflower seeds, I could encourage a few chickadees to entertain me on cold winter days.

It took only one day before the first visitor made an appearance at my feeder. A robin-sized bird with a stunning black head glided down to my mound of sunflower seeds. Its back was colored in a deeper blue than the heart of an Alaskan glacier. Unmistakably, I had a Steller’s Jay boldly perched on my feeder like it owned the place. It kicked at the sunflower seeds and ate a few before disappearing into the dark spruce forest behind my house.

I had a sudden feeling of nostalgia thinking about this bird. It was the first bird I had ever identified in the little microcosm of my backyard. Likewise, it was the first bird ever described in Alaska by the European naturalist Georg Wilhelm Steller. Okay, I am reaching a little, but there was something special about this creature being the first species to visit my feeder. In July 1741, Georg Steller landed on Kayak Island in Prince William Sound as part of the crew of the Vitus Bering Expedition on the ship the St. Peter. They landed just long enough to collect fresh water and also long enough for Georg to take detailed notes on the first land bird ever classified in Alaska.

Unfortunately, the expedition met with considerable hardship. Their vessel ran aground on Bering Island during their return to Russia. They spent that winter on the island, with Vitus Bering and half of the crew dying of scurvy. Eventually they built another boat and sailed home the next spring. Georg Steller explored the Kamchatka Peninsula for 2 years and while returning to St. Petersburg, he was overcome by a fever and died. During his brief travels to our area of the world he made significant discoveries of new plants and animals including the bird bounding

around my back yard.

While there is evidence that Steller’s Jays have been in Alaska for quite some time, it is a relatively new resident to the western Kenai Peninsula. I can find no records of this species in the Kenai/Soldotna area until at least the 1970s. It appears that they are moving into our area from two directions. Starting in the early 1980s, there were many sightings of these birds along the Kenai River coming from Seward and the Prince William Sound direction. At approximately the same time, there were an increasing number of reports from the southern Kenai Peninsula moving northward.

While Steller’s Jays are most common throughout the coastal conifer forests of the Pacific Northwest, the southern end of its range extends as far south as northern Nicaragua. It is also interesting that as you move further south in the range, the completely black head changes to gray, brown, and many shades in-between. The throat and face also vary considerably across the range with some subspecies having completely white throats, and stripes above and below the eye. Despite all of the variation, there is no mistaking the striking crest and harsh raspy call of a Steller’s Jay.

Last year, a friend of mine asked me how to keep Steller’s Jays coming to his feeder. I told him the best food was whole unsalted peanuts in the shell. He told me recently that I had cost him a fortune over the past summer, as the Steller’s were eating or stashing every peanut he put out and he had to start rationing them. I now find myself in the same position. This single bird will willingly take every peanut I put out there. So if you have infrequent visits from Steller’s Jays and want to watch them more frequently, keep a bag of peanuts ready. The first time you rattle that bag and give them a handful, you will have them hooked. Similarly, having the opportunity to watch their antics as they bury those peanuts around the yard, you too will be hooked on this dark crested beauty: the Steller’s Jay.

Todd Eskelin is a Biological Technician at the Kenai National Wildlife Refuge. He specializes in birds and has conducted research on songbirds in many areas of the state. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

A robin by any other name...

by Doug Newbould

My wife being at least half-Irish by blood and by virtue of surviving a quarter-century of marriage to me is probably eligible for sainthood or her own reality show, but was willing to settle for a trip to Ireland to commemorate our 25th anniversary. Luckily, she saw fit to drag me along.

We planned our trip for the last two weeks of September, reasoning that most of the tourists would be long gone and we could enjoy the emerald isle in relative peace and quietude. As with many assumptions, this one turned out to be full of blarney. We were soon to discover that solitude, even in a rural and in some places a rugged land, is a precious commodity.

According to our gracious and friendly hosts, Ireland's economy and its tourism are booming, despite the high cost of transportation fuel. We were told this new-found prosperity is either due to the success of the European Union, or because of former President Bill Clinton, or because of the virtues of Guinness Stout (or some combination thereof). Don't ask me to explain.

Now before I get too far into this tale, I must say that I am planning to relate this story back to the Kenai National Wildlife Refuge, or at least to Alaska. So, please bear with me. And since there are said to be more than 40 million Americans with Irish blood in their veins, I am assuming there is someone still reading this. And no, I did not kiss the Blarney Stone.

So, we began our journey together in Seattle, having each spent several days away from Alaska on separate business trips. We flew to Shannon, the southwestern-most international jetport in Ireland, via JFK and Heathrow. Having spoken to numerous friends about Ireland prior to our trip and studying various tourist information sources, we decided to spend as much time as we wanted visiting the south and western counties of Cork, Kerry, Clare, Galway and Mayo.

We went purposely without an itinerary so we could take a leisurely pace and optimize rather than maximize our experience. Traveling by rental car through these rural counties, we thought we could get off the "beaten path" to view the countryside, witness the wildlife, find the wild places and meet the real peo-

ple.

Now I have to say my intent is not to narrate our journey ad nauseam, but to share a few observations about the land we traveled and about the flora and fauna. If you want ad nauseam, you'll have to talk to me or my lovely Irish wife. Either of us could go on and on—about Irish history, our ancestry, the weather, the roads, the prices, the B&B's, and O' the music! Consider yourself forewarned.

If you go to Ireland with the intent to find the wild places and observe the life there, you'll need detailed maps and a good guidebook. One book we found useful was, *Complete Irish Wildlife*, by Paul Sterry [Harper Collins Publishers, Ltd. 2004]. This book is a comprehensive identification guide to the fauna and flora of Ireland, and we used it every day.

Since we did not have the time or the inclination to visit Ireland in its entirety, I will not try to describe the whole. But there are a few factoids about the land I would like to share. Ireland is an island encompassing about 32,500 square miles or just under 21 million acres. To make a comparison with Alaska—two of the sixteen National Wildlife Refuges in Alaska (Arctic and Yukon Delta), are each nearly equal in size to Ireland. Lands within the Kenai Peninsula Borough cover about 15,700 square miles, roughly half the landmass of Ireland.

Ireland's natural history shares some similarities with that of the Kenai Peninsula. As the last great northern polar ice cap began to recede and sea levels rose about 15,000 years ago, Ireland was a sub-arctic tundra landscape, surrounded by mountain glaciers. Grasslands dominated the island about 13,000 years ago and the land-bridge between Ireland and Britain disappeared about a thousand years later.

The first people arrived about 9,000 years ago when Ireland was dominated by forests. Farming began about 6,000 years ago. As the human population increased, the demand for wood products and the need to grow food resulted in the nearly complete deforestation of the island. Today there are only a few remnant old-growth forests of sessile oak (*Quercus petraea*), and scattered forest reserve plantations dominated by Scots pine (*Pinus sylvestris*), Norway spruce, European

larch and introduced North American conifers such as Douglas fir, Sitka spruce and western hemlock.

Other familiar trees we saw in mixed hardwood-conifer forests included aspen, poplar, birch alder and willow. Perhaps the most unusual and culturally significant tree we encountered was the yew (*Taxus baccata*). Yews are common throughout Ireland as single ornamentals, and can be found growing still in the inner courtyards of many of the ruined abbeys and friaries, where the trees held a place of honor. The unique fruit of the yew is a single seed surrounded by a crimson fleshy, drupe-like aril. The yew has worldwide importance as a source of the compound—taxol, which is used to treat ovarian cancer.

The western side of Ireland is mountainous with summits reaching 1,000 meters above sea level. While the glaciers have all disappeared, the rugged landscape bears witness to their passing. The jagged coastline of western Ireland is dominated by fjord-like bays and rocky landscapes. The mountains, while not that tall are impressively steep and difficult to traverse.

Atlantic storms frequently lash the western coastline, bringing rain and strong winds to the mountains, especially in the autumn, as we were so fortunate to experience firsthand. The cool, moist coastal climate sustains the moors, fens and bogs that dominate the uncultivated parts of western Ireland.

As for the fauna, Ireland has about 425 bird species, 50 marine and land mammals, three amphibians and one land reptile (viviparous lizard). There are 27 freshwater fish species in Ireland and a rich marine ecosystem that produces abundant seafood, which we sampled frequently.

Of the 22 land mammals, 13 were introduced by man. We saw fallow deer (*Dama dama*), fox (*Vulpes vulpes*) and the Irish mountain hare (*Lepus timidus hibernicus*). We also saw a stoat (*Mustela erminea*). When I spotted the critter, we were driving across the Burren, an 800 square-kilometer exposed limestone plateau in counties Clare and Galway. I exclaimed to Denise, “There’s a weasel!”

When she referred to the guidebook, she said I was mistaken. She read the following description to me: “Confusingly, often referred to as a ‘Weasel.’ Note the long, sinuous body and the distinctive black tip to tail. Coat colour orange-brown above with clear demarcation from white underparts. Some N (northern) indi-

viduals turn white in winter, retaining black tip to tail. Sometimes located by pinpointing anguished squeals of rabbit prey, a favourite food. Found throughout Ireland.” In my book, if it looks like a weasel, walks like a weasel and smells like a weasel, it’s a weasel!

As for the numerous bird species on the island, we saw many songbirds and shorebirds we had not seen before. There were grey herons (*Ardea cinerea*), oystercatchers (*Haematopus ostralegus*), mute swans (*Cygnus olor*), pied wagtails (*Motacilla alba ssp. yarellii*) and hooded crows (*Corvus corone ssp. cornix*). We saw many familiar birds as well, including dunlins, plovers, sandpipers and curlews.

One little songbird in particular, stood out from the rest. About 14 centimeters long, it had a bittersweet orange face and breast, grey shoulders and crown, and brownish streaked back and wings. When we looked up this striking little bird we were surprised to learn it was a robin (*Erithacus rubecula*). “No,” I said, “That’s not a robin. Robins are thrushes and at least twice as large as this little guy.” Again, I was mistaken.

After thinking about it for a minute, I realized the error in my ways. This little songbird had likely been christened, ‘Robin’ long before the American robin was discovered. What was more likely was that the American bird had been named by someone familiar with the European bird’s orange breast. I began to lose my American pride and prejudice somewhat. Who am I to say a stoat is not a stoat! The confusion caused by the use of common names is why scientists use Latin nomenclature to differentiate between species.

Our trip to Ireland was wonderful. We truly enjoyed the landscapes, the wildlife, the culture and the people. We want to go back again. But, as always, we were happy to get back home to Alaska and the Kenai. Reading about and seeing firsthand how the wild places, the flora and fauna of Ireland had been changed by its inhabitants over the centuries, makes me appreciate the wild places of Alaska: the parks, the forests and the wildlife refuges. Perhaps we can avoid some of the environmental mistakes made by other cultures and nurture those remaining wild places and the diversity of life they contain.

Doug Newbould has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

The Kenai Peninsula as seen from outer space

by Lee O'Brien

The Kenai National Wildlife Refuge is using space age technology to monitor the status of landscapes on the Kenai Peninsula. We have begun an on-going project using satellite images to map land cover and monitor changes over time.

In 1972, NASA launched its first of seven Landsat satellites. Two of the satellites, Landsat 5 and Landsat 7, still continually orbit the Earth, recording images of its surface. It takes one satellite 16 days and 233 orbits to cover the entire Earth. Landsat 7, launched in 1999, records more wavelengths at a higher resolution than Landsat 5, which was launched in 1984. The images from both satellites are downloaded at the U.S. Geological Survey (USGS) EROS Data Center (EDC) in Sioux Falls, South Dakota.

The images from these satellites do not just include the colors we can see - they also include near infrared and thermal infrared wavelengths. Just like with digital cameras, images from satellites are collections of pixels. One pixel in a Landsat satellite image represents a 30m by 30m (98ft x 98ft) square of the Earth's surface. Each pixel stores a set of values for the light reflection at different wavelengths (blue, green, red and infrared) for that spot on the ground. This set of values is called the pixel's spectral signature. Pixels with similar spectral signatures can be grouped together so that, in theory, they represent some feature on the Earth's surface, like a stand of aspen trees, or a parking lot.

The Refuge has acquired four Landsat 7 satellite images that cover the entire Kenai Peninsula. Ideally these images would all be from the same day from a single pass-over of the satellite. However, this is not very likely since there is often cloud cover over some portion of the peninsula on any given day. Also, certain times of the year are better for taking pictures than others. Images taken in February are pretty uniformly white. You want pictures when distinctions between land cover features are easiest to discern. Spring and fall are usually the best.

To get images from a Spring or Fall day without a single cloud over the peninsula at the precise time when the satellite goes over (once every 16 days) is not a frequent occurrence. The images we are us-

ing for this land cover classification were obtained in July of 2002. The satellite passed over the west side of the peninsula and took three images (from north to south) with only a few small puffy white clouds. Two days later the satellite past over again and captured the northeastern portion of the peninsula with just some clouds over the islands and peninsulas in Prince William Sound. This image is darker though than the earlier one, which makes it difficult to match up pixel signatures.

Once you have picked out which dates you want and stitched together the relatively cloud-free images into one large image, you have a nice color picture of the Kenai Peninsula from outer space. Except as a wall hanging, this is not much use in and of itself. The next step is to figure out what different land cover features are represented in the image.

There are software programs that can look across all the pixels in the image and group them into a number of similar spectral signatures. Once you have the pixels grouped, you have to put labels on the groups. Sometimes this is easy. One particularly large group of pixels looks a lot like Skilak Lake. You can label this group "lake" and all the other pixels on the image with similar spectral signatures will get labeled as lakes.

Another group of pixels may look strikingly like the Fred Meyer parking lot. You label these pixels "concrete" or "urban." So far, these land cover features, along with "glaciers" and "exposed rock" are pretty easy to classify. It becomes difficult when you try to tell the difference between black spruce, white spruce and hemlock. Or birch, aspen and alder. To do this you have to go out on the Earth's surface yourself, stand in the middle of a patch of alder, or aspen, or hemlock, and record your location using a GPS receiver. This gives you an exact location based on calculations from another set of satellites orbiting the earth. You then map that exact location on your geo-rectified Landsat image and tell it that the group of pixels at that location is a stand of hemlock. You do this many times over and "train" the image to recognize pixels with a certain spectral signature to be a particular land cover feature. If all goes well, you then have a map of all land cover features.

We have just finished a draft version of a map of the land cover features of the Kenai Peninsula. This map makes an even nicer wall hanging. Its main purpose, however, is as a tool describing the peninsula landscape, and to be able to track changes over time with future images. Besides letting us know how much of each land cover type there is and where they are located, we can compare this map to maps from the past and ones created in the future to detect changes like wetland drying, glacier retreat and advancing tree lines, as expected with a warming climate. We can also predict fire behavior in different land cover types, and we can see the effects of previous fires on the landscape. We can locate and monitor wildlife habitat, to answer questions like: Is the habitat for moose in-

creasing, decreasing or remaining constant.

With the availability of continuous satellite imagery and the software to classify it into land cover maps, we can closely monitor a large area like the wildlife refuge, or the entire Kenai Peninsula, keeping an eye on landscape changes from outer space.

Lee O'Brien is a wildlife biologist/GIS specialist at the Kenai National Wildlife Refuge. He has a masters degree in Landscape Ecology. GIS is a computer application used to manage and analyze spatial data, and stands for Geographic Information System, or Geeks In Sandals, depending on who you ask. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Bark beetles hammer forests throughout the West, headed eastward

by Ed Berg

The spruce bark beetle outbreak of the last decade is slowly shifting to the back burner of environmental issues on the Kenai as deep grass covers the stump fields and homeowners enjoy their “emerging views,” as the realtors like to say. There is always a background level of bark beetle activity, and people are still cutting an occasional beetle-killed tree on their property, especially around Soldotna where many younger trees survived the outbreak of the mid-1990s. In Kachemak Bay, however, there is not much left to eat; Homer experienced another record warm summer in 2005 but there was hardly a beetle to be seen.

In the western U.S., British Columbia and the Yukon, however, the bark beetle outbreak is going full bore, in response to warmer climate, as on the Kenai in the 1990s. The western culprit is the mountain pine beetle (MPB) *Dendroctonus ponderosae*, a close cousin of our spruce bark beetle *Dendroctonus rufipennis*. The MPB specializes on lodgepole pine (which is optimistically being widely replanted on the southern Kenai), and has killed millions of acres of pine forest in the West. It is now moving northward and is about two-thirds of the way up British Columbia.

Last week I attended a Forest Service conference in Utah, where bark beetle researchers from around the U.S. and Canada shared their research and experiences. There is no “cure” in sight for bark beetles, but we have a much better understanding of the ecological role of bark beetles in the forests and can make better forecasts of their future activity. Bark beetles, like fire and wood-rotting fungi, are a natural part of the forest cycle, even though they can certainly derail human ambitions and economies.

I spent several years of weekends in the mid-1990s cutting down my beautiful old Sitka spruce trees in Kachemak Bay. These giants had survived the bark beetle outbreak of the 1870s-1880s as pole-sized juveniles but they were prime beetle fodder at ages of more than 270 years in the 1990s. My audience at the Utah conference listened with a mixture of empathy and scientific interest as I described the 250-year record of bark beetle activity that we have developed for the

Kenai Peninsula and the Yukon using growth pulses in tree-rings (dendrochronology). Many of these researchers had seen some of their favorite forests hammered by the beetles and had cut down their share of beetle-killed trees.

It was a special treat at this conference to hear a talk from fellow dendrochronologist Tom Veblen from the University of Colorado, who has used tree-rings to document extensive bark beetle outbreaks in the 1850s and 1940s in the Colorado Rockies. When I started studying bark beetle history on the Kenai in 1993, I applied Veblen’s method looking for growth pulses in tree-rings as an indication of canopy thinning, due to bark beetle outbreaks.

Tom Veblen and his graduate students have published several papers examining the relationship between fire and bark beetle outbreaks in subalpine forests in Colorado. Essentially, they found no relationship at all; beetle-killed subalpine forests were no more likely to burn than non-beetle killed forests. I have found similar results on the Kenai, where on the southern Kenai white spruce forests have not burned for an average of more than 600 years, whereas the beetles have thinned the forests on an average of every 50 years or so. In both Colorado and the Kenai it is dry weather, rather than fuel build-up, that drives forest fires. Under dry conditions everything burns well, dead or a live.

One of the most poignant talks at the conference was given by Diana Tomback of the University of Colorado on the tenuous future of Whitebark Pine, a high-elevation species similar to our Mountain Hemlock. Whitebark pine lives in a narrow belt at timberline above other conifer species which require warmer conditions. In the past whitebark pine was safe from mountain pine beetles because the cold winters would often hit the -40°F necessary to kill the beetles. As the climate has warmed in the 1990s, however, the beetles have moved higher and higher.

As if the mountain pine beetles were not enough, whitebark pine is also susceptible to white pine blister rust, a fungus introduced from Asia in 1910 that has

been a major forest pathogen throughout the West. A small percentage of whitebark seedlings are resistant to the blister rust, so foresters had hoped that future generations of whitebark pine would free of rust. With climate warming and mountain pine beetles added to the equation, however, there may not be many future generations of whitebark pine. The large seeds (called pine nuts) of whitebark pine are important food sources for grizzly bears, squirrels, and the Clark's Nutcracker bird, so the loss of whitebark pine could have a cascading effect in the ecosystem that would affect many other species, directly or indirectly.

The climate warming in the West is also driving the northward expansion of mountain pine beetle through the lodgepole pine forests of British Columbia, as noted above. Lodgepole pine lives on the west side of the Rocky Mountains; it is mainly a subalpine species, not a boreal forest species. The Rockies meet the boreal forest in central British Columbia, in the area of the Peace River. (If you have driven the Alaska Highway, you crossed the Peace River near Fort St. John in east-central B.C., not far from the Alberta border.) The pine species of the boreal forest is Jack Pine, which extends all across the southern boreal forest from Alberta to Nova Scotia, and dips down into Minnesota, Wisconsin, and Michigan.

In the Peace River area, lodgepole pine and jack pine overlap in a hybrid zone, similar to our Lutz spruce hybrid zone on the southern Kenai where white spruce hybridizes with Sitka spruce. In 2002 mountain pine beetles appeared just west of the lodgepole-jack pine hybrid zone, apparently having been transported by wind in a single long-distance dispersal event. The beetles had in effect breached the Rocky Mountain barrier, which hitherto confined them to the west side of the Rockies.

Now, here is the question: will the mountain pine beetles move through and beyond the hybrid zone and go all the way across Canada to the East Coast? With a warmer climate they appear to have a green light... The beetles might have to make some evolutionary adjustments to thrive on jack pine, but they can be eased along by first adjusting to the lodgepole-jack pine hybrids as sort of a halfway house. In laboratory tests, however, the beetles survive and reproduce quite well in freshly cut bolts of jack pine, so maybe they are already pretty well equipped to live in jack pine.

In the past, cold weather in the boreal forest was too much for mountain pine beetles and set a very definite limit on their northern expansion. Several weeks

of -40°F winter weather or early fall or late spring cold snaps of $+13^{\circ}\text{F}$ are sufficient to kill beetle larvae and shut down an outbreak. Recent warmer winters have decreased winter larval mortality from 80% to less than 10%, according to some estimates, so there are a lot more mountain pine beetles available now to fuel the expansion to the north and east.

The story gets worse. In the past the Rocky Mountains and the Great Plains were the barriers that kept mountain pine beetles from spreading to the Midwest and eastern U.S. Having now breached the Rocky Mountains, if the beetles are able to skirt around the Great Plains to the north through the Canadian boreal forest, the pine forests of the eastern U.S. and Midwest will be easy picking. These mountain pine beetles are much more versatile than our spruce bark beetles. According to Canadian Forest Service entomologist Allan Carroll, if the climate is right, the mountain pine beetles can eat just about any kind of pine (Jeffrey Pine is one exception, albeit a minor one). If this scenario plays out—and with predicted climate warming there is no reason why it will not—the mountain pine beetle will nearly encircle the Great Plains, running from the intermontane west from Arizona up through British Columbia, across the boreal forest to eastern Canada, and down through the Midwest and East Coast, across the South and into Texas.

If the mountain pine beetles move into the eastern U.S., they will meet another cousin—the southern pine beetle (*Dendroctonus frontalis*), which presently ranges Pennsylvania to Texas and from New Mexico and Arizona to Honduras. The southern pine beetles are moving northward into Ohio, Pennsylvania, and New Jersey. The southern pine beetle already does a lot of damage to commercial pine forests in the Southeast, and if the mountain pine beetle is added to these forests, the price of a wood-built home may go out of sight.

One might hope that spruce will still be available for lumber, even if pine is eliminated, but our own spruce bark beetle continues to make a name for itself down through British Columbia and into southern Utah in record-breaking levels of attack. In the Southwest the Pinyon Ips beetle (*Ips confusus*) is hammering Pinyon pine-juniper woodlands, and other bark beetle species are attacking Ponderosa pine forests.

A common denominator of all these insect outbreaks is that they are way outside their known ranges of natural variability. We see this in southern Alaska and the Yukon, for example, where the current out-

break continues to expand into new areas in the Yukon and across Cook Inlet, greatly exceeding the area and duration of all previous outbreaks that we have been able to document in the last 250 years. Similarly, the outbreaks in the West are all well beyond their known ranges, and have the potential to go much further yet. All of these outbreaks appear to be driven by a warming climate—both warmer summers which allow more effective infestation of drought-stressed trees and warmer winters which allow greater survival of the beetle larvae.

The climatic control of the outbreaks has been well-studied in the mountain pine beetle, and less so in other bark beetle species. Jesse Logan and Barbara Bentz with the Forest Service in Logan, Utah and Jim Powell at Utah State University have studied the life cycle of the mountain pine beetles in great detail, first growing the beetles under different temperature conditions in the lab, and then modeling how beetle populations will cycle over a period of years, given various weather scenarios. When their beetle population model was coupled with warmer climates predicted by whole-earth climate simulation models, their model

quite clearly predicted the now-observed northward spread of mountain pine beetles in British Columbia and the shift higher in elevation to the whitebark pine zone.

The long and the short of all this is that now is a bad time in history to be a conifer tree of any kind. The warming climate will shift forests in North America towards more hardwoods, and the lumber industry will probably lose the cheap supplies of pine, spruce and fir that we have historically enjoyed. On the Kenai Peninsula we already see a shift to more alder in areas of recent beetle-killed spruce, and a shift to more birch and cottonwood in some of the beetle-kill areas of the 1970s; the supply of spruce available for saw timber has shrunk to a truly marginal level. This appears to be yet another example of how Alaska is the “canary in the coal mine” that is warning of things to come throughout North America in the era of global warming.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Alaska Natural History Association—an important partner for the Kenai Refuge

by Brenda Nichol

What is the first thing you see when you walk into the Visitor Center at the Kenai National Wildlife Refuge on Ski Hill Road? If you said a book or gift store, you would be right. If you think the store is owned and operated by the refuge, you would only be partly right. It is operated by the refuge staff in the Visitor Center, but bookstore is actually owned by the Alaska Natural History Association (ANHA).

You might ask, “Who or what is this organization called ANHA?” Well, ANHA is a non-profit organization dedicated to sharing Alaska’s natural and cultural heritage through education. ANHA is also “a bookstore, an educator, and a supporter of public land educational programs.” The organization works with federal and state land management agencies all around Alaska.

Originally founded in the 1950s as the Mount McKinley National Park Association, the organization was initially run by National Park Service employees. Eventually, the name was changed to Alaska National Parks and Monuments Association in order to include other national parks in Alaska.

Soon, other federal land agencies in Alaska wanted to be included in the organization to provide similar services for their visitors. So, in 1978, the Alaska Natural History Association was created, and the U.S. Fish and Wildlife Service signed on as one of several partner agencies. Today ANHA has 35 branches and 50 sales outlets in the state. The Kenai Refuge is just one of their many branches.

Our ANHA bookstore opened for business in 1980 and has been serving the community and visitors for 25 years. We have two sales outlets; the main outlet is at the refuge headquarters (Visitor Center) in Soldotna. During the summer, we also have an outlet at the Visitor Contact Station, near Jim’s Landing on the Sterling Highway. Furthermore, at Hidden Lake and Upper Skilak Lake Campgrounds, the volunteer camp hosts sell firewood between Memorial Day and Labor Day, and these sales too are also part of ANHA.

While the sales outlets are quite visible, there are some aspects about ANHA that may not be so obvious,

such as where the sales money goes. Since the Alaska Natural History Association is a non-profit organization, what happens to the proceeds from the sales? When you buy something in most retail stores, your money goes into the company’s pocket.

When you shop at an ANHA store, your money comes back to you, at least in part. How does that happen? Well, it’s not as obvious as getting cash back at the end of the sale. Let’s say you come into the refuge to get information on cross country skiing. While you are here, you purchase the “Kenai Trails” book for yourself, a unique leather bookmark, and a “Taste of Alaska” chocolate bar. Before leaving, you also pick up the Reflections Visitor Guide and a Bear Facts brochure. Perhaps you found out about upcoming winter events because your children got some “freebies” and won a door prize at the refuge’s new Environmental Education Center Dedication event last month. So where is the reward for shopping here?

Part of the reward is the free publications you picked up. In 2005, ANHA gave back \$3900 to the refuge to develop and print our free “Reflections Visitor Guide” for the refuge. They also participated in publishing the “Bear Facts” brochure. In 2003 ANHA contributed \$10,000 in matching funds for media equipment and education materials for the new Environmental Education Center. Remember the door prize and “freebies” your kids took home? Those items were donated by ANHA. These kinds of rewards for shopping at an ANHA bookstore contribute to your education and enjoyment of the Refuge and Alaska.

While most of the money and items contributed by ANHA are used for education, others are not. The federal government is not allowed to use its funds for certain things, such as providing food and guest speakers at special events. ANHA allows the refuge to provide these special events and allows us to show appreciation to our refuge volunteers through gifts and awards.

These same services are also provided to other refuges, and other land management agencies partnered by the Alaska Natural History Association. Throughout the state, ANHA contributes over 1.2 mil-

lion dollars to its branches and agency partners.

A portion of every dollar spent at an ANHA branch comes back to that specific branch or agency. So remember, the next time you visit the refuge and spend your hard earned money at one of our sales outlets, some of that money is going to come back to you, one way or another. Whether it is a free visitor's guide, a door prize, or a hot dog, the Alaska Natural History Association is creating a special experience for you and your family at the Kenai National Wildlife Refuge.

You can find information about the Alaska Natural

History Association on the web: www.alaskanha.org, call (907) 274-8440, or ask one of the employees or volunteers who greet you the next time you visit the refuge.

Brenda Nichol lives in Soldotna with her husband, Randy and their children. She began working for the refuge in 1989 and has been supporting the refuge's ANHA operations as the Assistant Branch Manager for the past 16 years. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Refuge used new strategy for the Fox Creek and Irish Channel Fires

by Doug Newbould

While 2005 was an exceptional fire season for the Refuge and the Kenai Peninsula, one which tested our mettle in many ways, it provided us with opportunities to manage wildfire using a new strategy. This wild-fire management strategy, which is not really new—but which has not been used until recently in Alaska, is known as ‘wildland fire use’ or WFU.

Wildland fire use can be defined as—the management of naturally ignited (usually by lightning) wildland fires to accomplish specific pre-stated resource management objectives in predefined areas outlined in Fire Management Plans. In fact, WFU is mandated by Department of Interior wildland fire management policy (620 DM 1): “Wildland fire will be used to protect, maintain, and enhance natural and cultural resources and, as nearly as possible, be allowed to function in its natural ecological role.”

The term, wildland fire use, is relatively new although the strategy has been used on some federal lands in the United States since the late 1960s. The National Park Service was the first federal land management agency to allow natural fires to burn in specific areas of some national parks, especially in wilderness areas. This strategy some referred to as the ‘Let Burn Policy’ came to be known as ‘Prescribed Natural Fire’ (PNF).

However, both of those terms were unpopular with the fire management community. So, after the 1988 Yellowstone fires generated a national debate about wildland fire management policies and strategies (a debate that has continued for most of two decades), national fire policies changed and so did some of the terminology. One of the new terms is Wildland Fire Use, which replaced the technical term—PNF and the politically-incorrect ‘Let Burn’.

So, even though the terminology has changed and the management strategy has matured over the years, the underlying philosophy for WFU and its purposes have not changed. I guess one could say that the (inappropriate) names have been changed to protect the innocent (good policy). And now, because it is widely recognized as good policy, WFU is utilized (where des-

ignated by approved fire management plans) by every federal land management agency in the United States.

Those of you who are familiar with wildland fire management in Alaska might ask, “How does WFU differ from other fire management strategies or options, such as Limited suppression?” Well, I must admit there are similarities between WFU and Limited suppression. Both are designed to provide public and firefighter life safety and protect private property and other important values at risk. And both tend to reduce costs by limiting the use of aggressive firefighting tactics.

But there are also important differences. Compare the definition given above (WFU) with that of suppression: a management action intended to protect identified values from a fire, extinguish a fire, or alter a fire’s direction of spread. By national policy, all wildland fires caused by humans are classified as unwanted wildfires that must be suppressed. And land managers are mandated to investigate any wildfire to determine cause, origin, and responsibility. WFU may only be an appropriate management response for some naturally-ignited wildfires and is not an option for human ignitions.

Again, WFU is a strategy used to accomplish specific resource management objectives, such as: reduce hazardous fuels, restore or maintain fire-adapted ecosystems, prevent or alter the spread of future unwanted wildfires, or protect wilderness values. Suppression is a defensive strategy, while wildland fire use is offensive. WFU is proactive, while suppression is reactive. The difference is really a matter of management perspective.

With WFU, the land manager asks the question, “How can we manage this unplanned natural wildfire to meet our land and resource management objectives and agency purposes?” With any suppression response, the land manager asks, “How can we manage this unplanned unwanted wildfire to minimize the risks to human life and property, minimize the environmental impacts of suppression activities and minimize suppression/rehabilitation costs?”

Congress has recognized the differences between

WFU and Suppression. They see that nationally, WFU costs much less per acre than wildfire suppression and Doug Newbould has lived and worked on the Kenai Peninsula since 1991 and has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Costs much less per acre than mechanical fuel reduction. Also, wildland fire use generally produces ecological benefits while suppression activities can produce adverse environmental impacts.

Of the 12 lightning fires on the Refuge in 2005, five started in designated Wilderness areas but only two were managed as WFU fires: the 1,000-acre Irish Channel Fire and the 26,300-acre Fox Creek Fire. Both fires started in remote wilderness areas, where values at risk were at least somewhat minimized.

The three wilderness lightning fires that were suppressed included the 10,300-acre King County Creek Fire, the 0.2-acre Brown's Lake Fire and the 13.5-acre Moose Lake Fire. The first two were suppressed because of the risk to communities (Funny River and Sterling), the third was suppressed because it threatened to overrun the Moose Research Center.

The decision to manage the Irish Channel Fire under the WFU strategy was a relatively simple one for Refuge Manager, Robin West. A lightning storm on July 6th ignited several fires on the Peninsula, including a fire at the east end of Skilak Lake on a rocky knob south of Lucas Island. Surrounded by natural barriers (Skilak Lake to the north, the braided glacial Skilak River to the east, alpine vegetation to the south and the 2003 Pipe Creek Fire scar to the west), the Irish Channel Fire essentially had nowhere to go.

The resource management objectives identified for Irish Channel were to allow the fire to play its natural ecological role and to protect wilderness values while ensuring public and firefighter safety. In all, the fire burned for three months, consuming about 1,000 acres of mountain hemlock and spruce forest in the Andrew Simons Wilderness Unit. The only costs attributed to the management of the Irish Channel Fire were for planning and surveillance.

The decision to manage the Fox Creek Fire under WFU was not nearly so simple. The Fox Creek Fire was ignited by lightning sometime on or before July 11th, when it was first discovered burning in remote Wilderness, in black spruce and beetle-killed white spruce south of Big Bay, which is about midway along the southwest shore of Tustumena Lake.

And although there were impenetrable natural barriers to the north (Tustumena Lake) and the east

(the Kenai Mountains), and substantial vegetation barriers to the northwest (the 1996 Crooked Creek Fire scar) and southwest (the Caribou Hills), the fire was within one of the largest continuous fuelbeds on the Kenai Peninsula—about 125,000 acres of beetle-killed white spruce and live black spruce. And there was one potential route of escape for the fire if it decided to burn west across the Nikolai and Crooked Creek drainages. This doorway to the west became known as the 'Gate.'

Because of the fire's potential to get very large and possibly threaten structures in the Ninilchik Forties/Caribou Hills (if it got through the Gate) and because it could last for two or three months, an Alaskan Type-2 Incident Management Team was ordered to help us manage the incident. But during the situation analysis, when the land manager must decide whether to suppress a lightning fire or manage it for resource benefits, perhaps the one factor that tipped the scales towards WFU was named Mary Kwart.

Mary is the Assistant Regional Fire Management Coordinator and Wildland-Urban Interface Specialist for the U.S. Fish & Wildlife Service in Alaska. She is a fully-qualified and experienced Fire Use Manager (FUMA), and it just so happened that she was in Soldotna (helping us manage the Irish Channel WFU Fire) when Fox Creek started. Without a qualified FUMA, we could not have managed the fire as WFU, and the chances were slim we could order a FUMA to be part of the incident management team in a timely manner.

Still, even with Mary on board, I'm not sure Robin slept much during the first several days of the Fox Creek Fire. I know I didn't. When the smoke finally cleared, the fire had burned about 26,300 acres of black spruce and beetle-kill, making it the largest wildfire on the Kenai Peninsula since 1969. But, I'm happy to report that all of the natural barriers held, no firefighters were injured and no structures were lost. Even the historic Big Bay Cabin was saved from almost certain destruction, if not for the valiant efforts of the Refuge fire crew under the expert leadership of Assistant Fire Management Officer, Dianne MacLean.

The only negative incident during the successful management of the Fox Creek Fire occurred when the large smoke column from the fire collapsed on Anchorage for about six hours, making some folks very unhappy. The good news is that no injuries or illnesses resulted from the smoke event. Less than a million dollars were spent managing the Fox Creek WFU Fire. By contrast, suppression costs for the King County

Creek Fire, a fire less than half the size of Fox Creek, amounted to nearly 4 million dollars.

The lightning we experienced in 2005 and the number of lightning fires that occurred are unprecedented, at least here on the Kenai. But if it is true that lightning fires are on the increase, then it is my hope that the wildland fire use strategy will always be in our fire

management toolbox.

Doug Newbould has lived and worked on the Kenai Peninsula since 1991 and has been the Fire Management Officer at the Kenai National Wildlife Refuge since 1999. Previous Refuge Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.

Refuge Place Names: How places were named on the Kenai National Wildlife Refuge

by Gary Titus

Imagine if places had no names. How would your friends tell you how to find that “secret” moose hunting lake or fishing hole? Yet, early maps of Alaska showed vast areas of land and water with no names. A 1915 U.S. Geological Survey map of the Kenai Peninsula has the entire eastern half of the Kenai marked as “unexplored.”

The Dena’ina people of Alaska already had place names for many lakes and streams. These names were passed down through story telling and experiences. The names sounded strange to early explorers and settlers, who had trouble pronouncing them or spelling them. Some names were changed into forms resembling English words or were just replaced. Some a few examples are: Shantatlik Creek which replaced Shanteh K’eleht, meaning summer fish run place, and Botteninthin Lake replaced Batinitin Bena, (Trail-goes-by-it Lake) and Tustumena Lake replaced Dusdubena Lake.

In 1964 refuge managers recognized the problems of not having place names. Approximately 250 lakes were labeled by name on geological maps and sent to the U. S. Geological Survey for updating. Today, approximately 1,000 lakes of significant size are still unnamed. The names that were selected were primarily historical or represented names of birds, animals and trees. A few names were of local Indian or Eskimo origin and while others took on the names of later homesteaders and residents like Frisbee and Swanson.

The lakes Petersen, Watson, Chatelain and Rhode were named after former Fish and Wildlife employees who died in the line of duty.

On September 9, 1955, James D. Petersen and Gerald H. Watson, wildlife refuge employees were lost in Skylark Lake in the line of duty. It was moose hunting season and they were out to enforce the rules. Watson was a federal trainee visiting the territory in the summer of 1955. Petersen, his boss, was born in a cabin at the mouth of the Kasilof River, the son of a prominent Kenai family whose history in the territory went back to the days of sailing ships. As Assistant Refuge Manager for seven years, Petersen had been among the first

employees hired by the Kenai National Moose Range.

Rhode Lake was named after former Alaska Bureau of Sport Fisheries and Wildlife Director and pilot Clarence Rhode who went missing in his beloved Grumman Goose in the Brooks Range.

In those days naming or re-naming a lake after a person or otherwise was relatively simple with little more than a letter to the United States Geological Survey. More recently, naming an unnamed lake has become a very difficult and seldom accomplished process. For example there was an unsuccessful attempt by The Alaska Department of Fish and Game and others to name a lake in the area encompassed by the Moose Research Center within the Refuge after a former employee who was lost in a polar bear survey north of Barrow. Despite a concerted formal effort the naming request was denied.

Today on the Kenai National Wildlife Refuge there are lake names that follow certain themes like Swan, Cygnet, Waterfowl, and Nest or lakes that are named because of certain geographic features or landforms. For example Rock Lake has a huge glacially deposited rock protruding as an island and Twin Lakes feature two nearly identical lakes. Gooseneck Lake as you might imagine resembles a goose with an outstretched neck and Elephant took on the vague shape of an Elephant. One can almost imagine the guess-that-shape exercise that managers went through prior to submitting their place names list to the United States Geological Survey.

Other lakes and places were named after activities, proximity or individuals known to use the lakes. We have a chain of Canoe lakes within the Refuge’s canoe trails, a Trapper Joe Lake named after a trapper nick-named “Joe,” and a Lonely and a Lonesome, that sit apart geographically from other lakes. One might wonder how some lakes were named, while others are obvious. There are also lakes named for fishing: an Angler, Sport Fish, Hook, Lure, Spinner, Snag, Fish, Dolly Varden, Trout, Chum and Rainbow Lake. Just about any kind of animal is a favorite name for a mountain, river, or whatever, from Woodpeck-

ers to Donkeys and Muskrats to Bears. Taking creeks alone, the Refuge has Moose, Bear, Beaver, and Sheep creeks on the Refuge. Now this would be fine if you're describing a hot fishing spot to a local resident but in the state of Alaska there are 47 Moose creeks, 57 Bear creeks and 28 Sheep creeks. We do have the only Afonasi Creek, Akula Lake, and Jigsaw Lake, however.

Sometimes place names were controversial. The controversy might relate to the correct spelling or use of an apostrophe in a name like in Jim's Landing, a boat landing on the Upper Kenai River. Jims' Landing was not named after one Jim, but two, Jim Dunmire and Jim O'Brien, so it should be Jims' Landing. Before the Jims, it was known as Melchoir Landing, after a Surprise Creek miner who used this popular spot as a boat launch.

In the case of Upper and Lower Alcatraz, these were changed in 1965 to Upper and Lower Ohmer lakes in honor of Earl N. Ohmer, who served as chairman of the Territorial Alaska Game Commission. I prefer the original names myself, the new cabin on Upper Ohmer could be named, "Alcatraz."

During the winter while building the original Sterling highway a road crew was working in the Rock Lake area on Skilak Loop Road. The weather got colder and as the temperature dropped to 30 and then 40 below, the mix of the isolation, cold and fear of never getting out gave them the feeling of being in Alcatraz. Alcatraz was America's premier maximum-security prison from 1934 to 1963. The crew did get out and the name stuck. What happened to the crew? They quit as soon as they reached "civilization."

Local names not otherwise known to officials have always played an important role in describing and

identifying locations to others. When Refuge managers named lakes in the 1950s and 1960s, historically used local names were not always known to managers attempting to formally name streams, lakes, mountains and rivers. Errors or mis-understandings were not uncommon. This process forever confused certain old timers trying to reconcile new names with the ones they had always used. For example, Bear Creek on Tustumena Lake somehow got re-named from Birch Creek and the locally known real Bear Creek further up the Tustumena shore was somehow re-named Moose Creek. Tustumena folk continued to have a Bear Creek, just not in the right place.

As I grow older, it becomes harder to accept change in general and place names specifically. The hardest name change for me is remembering not to call the Kenai National Wildlife Refuge the "Moose Range." The Kenai National Moose Range was established by executive order to protect "the natural breeding and feeding range of the giant Kenai moose" in 1941. The name was changed to the Kenai National Wildlife Refuge in 1980, yet I still prefer calling the Refuge the Moose Range! Traditional names die hard for many others as well. It is not uncommon to still get a puzzled look from a long-time Kenai Peninsula resident when you tell them you work for Kenai National Wildlife Refuge... but when you quickly recover with a... you know... the "Moose Range," all is well and understood.

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