

Refuge Notebook

Volume 4 • 2002

This volume was compiled in 2015 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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How have wildfires affected the peninsula's caribou population?

by Brandon Miner

A few years ago, I was fortunate enough to have my name drawn for a caribou hunting permit for the Kenai Mountains. I have hunted white-tailed deer and mule deer for many years in the Midwest, and this was my first caribou hunt. I didn't take an animal, but I certainly enjoyed the excitement of the hunt and the scenic hike above treeline.

This past fall I accompanied some friends on a successful caribou hunt in the Kenai Mountains. One could say that I was fortunate to accompany my friends on this hunt, but after packing 80 pounds of meat four miles down the mountain, I found out why they were so keen to have me along.

Caribou have always been mysterious animals to me. I've long thought of them as creatures of wilderness, tough enough to endure extra-harsh conditions.

Having done some research on moose and fire, I began to wonder about caribou. It's widely recognized that burning spruce forest is beneficial to moose because fire generates hardwood winter browse such as birch, willow and aspen. But what about caribou and fire on the Kenai Peninsula? Do caribou benefit from fire?

Historically, caribou were found on the Kenai Peninsula, although the few historical records are not clear on their distribution and population size. During the 1800s, caribou were in the Caribou Hills and Skilak-Tustumena benchlands areas. Moose are reported to have been rare during this time. By about 1913, caribou became extinct on the Kenai Peninsula.

The peninsula is connected to mainland Alaska by an 11-mile wide strip of land, much of it ice-covered. For many species, this narrow isthmus makes the Kenai more of an island than a peninsula. We hypothesize that the original Kenai caribou were genetically distinct from interior herds due to breeding isolation on our "island," perhaps since the last major glacial period. Some historical reports claim that caribou became extinct on the peninsula because their winter range was destroyed by fire, while others claim that uncontrolled hunting and natural mortality were the primary causes.

Trapper Andrew Berg, for example, described fires on the Tustumena benchlands in 1871, 1881 and 1910, and it is possible that these fires destroyed lichen winter range that was important to local caribou.

Be that as it may, the benchlands fires probably created a lot of willow browse, which greatly increased the moose population. By the turn of the century, hunters from Europe were writing exuberant travelogues on the excellence of moose hunting on the Kenai benchlands.

A 1994 Alaska Department of Fish and Game report stated that market hunters during the early 1900s hunted caribou for mining camps and may have killed most of the remaining original population. Animals not killed by humans probably died through predation and old age. Whether fire was a substantial factor in the caribou decline remains an open question, because the known fires were nowhere nearly extensive enough to have significantly reduced the potential caribou range over the entire peninsula.

Fortunately, this story has a happy ending. Interest in reintroducing caribou to the peninsula increased in the 1950s, with the U.S. Fish and Wildlife Service leading the way with a 1951 reintroduction plan. In 1965 and 1966, Fish and Game imported 44 caribou from the Nelchina herd near Glennallen, which created the Kenai Mountains herd (north of the Sterling Highway) and the Kenai Lowland herd.

Despite these successful reintroductions, the historical caribou range in the central and southern peninsula remained unoccupied. So, in 1985 and 1986, 80 more animals from the Nelchina herd were released at four sites, creating several new herds in the mountains between Skilak Lake and the Fox River.

But still the question remains, what about the effect of fire on Kenai caribou?

In Interior Alaska people usually assume that because caribou are often feed in mature black spruce-lichen habitat on their winter ranges, burning such habitat was detrimental to caribou and caused population declines. Recent studies, however, have shown that caribou are not entirely dependent upon lichen for

winter food and that only an insignificant percentage of total caribou winter range is burned annually. This view maintains that fire is necessary for nutrient cycling processes in the northern environment, and that fire is not at all detrimental to caribou populations in the long run.

On the peninsula, the alpine herds spend both summer and winter in the mountains, well above tree-line, so they are effectively beyond the range of most fires. The Lowland herd, however, ranges over much of the central peninsula, from the Kenai River flats to the foothills of the Kenai Mountains. These caribou could be affected by a loss of forest habitat, and they are probably the modern analogue of the original Kenai caribou.

As in most forested areas in the northern region, fire is a natural occurrence on the Kenai Peninsula. Although lichens recover very slowly following a fire, vegetation studies show that in the absence of fire, shade-tolerant mosses can replace light-loving lichens as the forest canopy closes over a period of decades. While fire destruction of lichens means immediate loss of winter caribou range, fire at long intervals appears to be necessary to maintain optimum lichen growth in the forests.

Although the caribou herds on the peninsula are much smaller than in Interior Alaska, it would take quite a large fire to remove enough forest to affect our Lowland caribou herd. In fact, a natural fire regime is probably the best guarantee that such a large fire will

not occur. Many small fires spread over many years will create a vegetation mosaic and prevent the spread of new fires, so that in any given year only a small percentage of the range is burned.

With an ever-increasing human presence on the Kenai, a natural “let burn” fire regime is not always possible over much of the Peninsula. Fire managers walk a tightrope because complete fire suppression can cause a large fuel build-up (over a time span of decades, as we see in the western United States) and subsequent large catastrophic fires. On the other hand, a “let burn” approach risks the possibility of escaped fire that threatens human life and property.

The best option is probably to allow natural fires to burn when not near human settlement, supplemented with prescribed burning in selected areas for fuel reduction and habitat improvement. With careful management and luck, we should be able to prevent large devastating fires that are bad for both humans and caribou, and still create a mosaic of forest vegetation of different ages that is beneficial for all forms of wildlife.

Brandon Miner has worked at the Kenai National Wildlife Refuge since 1998. He recently completed an master's degree at Alaska Pacific University, evaluating 50 years of moose habitat enhancement programs on the refuge. He is currently employed as a biological science technician with the refuge fire program. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

New additions, improvements make refuge more user friendly

by Bill Kent

Changes. Sorry, this will not be a discussion of the David Bowie song from his glitter rock days, so put your platform heel boots back in the closet. Instead, I was recently reflecting about the changes to facilities (for your enjoyment of the Kenai National Wildlife Refuge) I have seen since I transferred here in the spring of 1991. Some of these changes are quite apparent to you, our most frequent users; a few occurred at new locations and have not been noticeable yet. Some were initiated by the refuge staff, and not a few result from suggestions made by you, the users of the refuge.

Easily, most changes have been along the Skilak Loop Road because that is where a majority of our visitors choose to visit. Hidden Lake and Upper Skilak campgrounds were enlarged and the roads paved, campsites were clearly defined with gravel pads and have picnic tables and fire rings. Upper Skilak also has a “walk-in” area for those campers who prefer some separation from RV campers.

Both facilities have campground hosts during the summer who provide valuable information to campers and can assist with emergencies which might arise. A new fee program allows a large percentage of the fees charged at both sites to be returned to us; we use the funds to provide dumpsters and pay for toilet pumping. This was a significant change for the better, as previously these services came from our base operating budget.

Lower Skilak campground benefited when the entrance road was widened and resurfaced and the boat launch parking area was enlarged. Additional parking areas were established to reduce the parking congestion which resulted when the second sockeye salmon run provided excellent opportunities for harvesting these fish in the Kenai River below Skilak Lake.

Two new toilets were also constructed here. Construction at Jim’s Landing eliminated campsites on the banks of the Kenai River that were causing the banks to slough off. Steps to stabilize and protect the riverbank were employed. At this time, the riverbank is responding well and the re-established vegetation is

providing shelter for juvenile fish.

New traffic flow patterns were established and new toilets were also constructed. New and larger parking areas (with more new toilets) at the Visitor Contact Station across the Sterling Highway connect to Jim’s Landing with a new footpath.

Along the Skilak Loop Road, trail head parking areas were enlarged and resurfaced. A new RV dump station was constructed, and new toilets were placed at Lower Ohmer and Engineer Lake. Three new trails have been constructed:

- The Hideout Trail, which goes up the east facing hill at approximately the two-mile point when entering the Skilak Loop from the east, provides spectacular views of the Kenai River valley toward Cooper Landing;
- A yet to be named trail is nearing completion at Upper Skilak campground and will take you to a high point above Skilak Lake;
- Burney’s Trail begins in the Skyview Loop at Hidden Lake Campground and is an excellent trail for families.

New interpretive panels were installed, too, at various sites along the Skilak Loop Road. The panels relate a range of information on the refuge’s wildlife and fish, natural resource management activities, wildlife research, human history and the importance of the Kenai River. We hope to continue this educational effort at more sites in the Skilak Loop as funds become available.

The Outdoor Education Center located on Swan Lake Road was the beneficiary of a cooperative agreement with the Church of Latter Day Saints. Refuge staff removed an old, dark meeting cabin and a crew from the church replaced it with a larger, brighter structure. The education groups using the facility have made many positive comments about this change, as well as about a new toilet structure erected by the crew.

New toilets replaced old, dark structures at Dolly Varden, Rainbow Lake and Swanson River Landing, in the area of the refuge north of the Sterling Highway.

Hopefully some of you took the opportunity to use the new fishing platforms at Moose Range Meadows when water levels in the Kenai River were lower this past summer. The platforms were installed in an effort to provide fishing access after we were forced to close a public-use easement due to the impact of foot traffic along the riverbank in this area.

The project came about from the shared efforts of the Exxon Valdez Oil Spill Trustees Council, The Salamatof Native Association, Kenai River Sportfishing Association and Sen. Ted Stevens. Even if you choose not to fish here, the views of the Kenai River, interpretive panels along the walkways, and a chance to observe the wildlife using the river corridor are worth a visit.

Last, a new contractor at the Russian River Ferry

has come on board, and I receive numerous positive comments from visitors when I am there for inspections or other business. The contractor is Alaska Recreation Management, and its staff is dedicated to providing high quality visitor services.

I am sure I have left out other changes that have occurred, but from my vantage point as the person with the overall responsibility for the visitor services program on the refuge, I think these changes have been very positive for our visitors.

I hope you have had the chance to use these facilities and agree. I also encourage you to contact me or my staff if you have suggestions on what changes you think would benefit refuge visitors.

Bill Kent is the supervisory park ranger at Kenai National Wildlife Refuge. He and his family live in Sterling. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Nest adds new member to Kenai Peninsula bird list

by Todd Eskelin

This past summer a bird species was found breeding on the Kenai Peninsula for the first time.

I was a little surprised to hear that it was the first nesting record, because I often see these birds and assumed that they bred somewhere on the Peninsula. Forest Service biologist Bill Schuster documented a northern hawk owl nesting in the Kenai Mountains near the Chugach National Forest-Kenai National Wildlife Refuge boundary. Hawk owls have occasionally nested near Anchorage, but we have never observed any nests down here until last summer.

It was an exciting event for birders, and Bill escorted several hundred people to the nest for a glimpse of the birds. To keep impacts to a minimum, Bill guided visitors to the nest in small groups. Many bird watchers came from out of state to see the birds.

I did a little research and found that northern hawk owls are one of the least studied birds in North America. Very little is known about numbers of birds, trends in the population, or what if any threats exist to the species. Northern hawk owls inhabit boreal forests from Alaska to Newfoundland on our side of the planet and from Scandinavia to Siberia on the other side.

So, why is there so little known about these birds? Unlike many owls, they are diurnal (feed during the daytime) and they like to perch in the tops of trees while hunting. They are called “hawk owls” because they are the only “long-tailed” owls in North America. They look and behave like a hawk, but have an owl head.

Experts consider them different enough to be classified as the only member of their genus. Not only are they easy to see, but also they seem to be fairly tolerant to humans and allow for close viewing during the winter months. So, one would think that with their unique stature and highly visible habits, they would be one of the most studied owls, not the least.

Bird banding often is used to determine how long birds live, where and how they migrate, and many other details about their lives. Last winter, I decided to start banding hawk owls, when I could find them in areas where they could be safely captured. This has proved to be more difficult than I expected; to date, I have managed to band only one hawk owl on the

Peninsula.

I expected to band more birds this winter, but so far I haven't found any. I found several birds last winter around Bridge Access Road and along Kalifornsky Beach Road but there was too much traffic, and it would have been unsafe to try to catch them. I did catch one bird on Funny River Road, and it stayed in the same area for several weeks. It disappeared in the spring, presumably to nest somewhere else.

Interestingly, last winter produced many more sightings of this owl in our area than I ever remembered in the past.

Recently, I learned that our area was not the only place that had an increase in hawk owl sightings last winter. Rob MacDonald at the Togiak National Wildlife Refuge in Dillingham told me they were frequently seeing hawk owls, whereas normally they see only one or two per winter.

Rob also told me an amazing story about a banded hawk owl that was hit by a car in Dillingham. In February of 2000, Hardy Pletz banded a hawk owl near Edmonton, Alberta. Little did he know that the bird would be hit by a car only eight months later in Dillingham. He probably never imagined that the bird he banded would establish the world record for the longest recorded movement of a hawk owl.

The bird had traveled a distance of 1,980 miles in eight months. The previous record in North America was bird banded in New York and found dead 160 miles away in Quebec, Canada.

Worldwide, the record was 1,116 miles for a European banding record. This is quite a distance for what is believed to be a non-migratory species.

When possible, it is always good to check if a bird is banded. You never know when a road kill or a bird that the cat drags home may provide valuable information about a species. I will continue my banding efforts on hawk owls and would appreciate any sightings of these birds that Clarion readers might offer. Hawk owls observations in the summer months would be especially useful, as they might lead us to new nest discoveries. Winter sightings are helpful because winter is the best time to catch the birds for banding.

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://kenai.fws.gov>.

Severe early winter may have forced muskrats to seek better life

by Ted Bailey

It was on one of the few above-freezing days we had in back in mid-November that I came across an unexpected track of an animal.

Etched in the bottom of a furrow in the snow were the drag marks of a tail between closely spaced footprints. It was the distinctive trail of a muskrat on the move miles from any open water. I followed the trail and could see where the muskrat struggled through the deep snow, first through a black spruce thicket, then an open bog, through a small birch-spruce forest and toward a nearby lake.

As I approached the shoreline of the frozen lake I suddenly lost the muskrat's trail—it just disappeared. Backtracking, I discovered that I had missed seeing a small hole under a clump of snow where the muskrat burrowed underneath the snow and ice, presumably into the safety of the water below.

The weather then turned bitterly cold again with daily temperatures well below zero. Several weeks later, in December, after a warm day near 30 degrees, I discovered another trail of a smaller muskrat coming from the same direction. The temperature the previous night had already dropped to minus 10, and the snow was eight to 10 inches deeper than before.

However, this muskrat unknowingly turned away from instead of toward the distant lake. Its trail was more torturous as it zig-zagged from the base of one tree to another, where there was less snow. It then struggled through deep snow in a large open bog and continued wandering aimlessly parallel to the unseen, distant frozen lake shoreline.

I finally abandoned the meandering trail in the bitter cold. An inspection of the lakeshore nearby did not reveal a trail of an approaching muskrat. This second muskrat had presumably perished in the bitter subzero night.

Both muskrats appeared to have come from the same smaller lake. One wandering muskrat hopefully survived the ordeal by reaching safety under the ice of the larger lake; the other probably froze to death in the woods nearby. Although I had witnessed this mid-winter wandering of muskrats during warm spells in

severe winters before, I decided to consult the findings of an expert on this matter.

Paul L. Errington was perhaps the world's greatest authority on muskrats. He started as a professional trapper in South Dakota, but soon turned his love of the outdoors to studying muskrat ecology and population dynamics.

He spent 30 years as a professor at Iowa State University, most of them studying muskrats and mink in Iowa marshes, lakes, rivers and creeks. He died 40 years ago, in 1962, the same year I began my studies in zoology and wildlife science.

He wrote several classic books about muskrats, marshes and predation. I have most of them because I admired his research more than that of any other wildlife biologist at the time. I particularly liked his unpretentious style of writing, and I consulted two of his books—*Muskrats and Marsh Management* and *Muskrat Populations*—regarding the wandering and deaths of muskrats in the winter.

Errington wrote: "They freeze to death. The tips of the tails of muskrats freeze first when long exposed to cold. If that is the worst that happens, the animals gnaw away the frozen and festering tips and go through the rest of their lives with bobbed tails. In the more advanced cases of freezing, eyes and feet freeze, or the victims may be so beaten by cold that they just huddle and die. Where winters have been long, cold, and short of snow, the descent of frost lines to depths of several feet can bring death to the majority of muskrats of tremendous areas."

Instead of freezing in place, some muskrats gnaw and dig their way out through the frozen ground or ice and take their chances on finding a better place to live elsewhere. However, only a few muskrats survive such perilous excursions. Most perish. The bitter cold of this winter's past November and December may thus have doomed unknown numbers of the peninsula's muskrats.

Ted Bailey is a recently retired Kenai National Wildlife Refuge wildlife biologist who has worked on the Kenai Peninsula for more than 25 years. He maintains a

keen interest in the peninsula's wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

However it's defined, subsistence is still just a way of life

by Jim Hall

It is my culture, my way of life: living from the land, picking berries, canning and drying fish, eating wild game.

I remember my father teaching me these lessons as a young child back in the 1960s. I remember him telling me, "The land will give you what you need, if you will respect it. Only take what you need for food, and never waste anything."

We did not call it "subsistence" then, nor "personal use." It just was the way we lived. Our freezer was full of wild game; fish was dried, canned or frozen. Berries were frozen or made into jams and jellies, and by first frost each year we were ready for winter.

In Alaska, as time has passed, laws have been enacted and new words have entered the vocabulary. Words like "subsistence," "personal use," "Tier 2," "escapement" and "limited entry." What do these words mean to most Alaskans? These words control the way things are done and who controls them.

Is subsistence an issue here on the Kenai Peninsula? At first, one might hurry to say no, for the majority of the peninsula is not rural. However, some areas on the Kenai would be considered rural most anywhere, such as areas further than 30 miles from an established community, areas accessible only by boat, floatplane or foot.

These are questions that I trust will be answered in the coming years, and I trust they will be answered in an honorable and fair manner.

These areas, these rules and these words are issues too big for one person to deal with, for in giving something to someone you must take it from someone or something else. I do not envy the folks on the Federal Subsistence Board. Those folks have a very difficult job to do, and they do it trying to comply with the law, and knowing that each of their actions will affect someone.

As for me? I'll continue my way of life, like most Alaskans, within the confines of existing laws. I'll fish where it's legal, apply for permit hunts and try to get a moose when the season is open. This year I have moose, caribou, salmon, halibut, clams, trout and spruce grouse all preserved, and my family is ready for the winter.

It has been a good year for us, and I know there will be enough. We even had some to share with our neighbors. Life is good.

I'm not sure where the subsistence issue on the peninsula will go. One of the things that surprises me is the durability of the salmon fishery here. It begins when those salmon returning to Cook Inlet first meet the commercial fishers who are trying to make a living. Then the fish have to get by the personal-use fishers with dipnets. After that, it's the local recreational fishers, and the tourist fishers drawn to Alaska by the dream of catching an Alaska salmon.

Most of these folks will personally eat some, if not all of their catch. On top of all of these pressures, the salmon also have to escape seals, bears and a host of other critters that depend primarily on these fish for their survival. If the salmon can survive all of that, they get to spawn, to provide for the next generation.

Wow! That's pretty amazing if you think about it. Through continued protection of the habitat, and ensuring adequate escapement, we hope to always have this incredible resource to enjoy.

I'm not from Alaska. I grew up in the mountains of north Georgia, and I have seen days when if I didn't catch something, my family did not eat that day. Those were lean times.

Is it subsistence I have been practicing all of these years? To me, it does not matter what you call it, for I call it "living." Subsistence here in Alaska is a very complicated issue involving many diverse groups and individuals. Many people have been working very hard for many years to sort out the issues. It is complex, and there are no easy answers.

For those folks trying to find a solution, they have my support, sympathies and prayers. My family and I moved to the peninsula about a year and a half ago from Mississippi, and although some things can get complicated here, I feel that I should have been here all along.

Jim Hall is the deputy refuge manager of the Kenai National Wildlife Refuge. Jim and his wife, Elaine, and daughters, Danya and Kit, live in Clam Gulch and enjoy harvesting the local bounty. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Tiny omnivorous mammal maintains low profile on refuge

by Stephanie Rickabaugh

At birth I weigh about one ounce, have yellowish hair and my eyes are shut. At maturity I weigh three pounds or more. I am an omnivore, eating both plants and animals, and I spend most of my time in old-growth forest. In fact, research on the Kenai National Wildlife Refuge has shown that I primarily feed on voles, berries, birds, eggs, and insects, although I like voles best.

As an adult, I am larger than a weasel and my coat is yellow to dark brown in color. I am a solitary species and will actively defend my territory from other individuals except during mating season in July and August, when males and females cross territorial boundaries.

After mating, our females delay implantation of fertilized eggs for six months because they don't want the babies born until the following April. (An implanted egg takes only 27 days to grow a deliverable pup.) Average litter size is three pups. Our home range size varies according to food availability, but can be from one to 15 square miles. Good snow depth for insulation is very important to my survival during the winter months. Some of my calls have been described as "chirping" sounds.

As you may have guessed, the creature in question is a marten, or *Martes americana*, a fur-bearing relative of the mink and wolverine. Marten have slender torsos, long legs, bushy tails and well-developed markings on their fur. Marten populations are scattered throughout the boreal and forested mountain areas across North America.

In Alaska, marten range from Southeast to the northern and western forested areas of the Interior. Marten are one of the most habitat-specialized of the North American carnivores, generally being found only in old-growth forests.

Due to minimal fat reserves, marten do not hibernate during the winter and must actively search for food all year long. People used to believe that marten traveled from tree to tree and ate primarily squirrels, but radio-collar studies have shown that martens cover large home ranges, moving mostly on the ground or snow surface. Their large furry paws and small body mass allow for easy travel over (and beneath) deep

snow. Furthermore, refuge studies of scat samples have shown voles to be their number one dietary favorite.

I have heard stories of people lying in their tents and hearing a marten chirping. They describe the chirping sound as similar to that of "velociraptors" in the movie "Jurassic Park." Once folks have the nerve to crawl out of the tent to investigate the chirping, they generally find a marten rather than a dreaded velociraptor. I, on the other hand, have spent weeks in the woods in Alaska and have never seen a marten.

Historical marten abundance and distribution on the peninsula are not well documented. Fur records and daily logs from the Alaska Commercial Company during the 19th century report some marten pelts being purchased on the Kenai Peninsula but don't say where the animals were collected. Historical reports from hunters and trappers generally indicate that few marten were taken on the western Kenai in the 1930s and 1940s.

The Alaska Department of Fish and Game began sealing marten pelts with the 1988-89 season, so the peninsulawide harvest was not accurately tracked prior to that time.

There appear to be many more marten on the Prince William Sound side of the peninsula, in the old growth forest along the coast.

For example, 484 marten were taken in the Portage-Seward area (Game Management Unit 7) in the most recent five-year period (1996-2001), whereas only 14 marten were taken on the Kenai refuge in the 37-year period of 1960-1997.

How do we explain this extreme difference?

The most likely explanation is that our western Kenai forests are basically too young for marten. Frequent wildfires have recycled the forests on the western side of the peninsula, and classic old-growth forest has not had time to develop on a wide scale. There are old-growth forest stands on the south side of Kachemak Bay, but most of the western peninsula has younger forests that have burned within the last 400 years or so.

These "young" forests lack the abundant large fallen woody debris that marten like for winter shelter.

Maybe with all the beetle-killed trees coming down nowadays, the prospects for marten habitat could be improving dramatically.

Stephanie Rickabaugh has worked as a wildlife technician at the Kenai National Wildlife Refuge since 1996.

Prior to moving to Alaska, she worked with the U.S. Forest Service tracking pine marten in Northern California. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Unattended property poses problems for refuge managers, users

by Rick Johnston

In my 20-plus years at the Kenai National Wildlife Refuge, one of the questions I have heard the most is, “How long can I leave my personal property out on the refuge?” Other variations are, “Can I leave my boat at XYZ lake until next spring?” Or, “Can I leave a tent up to reserve a campsite between vacation weekends in July?”

In most instances visitors are wanting to leave relatively inexpensive equipment that they hope to use on a subsequent trip. They want to avoid the time and cost of transporting the equipment to and from a favorite refuge location. The possibility of theft is often outweighed by the potential benefits and the perceived unlikelihood of theft or vandalism at a remote site.

In other instances, transporting gear out of a remote location seems at the time to be less costly than “donating” it to the refuge or to future potential users. Tarps, cheap tents, leaky boats, old snowmobiles, furniture, food caches, pots, pans, tree stands, fuel cans—full or empty—all fit into this category.

With few exceptions, my advice is to take on to the refuge only what you expect to take with you when you leave. This simple concept is supported by both general and specific regulations for national wildlife refuges, whose basic thrust is, “Take it out with you.” Even a well-intended donation of unused food left behind at a refuge cabin can unintentionally attract a spring bear that leaves the cabin in shambles.

Much of the personal property found on the refuge takes the form of unauthorized structures and camps, especially moose hunting camps, and the equipment and “furniture” associated with use of these unauthorized structures.

Just when I thought I had seen it all, I was flying back to Kenai one evening and observed four hunters sitting on chairs and playing cards at a card table situated on a large tree platform about 15 feet up in the air. By the time I was able to hike to the stand the next day, the card players were long gone, having left the high tree house, tables, chairs, playing cards, camo-net and miscellaneous personal property. I was never able to identify the card players, and none of the considerable

property was ever claimed.

Most of my discoveries are less noteworthy than this card game site, but each year we discover numerous abandoned tents, tent frames, lumber caches and tree stands. While commercially available friction-attached tree stands are legal for hunting, tree stands that are nailed into trees are not legal on refuge lands.

Hunters usually abandon nailed-down stands after their use, in part, because such stands can be difficult and dangerous to remove. Abandoned and aging tree stands often provide unsafe perches for unsuspecting opportunists, and can easily generate a broken leg or back.

Certain special circumstances for Alaska were recognized when Alaska-specific regulations were published. For example, Alaska refuges, except Kenai, generally allow certain personal property to be left for up to 12 months unattended, provided the property is not “abandoned” and that it does not interfere with the safe and orderly management of the refuge.

On the Kenai refuge, this privilege is only good for three days, and we ask that property owners leave a contact name or indication of ownership, so that any found property is not perceived to be stolen or abandoned.

In limited circumstances, refuge permits can be obtained for leaving property unattended for longer periods than three days. Examples of this would be a trapper who is permitted to leave a trap set for up to seven days. Or a visiting scientist who is specifically authorized to leave unattended boats, equipment and perhaps a shelter at a remote site between research visits.

Common examples of unattended property that would not be authorized are leaving an unattended tent and associated equipment at a popular riverside campsite from weekend to weekend, or leaving a boat or camper in a campground for storage and then visiting only on weekends.

One of my most puzzling abandoned property incidents was the discarding of a new Alumacraft square-stern canoe. In this episode, two adult women were

traveling through the Swanson River canoe route in two separate canoes with several small children. The women reportedly decided to abandon the heavier square-stern canoe and self-rescue by all piling into the lighter canoe.

Two weeks later, we located and retrieved the canoe, which had been abandoned along the remote stream. After numerous unsuccessful attempts to return the craft to its ill-fated owners, we put the canoe in storage, and after several years added it to the refuge fleet.

I'll always wonder why the canoeists didn't contact us regarding their problematic trip and seek assistance in recovering the canoe. Refuge officers find several boats and canoes annually left unattended at remote lakes. We post a dated note on abandoned boats and other property and request the owner to contact us. In some instances such as an emergency

or other circumstance, there is an explanation for the abandoned property, and simply removing the boat or equipment is the end of the matter. In other cases, we issue a notice of violation and a removal order if the owner can be determined.

I can understand that there are lots of practical reasons why a person might want to cache personal equipment on the refuge, especially in remote areas. Fifty years ago we had a lot fewer people using the refuge, and they only had horses and strong backs to tote in their gear. We are very privileged to have a 2 million-acre refuge in our back yard, but that great expanse could shrink up pretty fast if it is cluttered with too many "donations."

Rick Johnston has been a ranger/pilot for the Kenai National Wildlife Refuge since 1979. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Forest regeneration efforts benefit moose on wildlife refuge

by Brandon Miner

Moose habitat management has a long and colorful history on the Kenai National Wildlife Refuge.

It all started with a huge 310,000-acre wildfire in 1947 that came to be known as the '47 burn. It got an important boost in 1969 from an 86,000-acre fire north of Kenai, called the '69 burn.

In the 1950s, managers of the moose range (as the refuge was called prior to 1980) observed that black spruce seedlings were growing prolifically in the '47 burn. Black spruce has little food value for moose, and so the moose range launched a war on black spruce.

From the 1950s through the 1980s, thousands of acres of young forest were mechanically manipulated by methods ranging from hand-pulling of seedlings to behemoth 40-ton tree crushers. Many old timers around here are veterans of these campaigns.

The tree crushers were deployed in the 1970s in the '47 and '69 burns to stimulate stump sprouting and root suckering of hardwood browse, such as aspen, birch and willow, and to break off spruce trees. The tree crushers were about the size of a road grader and had three large steel wheels that broke pole-sized trees into 3-foot lengths, mostly without disturbing the underlying soil.

Tree crushing was effective, but it cost a lot of money, both for operator time and for expensive repairs of the machines. The crushers were sold in 1988, having accomplished about 20,000 acres of treatment.

Between 1970 and 1980, the goal of tree crushing on the moose range was to convert young black spruce stands to early succession hardwood stands. This was optimistically called "type conversion."

Generally, hardwood species are faster growing and more sun-loving than spruce and are able to aggressively colonize an area after a disturbance (such as fire or crushing). Over a period of decades, however, spruce usually catches up and shades out most of the hardwoods.

By the mid-1980s, it became apparent that crushing alone was failing to accomplish type conversion from spruce to hardwoods. Crushing reduced black spruce density, but did not expose mineral soil for

good hardwood germination. Some-thing else was needed. So, in 1986, the refuge undertook prescribed burning, with the hope that fire could achieve the hardwood browse production that mechanical treatment failed to deliver.

In 1998-99 I conducted a forest regeneration study on the refuge for my master's degree thesis project. My goal was to evaluate the results of the black spruce campaigns of the last half-century. Had all this effort accomplished anything? What methods worked best?

I studied 11 sites that had been burned, crushed or crushed-and-burned from 11 to 52 years in the past. I found that hardwood browse regeneration was best at sites (in the Skilak Loop and Lily Lake areas) that had been crushed and burned with prescribed fire in the 1980s. Before crushing, these areas were primarily young black spruce in the '47 burn; in 1999 these areas contained an average of 7,700 stems per acre of browse species, which is a lot of moose food.

Browse density was also relatively high in the 1969 burn at 5,700 stems per acre, although much of the birch and aspen has now grown beyond the reach of moose. The areas that we surveyed within the older (untreated) 1947 burn averaged only 800 browse stems per acre. Browse densities at sites that were simply crushed with no subsequent burning contained an average of only 2,400 stems per acre.

Overall, I concluded that the crushing-and-burning combination was much better than either crushing or burning alone.

Mechanical pre-treatment of a forest creates a continuous fuel bed (a layer of down, dead woody fuel), which allows a surface fire to burn at high intensity and consume the ground fuels (moss and duff). This exposes more mineral soil much more effectively than a fire carried in the canopy of standing live trees. We like to see good mineral soil exposure from a fire because seeds germinate best on mineral soil.

On the other hand, light to moderate severity burns in areas where hardwoods are scarce can stimulate grass invasion and prevent reforestation for decades. But if aspen and willow are abundant before

burning, a light to moderate severity burn can stimulate good stump sprouting and root suckering.

One very practical advantage to mechanically pre-treating a stand is that we can burn under damper conditions than are required for standing live forest. It is easier to get a good fire going in dead wood on the ground than in upright green timber. This means that we need fewer firefighters on hand, and there is less chance of the fire escaping control.

Sometimes people ask, "Why worry about burning the forest? Why not just leave things the way they are?" Fires are a natural part of the ecosystem on the Kenai Peninsula. They have occurred regularly ever since deglaciation 13,000 years ago, as we have seen in our lake sediment charcoal studies.

With increasing human population on the peninsula, however, we have to suppress many wildfires to protect life and property. Prescribed burning gives us a chance to achieve the same results of natural fires, but on a smaller scale and under more controlled conditions.

In addition to providing moose browse, fire in the forest recycles important mineral nutrients, increases soil temperatures, and prepares a seed bed for new seedlings. On a scale of decades to centuries, fire cre-

ates a vegetation mosaic or patchwork of uneven aged stands that is beneficial to many types of birds and animals.

Snowshoe hares, for example, benefit from abundant browse, as do all the animals that prey on hares, such as lynx, wolves and birds of prey. Indeed, fire provides the base of the food chain in our forests.

Although prescribed burning has recently received somewhat of a "black eye" because of several well-publicized mishaps on public lands, it still is one of our best habitat management tools. Since the 1980s we have successfully used prescribed burning on the refuge to enhance wildlife habitat and provide good fire breaks, and we have gotten our best results when we were able to mechanically pre-treat the fuels before burning.

Brandon Miner has worked at the Kenai National Wildlife Refuge since 1998. He completed his master's degree from Alaska Pacific University in 2000, summarizing 50 years of vegetation manipulations on the refuge. He is currently employed as a biological science technician with the refuge fire program. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Mountain lion ‘sightings’ on refuge still unsubstantiated

by Ted Bailey

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 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 longtime 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 longtime 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.

What are these people seeing?

These are several of the best reports to which I personally listened during my years as supervisory biologist at the 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 re-

search 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.

Ted Bailey is a retired refuge wildlife biologist who has worked on the Kenai Peninsula for more than 25 years. He maintains a keen interest in the peninsula's wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Modern technology helps chase refuge rainbows, Dolly Varden

by Doug Palmer

The Kenai River supports one of the most popular sport fisheries for rainbow trout and Dolly Varden in Alaska. Both species are caught throughout the Kenai River, although the majority of fishing effort is above and below Skilak Lake on the Kenai National Wildlife Refuge.

Thousands of anglers flock to the river each year to chase rainbows and Dollies, using an assortment of artificial lures resembling salmon eggs and aquatic insects. Since 1995, the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game have also been chasing these fish. Instead of traditional fishing equipment, however, we have taken a couple steps up the technology ladder and are using radio telemetry transmitters and receivers to track these species within the Kenai River watershed.

Over the last several years, we have surgically implanted radio transmitters into 280 rainbow trout and 400 Dolly Varden. These radio transmitters weigh only 10 grams and are digitally encoded to identify individual fish.

The surgical implanting takes five to six minutes. We use a light concentration of clove oil as an anesthesia to calm the fish, and irrigate the gills with water from a turkey baster during surgery. We then place the fish in a recovery tank before releasing it back into the river.

The battery life and programming of the transmitters have improved substantially since we began the study. Our first transmitters sent out a signal 24 hours a day and had a battery life of about one year.

Recent innovations in transmitter technology now allow various duty cycles to be programmed into each transmitter. Transmitters used since 1998 have been programmed with an eight-hour per day duty cycle that extends battery life to nearly three years.

We track the movements of radio-tagged fish using a combination of aerial and ground-based surveys. Ground-based tracking is conducted from boats and on foot. Aerial tracking is used primarily to track fish during the winter months and to find fish wandering into more remote areas of the watershed.

We use a global positioning satellite receiver to record latitude and longitude for each fish located during the tracking surveys, and then download these coordinates to a computer for plotting fish movements on a map.

Our telemetry research has led to several interesting discoveries. Movement patterns of rainbows tend to be more predictable than Dollies because most rainbows display a high level of fidelity to spawning, feeding and overwintering areas. Dollies also display a high level of fidelity to spawning areas, but tend to be more nomadic and range longer distances to meet their feeding and overwintering needs.

Most rainbows spend the winter in Skilak Lake or Kenai Lake, with smaller numbers of fish overwintering in the river. Rainbows move from winter sites to spawning areas during late April and early May. Most rainbows spawn during late May and early June in the mainstem Kenai River or tributary streams such as the Russian River.

After spawning, rainbows travel to feeding areas in the mainstem Kenai River. Some rainbows will use the same feeding area all summer, while others may select two or more areas.

Although feeding strategies may vary among rainbow trout, feeding behaviors of individual fish are generally predictable. For example, if a rainbow with transmitter No. 116 were found at river mile 71 in mid-August last year, it's a pretty good bet that this same fish will be in close proximity to river mile 71 during mid-August this summer.

Both rainbows and Dollies rely heavily on spawning salmon for food sources, and their movement patterns during summer are highly correlated with the timing and location of spawning salmon.

Rainbows typically move from summer feeding areas to overwintering locations during October and November. As with feeding locations, rainbow selection of overwintering areas is generally predictable, with a given fish returning to the same location year after year.

If we say that rainbows are conservative creatures

of habit, then Dolly Varden would have to be called the roaming gadflies.

Our telemetry research on Dolly Varden has focused on spawning populations in Quartz Creek, Cooper Creek, Snow River and the upper Kenai River. Dollies typically spawn during September and October in a creek or river, and then for overwintering they move to a lake such as Skilak, Kenai, Upper Trail, Tern or Tustumena.

One Dolly that we radio-tagged in the Kenai River above Skilak Lake during August 1996 traveled to Tustumena Lake to spend the winter, and then returned to the Kenai River the following summer. All the rest of our radio-tagged fish have stayed put within the Kenai River watershed.

Feeding areas used by Dollies include all reaches of the Kenai River and some tributary streams. Several of the radio-tagged Dollies from Cooper and Quartz creeks and the upper Kenai River routinely follow the early run of chinook salmon up the Killey River each year to take advantage of this food source. Snow River

Dollies, however, never enter the Killey River, but select feeding areas in the Kenai River near spawning sockeyes.

We are presently monitoring rainbows in the upper Kenai River, using 200 transmitters purchased for the study by the Kenai River Sportfishing Association. These fish have been cruising the blue-green waters of the Kenai River for several months now, allowing us to track their every move.

The end result will be a better understanding of the migratory behavior and important habitats used by the upper Kenai River rainbows.

The trout packing the transmitters are unaware that we are watching them, but they are helping us develop better management strategies for one of the most popular rainbow trout fisheries in Alaska.

Doug Palmer has been a fishery biologist at the Kenai Fishery Resource Office since 1990. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

2001 Mystery Hills wildfire offers firefighters snapshot of 1947

by Doug Newbould

The big, lumbering thunderheads marched single-file northeast along the western foothills of the Kenai Mountains.

These were no ordinary peninsula storm cells—these were the “real deal,” with the characteristic anvil shape, dark bottoms and snow-white tops at 30,000 feet. Storms like these always inspire a sense of awe in me, as I have witnessed their power so many times in the western half of the United States.

No, these weren't the monsters of eastern Colorado with 50,000-foot tops, softball-sized hail, spin-off tornados and microbursts that flatten mature forests. These were a kinder, gentler variety. Here on the Kenai, thunderstorms tend to be wet. On those few occasions when lightning connects with the ground here, resulting fires tend to get “rained out.”

On this day however, there were only a few showers—these were essentially dry thunderstorms—a rarity on the peninsula.

It was Thursday, June 28, 2001, about 6 o'clock in the evening. I was driving along Kalifornsky Beach Road when I heard the radio traffic on a State Forestry frequency. One of Forestry's engine patrols, while driving east on the Sterling Highway, spotted lightning strikes in the Mystery Hills—a few miles north of the highway.

A few moments later, a smoke column appeared in the same area. From the firefighter's description of the smoke column and its location, I knew the fire was on the Kenai National Wildlife Refuge. So I pointed my truck at the Division of Forestry office, just as my cell phone began to ring.

Little did I realize at the time that the next 10 days of my life would be consumed, as the Refuge and State Forestry joined forces to manage a wildfire in the Mystery Hills.

The phone call (as expected) was from Forestry, to notify me (the land manager) there was a fire on the refuge and to find out how the refuge wanted to manage the fire. I said I would be there in five minutes.

In the meantime, we agreed that Forestry should go ahead and launch its helicopter to fly over the

fire and do a size-up: get a precise location; describe the fire size, the rate of spread and fire behavior; and describe the surrounding fire environment (local weather, fuels, terrain features and values at risk). This information would be critical to our decision-making process.

Even as I drove to Soldotna Forestry, and as the helitack ship was on its way to gather fire information, I was already thinking about some of the known factors that would influence our decisions. I knew the fire was in a limited suppression response zone, which does not mandate initial attack (as would a fire in a full or critical response zone), but essentially allows the fire/land manager to use an appropriate fire management response from a full range of options: from a monitoring (no suppression) response to a full or total suppression response, or something in between. The keys to this decision process would be gathering good information, making sound management decisions, and documenting the reasons for those decisions.

Another known factor was the drought conditions we were experiencing on the Kenai Peninsula. We use the Canadian Forest Fire Danger Rating System (CFFDRS) here in Alaska to monitor fire weather and fuel conditions.

All of the CFFDRS indices, including the Drought Code, the Fire Weather Index and the Build-up Index, were at extreme fire danger levels at all of the local weather stations on June 28.

One of the lessons we fire managers learned from the fires at Yellowstone (1988) and Los Alamos, (2000), is that wildfires quickly become uncontrollable during drought conditions. I was on one of those Yellowstone fires in '88 and many other large project fires in my career, and I know how difficult wildfires are to control when forest fuels are impacted by drought.

A third factor to consider in deciding how best to manage the Mystery Hills Fire was the availability of fire suppression resources.

The Kenai Lake Fire on the Chugach National Forest near Crown Point had already drawn a number of Alaska firefighting resources, including two Kenai

refuge fire engines, several Hotshot crews and aircraft, and a Type-1 incident management team from the Lower 48.

Many other Alaska crews and aircraft were committed to the large fires in the Alaska Interior. So even if the decision were made to attack or suppress the Mystery Hills Fire, there was no guarantee that adequate firefighting resources would be available.

A fourth factor was the approach of the Fourth of July holiday and the thousands of refuge visitors who would likely be traveling the Sterling Highway, recreating in the Skilak Lake area and canoeing on refuge trails.

The prospect of evacuating a neighborhood or a campground is daunting enough, but evacuating back-country recreationists is even more problematic because you don't really know where people are located.

By the time I drove through the Soldotna construction and tourist traffic gauntlet and pulled into the parking lot at state Forestry, the helicopter crew was already circling over the fire and radioing size-up information to Forestry dispatch.

As it turned out, there were two fires burning in the Mystery Hills. The first fire (Mystery Hills) was about 2 miles north of the Sterling Highway and 1.5 miles east of the Mystery Creek Road.

Strong downdrafts from the thunderstorms were pushing the fire downslope to the south and west, through dense stands of black spruce.

The second fire (Thurman Creek) was several miles away to the northeast, near the confluence of Thurman Creek and the Chickaloon River in the Mystery Hills Wilderness.

It was burning hotly upslope (to the east) in mixed forest fuels. Initially, the Thurman Creek Fire was the more active of the two, but its more remote location and direction of spread made it less of a threat to public safety.

Next week: Battling the blaze

Doug Newbould is the fire management officer at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Part II: Fighting the blaze in the Kenai National Wildlife Refuge's Mystery Hills

by Doug Newbould

Editor's note: This is the second part of the Refuge Notebook article that appeared in the Outdoors section last Friday.

In last week's column, I wrote about the events of June 28, 2001, when two lightning strikes ignited separate wildfires on the western slope of the Kenai Mountains, in the area of the Kenai National Wildlife Refuge known as the Mystery Hills.

As I pick up the story again, the time was about 6:15 p.m., I had just arrived at the Kenai-Kodiak Area Office of the Alaska Division of Forestry in Soldotna, and the initial size-up reports from the helicopter reconnaissance mission were just coming in over the radio.

As I walked into the fire management office I could feel the excitement as firefighters moved briskly about, gathering equipment and making final preparations as they waited for the order to respond to the wildfires on the refuge. But before orders could be given, I needed to meet with Ric Plate, the fire management officer for the Division of Forestry.

For the next 10 or 15 minutes, we assembled all of the available information about the two fires and their respective environments. We assessed the life safety hazards and the values at risk. We considered the fire weather, the fuel types in and adjacent to the fires, and the fire behavior. We discussed the availability of local wildland firefighting resources, considering the close proximity of the Kenai Lake Fire on the Chugach National Forest, about 30 miles east of our fires.

Finally, after consulting with our superiors, we made the decision to initially attack the Mystery Hills Fire with helicopters and retardant ships during this first burning period. Concurrently, we decided not to suppress the Thurman Creek Fire, but to monitor its progress from the air and reassess the situation in the morning.

Some of the factors we considered in making our decision to suppress the Mystery Hills Fire included: the fire's proximity to powerlines, to the Sterling Highway, to the Skilak Lake recreation area and to an unknown number of recreationists in the vicinity; the

large tracts of continuous black spruce forests to the south and west of the fire; and considering the extreme fire danger resulting from the drought conditions in the region, the potential for the fire to get very large in a short period of time if no suppression actions were taken.

Once the decision was made to suppress the fire, additional air attack resources were immediately ordered, including a second helicopter with a water bucket and a state air tanker. We also agreed that no ground forces would be sent into the fire until we could provide adequate escape routes and safety zones. That evening we would have to settle for an air attack, and the next day we would reassess the situation and develop a new plan of attack.

Friday morning, because of our decision to suppress the Mystery Hills Fire and because of the fire's potential to exceed the capabilities of our local resources, Ric and I completed what's known in fire circles as a "woofsah," or WFSA, an acronym for Wildland Fire Situation Analysis.

A WFSA is a standardized tool used by fire managers nationwide to document critical information about a wildfire incident and to help fire managers develop a management plan for the incident. A WFSA is a "living document" that is adjusted as new information is collected or to meet any new challenges as the incident changes. In hindsight, this was an important exercise for me and Ric, since it was our first "project fire" working together as fire management officers.

While Ric and I completed the WFSA, the aerial fire-suppression efforts continued on the Mystery Hills Fire. The Thurman Creek Fire continued to be monitored from the air; but its position, the surrounding fuels and its behavior were such that no suppression efforts were deemed necessary at the time. An Extended Attack Incident Commander (ICT3) from state Forestry in Palmer supervised the suppression efforts that day. By the end of the day, Mystery Hills had grown to about 600 acres and Thurman Creek covered about 10 acres. Because Mystery Hills continued to grow, and the weather forecasts gave us little hope for

a change, we decided to order a Type 2 Incident Management Team to help us manage the Mystery Hills fires.

Fortunately for us, the Division of Forestry had already ordered a Type 2 team to be pre-positioned or staged in Anchorage. This saved us at least a couple of days in getting the incident management team to the Kenai Peninsula. As it turned out, this was the second of three fortuitous circumstances that allowed us to bring the Mystery Hills Fire under control. The first was the aerial retardant lines that were laid down on Thursday and Friday—in front of the advancing fire fronts on the south and west flanks. Ultimately, these lines were what kept the fire from reaching the Sterling Highway and Mystery Creek Road.

Forestry fire managers deserve a lot of credit for pre-positioning a retardant ship in Homer these last two years and developing a retardant-loading site at the Kenai Airport.

The third fortunate circumstance was the favorable weather change that occurred on July 4. By the time the incident management team from Oregon/California (also known as the ORCA team) was set up and fully functional at the Sterling Elementary ICP (incident command post), the cooler/wetter weather that is typical of mid- to late July finally arrived.

This allowed us to change our fire-suppression tactics from a defensive indirect attack to an offensive direct attack. In other words, we were able to safely send firefighters into the fire to construct handlines and direct attack the fire's edge. By Saturday, Hotshot crews from Alaska and the Northwest had the fire contained and well under control.

Having flown over the fire a couple of times, after walking completely around its perimeter, and after studying the satellite imagery provided by the borough's Spruce Bark Beetle Office, I noticed a very interesting pattern—one that I think deserves our attention in the years ahead. The Mystery Hills Fire burned

the same fuels and followed the same pattern as the 1947 Fire, which burned more than 300,000 acres.

The Mystery Hills Fire burned most actively in the black spruce woodlands that regenerated after the '47 Fire. This fuel type dominates the drier upland ridges in the Mystery Hills and throughout the western foothills of the Kenai Mountains.

When the fire burned into the decadent remnant stands or stringers of beetle-killed white spruce, it tended to go out on its own. These white spruce stands exist in the wetter sites found in the valley bottoms and at higher elevations (about 1,200 feet). In fact, at several locations within the fire perimeter, the fire clearly jumped across these wet stringers of white spruce even with all that large dead woody material lying around, and burned the adjacent dry ridges of 50-year-old black spruce.

There are at least two inferences we can derive from this information: that the black spruce woodlands regenerated by the 1947 Fire are once again capable of sustaining wildland fire, and that wetlands—even those dominated by old or beetle-killed white spruce, can withstand the effects of an intense wild-fire in some situations.

I thought it would be useful to tell you my story about last year's Mystery Hills fires now, because another wildfire season is almost upon us. Have you taken the steps necessary to be FireWise and protect your family and home from the devastating effects of a wildfire?

For more information about the FireWise Community Action Program and how to be prepared, contact me at the refuge, 262-7021, or call the Division of Forestry at 262-4124.

Doug Newbould is the fire management officer at the Kenai National Wildlife Refuge. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Genetic research reveals unique characteristics of Kenai lynx population

by Ted Bailey

Senior author Michael K. Schwartz from the University of Montana reported the results of the first genetic study comparing lynx populations in North America in recent issue of the distinguished international science journal *Nature*. An Anchorage Daily News article on this research also appeared in the Science section on Feb. 10.

Included in the study of 17 western North American lynx populations were 115 samples of DNA from the Kenai Peninsula lynx population.

Mike and I began corresponding several years ago. He was conducting research on the genetics of two threatened species—the Canada lynx and the San Joaquin kit fox—for his doctorate degree. Mike became aware that we had been studying lynx ecology on the Kenai National Wildlife Refuge for many years. He inquired whether we had collected any blood or tissue samples from lynx that he could use for various DNA tests. Fortunately we had frozen blood samples collected from live-captured lynx and frozen tissue samples from carcasses of trapped lynx. We provided our lynx tissue samples to Mike. As it turned out, the Kenai lynx provided the largest sample size of the 17 lynx populations that he studied.

Years before Mike and I began corresponding, I had wondered if lynx on the Kenai might be relatively isolated from lynx populations elsewhere. We had radio-collared well over a hundred lynx during 15-plus years, and we knew of only one individual that successfully escaped from the Kenai Peninsula. It was a large male that we captured near Skilak Lake in 1985; he was finally trapped near Chitna on the Copper River in 1988.

Studies in other areas have shown that individual lynx have dispersed over 600 miles. Even so, none of the numerous lynx which were radio-collared or ear-tagged in Interior Alaska or the Yukon Territory were known to have dispersed to the Kenai Peninsula. For outsiders, and indeed most locals, the Kenai Peninsula looks more like an island than a peninsula.

Considering our island-like status, I was eager to see what the genetic work would reveal, and indeed, it delivered some fascinating and unanticipated results.

Mike Schwartz and his co-authors showed that there was high gene flow (interbreeding) among all their sampled lynx populations across western North America, despite some populations being separated by distances of more than 1,900 miles. They interpreted this to mean that lynx were successfully breeding after physically dispersing great distances.

They termed this finding “the lynx migration hypothesis,” which states that gene flow has been ubiquitous among all the sampled lynx populations. For example, two of only three lynx known at that time in Wyoming were more genetically more similar to lynx from the Yukon Territory and Northwest Territory of Canada than they were to the closest known lynx in Montana.

In my opinion, however, the lynx DNA from the Kenai Peninsula showed the most interesting results of the study.

Lynx on the Kenai Peninsula are not listed as threatened or endangered, but Mike reported in his dissertation that Kenai lynx had the lowest genetic heterozygosity—a measure of genetic variation—of the 17 sampled lynx populations. Geneticists generally believe that populations with higher levels of genetic variation can better adapt to changes in their environment and therefore have more survival potential than do populations with little genetic variation. Genetically diverse populations have more genetic cards in their deck, so to speak, in a game where a winning hand means survival of the fittest.

Although the authors reported that the Kenai lynx were probably not biologically different from other lynx (because of the high gene flow), the Kenai lynx population as a whole was the most genetically unique of the 17 populations. In his Ph.D. dissertation, Mike Schwartz stated, “Landscape features such as islands or peninsulas can reduce genetic variation,” and “Peninsulas have also been implicated as places on the landscape where genetic variability is reduced, presumably because of small population sizes and isolation.”

The authors estimated that only four new indi-

viduals entering the breeding population per generation (from other populations) could explain the genetic variation observed for the Kenai lynx population. Although this estimated immigration rate is not enough to sustain an actual lynx population, it is apparently enough to maintain the observed level of genetic variation within the present population.

Kenai lynx were also genetically different in that they were the only lynx population that had more than one (three) of nine tested genetic loci that deviated from the expected genetic proportions. These data suggest that because of their relative isolation and small population size, Kenai lynx have developed some subtle genetic differences from other lynx populations. But we do not currently know what biological effects, if any, these subtle genetic differences mean for Kenai lynx.

The DNA data further indicated that Kenai lynx have a relatively low “effective population size” of 22 to 29 individuals, which is a genetic measure of a population’s ideal breeding size needed to maintain the observed genetic diversity. Geneticists generally assume that this effective population size represents 10 to 20 percent of the actual population size because of unequal sex ratios, differential reproductive success, overlapping generations, and changes in population size.

The implications of the genetic research are several. Although the authors’ main conclusion was that the persistence of peripheral, threatened lynx populations in the Lower-48 depends upon dispersal from core populations to the north, the Kenai Peninsula

lynx population was genetically the most unique and isolated of the sampled lynx populations.

The authors emphasized that maintaining connectivity between core and peripheral populations, by way of dispersal corridors, is necessary in order for peripheral populations to be sustained. Because lynx prefer to travel in dense cover, lynx dispersing to or from the Kenai Peninsula are restricted to a few forested corridors in the eastern mountains, usually valley bottoms, most of which contain the highway, secondary roads, the railroad, and increasing development.

Lynx are reluctant to travel great distances across wide, open, treeless mountain passes or across alpine or sub-alpine mountainous areas devoid of protective trees. Lynx are forest animals. Trees provide concealment and trees can be climbed to escape from potential dangers. This genetic study and other data indicate that because of their genetic isolation and small population size relative to mainland Alaska lynx populations, lynx on the Kenai Peninsula require careful land management to maintain connectivity to mainland Alaska and more cautious population management than is required for mainland Alaska lynx populations.

Ted Bailey is a retired Kenai Refuge wildlife biologist who has worked on the Kenai Peninsula for over 25 years. He 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://kenai.fws.gov>.

Elusive harlequin ducks can be spotted on peninsula's streams

by Todd Eskelin



Last month marked 13 years since the Exxon Valdez ran aground and spilled large quantities of oil in Prince William Sound.

For years, scientists have been studying the impacts of the oil spill on the various marine species in the Gulf of Alaska. I was curious which bird species had recovered so I surfed the Web and found the Exxon Valdez Oil Spill Trustee Council Web page. One species that jumped out at me was the harlequin duck.

I have been fascinated by harlequin ducks since I was a kid out halibut fishing and saw these strange colored ducks hanging out on the rocks. Back then I called them the clown ducks. I was saddened to learn that they are one of the species in Prince William Sound that continues to show signs of contamination.

If you have not seen a male harlequin duck you are really missing out. The name harlequin was actually derived from characters in Italian comedies that wore outrageous outfits and preformed tricks. They have also been called sea mice, due to the funny squeaking noises they make while feeding in groups. It is worth traveling to Homer or Seward to take a day cruise just to see these birds.

They are often found feeding in the intertidal rocky areas diving for crabs, clams, snails, and occasionally small fish. That is probably why they were impacted by the oil spill. When the oil hit the beaches and rocky

outcroppings, it covered their preferred feeding areas during fall, winter, and spring. Over the years, some of the oil has broken down and disappeared, but some of the oil was buried in the rocks and gravel on the beaches. This oil is then filtered and absorbed by the crabs and clams, and eventually eaten by harlequin ducks.

So why am I writing about a sea duck when I work at the Kenai National Wildlife Refuge (NWR)? It sounds like I should be working for Alaska Maritime NWR in Homer.

Well, during summer, many species of sea ducks travel inland to breed. Long-tailed ducks travel hundreds of miles inland and can be found in Denali National Park. Spectacled Eiders go inland to breed on the North Slope and can be found in the Arctic National Wildlife Refuge. Harlequin ducks also travel inland and have been found breeding here on the Kenai NWR.

Sometime around the end of April, male and female harlequin ducks will move inland and the female will pick out a nest site. Typically, they nest on the upper stretches of very clear, fast, high-mountain streams.

They feed primarily on aquatic insects, but will also supplement their diet with salmon eggs in the fall. After the female walks around and finds a nest site, the male supervises while she collects nesting material and builds the nest. Then after a brief courtship and mating, the male returns to the ocean until he is needed the next summer.

The females are highly sensitive to disturbance while on the nest, so they often build it on small islands in the middle of these tiny streams. When disturbed, they often flush from the nest long before people or predators are even in sight. This is one reason they often go unnoticed, and why I thought I would write this article.

It is likely that some of the harlequin ducks that breed on the refuge spend their winters in Prince William Sound. The number of harlequin ducks wintering in the Sound is double the estimated number

that breed in the area.

With all the changes going on in the refuge, i.e. spruce bark beetles, wild fires, and development along the major rivers, we should try and identify which streams currently support a breeding population of harlequin ducks.

Due to the various threats to their populations, the East Coast population was listed as endangered in Canada and threatened in Maine in 1991. The wintering population on the East Coast is less than 1,500, down from historic estimates of 10,000 birds.

We could possibly see the same thing happen here on the West Coast if we don't pay attention. The population outside of Prince William Sound has been fairly

stable for the past 10 years, but who knows what the future holds.

So, if you are out hiking on the dozens of small streams on the Kenai Peninsula and you happen to spot a harlequin duck, write down the date and exact location and give me a call at the Refuge 262-7021. I will be out checking many of the likely spots myself, but I can only cover a small area and would appreciate any sightings of this elusive duck.

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://kenai.fws.gov>.

Worker bees keep Kenai National Wildlife Refuge running smoothly

by Karen McGahan

The responsibility for the Refuge Notebook articles is rotated among the different departments at the Kenai National Wildlife Refuge. This week it lands on the administrative staff.

Well, the manager and his next in command can only write so many, so it has been delegated on down the line. This time it has come all the way down to the refuge clerk. After much deliberation, I decided that how our phone system or the filing were kept up wouldn't be tantalizing enough to keep the interest of the readers.

But what would? Would bees keep their interest? Maybe the "worker bees." Let me tell you about this little known species on the refuge.

Our permanent staff is divided into five different departments and runs just over 30 employees in the winter. This number explodes to more than 80 in the summer. This number doesn't include our numerous volunteers—a little known-about, but invaluable resource of the refuge.

Volunteers work for only their own satisfaction and the appreciation of the staff and community. Non-residents may get a small stipend for food. Wonderful people these volunteers.

The staff and volunteers originate from all over the United States and every once in awhile the globe. Like our origins, we even choose to live all over the Kenai Peninsula. Our employees live from Sterling to Nikiski to Clam Gulch, with one dedicated employee living in Homer and keeping a place here during the week.

I personally have a great respect and admiration for everyone who devotes his or her career to this refuge. The refuge encompasses lands from Chickaloon, along the tidal flats of Turnagain Arm, down to a section of land on the south side of Kachemak Bay.

Let's start with the biology staff, one of my favorites. These are some of our most committed and passionate employees on the refuge. Their work includes the best and worst that Alaska has to offer.

These people survey, track, collar and tag a variety of animals on the refuge. Bears, caribou, lynx and a variety of birds are all a source of enthusiasm for this

wonderful group of people. Even the bugs and beetles get a great deal of attention from the Biology Department.

These people accomplish their goals by getting outdoors and utilizing all modes of transportation. They use boats, planes, snowmachines and, most often, their own feet. They can be seen on all the great summer days observing and tracking their favorite animals.

What's the downside? They are also out floating the waters and observing on all the rainy, cold and snowy days too. Personally, I would like to trade positions with them only on the good days.

Let's move on to Visitor Services. This is our largest department, and staff are just as committed to their goals as the others. This group of people tries to balance visitor services, or people, with maintaining the land and animals.

The 14 refuge campgrounds are maintained and managed by this department. Your kids can go on field trips to learn about wetlands, fire programs and "leave no trace" camping because of these people.

Do you want to volunteer for a project? See Visitor Services. This is the group that knows all four corners of the refuge and can answer almost any question about the refuge, except those pertaining to a specific critter (that's biology). Staff can issue you a commercial, trapping or bear-baiting permit, and they are devoted to making your experience in the refuge an enjoyable one.

They also encourage and support the Friends of the Kenai National Wildlife Refuge. An amazing collection of people dedicated to supporting the refuge in a variety of ways. Consider becoming a member of this group.

This department also houses our law enforcement personnel. A committed group of individuals that look out for the regulations. These folks might dampen a few people's experiences, "here's your ticket", but if you adhere to the regulations, an encounter with them can be quite informational or even pleasant.

They also are involved in numerous search and res-

cues each summer. These adventures include animals as well as people. Just ask an officer or a biologist, birds are much more elusive than people.

These people in brown are happy to answer any questions you might have about the refuge. They might have badges and guns, but they are out there to ensure public safety and to help your visit be more enjoyable.

Enough Visitor Services. It's exhausting just thinking about all they do. Let's move on to the "hottest" department.

What's the "hottest" department on the refuge? Well, Fire Management, of course. What an exciting area of the refuge. Most people don't realize that the refuge even has a fire program. This group is quite small, but effective.

In the winter, only about three people staff the fire crew, which expands to approximately 10 devoted workers in the summer. This group works hard to keep the area free from one of nature's most devastating elements: fire.

They coordinate with many different agencies that are helping to educate the public on fire prevention. FireWise is a growing and much needed prevention measure in this time of the spruce bark beetle. They are very active outdoors working on preventative fire lines, outlining and implementing prescribed burns, (excellent for our massive moose), and helping where they are needed anywhere in the nation on wildfires.

Fire staff also help keep people warm in the winter by maintaining the personal-use woodcut area on Funny River Road.

While their office is away from the main visitor center area, they make a significant contribution to maintaining the refuge.

When you think of the wildlife refuge, you probably don't think of our final two departments: Maintenance and Administration. What could a maintenance worker or administrative worker contribute to maintaining wildlife and lands?

Well, a great deal actually.

The Maintenance department is headed by an Operations Specialist. This person is also the oil and gas operation contact and law enforcement.

Now that's a full plate.

He or she supervises six to eight employees. These employees have more than they can handle at times, grading roads for the public to drive on, keeping vehicles running to get crews to their work sites, and

maintaining everything from boats to the buildings, to keeping the wells working in the campgrounds. Without the maintenance crew, a lot of work might not get done.

The Administration staff is headed by two people, the refuge manager and the deputy refuge manager. These two are ultimately responsible for everything related to the refuge. They do everything from reviewing Environmental Impact Statements—stimulating reading I assure you—to getting out and helping put in and take out the public-use boardwalk at Moose Range Meadows. Yet, they are never too busy to discuss any concerns that the public might have.

They also supervise the remainder of the administrative staff. What do we do? We can do it all. Well, just about.

Between the four of us, we can purchase anything the departments need to do their jobs, keep their computers up and running, answer any and all of the personnel's questions, radio dispatch, copy, file and find any paper or other item the staff needs to work more efficiently.

We can even make an awesome cup of coffee. We are talented, but then again I might be a little biased. As for your questions, we can't answer them all, but we try to get you to someone who can.

I only just briefly touched on what each department in the refuge does. I hope that if you have questions or there is something that you would like to see in the Refuge Notebook series that you will call and make the suggestion.

There is a wealth of knowledge on a variety of subjects that can be taken from the employees here. So, if you would like to see an article on anything from public-use cabins, to a specific critter, or even the intricacies of the refuge filing system, please call or e-mail us at kenai@fws.gov with your suggestions.

Finally, the next time you are out enjoying the facility, please take a brief moment to think about the "worker bees" who are dedicated to helping make your experience the best possible.

Now, wasn't that more exciting than learning about how our phones work?

Karen McGahan is the refuge clerk for the Kenai National Wildlife Refuge. She lives in Nikiski with her husband, Elton, golden retriever, Missy, and Springer spaniel, Maddy. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

The welcome sounds and sights of the harbingers of spring

by Ted Bailey

It seems that spring this year is having a difficult time establishing itself. Snow is scattered but still piled deeply among the trees. Lakes, including Skilak Lake, are still frozen, and two to three inches of new snow arrived on the ground before melting on the morning of May 3.

But there have been previous years when spring arrived later than we would have liked. Fortunately I have already experienced one spring back in Ohio this year.

In April, I listened to cardinals, robins and house wrens singing in the early mornings and saw displays of spring wildflowers, including white spring beauties, yellow trout lilies, blue bluebells and purple violets in the eastern hardwood forest. And daily I watched as my mother's lilac bushes first budded out, then rapidly burst into bloom within a two-week period.

Despite the snow and ice when I returned to Alaska, the harbingers of my second spring of the year began to put in their appearance. First were the flights of calling sandhill cranes and Canada geese flying in huge V's overhead. Then gulls calling and flying over the still frozen lake near our house, appearing as impatient for the ice to melt as are we humans.

But I associate the true arrival of an Alaska spring with three other natural events. These events usually occur together, but not always in the same sequence.

The first event is the winnowing sound made by the aerial displays of territorial snipe. Though more common in the evenings, at their peak, these migrant male snipe displays occur throughout the day. The sound is made by air rushing through their feathers as the birds constantly circle and dive around the boundaries of the territory they are attempting to establish.

They are difficult to see when they are displaying because they are relatively small birds, fly high in the sky and are constantly on the move. Many people hear these sounds but have no idea of their source. A male snipe establishing his territory near our home began displaying over the black spruce bogs during the last week of April.

The second event that I associate with the appearance of spring is the arrival and calling of the male ruby-crowned kinglets. They are often the first long-distance migrant songbirds to arrive on the peninsula.

Like the male snipe, the tiny male ruby-crowned kinglet is also establishing his territory. But unlike the snipe, this tiny bird with a small ruby-colored spot on the top of its head has a big voice that's hard to miss. The kinglet makes its unique call as it flits from the top of one spruce tree to another around the boundary of its territory. The first one to arrive near our home began singing on Saturday.

The third spring event is the vocalizations of breeding wood frogs. So far—as of Sunday—I have yet to hear the local wood frogs begin their chorus. But I expect to hear them any evening now, and by time this article appears, I am certain they will be calling.

Unlike the birds that left to spend the winter in a warmer area, these wood frogs have literally been frozen under leaves and other debris in the ground during the winter and have to first thaw out. Their extraordinary physiology, which allows their bodies to actually freeze solid and survive, is unique among the higher animals and is the subject of research.

Imagine space travelers of the future being frozen until they arrive at their distant destination. Did you see “2001: A Space Odyssey?” Perhaps the wood frog will someday help us in our exploration of space.

There are many other “signs” in our natural world that spring is finally here. The appearance of the first robin and loons calling from a lake are others. But in my book, the displaying snipes, ruby-crowned kinglets singing and wood frogs calling are the “signs” of spring I anticipate and enjoy each year.

Too soon we will be complaining about the mosquitoes. Enjoy spring! It doesn't last long.

Ted Bailey is a retired Kenai National Wildlife Refuge wildlife biologist who has worked on the peninsula for more than 25 years. He maintains a keen interest in the peninsula's wildlife and natural history. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Bark beetle history in the Yukon quite different from Kenai Peninsula

by Ed Berg

There has been a fair amount of spruce bark beetle activity in the Yukon in the last decade, but bark beetles are something new in the memories of most Yukoners. Last summer I was invited over to Kluane National Park at Haines Junction, YT to take a look at the tree-rings of their white spruce forests for evidence of past beetle history. We have used the tree-ring method extensively on the Kenai to develop a 250-300 year record of beetle activity from 20 sites in the Kenai Peninsula–Cook Inlet area. Conservation ecologist David Henry at Kluane Park had read some of my reports on the Kenai beetle history, and invited me to assist him with a similar study in the Kluane area.

We asked a basic question: Have spruce bark beetles been in the Kluane forests in the past? No one remembered any beetle outbreaks, but we did have one clue—an old US Forest Service report that described a bark beetle outbreak along the road from Haines Junction down to Haines, Alaska. This report described an early 1940s outbreak along the Haines Cut-Off, as the road was known. The road was being constructed about that time, as a connector to the Alcan Highway from the port of Haines, during World War II. I reasoned that the beetles probably got started in slash piles along the new road. The beetles love horizontal trees, and produce many more offspring from a recently fallen tree than from a standing live tree.

Armed with increment borers and notebooks, I and my vegetation crew—Candace Cartwright, Pam Russell, and Doug Fisher—set off last June for a week of intensive tree coring with David Henry and his Kluane Park co-workers. We sampled four stands, taking a total of 439 cores and discs of trees. We chose one stand along the Haines Road, where we could see old standing snags with bark beetle scars. The bark was long gone, but the narrow three-inch maternal beetle galleries aligned along the trunks were still plainly visible. Kluane has a dry climate (12 inches of precipitation at Haines Junction), and dead trees preserve very well, unlike the Kenai where wood rots quite readily.

When we cross-dated the old beetle-scarred snags, we found they died between 1934 and 1942. So, the

beetle outbreak started well before the World War II construction of the Haines Road, contrary to my initial conjecture. I imagine, however, that the added construction slash fueled the beetle fire, even if it didn't start it.

When we measured the tree-rings of the older living trees we observed a strong growth pulse starting in the late 1930s. The wide rings were typical of a beetle-thinned stand, where smaller survivors have been “released” from competition with the now-deceased overstory trees. In many trees this growth pulse continues to the present day because the canopy has not completely reclosed in that forest.

The pre-construction start of the Haines Road outbreak was a surprise, but it was “small potatoes” compared to what we found, or didn't find, in the other three stands. In the other stands the trees had grown very slowly but steadily; indeed, remarkably steady, without a hint of any growth pulses in the 200-350 years recorded in their tree-rings. These stands simply had never been thinned—by beetles, windstorms, or by human hands. This uniform growth pattern is totally opposite from the Kenai, where every stand that we have examined shows from one to five growth pulses, indicating bark beetle thinning at least every 75-100 years, and often more frequently if the thinning (i.e., tree mortality) has been light.

The oldest outbreak that we can see in our 250+ year record on the Kenai is in the 1810-1820s. A major outbreak occurred in the 1870-1880s in the southern and central Peninsula, and the 1910s saw beetle thinning from Homer to Elmendorf. The 1970s brought brief but extensive thinning from Sterling north to Point Possession. These events are clearly visible as growth pulses in the tree-rings of survivors. To not find such pulses in the three Kluane stands “knocked our socks off!” The Kluane stands are typical productive upland sites that are representative of the forests of the region, and they all have beetles today. For this reason, I am fairly confident that our small sample of stands indicates that spruce bark beetle outbreaks have been very rare in the Kluane area in the past.

Both Kluane and the Kenai have experienced major regional outbreaks in the 1990s. Our tree-ring evidence suggests that these are the most severe outbreaks for the 250-350 years that we have good tree-ring records. What has been so special about the recent period? I point the finger to the record-breaking run of warm summers that we have been enjoying. On the Kenai the summers warmed up in 1987 and stayed quite warm through 1997, and are still warmer than the long-term average.

In Kluane the summers warmed up in 1989 and were several degrees warmer through 1995; there was a cool 1996, then a very warm 1997. In 1998 the temperatures dropped back down to average and have since stayed there. The Kluane beetles took several years to build up after the 1989 warm-up, and they attracted the attention of foresters for aerial surveys beginning in 1994. The Kluane red-needle acreage (newly dead trees) peaked in 1998, and then dropped off sharply when the summers cooled back down to normal.

On the Kenai the red-needle acreage has dropped dramatically in recent years (e.g., down to 15,823 acres in 2001), but only because there aren't many large spruce trees left. The beetles have eaten themselves out of house and home. In Kluane there are still many mature trees alive in the forests, and the cool summers since 1998 appear to have arrested the outbreak in mid-stream. We had a similar situation with the northern Kenai outbreak which followed the extremely warm (and dry) period of 1968-1969; that outbreak was arrested by the cool summers of the early 1970s.

As I see it, the chief reason why the recent bee-

tle outbreak has been the largest and the longest is that the run of warm summers has been warmer and longer than at any time since the 1600s (for which we have tree-ring based estimates of summer temperatures). Indeed, our summers probably haven't been this warm—for multiple summers—since the Medieval Warm Period which ended in the 1200s with the onset of the Little Ice Age. Andy De Volder has reconstructed summer temperatures from hemlock tree-rings on the Skyline Trail, and sees the coldest point in the 1810s. Temperatures have risen irregularly since that time, like the stock market, but the 1990s were clearly the longest run of warm summers. Temperature reconstructions from the Yukon show a similar upward trend from the 1830s, as do many high latitude sites worldwide. This is global warming in our backyard.

We are approaching the time of year for the annual bark beetle mating flight, being usually at the end of May or early June. The beetles like several days of 60 degree weather, and then you see them buzzing around rather drunkenly, looking for a fresh tree. I always ask readers to give me a call (at 260-2812) if you see a bark beetle flight. The calls have been fewer in recent years, thankfully, but I'd appreciate hearing about any flights that you see.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Additional information can be found on his Cycles of Nature website at http://chinook.kpc.alaska.edu/~ifeeb/cycles/cycles_index.html. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Kenai National Wildlife Refuge wears many hats, but none with plumes

by Dave Kenagy

It all started with ladies' hats and pens. We're not talking about ordinary bonnets, mind you, but frilly, feathery, fancy kinds of hats. I know you've seen pictures of these hats with long plumes of feathers. Some of the feathers came from pelicans.

The pens were the kind you write with, or should I say, wrote with. There was a time before ballpoint pens when people wrote with feather quill pens, and some of the "feathers of choice" came from pelicans.

Obviously, we are not talking about yesterday. We are talking about the beginning of the 20th century, a time when market hunting for waterfowl, upland game birds and birds such as pelicans was a part of everyday life. This market hunting, however, was decimating populations of birds and other animals all across the country, and many people were becoming concerned.

One of those concerned was a German immigrant name Paul Kroegel, who lived on the Indian River Lagoon in Florida. Kroegel was saddened by the huge impact that feather hunters were having on the brown pelicans on a small island near his home, and he personally petitioned President Theodore Roosevelt to set aside the island as a wildlife refuge.

President Roosevelt thought Kroegel's idea was a good one and created the Pelican Island Refuge on March 14, 1903. Pelican Island became the country's first national wildlife refuge, and Paul Kroegel became the country's first national wildlife refuge "manager."

Kroegel was also the first volunteer to work for what later became the U.S. Fish and Wildlife Service. You see, at first Kroegel was not paid by the government, although he did receive the tidy sum of \$1 per month from the National Audubon Society. He furnished his own boat and gun to patrol the refuge.

The national wildlife refuge system has come a long way since the days of Paul Kroegel, and there are now more than 530 refuges across the country. And, although refuges now have many paid employees, they also have many volunteers. These volunteers are people like Paul Kroegel; people who want to donate their time, energy, and expertise to protect

wildlife and make refuges good places to visit.

Lets's jump forward a century to the summer of 2002 to see what refuge volunteers are doing at the Kenai National Wildlife Refuge.

Did you know that the Kenai Refuge trail system is maintained by volunteers, under the supervision of a backcountry ranger? This year three Student Conservation Association volunteers will be clearing blow-downs, removing brush and putting up signs on trails. They'll also clean and rehabilitate remote campsites and talk with backcountry travelers.

If you're hiking a trail or paddling on the canoe system, stop and talk with these volunteers and thank them for the good work they do. And remember, it isn't just this year that volunteers are maintaining trails; they've been doing it for more than 20 years.

Our campground hosts also are volunteers; these folks are dedicated to making sure that campgrounds are clean, safe and fun places to visit. You'll find them at Hidden Lake Campground and Upper Skilak Campground. As you drive through the campgrounds, you'll see a "Campground Host" sign in front of their trailers.

Stop by and talk with them, even if you're not camping. They are there to help and to give you the latest information on camping, fishing, hiking, and wildlife watching.

If you stop by refuge headquarters or the visitor contact station near Jim's Landing with a question about camping, hiking, hunting, fishing, refuge regulations or any one of a hundred other topics, you'll probably talk with a volunteer. If you go to a campfire program at Hidden Lake or go on a natural history hike, there's a good chance a volunteer will be giving the program or hike.

That's because this summer the refuge has three SCA volunteer interpreters who are here to answer your questions and educate you about the incredible wildlife, plants, geology and history of the refuge.

This isn't new, either. We depend on SCA volunteer interpreters every year. Stop by and ask a question; they'll be happy to provide an answer.

Volunteers also will work with the biologists this

summer. We are always amazed at how hard these biology volunteers work. This year they'll be working on a frog study. Frogs, it seems, are very sensitive to contaminants and depend on clean water. Maintaining water quality is one of the priorities of the Kenai National Wildlife Refuge. These volunteers will be providing vital data to help assure high water quality, with the help of the frogs.

In the past several years we have added two new trails to our trail system. The work has been done by a crew of high school SCA volunteers. The work they do is truly impressive, and it is all done with hand tools. They completed Hideout Trail in 1999 and will complete the new trail at Upper Skilak Campground this year. Without the hard work of these volunteers, neither of the new trails would have been built.

Perhaps you have seen the historical Andrew Berg cabin at refuge headquarters on Ski Hill Road. Most of the furnishings in it were found or made by two refuge volunteers—Bud Crawford and Bill Nelson. These two fellows have shown a keen interest in restoring the cabin and giving it the look and feel it would have had when it was built in the 1930s.

If you haven't seen the cabin, stop by headquarters for a look back in time. There's a good chance you might bump into Bud or Bill; they can frequently be

found working on the cabin. Stop and talk with them; they have stories to tell. And, give them a big "thank you" for a job well done.

This year we have already had Boy Scout groups helping with projects, with more groups wanting to join in. The ways local groups or individuals can volunteer are almost endless. If you or your group would like to volunteer, give me a call to explore the possibilities at 260-6163.

Last year volunteers gave over 12,000 hours of their time to the refuge. Isn't that fantastic? We got 12,000 hours of things done that we wouldn't have without volunteers.

Well, hats off (no plumes, of course) to all of our refuge volunteers. If you run into one of them during the summer, give them a big "thank you." Many will be wearing a blue SCA uniform, with a volunteer patch on the sleeve.

So, that's the story of ladies hats, quill pens, the refuge system, Paul Kroegel and volunteers. Actually, the story isn't over yet; maybe you can write some of it yourself.

Dave Kenagy is the refuge volunteer coordinator. He also supervises volunteer trail crews working on special projects. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Satellites spy on sandhill cranes as bird-study technology increases

by Todd Eskelin

This spring, while conducting the annual snow goose count at the Kenai Flats, I spotted a sandhill crane with a yellow colored band on its left leg that read A05. On the right leg just above the knee joint was a band that contained a small transmitter and antenna.

Spotting a banded bird is like opening a Christmas present for me. The band number is sent into the bird banding lab, and they send you all of the information that is known about that bird. I always wait anxiously to find out where the bird came from, when it was banded, how old it was and if it had been seen by anyone else. That is why I always scan for banded birds when I am at the flats.

Two years ago, I spotted a sandpiper that was banded in Ecuador the previous winter. So, I reported the band number from the sandhill crane to the bird banding laboratory in Laurel, Md. Soon after I was notified that the bird had been banded in Palmer by the Alaska Department of Fish and Game. I contacted Mike Petrula with Fish and Game in Anchorage and he directed me to the Web page on the sandhill crane project. He said the bird I spotted could be identified on the Web page as bird #13387.

Technology in bird studies has come a long way in the last 10 years. I pulled up the Web page to find a complete map of the bird's movements. As a colt it was banded last fall at Palmer Hay Flats, then migrated down to the wintering grounds in California's Central Valley, and then back to the Kenai Peninsula.

All of this information was obtained using a satellite transmitter placed on the crane's leg. These satellite transmitters only weigh 35 grams and allow researchers to pinpoint a bird's location. It is like a scene from a James Bond movie. The satellite transmitter is slightly heavier than a AA-battery and can track a bird's movements for over a year depending on the programming.

These transmitters were programmed to send out a signal every two days during migration and every four days while on the wintering grounds. Unfortunately, we cannot track a colt to its breeding grounds

as it takes two to seven years before they begin to breed. The oldest known sandhill crane from a banding record lived 29 years and three months.

We often think of cranes dancing around with their elaborate courtship dances or circling overhead with those prehistoric calls while we are out moose hunting. Tracking cranes with satellites we find they are also very fast fliers. The bird I saw was in Kamloops, British Columbia, on April 23; Chichagof Island, Southeast Alaska, on the April 27; and Kenai Flats on the morning of April 30.

I read that they average 150 miles per day during migration, but for that last leg from British Columbia to the Kenai Peninsula, this bird averaged over 200 miles per day. Sandhill cranes have been clocked at over 50 miles per hour. These speeds are accomplished by flying high and catching a good wind. Cranes have been spotted flying in the V formation at nearly 12,000 feet.

Using satellite transmitters also revealed that both the adults and the colts follow the coast of Alaska to Southeast, and then cut inland around the Stikine River. From there they head south through British Columbia, Eastern Washington and Eastern Oregon to the wintering grounds. The maps also revealed where many of the important staging areas are in Central and Eastern Washington and Oregon.

If you would like to see these maps for yourself, I highly recommend you visit the Fish and Game Web page at the address listed at the end of this column.

If you spot any banded birds, you can call the Kenai National Wildlife Refuge at 262-7021 or you can call the bird banding lab at 1-800-327-BAND.

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. For more information on the maps: http://www.state.ak.us/local/akpages/FISH_GAME/wildlife/duck/crane/crane.htm. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Refuge campfires—if you choose to light one, be ready to put it out

by Doug Newbould

Campfires, especially those that are left unattended or abandoned, continue to plague Peninsula firefighters in 2002. In fact, campfires are still the number one cause of wildfires on the Peninsula and the Kenai National Wildlife Refuge.

In the week leading up to and including Memorial Day, firefighters from the Alaska Division of Forestry and the Refuge extinguished more than 30 unattended or abandoned campfires on the western half of the Peninsula. This number does not include campfires that local fire departments, the Chugach National Forest or conscientious citizens put out.

Considering the unreported fires, it would be reasonable to assume that more than 50 abandoned campfires were discovered and extinguished during the extended holiday weekend. And frankly, I am just flabbergasted by this statistic. How can this be?

Over the past five years or so, the local firefighting community has spent a lot of time, money and effort on wildland fire prevention. There have been numerous fire prevention news articles, radio spots and talk shows, pamphlets, fliers and posters. We have done “campfire talks” in the campgrounds, environmental education with school groups and individually contacted thousands of campers over the years with the outdoor fire safety message. So why, after 50 years of Smokey saying, “Only you can prevent forest fires!” do we still face this problem? Has the message been overused to the point that it has lost its meaning? Do some people hit the disconnect switch whenever they hear the words “fire prevention?” I just don’t know.

If we assume that most people who camp or start campfires on the Peninsula are aware of the fire danger and that they know how to start, maintain and extinguish a campfire safely, then the problem must be with attitude. We can speculate and make inferences about the attitudes of carelessness, laziness, malice and ignorance as reasons why people abandon campfires.

So how can we change the attitudes of those who walk away from a burning campfire, without at least attempting to put it out? Obviously, those of us in fire prevention are struggling with this question.

Besides attitude, another issue is location. In general, wildfires caused by abandoned campfires occur in primitive campsites, in the backcountry or outside of developed campgrounds. Is this because the type of people who prefer a more primitive or private camping experience are more careless? Is it because people in developed campgrounds do a better job of keeping an eye on each other? Or is it because primitive campsites don’t generally have steel or concrete fire rings?

From the people I’ve met in the backcountry, I don’t believe primitive campers are more careless. Developed campgrounds do benefit from intensive management and tend to be self-policing. So perhaps the third reason, the lack of fire rings, has some validity.

I should emphasize that most unattended or abandoned campfires that escape to become wildfires either smolder and creep through the duff, or throw burning embers into surrounding forest fuels.

Perhaps there are still people out there who lack knowledge about how to prepare a safe campfire site before igniting the fire, or about how to be sure a campfire is dead out.

Tom Marok, the logistics coordinator at State Forestry in Soldotna likes to say this about campfires: “Prepare before you begin.”

This is good advice for every camper. Before you light your campfire or camp stove or charcoal grill, ask yourself these questions:

Is there a mineral soil fire line around my fire? (With no burnable vegetation, fuel or organic soils that the fire can reach?).

Do I have an adequate supply of water and a tool available to put the fire out or stop it, if it escapes confinement?

Is it too windy or dry for me to safely light a fire?

Sharon Roesch is the fire prevention officer at Soldotna Forestry (260-4200). She has a lot of good fire prevention information and she is always thinking about new ways to get the word out.

When I asked her what she wanted to say about campfire safety, she said, “Location, Location, Location. Pick a good spot for your campfire, because peat

burns deep!”

Sharon and Tom and I all agree, a peat or duff fire is the most likely fire to escape detection and it can be the most difficult to put out. So choose the location for your campfire wisely. Avoid deep duff, peat moss and organic soils.

And finally, make sure you put the fire out “cold” or “dead out” as some of us say. Drown the fire with water, and use your camp shovel to mix the coals with dirt. Before you leave camp, carefully feel all materials with your bare hands, making sure that no roots or duff are burning at the edges of the fire.

I doubt that people who take the time to read the

Refuge Notebook articles are the kind of people who would abandon a campfire.

On the contrary, I believe they are the people who help take care of our campgrounds, trails and wild places. Let’s all continue to be vigilant, when it comes to campfire safety and wildfire prevention on the Peninsula.

We’ve got a lot to lose!

Doug Newbould is the Fire Management Officer at the Kenai National Wildlife Refuge. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Name that tune—the Kenai Peninsula’s songbirds are back for the summer

by Liz Jozwiak

A central theme each June to our Refuge Notebook series is an article about the spring arrival of birds to the Kenai Peninsula.

Most songbirds such as the warblers, juncos, thrushes and sparrows arrive on the Kenai Peninsula to breed by early June. Flycatchers and peewees arrive a few weeks later. These songbirds are also known as “neo-tropical migrants” because they winter far south in the neotropics of Central and South America and migrate to Alaska in the spring to breed.

This is also the time of year that I get ready to “bird by ear” and conduct forest bird surveys on the Kenai National Wildlife Refuge with Chet Vincent, an expert birder and volunteer with the U.S. Fish and Wildlife Service.

Each spring we survey two routes of the North American Breeding Bird Surveys (BBS); one in the Swanson River and the other in the Skilak Lake and Mystery Creek area.

The data that Chet and I collect along with the other 4,100 BBS routes surveyed in North America help biologists estimate continental and regional changes in bird populations.

We identify most of the birds in our surveys by their songs. In most habitats, the vast majority of birds are simply not visible, and listening to songs and calls is the only way to sample these habitats. You may have heard a bird singing in your back yard and wondered what it was. It is great fun and a rewarding challenge to identify birds by their vocalizations, as well as by their appearance and behavior.

There are many Web sites on the Internet dedicated to helping individuals learn bird songs in their area. One excellent site that you can download bird song recordings (as .wav files) is at

www.mbr-pwrc.usgs.gov/bbs. You can also purchase the excellent two-CD set *Bird Songs of Alaska*, published by the Cornell Laboratory of Ornithology.

I started learning bird calls by trying to identify something unique about the song of each bird. For instance, the song of the black-capped chickadee sounds like “chick-a-dee, chick-a-dee-dee-dee.”

The varied thrush sounds like one long metallic low note, which reminds me of the ringing of a European telephone. The song of an olive-sided flycatcher sounds like it’s saying “Quick, three beers.”

My most favorite bird song is that of the hermit thrush, which I hear along the upper elevation hill-sides along Skilak Loop Road. The song of the hermit thrush sounds like a melodic flute which always ends on a high note. You can make up mnemonics like these on the spot to keep bird songs in your memory until you can use an audio guide for a positive identification.

Elizabeth Jozwiak is a wildlife biologist at the Kenai National Wildlife Refuge. She just returned from a wintertime assignment with the Disease Investigation Branch of the National Wildlife Health Center in Madison, WI. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Now showing on your local trees: spruce bark beetles and Ips beetles

by Ed Berg

It's bark beetle time once again on the Peninsula. Have you noticed the little piles of rusty sawdust and pitch bubbles on your spruce trees? If you take a stout knife and dig under the bark, you can follow the grooved channel in the inner bark and find a mother beetle at work laying her eggs.

In the central peninsula, we are seeing a lot of the engraver (Ips) beetle, which is a smaller and less deadly cousin of our infamous spruce bark beetle *Dendroctonus rufipennis*. If you examine a recently downed tree, say from winter logging or firewood cutting, you may see dozens of little piles of rusty sawdust on top of the log.

Ips likes warm places, such as the top of a log or the sunny side of a tree. It can be alarming to see all these beetle borings on a log in your yard. If these were spruce bark beetles in such densities, you could pretty well kiss the rest of your forest goodbye.

Like the spruce bark beetle, Ips is eating the sweet inner bark, where the tree's sugars are concentrated. Fortunately, Ips rarely kills a mature tree because it prefers to attack the top of trees, and it doesn't seem to attack in such large numbers as the spruce bark beetle.

If you are concerned about beetle activity in your trees, it helps to learn to distinguish the spruce bark beetle and Ips in order to achieve some peace of mind. Dig out some beetles with a knife and examine them with a strong magnifying glass. Ips are three millimeters (1/8 inch). Their back end has a pushed-down look, as if they had been rear-ended by a bigger vehicle. Furthermore, they have several spines in a vertical row on either side of the pushed-down area.

These spines look like finned taillights on a 1950s hotrod car. The taillights are hard to miss, once you have seen them. There are many species of Ips, but they all have taillights. The spruce bark beetle, on the other hand, is larger at five millimeters (1/5 inch), and has a nice, well-rounded rear end, reminiscent of, say, a '49 Ford.

We have set up two beetle trapping stations near the refuge headquarters this spring, under the guid-

ance of retired Forest Service entomologist Skeeter Werner. The traps are baited with potent attractants (called pheromones), as well as woody-smelling turpentine and alcohol.

If beetles were abundant, we could potentially be catching hundreds of beetles per week per trap. But, in fact, we are doing quite poorly: we have been catching about a half-dozen spruce bark beetles per week, and no more than five Ips. If we had more recently downed trees in our woods, we would probably be seeing more Ips. In any case, I am quite pleased to see the spruce bark beetles in short supply because they are the primary offenders.

To be fair, I shouldn't let Ips off scot-free in this discussion. Ips will often successfully attack and kill small trees (say three-five inch diameter) on the peninsula, and they can finish off a tree that has already been weakened by previous spruce bark beetle damage. In the Interior, Ips is more aggressive and often turns treetops red along the big river flood plains with flood-downed trees, as well as at logging sites with leftover slash.

Waiting in the wings in the Russian Far East is a real trouble-maker—*Ips typographus*, which is considered hands down the most destructive bark beetle in the forests of Europe and northern Asia. This has not yet been detected in Alaska, but it is definitely one exotic pest that we don't want to see anytime soon.

In short, don't panic if you see a lot of beetle sawdust piles on your downed logs right now. Get out the magnifying glass and look for the taillights on the beetle butts; the sawdust may look bad, but if it's only Ips, your trees should survive.

Additional information on bark beetles can be found on his *Cycles of Nature Website* at http://chinook.kpc.alaska.edu/~ifeeb/cycles/cycles_index.html.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Scent of witches'-broom not for the tender-nosed

by Ed Berg

If you have walked through a spruce forest recently, you may have noticed a rather potent sweet smell in the air, quite unlike the fragrant flowers of your garden.

A bit of searching will reveal that the odor is coming from a "witches'-broom" on a spruce tree. These brooms are one to three feet in diameter, and are a thick wad of tangled branches. Right now they are displaying new needles, which are light green in color, and stand out in contrast with the normal dark green needles of the rest of the tree. If you are working in the woods at this time of year, you have probably learned to not sit down and eat your lunch beside a tree with one of these smelly brooms.

When I first noticed the smell of the witches'-broom, it reminded me of an animal cage overdue for cleaning. When my daughter Tanya was little, we had hamsters, gerbils, and guinea pigs, and Tanya was generally a bit slow on the cage cleaning detail.

My first thought was that animals (such as squirrels) were nesting in the witches'-broom and that is why they smelled so bad. After inspecting a few of them, however, I noticed that even the new brooms with too few branches for a nest smelled equally bad, so I eliminated the dirty nest hypothesis. After watching the brooms for several years I found that they only smell bad for a few weeks in the spring.

Witches brooms are cancer-like growths caused by a rust fungus (called spruce broom rust or *Chrysomyxa arctostaphyli*) which has a remarkable two-phase life-cycle. If you look at the needles of broom rust with a magnifying glass, you will see yellow dots. These dots will turn dark, and then release tiny spores, just like a mushroom. The spores will be dispersed by the wind, and some will land on kinnikinnick (bearberry, *Arctostaphylos uva-ursi*), whose dark berries on sprawling vines are well-known to fall berry pickers.

The spores will infect the bearberry leaves, although you would never notice this unless you were looking for it. Infected leaves have an orange-brown powder on the underside, which is the second type of spores in the rust life cycle.

The remarkable aspect of this life cycle is that both hosts are required to complete the cycle. A witches'-

broom on a spruce tree cannot infect other spruce trees; it has to first infect a bearberry vine. The bearberry has to produce its spores to infect more spruce.

Likewise, one bearberry vine cannot infect another bearberry vine; it has to go through the spruce stage. This is called an "obligate" relationship because the cycle only works when both partners are available.

There are many examples of these obligate partnerships in nature. I remember as a teenage applying (unsuccessfully) for a job with the Forest Service in Idaho fighting the white pine blister rust, which kills a lot of white pine in the western states.

The alternate hosts of the blister rust are currants and gooseberry bushes (all of the genus *Ribes*), and for years crews of strong young backs were hired to go through the woods and chop out the currants and gooseberries. I think this program has long since been abandoned because it was simply impossible to get rid of all the bushes. If we were concerned about witches'-brooms, we could be sending kids out in the woods to chop out the bearberry.

Fortunately, witches'-brooms are not a major threat in Alaska. If you don't like looking at them, it is fine to saw off the branches with the brooms. I don't recall ever seeing a tree so loaded with brooms that its life was threatened.

Spruce needle rust (*Chrysomyxa ledicola*) is another example of an obligate partnership. You may have seen twigs on spruce trees whose new needles turn bright yellow-orange in the summer. If you flick the twig, a cloud of yellow "smoke" (spores) will appear. This rust has Labrador tea (*Ledum*) as an alternate host.

There were localized occurrences of needle rust around Kenai several years ago. Again, this is worrisome to see on your trees, but it doesn't generally kill the trees. The outbreaks usually occur for only one year, especially with cool damp weather, so the trees are not affected from year to year.

If you really wanted to get rid of it, it would probably be necessary to remove all Labrador tea bushes within 1,000 feet of your spruce trees, according to Forest Service plant pathologists.

I am still puzzling about the weird smell of the

witches'-broom. Some smells in nature have important adaptive value: flowers attract pollinators to aid fertilization, and plants with good-smelling fruits get their seeds dispersed by whoever eats the fruit.

Spruce bark beetles emit attracting and repelling odors (pheromones) to regulate the numbers of beetles attacking a tree. So, what does the witches'-broom accomplish with its aroma?

Probably nothing, as best I can tell. Its spores are distributed by the wind—no critters are required. Ap-

parently, some volatile compound is involved in the spore production process, but it's probably just an accident of the way our noses work that we find it so smelly.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Biologists begin to explore hidden corner of Kenai National Wildlife Refuge

by Ed Berg

Many Peninsula residents know the Kenai National Wildlife Refuge as the hunting and fishing grounds of the central and northern Kenai Peninsula. Only diehard map devotees know that there is a separate block of Refuge land south of Kachemak Bay.

This block of 147 square miles was added in 1980. It includes most of Grewingk Glacier, and the high mountain peaks and glaciers that fill the picture-window views across from Homer and East End Road. Ice worms are the probably the largest species of interest on much of this snow-covered terrain.

We call this block the “southern cube,” and few of the Refuge staff have ever been there on the ground. Last winter we decided that it was time to take a serious look at the area and inventory the resources, at least on the unglaciated part. So we began planning an expedition. On June 24 we bundled into an Otter piloted by Gary Porter of Bald Mountain Air and lifted off from Beluga Lake for two quick hops over Kachemak Bay to Emerald Lake, east of Grewingk Glacier.

Emerald Lake lies nested in a bench-like sub-alpine valley. The east side is flanked by an 1,800-foot wall leading up to the flat crest of the mountains. The west side of the valley is rimmed by a line of hills overlooking the deep channel of Grewingk Glacier to the west. The north end of Emerald lies in Kachemak Bay State Park and can be accessed by a trail loop from Humpy Creek and the Grewingk outwash plain. The south end of Emerald Lake, where we camped, lies in the Kenai Refuge.

The broad valley southeast of Emerald Lake consists of willow and alder thickets, open flower-laced meadows, hilly moraines, and several small lakes. This is prime black bear country with good root digging and lots of salmonberries and blueberries. On the first day we saw a sow and cub, and two solitary adults, but generally had no unpleasant encounters or camp visitations.

At 5 a.m. every morning Todd Eskelin and one sleepy volunteer hit the bushes running to do songbird surveys. They would stop every 400 meters, and Eske-

lin, who has an incredible ear for birdcalls and songs, would listen for five minutes, counting the number of each species within and beyond 50 meters. Only calling or singing birds were counted; silent types in the bushes would be impossible to detect without x-ray vision.

A typical morning transect covered 3,200 meters (roughly two miles) with eight to 12 stops and generally involved a massive amount of bushwhacking.

The bird surveys yielded lots of golden-crowned sparrows, Wilson’s warblers, hermit thrushes and fox sparrows. Wilson’s warbler is the smallest warbler in Alaska and is brightly colored like a yellow canary. These species are typical of sub-alpine open brush and were expected. When Eskelin crested the last hill west of Emerald Lake, which had better spruce cover and a great view of the glacier, he picked up more of the boreal forest species such as varied thrushes, pine siskins, slate-colored juncos and ruby-crowned kinglets.

The golden crown sparrow, with its descending three-note call, was certainly the most noticeable bird in the valley, as in many areas of the southern Peninsula at this time of year. Some folks hear its plaintive falling call as “Three blind mice,” or “Oh dear me.” Across the Canadian border it says “Oh Cana-da.” In Homer it is known as the homesteader bird, which mocks the struggling homesteader with “You damn fool.” Listening to it as we thrashed through the alders and willows, this last interpretation seemed to fit best.

We saw a pair of golden eagles soaring high over the bluffs above Emerald Lake. No nest was visible, but they are known to prefer high craggy sites well above treeline. Eskelin also found a single song sparrow singing in its territory high up near the glacier. This is a typical coastal beach species, a long way from its proper turf.

Todd set up his mist net, which looks like a badminton net of very fine mesh, and captured 23 birds of five species for banding. Some of these birds may report back from Central America in the next few winters, and maybe we will find them back on the Kenai in

future summers. Eskelin has been banding birds since 1989, and often conducts bird-banding demonstrations at the Refuge headquarters. Watch for announcements of dates and times.

A second morning chore was checking the small mammal traps. Stephanie Rickabaugh deployed 47 pairs of snap traps and pitfall traps to capture some of the smaller denizens of the valley floor.

In the meadows we saw lots of vole tunnels from last winter running everywhere through the grass. We expected a large catch in the traps. It appeared, however, that the small critters had moved to less exposed areas for the summer. The total catch in four nights of trapping was eleven tundra and red-backed voles and seven masked shrews.

We saw a type of small mammal house that we have not seen before. The largest version was a mound of flat-lying dead grass eight to 10 inches high and about 18 inches wide, but typically the houses were smaller at six to eight inches high and 10 to 12 inches wide. When you lift off the top two-thirds of the grass, you find a central nest chamber about the size of your

fist, and a tunnel leading out at the base.

I would imagine that this is a very warm house with a few feet of snow on top. The houses would have to be constructed in the fall before snowfall, unlike the tunnels through the sod that probably provide a continuous winter-long food source. To construct the house a large amount of dead grass would have to be carried and piled up. Beavers are famous for this kind of industry, but voles?

Of the larger wildlife, we saw six goats one evening high on the ridge, three moose, at least four black bears, a coyote, scats of wolf and porcupine, and tracks of a lynx and possibly a mink. We didn't see or hear any marmots or pikas, although we did see lots of marmot-sized borrows.

Next week: Emerald Lake, Part 2: Catching bugs, a new plant, and rising treeline.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Emerald Lake shows beautiful flowers, a variety of insects, and hints of climate change

by Ed Berg

As I reported last week, we recently completed a six-day field study of the Refuge's southern extremity in the mountains of Kachemak Bay. Collecting the plants and insects was an important part of our mission, as well as inventorying the wildlife. We have been wanting to upgrade our modest plant collection at the Refuge headquarters, and this seemed like the perfect opportunity. In six days of collecting at Emerald Lake above Grewingk Glacier we filled four plant presses with dozens of species, with Pam Russell and Candy Cartwright focusing on the flowering plants, while I worked on the mosses and lichens.

Spring was a bit late when we arrived in the last week of June, and I was at first worried that we had arrived a week or two prematurely before the peak of flowering. False hellebore spikes were less than a foot tall, and fireweed shoots were mostly in the early red stage and only three inches tall. Nevertheless, on sunny sites salmonberries, blueberries, and na-goonberries were in full bloom and promised bountiful picking in late July and August. Mountain marigolds were in bloom along every streamlet, even those with residual snow banks. We saw lots of yellow violets, as well as purple Alaska violets. Indian paintbrush was in flower, as were woolly louseworts and yellow buttercups of various kinds. Burnett was probably the most common herbaceous plant, although it was not yet in flower.

The prize flower—found by Candy Cartwright on a gravelly moraine—was a small primrose *Douglasia (Androsace) alaskana*. I had never seen anything like this in more than 20 years of plant picking on the Kenai, and it definitely had me stumped. It had a tight central clump of hairy leaves about an inch tall and eight wire-like three-inch stems arcing out of the central clump. Each stem had a single seed head at its tip; the petals were long gone so we couldn't tell their color. When we returned to the lab Candy keyed the plant out with Hulten's *Flora of Alaska* and sure enough, there it was on page 746. This is a showy little guy that would look good in a rock garden, and Candy plans to try to germinate some of the many tiny seeds.

I collected dozens of mosses and lichens—enough to keep my evenings busy for a good part of the winter. There are lots of crustose lichens on the rocks up in the mountains, which I collect with a hammer and cold chisel. Many boulders were encrusted with bright patches of the yellow-and-black *Rhizocarpon* lichen. Glacial geologists use this lichen to estimate the minimum number of years that a rock surface has been exposed after a glacier has retreated. In Kachemak Bay, for example, circular patches of *Rhizocarpon* grow at a slow but steady rate, taking about three years to add one millimeter of diameter. At this rate a patch the size of quarter represents about 60–70 years of growth. The largest patches I saw were two inches (50 millimeters) in diameter, indicating that the ice had pulled back from the Emerald lake valley at least 150 years ago. (For a picture of *Rhizocarpon* see <http://www.lichen.com/bigpix/Rgeographicum.html>).

The pit traps that we deployed for catching voles and shrews turned out to be much more effective for catching ground beetles. We brought along our insect collecting bottles and nets, and caught quite a few beetles in the 15-inch deep funnel-shaped pit traps, that were set flush with the ground surface. We used our nets to sweep the bushes and flowers, and quickly collected a great variety of midges, flies, moths, and butterflies. This winter we will make preliminary identifications of the insects and then send them off to be verified and archived at the University of Alaska Museum in Fairbanks.

One of my interests in collecting insects is to begin building a baseline inventory of common species for monitoring climate change. Beetles for example are very good thermometers. Each beetle species has its preferred range of temperature. If you look at 20 or 30 species in an area, you will see a range of several degrees where they all overlap. Beetle paleontologists and archeologists use this method to estimate the growing season temperature in deposits thousands of years old. In the case at hand I want to track changes in the kinds and numbers of insects as the climate of the Kenai Peninsula warms and dries in future years.

To look at climate change that has already taken place, I cored several big Sitka spruce trees above Emerald Lake. About 50% of the relatively few spruce trees up here are dead from spruce bark beetles, especially the larger trees. I was able to use my increment borer (a threaded tube) to extract wood core samples from trees as large as 28 inches in diameter. These trees were all growing at treeline, but the younger trees were growing especially vigorously with wide rings. This indicates that they could be growing higher; they are not growing at their limit of stress or at “physiological treeline.” I have seen this pattern at other treeline spruce sites around the Kenai Peninsula, and it indicates that treeline is rising, and indeed has been rising for more than 100 years.

Our tree-ring studies with mountain hemlocks at treeline indicate that summers on the Kenai have generally been warming since the 1810s. Furthermore, I have never seen a cohort of dead trees at treeline on the Kenai, which would indicate that a cold period had pushed treeline back down. We have had brief cold

periods in the last two centuries, but they apparently have never been cold enough to reverse the general rise of treeline.

Nevertheless, if the trees are growing well at treeline, why aren't they growing higher up than they are presently growing? Is something limiting their upward mobility? Seed dispersal studies have shown that most spruce seeds don't go very far. Despite being wind dispersed, most seeds fall within a radius equal to the height of the tree. That is why they are often in clumps—they are growing near their seed mothers. Climatewise, they could be growing higher, but they stay close to home. Like a lot of us, they could move up the hill faster, but after all, what's the rush—in the grand scheme of things?

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Combat fishing on the Russian River hasn't always been so civil

by Gary Titus

A shot broke the silence of a clear, warm day on the banks of Russian River, and a 30-40 rifle bullet sliced through Bill's right forearm, cut hair off Barney's neck, and slammed into a log in a fishing cabin. Otto had pulled the trigger, and he thought he had good reason to do so. The day had started like any other day; the river was full of sockeye salmon, more than enough to keep the men busy. The smokehouse fire was smoking and ready for a new load of bright red fillets.

Three fishermen, Otto Glatz, Bill Abbott and Barney Flaherty, were catching salmon for the fall and winter commercial market. They were staying at a camp called Kelly Olsen's which was located at the junction of the Kenai and Russian rivers. The camp consisted of four tents, a high cache for keeping salmon and a log house for smoking the fish. The camp was neither tidy nor clean. So, what made Otto cut loose on his fishing partners on that beautiful summer day? Well, fishing on the Russian was tough on the nerves, even in 1912. Bill Abbott was very particular about how to fillet a salmon and was watching Otto like a hawk. Otto just couldn't fillet by "the book" according to Bill. Bill had had enough, and just couldn't resist making a snide remark about Otto's ability to carve fish. Otto responded in German with a remark that had to do with the ancestry of Bill. Otto was so angry, he put down his knife and retired to his tent, hoping to calm down.

At noon, when the partners knocked off for lunch, the conversation heated back up regarding the proper method of cleaning fish. That's when Otto had all he could take, picked up his 30-40 rifle and fired the shot. Barney begged and begged Otto to put down the gun before someone became seriously injured. That provided a diversion for Bill, and he ran upstream to the Kenai Dredging Company to get his arm bandaged. Otto soon realized that Bill was gone, and he figured Bill had headed to Seward to get the marshall. Otto decided to turn himself in and immediately set out for Seward to turn himself in and to tell his side of the story before Bill could.

Only a few years after Otto, Bill, and Barney

worked at commercial salmon harvesting, the Russian River fishery had changed to a sport fishery. By 1915 the Russian River had the reputation as the "greatest fishing stream on the North American continent," according to the Seward Weekly Newspaper. Not all came to fish or shoot at their partners. Mrs. J. H. Sears visited the stream in August of 1915. Not wanting to fish, she decided to jump in for a swim. There was only one problem; Mrs. Sears immediately became part of a huge school of salmon. The salmon had no trouble swimming upstream, but Mrs. Sears was making no headway. Finally, she gave up and swam and crawled through the wiggling mass of salmon to reach the shore.

The Russian River continued to grow in popularity, and a road was extended from the town of Cooper's Landing to the Forest Service Boundary near the confluence in the late 1920s. That didn't mean that accessing the Russian was easy. Fisherman had to first take the train to Kenai Lake, and then catch a boat 20 miles down Kenai Lake to Cooper's Landing. Finally, if they could find Charles Lien, they were in luck. You see, Charles owned the first automobile on this seven-mile road, a Model-T Ford, and for fifty cents he would rent it and let you drive it to the Schooner's Bend bridge. From there, it was a short walk to the Russian River.

Later, the road was extended to the Chugach Forest boundary, and the first Russian River "ferry" was established in the 1930s by Henry "Hank" Lucas, a well-known hunting guide. Hank extended his guiding season by ferrying fisherman across the river and landing them below the confluence using a 25-horsepower outboard motor on a 16-foot riverboat. He charged a buck a head. Hank set up a tent near the present day ferry parking lot that he used as a base camp. Fishing and filleting are not only frustrating for fishermen; bears also have their bad days. Unfortunately for Hank, these bears would take out their frustration by ripping up Hank's tents.

The land area around the Russian River confluence has not really changed much over the passing years. It can still be frustrating for fishermen and bears, with

four months of intense fishing activity. So please remember to clean your salmon in the proper manner and enjoy your fishing trip to the Russian River. Be courteous to other fishermen and the bears. And, oh yes, leave your 30-40 at home.

Gary Titus is a wilderness ranger and historian at the Kenai National Wildlife Refuge. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Fireweed a good parent, but a poor competitor for sunlight with the big boys

by Ed Berg

The fireweed blossoms are moving inexorably up the stem, more or less hitting the halfway point this week, and reminding us that fall is not far away.

Fireweed is certainly one of our most beautiful plants, both up close for its showy flowers and for the flaming floral tint of our fall meadows and hillsides.

If you look at a flowering spike of fireweed right now, you will see the long seedpods on the bottom, the mature flowers in the middle, and unopened buds on the top. In the next few weeks the top of the spike will elongate, continuously adding new buds as the flowers below become mature and form their seedpods. If winter were to arrive early, no new buds would form. Conversely, if summer were to extend another month, extra buds would be added for more flowers and more seedpods. Botanists call this “indeterminate” growth, and contrast it with determinate growth where the genetic program produces a fixed number of flowers on the stem, for example, tulips and twinflowers.

The parts of a mature fireweed flower come in “fours:” four narrow sepals, four petals, eight stamens (each with a double pollen bag or anther on its tip), and the central style is split into four curls. Among plants, the “fours” pattern is rather uncommon—mustards come to mind as another example.

“Fives” are more common (pink, saxifrage, and heath families), the many lily family members come in “threes,” and the large buttercup and rose families usually have “many” parts.

Keeping these numbers in mind can often help you identify the family of a plant, or at least rule out what family it is not.

I have puzzled about whether fireweed is an annual or a perennial. When you pull up a fireweed, you see several inches of roots, but there is no remnant of last year’s stem. A typical perennial plant has well-developed roots for storage, for example, carrots, dandelions, and trees.

Furthermore, you can often see last year’s stem even if it puts up a new stem every year, like cow parsnip (pushki).

With fireweed, there isn’t an obvious storage root

or last year’s stem, unless you dig in a patch of really large fireweeds.

As with most flowering plants, fireweed can grow from a seed, especially in bare mineral soil, but fireweed propagates best from underground stems, called “rhizomes,” and is thus a perennial.

In late summer the rhizomes produce buds that lie dormant through the winter. One study, for example, found a four-year old fireweed rhizome 20 feet long with 56 buds. In the spring these buds sprout and push up the red shoots (which I find quite tasty). Within a month the new shoots have grown high enough to begin flowering, substantially aided by the initial pulse of parental funding from last year’s rhizome.

The importance of parental support becomes quite obvious if you dig up a few fireweed plants in a well-developed thicket of fireweed; the plants are all connected underground with heavy, almost woody rhizomes.

Contrast this with a single seed-generated plant that “goes it alone” in a garden or on the edge of a road; it will have a few simple roots and won’t be very large, because its tiny seed didn’t hold much food.

Dick Baldwin, in his excellent book *Growing Alaska Natives*, recommends planting a section of root (i.e., rhizome) as the best way to propagate fireweed. If you want to get rid of fireweed, it’s not a good idea to plow it up or disc it, because each piece of broken rhizome can start a new plant.

If fireweed seeds are small in size, they are large in quantity. A typical pod produces 300 to 500 seeds and a single plant can produce as many as 80,000 seeds per year.

Tests have shown 100 percent germination of seeds within 10 days, but the seeds lose viability in 18 to 24 months.

The fire hairs, or cottony plumes that carry the seeds with the wind, are sensitive to humidity. In moist air the plume diameter decreases and its loft is reduced, so that the seed tends to fall in places where there is adequate moisture for germination.

The lofting ability is important for good dispersal

of the seeds. Swedish experimenters found that seeds were commonly aloft for 10 hours per day and could be carried by the wind 60 to 180 miles in a day.

Fireweed is an early colonizer of burned sites, which, along with its color, may account for its name. For example, we have nine permanent plots in the 1947 Burn; one of these plots was in a severely-burned stand of white spruce, cottonwood and birch, where the mineral soil was well exposed by the fire.

Our survey records and photos show that fireweed came in as a wall-to-wall carpet by 1950 with 280,000 stems per acre. It declined steadily to 52,500 stems per acre by 1965, and was gone completely by 1995, because the new birch and alder canopy had closed and reduced the available light.

Fireweed seeds probably colonized the bare mineral soil toward the end of the summer in 1947 after the fire, and by 1950 the underground network of rhizomes would have been well established.

Despite this phenomenal early success, fireweed has its Achilles' heel in being shade-intolerant. In this plot, after twenty years, the slower growing birch and alder simply grew up, over-topped the fireweed, and outcompeted it.

Fireweed can be an important forage crop for moose, especially in the spring before the flowers appear.

One Alaska study found fireweed to have about 12 percent protein in July, with 62 percent dry matter digestibility for moose.

The flowers of fireweed, however, have evolved chemical defenses to prevent the plant from being eaten once reproduction is underway. The flowers contain tannins, which bind up proteins and make them indigestible, so moose avoid eating fireweed after it is in full bloom.

Many plants use the tannin defense; that is why strong black tea can upset your stomach. Tea drinkers know that they can avoid indigestion by adding some milk to their tea. The protein in the milk binds with the tannin, and the resulting lumps are moved on down the gut out of harm's way.

Details for this article came mostly from the Fire Effects Information System Web site: <http://www.fs.fed.us/database/feis/>. This remarkable Web site summarizes the literature on hundreds of species of common wild plants in very readable form. If you can't find it here, you probably don't need to know it.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Hunting one of many ways to enjoy National Wildlife Refuge System

by Robin West

Hunting is an American tradition filled with much history and lore. Recent surveys estimated that 6% of the U.S. population age 16 or older, over 13 million people, went hunting in 2001, averaging 17.5 days afield each, and accounting for approximately \$20 billion in total expenditures on travel, equipment, licenses, etc.

Alaska tied with Arkansas, Idaho, and South Dakota for fourth place for the highest percentage of residents (16%) who participated in hunting activities last year. Montana led the national average with a 24% participation rate, followed by North Dakota (19%), and West Virginia and Wyoming (17%). For sheer numbers of hunters, Texas lead the pack with 1,201,000, followed by Pennsylvania, then Michigan, New York and Wisconsin.

While these estimates are impressive, also important is the trend in the participation rate. It has been declining for quite some time. Hunting participation rates nationally dropped by 7% in the last five years alone. Interestingly, the 10-year comparison also showed a significant decline in the number of hunters, but with it came a significant increase in the total amount spent by hunters.

Changing demographics and public values, increasing costs, complexity of regulations, competing interests for free time and the availability of places to hunt are all probable reasons for the ongoing decline in hunting participation.

Along with the rapid urbanization of America, a lack of open lands readily accessible in many places probably accounts for most of the change. With this steadily increasing urban expansion, along with more and more private land being placed off limits to the general public, American hunters are increasingly looking to public lands for hunting opportunities.

Here enters the National Wildlife Refuge System. The system was established by President Theodore Roosevelt 100 years ago come March 2003. Roosevelt was, among other things, a noted hunter and conservationist. There are now 537 refuges in the system, at least one in each of the 50 states. Of these, 302 are open to hunting. All 16 National Wildlife Refuges in Alaska,

totaling about 80 million acres, are open to hunting.

Some people question how a wildlife refuge can be open to hunting. Shouldn't refuges be places of sanctuary, as the term "refuge" implies?

Congress mandated the mission of the National Wildlife Refuge System: "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."

Americans enjoy wildlife in a variety of ways: some participate in consumptive uses such as hunting and fishing, some participate in nonconsumptive uses like wildlife viewing and photography, and still others hold value in studying wildlife vicariously and appreciate knowing that they are simply "out there."

Many enjoy wildlife in multiple ways. Refuges, in implementing their mission, strive to provide for a variety of public values while managing for healthy and sustainable wildlife populations. The basic management premise is that we need adequate quality and quantity of wildlife habitats to have healthy wildlife populations, which in turn provide wildlife for study, viewing, photography, and hunting. All user groups share in the common need to manage for healthy sustainable wildlife populations.

When Congress passed the National Wildlife Refuge System Improvement Act of 1997, it clearly established wildlife conservation as the single mission of the system, but also instructed that wildlife-dependent recreational uses (hunting, fishing, wildlife viewing and photography, and outdoor education and interpretation) be recognized as appropriate and as the priority general public uses of the system through which the American public can develop an appreciation for fish and wildlife.

These uses are to be facilitated on refuges whenever they are determined to be compatible with the specific purposes for which individual refuges are established. While some refuges remain closed to all hunting (such as some small endangered species

refuges in the Lower 48), the majority of refuges include hunting in their public use programs.

Fishing and wildlife viewing are practiced by even more Americans than hunting. An estimated 34 million anglers (16% of the U.S. population) and 66 million wildlife viewers (31%) enjoyed these activities in 2001. These, and other statistics, are available as part of the preliminary findings of the U.S. Fish and Wildlife Service's 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation report. The report can be accessed on the Internet at: <http://federalaid.fws.gov/>

As members of the American public, you are co-

owners of National Wildlife Refuge System lands. I hope you enjoy them, whether you hunt or fish, watch or photograph wildlife, or just enjoy wild places that support healthy wildlife populations. Please come out and visit the best system of lands managed for wildlife anywhere in the world.

Robin West is the Refuge Manager of Kenai National Wildlife Refuge. Besides his professional conservation pursuits, he is an avid hunter, fisher and wildlife photographer. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Student Conservation Association volunteer discovers history of wilderness cabin

by Lindsay O'Reilly

Preserving the past just gained a new level of importance for me as a summer volunteer at the Kenai National Wildlife Refuge. I have been working on the backcountry trail crew, and I have been able to see and experience some of the best wilderness that the refuge has to offer. My wilderness appreciation just got a further boost after a weekend of remodeling the public-use cabin on Emma Lake.

The Emma Lake cabin, like many on the refuge, is a historic place. Joseph Secora built the cabin after he served with the Army Air Corps Rescue Squad in Alaska during World War II. Retreating to the wilderness, Secora took up gold mining downstream from the outlet of Emma Lake to Indian Creek. He led a life of solitude and self-reliance, and his cabin displays the hard work of a skilled craftsman with its split-log chinking and hand-sawn planks, three windows, roof, and front porch.

Secora lived there until 1972 when he died in an airplane accident at the Forks of the creek. After visiting the cabin, I have come to realize the importance of preserving this and other historic cabins on the refuge, and I feel fortunate to have had a hand in this preservation.

Trail crew member Kathy Pearson, backcountry ranger and historian Gary Titus and I devoted two days to maintaining the cabin and its access trail from Tustumena Lake. We cleared the cabin of all unnecessary articles and cleaned it top to bottom. With the floor repainted and a fresh coat of varnish on the ceiling and walls, the room took on the warmth of care and upkeep. And, with a load of firewood stocked outside, it will take on the warmth of home to the next visitors who pass through.

We also cleared the trail up from the cabin to the high country, which chases the ridge through meadows bright with fireweed, patches of sweet blueberries and vast views into the heart of the refuge. Looking down on the headwaters of the creek and a herd of caribou on a distant slope, our day reached its peak and concluded with a hike back down to the cabin.

Recorded in the cabin journal are messages from

others who shared appreciation and respect for the place during their stay. The refuge asks that visitors write the date and events of their visit, the condition of the cabin, and that they leave the cabin cleaner than it was found.

Respecting the cabin not only ensures that others will enjoy it, but honors the memory of its past inhabitant and preserves an aspect of Alaska's cultural history for the future.

The remains of approximately one hundred historic cabins are known to exist within the refuge boundaries. Without a crew to maintain these cabins, the work of homesteaders like Secora, and others dating back to the late nineteenth century, would be left to rot into the ground. With that, an enriching history would be lost.

The cabin is not just the work of a man, but a monument to a way of life. The wildness and freedom that epitomize the Last Frontier are perpetuated by the experience of wilderness. For Alaskans and visitors alike, immersing in the wilds as men like Secora have done can continue the essence of that lifestyle.

Coming across a cabin while trekking in the woods, a wilderness experience may be enhanced by sharing a connection with the land's history. A tent can be pitched by anyone at nearly any place, but those who breach the trails less traveled may find shelter in a cabin that is a unique historical asset to the refuge.

Each cabin is different, a monument to an individual builder. And each deserves care and respect, to be treated as a home to Alaskan history, to be treated as you would your own home.

In the time I spent at the Emma Lake cabin, I gained respect and knowledge for the building, for the man who built it, and a sense of what his daily life was like. I have traveled a great distance to spend my summer in Alaska and it was the lure of wilderness that led me here. However, it has made the wilderness come alive to know its history, to know the legends of the mountains. More than merely shelter, the cabin is a part of the complete wilderness experience the refuge has to offer.

Spend a night under its roof—your boots by the stove, sunset on the lake, the call of a loon echoing your own solitude—and you will experience truly what life in Alaska, or simply Life, is all about.

Lindsay O'Reilly is a Student Conservation Association volunteer on the backcountry trail crew at the Ke-

nai National Wildlife Refuge. She is from Massachusetts and is a student at Bard College in New York. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Blown down trees reveal secrets of the forest—past and future

by Ed Berg

I have spent the last several weeks looking at blown-over trees in logged forests of the central and southern parts of the Peninsula. The loggers left small live white spruce trees, as well as birch trees of all sizes, to provide seeds for a new generation of forest after the great beetle-kill of the 1990s. The downed birch trees were mostly alive prior to their fall, but the bark beetles had nailed many of the spruce trees after their larger brethren had been logged off.

The idea of leaving seed trees is sound in theory, but in practice it hasn't worked too well. First, as I said, the beetles have subsequently killed many of the spruce, even pole-sized trees down to four to five inches in diameter. Second, there is the general problem of "wind-hardening" or lack thereof. Trees that grow up in a crowded stand are protected from the wind by their neighbors. Trees that are open-grown, however, are constantly exposed to the wind and put out wider and stronger roots for mechanical strength against the wind. When a dense stand is logged, the remaining trees are unprotected and often are blown down. It is a shame to see huge birch trees that could provide millions of seeds going down in our strong winter windstorms, but that is a fact of life on the Kenai.

These wind-thrown trees, however, have provided an opportunity (a "windfall," one might say) for studying the forest fire history of the area. The tipped-up throw mounds expose the mineral soil quite nicely, sometimes lifting the top foot of soil from a patch six to eight feet in diameter.

In the exposed soil we can often find fragments of charcoal from forest fires of long ago. This charcoal can be dated using radiocarbon (Carbon-14) dating, such as archeologists commonly use for charcoal and bones from pre-historic sites.

Using throw mounds to find charcoal is much easier than digging holes. I and my colleagues from the Kenai National Wildlife Refuge—principally Candy Cartwright and Pam Russell—have become quite adept at finding charcoal in these throw mounds.

Using a trowel, we can check out a mound in about

five minutes to see if it has charcoal. If we find charcoal, we spend another 15 to 20 minutes collecting enough material (i.e., a teaspoon of charcoal) and taking a GPS reading of the mound location. The charcoal is usually in small fragments—a quarter to half inch-sized flakes—and it takes some patient troweling and sifting to find enough flakes to provide a dateable sample.

We have enough funding to send at least 50 of these samples to Beta Analytic, a commercial laboratory in Florida for radiocarbon dating.

Most of the charcoal we have found appears to be quite old: it is located within an inch or two of the top of the mineral soil layer (which is usually wind-blown silt or loess from the last glacial period), and underneath two to four inches of volcanic ash. Radiocarbon will provide age estimates to plus or minus 50 years or so, and I expect that these ages will show that most of these stands have not burned for many hundreds of years.

The area we have been studying is not small: it covers roughly 80 square miles of logged lands east of the Sterling Highway from Clam Gulch (Falls Creek Road) to Happy Valley (Cottonfield Avenue). We sample about every half mile along the logging roads, looking at anywhere from four or five to 40 or 50 throw mounds at each stopping point, depending on how many stumps are available within a few minutes walking distance of the road.

In a pilot study last year along East Road, southeast of Ninilchik, we found some younger charcoal, on burned wood. This material was located at the base of the organic layer, above the mineral soil and volcanic ash layers. We dated four samples and got dates around 1640, indicating that this stand has not burned for more than 350 years.

This year we have found more deeply buried charcoal (as described above) in the same area, which should provide dates for a much older fire or fires.

Some interesting observations are emerging from this study. First, let me note that, as I have discussed in several past columns, our tree-ring studies have shown

that forests from the Kenai River through Homer to the south side of Kachemak Bay were heavily hit by the bark beetles in the 1870s and 1880s.

Nine of the 11 stands that we have examined in detail in this area show a strong pulse of growth (i.e., wider rings) in the surviving trees after the forests were thinned by the beetles at that time.

Furthermore, we have never found any evidence that these beetle-killed stands burned after the outbreak, even though this widespread regional outbreak was locally as severe as the present outbreak, especially on the Homer bench. The fact that even the youngest charcoal we are finding in the logged areas is 350 years old again confirms the fact that these areas did not burn after the beetle-kill of the 1870s and 1880s.

The second observation bears on the future of the logged areas of the Kenai. We have looked at hundreds of throw-mounds, and in most mounds we can see the remains of old wood under the roots.

These rotten fragments are remnants of old “nurse” logs and stumps on which the present trees germinated and took root. These nurse logs and nurse stumps are usually not burned, indicating that the previous generation of trees came and went without burning. The only burned wood that we have found is from the 1640s fire. In this case, the oldest members of the present generation of trees germinated on burned wood, but over the rest of the study area we don’t see this; the present trees germinated on unburned wood.

Ideally, a forest fire consumes much of the organic layer of the forest floor and exposes mineral soil. Spruce, birch and other hardwoods love to germinate on mineral soil, and a good severe mineral-soil exposing fire is the fastest way to get the forest to grow back. Severe burns also provide the best hardwood browse for the moose, in the form of willow, birch and aspen.

In the central and southern Peninsula, however, we rarely get good mineral soil-exposing fires because of the heavy grass cover. Trees do not establish easily in heavy grass. Even if a seed germinates, it has to push its roots through many inches of heavy sod.

Furthermore, the heavy sod insulates the soil and reduces the soil temperature. In short, this means that to survive in a thick grass situation, tree seeds must germinate and establish on nurse logs and stumps. Mother trees advising their seed babies about grass should best say, “Don’t even go there!”

The problem with logging in forests with grass (i.e., our native bluejoint grass *Calamagrostis canadensis*) is

that removing the logs removes most of the nurse material for new seedlings.

Heavy equipment sometimes scarifies the soil during logging, and we often see seedlings established in Cat tracks and wheel ruts, as well as along roadside edges.

Generally, however, natural regeneration of spruce and hardwoods is very poor in the logged areas that we have visited; there are simply very few places where seeds can effectively germinate and establish; the grass is too thick and most of the potential nurse wood has been removed.

We have been pleased to see good survival of nursery seedlings—both spruce and lodgepole pine—in the areas that have been artificially planted. These seedlings were raised in a nursery for several years and then replanted with a mechanical tree-planter that opens a furrow in the soil. In my opinion, tree planting—mechanically or by hand—is probably the only way to effectively reestablish the forest in the logged areas.

Fire would be best, but it is too expensive and probably too dangerous to try to burn the many thousands of logged acres with prescribed burning, especially with fire severe enough to expose mineral soil.

The unlogged areas will slowly regenerate new forest as they always have in the past, but the beetle-killed trees must first fall down and then become rotten, before they can become seedbeds for new trees. These processes can take 20 to 40 years, just to prepare the seedbed, let alone to regrow a new tree.

In our 250-year tree-ring record we can see that past beetle outbreaks were less severe than the 1990s outbreak, and left many more surviving trees. These trees were usually stunted poles that began to grow more rapidly when the canopy was opened up by the death of larger overstory trees. Foresters call these poles “advanced regeneration” and they may recommend that a stand be mechanically thinned to release growth of these poles.

With much of the beetle-killed forest in the southern Peninsula, however, we don’t see many pole-sized trees, so this forest will not be replaced by release of advanced regeneration, as it was in the past. Thus, the natural forest will be replaced more slowly than it was in the past, because it will have to regrow from scratch with new seedlings on nurse wood.

The take-home message for landowners on the Kenai who have logged their forests is, I think, pretty straightforward: if you want trees to regrow on your

cutover lands, you had better figure on replanting the trees.

Nature may take its course, but there is no reason to think that trees will ever naturally regenerate on heavy grass sod, even on a scale of centuries. Without nurse logs or fire, there is simply no place in Calamagrostis turf for a seedling to get a foothold.

Tree planting is not a minor undertaking, but Congress has recently appropriated \$500,000 to help Alaska landowners replant trees on parcels of at least seven acres. The Forestry Incentive program can cover up to 65% of the costs of site preparation, seedlings, and plantings.

For information call Al Peterson at the Alaska Di-

vision of Forestry in Soldotna at 260-4221.

Additional information on bark beetles can be found on his *Cycles of Nature* Web site at http://chinook.kpc.alaska.edu/~ifeeb/cycles/cycles_index.html.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Peninsula forest history also will be discussed in his one-credit Geology of Kachemak Bay course at Kenai Peninsula College starting Sept. 10. For more information about the course, contact KPC at 262-0300. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

‘Foot-powered’ adaptive management on the Kenai National Wildlife Refuge

by Jim Hall

For the last few years, a subtle change has been occurring in the amount of people who are using the “horse trails” associated with the Benchlands above Tustumena Lake on the Kenai National Wildlife Refuge.

Some of this increased use is associated with folks accessing the area for caribou and moose hunting, and some has been with people who just want to go up and see the area in all its splendor. With any change in the way people use land, there is a corresponding set of consequences that occurs, such as: bear encounters; increased erosion; additional trash; etc.

In the science of land management, the words “adaptive management” refer to the ability to adapt management strategies to change. Can adaptive management overcome these kinds of problems?

As with many issues, one cannot understand the full scope of the problem without having firsthand knowledge of the lay of the land, the perceptions of the human users, and wildlife patterns of the area. So, refuge manager Robin West and I decided to hike the two main Benchlands horse trails in late July to determine if the trails could be relocated, or what, if anything, could be done to decrease the frequency of human-bear interactions in these areas.

We began our hike on a Monday morning at 10 a.m. on the shores of Tustumena Lake at the mouth of Bear Creek. For those of you who have never hiked up these trails, I’m inclined to say, “Don’t.” If at all possible, ride a horse! The trails have evolved with hunters and guides over the years, and they are now slotted ruts—a series of 12-inch deep holes spaced three feet apart.

The concept of “trail” is just that in this scenario—only a concept. A horse does not like to step on a high point, so over time, the holes in the trails have gotten deeper and deeper, OK for a horse, but very tough when you’re toting a backpack on foot!

Bear Creek trail follows the creek for a couple of miles, then turns and winds its way upward to the Benchlands, which is a high plateau. The morning we were on the trail, it was hot, muggy and the

mosquitoes were horrendous. One problem associated with hiking a fall trail in the late summer is that you may be the first person on that trail since the preceding fall, so the vegetation has had all summer to grow, unencumbered, completely concealing the trail in places!

Such was the case with us, and by late evening we had lost the trail somewhere near treeline. With the trail now gone, we made the decision to cut cross-country heading east, because all the alpine was to the east.

Three hours later we exited timber at “top camp,” and two hours after that across a few more miles of tundra, we camped for the night atop a small hill. Night came as we watched a small bull caribou trotting across the alpine.

By 6 o’clock in the morning we were up, loading our packs, and by 6:30 our feet were headed south toward the Bear Creek drainage and the elusive top camp trail that runs to Moose Creek below a prominent landmark on the Bench lands.

After bushwhacking through two drainages, including Bear Creek, we finally struck the trail. Lunchtime found us at the Moose Creek top camp, where we had a bite to eat, and I marveled at the garbage left behind from last hunting season.

Burnt scraps of a paperback suspense novel crowded the burn pit, while plastic buckets littered the landscape. Robin and I discussed how to get all of that garbage down from Moose Creek top camp, and how wilderness values were affected by its presence there.

All of this area, including Tustumena Lake, was designated as a Wilderness Area by Congress in 1980, so that present and future generations of Alaskans and Americans in general could enjoy the wild, scenic grandeur of this beautiful area of the Kenai Peninsula.

Time was moving, and so were we, and by 3 p.m. we were back on the shores of Tustumena awaiting our pickup boat.

The trails? Despite walking every foot of the Bear Creek and Moose Creek trails in the short time allotted to us, neither Robin nor I could see any logical, cost-effective method for relocating the trails away from

the creeks, the salmon therein, and the bears that result from the salmon.

However, we did decide to have our trail crews clear the sections of trail along the streams late next summer, thereby increasing visibility, and thus, hopefully, reducing the bear encounters.

As we sat there on the shore of Tustumena, silently absorbing the warm sun after a long hike, a small black bear stepped out onto the beach looking for an easy salmon to snag out of Moose Creek.

It watched us for a few moments, while we watched it from a distance of only 40 feet or so, before it finally decided that it would be better to hunt for fish

within the confines of the spruce, and it slipped from view.

It was the only bear we sighted in two days, and perhaps for me at least, a reminder of the resources the refuge protects and part of what makes living in Alaska so special.

Jim Hall has been the deputy refuge manager at the Kenai National Wildlife Refuge for the last two years. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Injured birds of prey have place on refuge

by Liz Jozwiak

The Kenai Refuge is one of a handful of National Wildlife Refuges that has had an active bird rehabilitation program since the mid-1980s.

Because of the proximity of Refuge Headquarters to the communities of Soldotna and Kenai, residents have a place to take injured birds. Even off refuge lands, as part of the U.S. Fish and Wildlife Service we are responsible for protecting all migratory non-game birds under the Migratory Bird Treaty Act. Most other Refuges do not have a federally licensed bird rehabilitator on their staff, or a wildlife veterinarian in town willing to donate his or her time to treat wildlife.

Here on the Kenai, we are lucky to have both.

With the help of various refuge biologists, technicians, local veterinarians and several trained and extremely dedicated community volunteers, the Kenai Refuge has handled, treated and/or released back into the wild over 150 sick or injured bald eagles, 45 to 50 hawks and owls, and a fair number of geese, ducks, swans and songbirds.

Over the years we have also had a wide variety of birds stranded on the Kenai Peninsula that needed some R and R. In 2001, for example, a snowy owl was discovered along the coast in North Kenai that we suspect was blown off course during his migration to warmer wintering grounds. A juvenile marbled murrelet was found on an offshore oil platform in Cook Inlet that probably hatched in the rigging during the summer.

Because of staffing and time restraints, we only hold the birds that we receive for a short period of time. Any birds that require long-term care and rehabilitation are transferred to the Bird Treatment and Learning Center in Anchorage, with Era Aviation graciously shipping these birds to Anchorage at no charge.

You may ask why we receive so many injured birds. Most of the bald eagles and great horned owls are due to impacts with vehicles. Bald eagles are hit by vehicles when they feed on roadkills (or moose gut piles) that are close to the highway, and they cannot get airborne quickly enough.

Almost every September, juvenile great horned owls are hit by cars along the Sterling Highway. These

inexperienced young owls are learning to catch small mammals such as voles, and they are attracted to roads because their prey is easier to spot.

Sick birds have had been diagnosed with lead poisoning either by feeding on an animal or fish with lead pellets or lead fishing weights. Other recent patients have been ill from eating contaminated garbage. Many birds also are injured in the summer when they get entangled in discarded monofilament fishing line.

Encounters with powerlines (either by collisions or electrocutions) have been another source of injuries to birds on the Kenai Peninsula.

A northern boreal owl collided with an electrical transmission line a few years ago and dislocated its shoulder. A juvenile osprey that was electrocuted and had all his feathers burnt off actually survived and was successfully rehabilitated.

Most other raptors that are electrocuted are not nearly so lucky because electrocutions are almost always fatal.

We are pleased to announce that we now have a new improved flight pen to house winged patients. Our new flight pen has been under construction for the last two summers by Boy Scout Troop 152, as Robert Doty's Eagle Scout Project. Congratulations, Robert, on its completion!

The rehab pen was built near the Refuge headquarters and can house two eagles or hawks at the same time.

The pen also can be expanded as an exercise flight pen for birds about to be released back into the wild.

Our bird rehabilitation program has been an ongoing success for many years because of the dedication of the many refuge staffers who at one time or another have responded to injured bird calls, often at strange hours.

Also critical for success are the various state agencies which help respond to injured bird calls, including the Fish and Wildlife Protection Officers of the Alaska State Troopers, Alaska State Park Rangers, as well as our two locally licensed bird rehabilitators, Cindy Sherlock and Marianne Clark, and veterinarians Bart and Sandy Richards of Richards Veterinary Clinic.

Elizabeth Jozwiak is a wildlife biologist and a li-

censed bird rehabilitator who heads up the Rehabilitation Program at the Kenai National Wildlife Refuge. For more information about the Refuge, visit the headquar-

ters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Migratory Bird Treaty Act sets the ground rules for waterfowl hunters

by Rob Barto

As daylight slowly dwindles and temperature drops, our thoughts turn from chasing salmon and halibut to chasing moose, caribou and waterfowl. As an avid waterfowl hunter and enforcement officer, I'd like to discuss some of the sticky points about the many laws enforced under the Migratory Bird Treaty Act (MBTA).

The original MBTA was enacted by Congress in 1913, but it was judged unconstitutional because it didn't address commercial hunting of waterfowl. In 1918 Congress passed a revised MBTA that with several amendments is the foundation for our present migratory bird laws. Basically, all "international" birds that migrate between Russia, Canada, Mexico and the U.S. are protected under federal law, including migratory game birds such as ducks, geese, swans, doves, pigeons, and cranes.

Let's take a look at how the MBTA regulations would cover a trip out Mystery Creek Road for some waterfowl hunting. Before departure, hunters need to purchase both federal and state duck stamps at the post office or sporting good stores. For a duck stamp to be valid, you must sign your name in ink across the face of the stamp. The stamp itself does not need to be attached but does need to be in your possession while waterfowl hunting. It's also good to pick up a copy of the waterfowl regulations, put out by the Alaska Department of Fish and Game, and generally available at sporting good stores or the Fish and Game headquarters on Kalifornsky Beach Road in Soldotna.

Once in the field, you need to know what species can be hunted and how many of each you are allowed to possess. This is usually the first place that people go astray.

Field possession is best described as the total amount of waterfowl one individual is allowed to have in hand while in the blind or walking to and from his or her vehicle or camp. For Game Management Units 7 and 15 (the central and northern Kenai Peninsula), a hunter is allowed to walk from the blind with eight ducks, four dark geese, three white geese, eight common snipe, and two sandhill cranes.

While hunting with other individuals, you may carry their birds out for them. However, if you are walking out at different times, the person carrying the birds must have in his or her possession a slip of paper with the absent hunter's signature, date, address, and the number and species of each bird being brought out. This prevents the warden who checks you in the blind, or en route from your blind to your vehicle, from seizing all your birds and writing you an over-possession violation ticket.

Possession limits off the hunting grounds are the next sticky point. Possession limits come into force when hunters either reach their personal residences or temporary lodging such as a motor home, duck shack or tent.

When staying at a temporary residence, hunters are allowed to have the full possession limit of waterfowl; in Game Management Units 7 and 15 a hunter would be allowed to have a total of 24 ducks, eight dark geese, six white geese, 16 common snipe, and four sandhill cranes. However, all birds in camp must be clearly labeled with the hunter's signature, date and total number of species and birds.

The best way to do this is, upon arrival at your camp, write down on a piece of paper the date, total number and species of all the birds you shot during the day and place this paper with the birds.

Once in camp, hunters are allowed to field dress waterfowl, but for identification purposes, a fully feathered wing or head must be left naturally attached to the bird. Hunters are not allowed to bring from the field any breasted birds. Birds that are eaten in the field are no longer part of your possession and do not have to be recorded.

I realize that this is only a fraction of the regulations governing waterfowl hunting, but as an enforcement officer I find that these are the most frequently violated and least understood regs. Hopefully this article has given you a better understanding of these regulations.

If you have further questions, feel free to contact me or any of the other officers here at the Kenai

Refuge. Our telephone number is 262-7021.

Rob Barto is a law enforcement officer at Kenai National Wildlife Refuge. For more information about the

Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Caribou herd reduction accomplished natural

by Rick Ernst

Sometime during this past winter an avalanche swept down a steep mountainside near Alpine Lake just west of Skilak Glacier.

Avalanches are nothing new on the Kenai Peninsula, but this one was very different: It took at least 143 caribou with it.

Caribou historically roamed the Kenai Peninsula until 1912. Some suggest that widespread fires may have decreased the amount of habitat; others concluded that caribou were probably exterminated by overhunting, as market hunters hunted caribou for mining camps during the early 1900's.

After a hiatus of 53 years, caribou returned to the Kenai Peninsula through a cooperative effort of the U.S. Fish and Wildlife Service, U.S. Forest Service and Alaska Department of Fish and Game. Fifteen caribou were released at an airstrip near Chickaloon River in 1965 to form the Kenai Mountain herd.

Another 29 caribou were released at Watson Lake, near Sterling, the following year, which became the Lowland herd. The Kenai Mountain herd now roams the mountains north of the Sterling Highway to Turnagain Arm. The Lowland herd is commonly seen along the Kenai River flats and north of the Kenai Airport in summer, and in the Moose River drainage north of Sterling in winter.

The next releases were made in 1985-86 to reestablish caribou on the Skilak-Tustumena benchlands and in the Caribou Hills (where the last original caribou were known to exist). Twenty-eight animals were released on Tustumena Glacier Flats, 18 at Lake Emma, 16 at Caribou Lake, and 18 at Green Lake. These releases became the Fox River, Killey River and Twin Lakes herds. But my avalanche story relates to the Killey River and Twin Lakes herds.

These releases have been very successful, especially for the Killey River herd, and wildlife managers have become concerned that the increasing population of caribou is overgrazing the habitat to the point that it cannot be supported. Hunting of the Killey River herd was first allowed in 1995 and continues today, with the goal of limiting population growth.

Our October 2001 census showed the Killey River herd at 643 caribou and the Twin Lakes herd at 67. In

March 2002, biologists from the Alaska Department of Fish and Game, U.S. Fish and Wildlife Service and the U.S. Forest Service met in Soldotna to discuss caribou management. Several years of radio-tracking data showed that the Killey River and Twin Lakes herds intermingle frequently, so we decided to consider the Killey River and Twin Lakes herds as one population, at least for management purposes.

The newly enlarged Killey River herd had a population of just over 700 animals—the largest on the Peninsula. This reclassification also opened access for caribou hunters who could now fly in to Twin Lakes and Iceberg Lake. Hopefully, this increased hunter access would raise the harvest of caribou and slow the population growth of the Killey River herd.

In late October and early December of 2001, we collared ten caribou calves and put global position satellite (GPS) collars on five cows in the Killey River herd. When I tracked these animals on March 6, I noticed that five of the radio-collars were on “mortality mode,” which is an 80-beat-per-minute pinging sound from the collar transmitter when the animal has stopped moving for an extended period. I also noticed a snow slide that came down the mountain all the way to Alpine Lake.

On a later flight I, picked up four more collars on mortality mode near Alpine Lake, and began to suspect that an avalanche had killed the radio-collared caribou. I also realized that if nine out of 21 radio-collared caribou were dead, there were probably many more dead caribou lying at the base of that avalanche.

Biologists didn't get to the location until early April, while recapturing caribou that were captured the previous October as calves. However, the snow was too deep to locate the radio-collars.

On May 28, Fish and Game biologist Ted Spraker, Doug Fesler of the Alaska Mountain Safety Center and Deputy Refuge Manager Jim Hall visited the site by helicopter. The helicopter prop wash filled the sky with caribou hair, and caribou skulls and bones lay scattered over a large area. Skulls were picked up and cached in a gully in the hopes that predators would not scatter the counted skulls with those yet to be uncovered as the snow melted.

One cow that Spraker dug up displayed the extreme force of the avalanche through her twisted and broken form. Looking at the scene, Fesler estimated that the avalanche occurred in late December or January, with a speed of approximately 80 mph, and that it was very likely a soft slab avalanche involving dry cold snow.

This first assessment counted 48 dead caribou: 17 bulls, 30 cows, and one calf. It appeared that the caribou were walking across the slope when a sheet of snow gave way and swept the animals in its path.

A follow up visit on July 8 by Hall, Fish and Game biologist Gino Del Frate and I uncovered an additional 87 animals: six bulls, 73 cows, and eight calves.

That brought the total, including the previous visit, to 135. I was in awe at the sheer number of broken bones and how they were scattered over rocks and tundra. Tufts of hair and hide were stuck on the sharp rocks. Bears, wolves, wolverine, and eagles were reap-

ing the benefit of the caribou's demise. There were still animals buried in snow and a later visit would be necessary.

I made one last trip on Sept. 9 with refuge officer Rob Barto. Much of the snow was melted and we counted an additional 8 animals. We recovered another radio-collar. This made a total of 143 caribou killed by this natural event, and that number is a minimum. There may be additional animals still buried in snow patches, or even deposited in Alpine Lake.

Some animals may have been injured and died elsewhere. Any way you cut it, this was an incredible event and will have a big impact on future management of the Killey River herd.

Rick Ernst has been a pilot and biologist at the Kenai National Wildlife Refuge since 1992. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Refuge sponsors play about Rachel Carson

by Candace Ward

The Kenai National Wildlife Refuge will host the play, *A Sense of Wonder*, at Soldotna High School auditorium on Oct. 11 at 7 p.m. The play is based on the life of Rachel Carson, noted American writer and conservationist.

The refuge is sponsoring this inspirational play as a gift to the community, as part of our centennial celebration of the National Wildlife Refuge System. KDLL Public Radio and Soldotna High School are cosponsors. There is no admission charge.

Actress Kaiulani Lee performs *A Sense of Wonder* as a one-person drama. Due to the mature theme of the play, the performance is recommended for ages 13 and older.

In 2000, Ms. Lee performed the play in Anchorage, Fairbanks, and Kodiak. From her experiences on that tour she fell in love with Alaska, and is excited about traveling and performing on the Kenai Peninsula this October. Ms. Lee has performed in movies, television, and on Broadway, where she won an BIE award.

This year marks the 40th anniversary of biologist Rachel Carson's ground-breaking book *Silent Spring*. Written in 1962, the book first warned the public about the long-term health hazards of pesticides to wildlife and people. The public outcry over pesticide abuse after the publication of *Silent Spring* made Rachel Carson one of the most controversial public figures of the 20th century. Who was this very private person that reluctantly became so notorious?

Rachel Carson was born in 1907 and spent her childhood in rural Pennsylvania. Even as a child she felt a deep fascination with the sea. This interest led her to pursue a master's degree in zoology with an emphasis on marine wildlife.

She began her career with the U.S. Bureau of Fisheries as a science writer of radio scripts on marine topics. In her 15 years with the federal government, she became the chief editor of all publications for the U. S. Fish and Wildlife Service.

In her free time, she wrote scientific articles for newspapers and magazines that were distinctive because they were written for a general rather than a

scientific audience. Over the course of two decades she wrote several award-winning books about the sea, including *Under the Sea Wind* (1941), *The Sea Around Us* (1952), and *The Edge of the Sea* (1955), and the children's books *Help Your Child to Wonder* (1956) and *Our Ever Changing Shore* (1957).

The success of *The Sea Around Us* allowed Carson to resign from her editor job and work full-time as a writer. Disturbed by the widespread and intensive use of chemical pesticides after World War II, Carson wrote *Silent Spring* about the dangers of misusing pesticides. Carson noted in a letter to a friend that writing *Silent Spring* "was simply something I believed in so deeply that there was no other course—I told you once that if I kept silent I could never again listen to a veery's song without overwhelming self-reproach."

Testifying before Congress in 1963, Rachel Carson called for new laws to protect human health and the environment, such as the outlawing of DDT. Congress subsequently passed much of this legislation, but not before she had died in 1964 after a long battle with cancer.

In national polls, Rachel Carson ranks as one of the top 100 writers, conservationists, and American women of the 20th century. She acted as an eloquent witness for nature and continues to inspire new generations to protect the environment.

Please join us for a very special evening commemorating Rachel Carson's legacy. You will find both entertainment and inspiration in Kaiulani Lee's *A Sense of Wonder*.

More information on Rachel Carson's life is available in the biography *Rachel Carson—Witness for Nature* by Linda Lear and on the Web site <http://www.rachelcarson.org>.

Candace Ward works as a park ranger in the Kenai National Wildlife Refuge's visitor service program. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

A season full of wonder and enjoyment for everyone

by Candace Cartwright

Well here we are, another fall has come and swept all of its leaves and frost onto our doorsteps. For the past three years, this season has been one of chaos and uncertainty for me. Being a seasonal employee here at the Kenai National Wildlife Refuge, I only work from May to October. Each year I would migrate up to Fairbanks, following my husband, who was attending college there. Of course, with that comes the endless tasks of moving: looking for a new job, packing, changing all our addresses, packing, pulling hair out and repacking.

Finally, I am down on the Kenai Peninsula year-round. This fall I decided to embrace the days rather than stress about them. After all, who could argue that fall is the most enchanting of the seasons? There are colors of gold, orange, brown and green painted across the countryside like a scene out of a Bob Ross painting. The trees sway and dance, while at the same time showering the ground with colorful leaves. And sometimes, the landscape shimmers with ice crystals built up ever so delicately on the leaves and twigs. And there is always a fresh, sweet and crisp taste in the air.

Fall is a time of year that symbolizes the end and a new beginning to some of nature's life cycles. Strong winds of the season are blowing down dead trees, making new nurse log material for future seedlings, as well as dousing our lights. The wasps that seemed to target me last summer are now cowering helplessly about the ground, as only the queens survive to hibernate through the winter and rear a new brood for next spring.

For many animals, fall is a time of great preparation. You can often see voles and red squirrels frantically running about collecting every bit of food they can find to cache for the oncoming winter.

My big push for this fall is to get outdoors and do the activities that I have been wanting to do all summer. Hiking, canoeing and non-rainy camping trips are always on my wish list. Unfortunately, I always have trouble finding people with whom to do things and I am not one for going it alone in the outdoors. If there is one thing I have learned about Alaska, it is that summers are non-stop and extremely chaotic. If people aren't working at their job, they're working on their house, yard or just trying to avoid the mad rush

of tourist traffic. I spent most of my weekends helping my in-laws with their yard work and avoiding the traffic (which is more than enough to try my patience).

Now that summer is over and done with, I am looking forward to getting out on some recreational hikes in the Kenai National Wildlife Refuge. I hope to venture up the Fuller Lakes Trail or the Kenai River Trail this coming weekend, before too much snow falls. I have always wanted to go up Hideout Mountain, so that is a possibility as well. And of course, a nice canoe trip along the Swan Lake Canoe system doesn't sound too bad either. If anything, it will be a nice time to do some relaxing and stress-free activities with my husband.

There are so many options to choose from when it comes to recreation on the refuge: hiking, canoeing, kayaking and horseback riding are just a few. Any one of them would make for a fun and enjoyable day, especially during this time of year. Now that the windstorm has come and blown all the leaves off the trees, you might spot something new that you could not have seen before. And with the migration of many birds and waterfowl under way, now is a great time to get out the binoculars and do some wildlife viewing.

It is a relief not having to head north this year. I am more than content to take a nice walk outdoors, then come inside and crawl up on the couch with a hot cup of apple cider and a good book at the end of a day. Some things will remain constant. I still will be searching for a winter job, and I'll try convincing myself that I will go through and clean out the massive amount of junk I have collected through the years. A great and never-ending task this last one is, I know, but fall gives me the energy to even think about it!

For me, fall is a time to shed away the old and begin with the new. I hope that whatever fall is for you, that it brings all the joy and freshness of mind it brings me. I just wish it would last a little longer!

Candace Cartwright has been a seasonal Biological Technician with the Kenai National Wildlife Refuge since 1999. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Wildland fire use is sometimes a difficult pill to swallow

by Doug Newbould

There is an interesting and very important debate occurring these days, among scientists, land managers, environmentalists, politicians and citizens all across America. What—if anything—should be done about dangerous accumulations of forest fuels, especially in the western United States? Since we've already been through the finger-pointing stage in this debate and most of the blame has been placed upon 20th century forest fire suppression policies and forest management practices, most of the debate is now centered around the "How do we fix it?" question.

Congress tried to deal with the forest health issue back in the mid-90s with the "Salvage Rider," which was designed to streamline the salvage timber sale process on federal lands and reduce the accumulation of dead and dying trees in the nation's forests. That act, signed by President Clinton, and the resulting salvage timber sale programs ultimately failed because they circumvented the NEPA process (National Environmental Policy Act of 1969), effectively eliminating public participation in federal land management decisions.

Now, President Bush is attempting to address the problem with his "healthy forests" initiative, which would feature mechanical thinning of overstocked forests to reduce hazardous fuel conditions. Once again, there is an attempt to "streamline" the decision-making process by reducing public involvement. The success of this initiative, how it is implemented and what effect it will have upon the problem—remain to be seen.

Another land management tool that has been used to address the national fuels problem is the use of fire. Both prescribed fire and wildland fire use can be effective tools for reducing forest fuel accumulations. Both however, come with some degree of risk. Prescribed fire has been used successfully by land managers across the continent for many decades. Occasionally, a prescribed fire has escaped its intended boundaries and done significant damage to public and private resources (remember the Cerro Grande Fire in Los Alamos, New Mexico?). These "bad apples" tend to spoil the whole bushel, resulting in management reluctance and public fear towards the use of prescribed

fire.

Wildland fire use, which is the management or use of lightning-caused natural fires to accomplish prescribed land and resource management objectives, is a relatively new tool in the land manager's toolbox. Although natural fires have been allowed to burn in some National Parks, refuges and wilderness areas for decades, wildland fire use has only gained widespread interagency acceptance in the past several years. I have personally worked on both sides of the fence while the debate over "Let it Burn/Put it Out" raged in the eighties and early nineties. I was in Yellowstone in 1988 where on one side of an imaginary line—lightning fires were allowed to burn naturally (Yellowstone National Park), and on the other side we fought with everything we had to put the fires out (Shoshone National Forest).

As the Fire Management Officer on the Kenai National Wildlife Refuge, I have the full toolbox from which to select an appropriate management response for any natural wildland fire: from full suppression of the fire to simply monitoring the fire, depending upon the values at risk, the fire's behavior, the weather and any other pertinent information. During the 2001 fire season, for example, we decided to suppress the lightning-caused Mystery Hills Fire because of its proximity to the Sterling Highway. But another lightning fire (Thurman Creek) less than ten miles to the northeast, was allowed to burn.

This fire season I experienced another aspect of the debate. In August, I was sent to the Big Fish Fire on the White River National Forest in western Colorado. I was excited when I learned of the assignment, because I worked on the White River NF from 1985 until I moved to Alaska in 1991. In fact, I had spent many a day working and recreating in the area where the Big Fish Fire was located. So before I left Alaska, I studied the national situation report to get more information about the fire. I found out that the Big Fish Fire was started by a lightning strike in the Flat Tops Wilderness and was being managed to consume a heavy accumulation of downed-dead spruce trees from a spruce bark beetle epidemic in the late 1940's. Sound familiar?

My excitement at returning to my old stomping grounds and visiting old co-workers was quickly subdued, however, when I arrived at the fire. I actually felt pain in my heart when I surveyed the devastation of that once-magnificent vista. The whole basin around Trapper's Lake was burned out.

In fact, except for Trapper's Lake and the surrounding vertical-walled peaks, there was little that I recognized. My mind leaped back to a beautiful, sunny day not so many years ago when my wife and I took our two young children and our dog out on Trapper's Lake in our canoe for a leisurely paddle and some cut-throat fishing.

It was a day I'll always remember with love as my son first learned to use an open-faced spinning reel and how we were so proud of his nice casts—that is, up until he accidentally let go of the rod on his ninth or tenth effort. I remember thinking he was going to dive in after it and reaching out to stop him, and how mad he got at himself. But now, all of that was gone. I was again dismayed at the thought that my son or my daughter or my wife and I will never be able to share

the beauty of that place with each other or anyone else in our lifetimes. Whether it was right or wrong for the land managers of the White River National Forest to let that natural fire do its thing at that particular time, I don't know. My head says yes, but my heart says no. But I do admire them for making a tough decision, and sticking to their long-range plan. The debate continues.

So, I think I have seen the debate from all sides now. And I don't know if there is a perfect solution to the forest health problems we face here in Alaska and throughout America. But I do know we can't do it in a vacuum. We need to work together, and use all the good management tools available to us, both old and new. And we need to be patient. We can't fix a century's worth of misguided land management policy in a few years, or even a decade. But, we can try.

Doug Newbould is the Fire Management Officer at the Kenai National Wildlife Refuge. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Are peninsula beetle-killed trees rotting faster than they used to?

by Ed Berg

I am puzzled about how fast beetle-killed spruce trees are coming down. Every windy day seems to bring power outages somewhere around the Peninsula as dead spruce trees fall on power lines.

Most of these treefalls are caused by breakage of the tree trunk rather than uprooting of the whole tree. The trunks are simply snapping off several feet above the ground.

If you look at the fractured wood in the broken zone, you can often see white threads and felt-like sheets of fungal fibers called mycelia. This is a sapwood rot fungus called pinicola conk or red belt fungus (*Fomitopsis pinicola*), which typically infects wounded live trees or dead trees. There are many species of wood rot in the Kenai forests, such as artist's conk (*Ganoderma*) and the tasty orange sulfur shelf or chicken-of-woods (*Polyporus*), but the red belt fungus is by far the most common wood rot, especially on beetle-killed spruce.

Mushrooms and wood rot fungi first produce a vast unseen network of mycelia fibers in their host (soil or wood), and then produce a fruiting body, which makes spores for reproduction. Mushrooms are the fruiting bodies of soil and some wood fungi, and as mushroom hunters well know, these fruiting bodies are ephemeral and only appear for a few weeks after a wet period.

Wood rots, however, produce a permanent woody conk, which is typically a round bulbous or shelf-like structure several inches wide growing on a tree trunk. The conk of the red belt rot fungus is shelf-like to hoof-shaped, and has a banded appearance. Some specimens have a dark red lower band, and hence the name "red belt," whereas other specimens are gray to black with no red. The lower surface is white to buff with minute pores, which emit spores.

Conks don't appear until the rot is well established, which can take at least three or four years after a tree is killed by beetles. By the time you see conks on a tree, it is often quite rotten inside and dangerous to cut with a chainsaw, because the tree may fall before you have completed the cut.

This may be just an impression, but I think that our dead spruce trees are rotting much faster today than they did in the past. For example, in 1995, Chris Fastie and I collected 450 "cookies" (tree cross-sections) from the new Bufflehead Road on the north side of the Swanson River oilfield. We went along with the sawyers and they cut a cookie off the bottom of each tree (both white spruce and birch) after they felled it.

Many of the trees were standing dead spruce that had been killed in the beetle outbreak that followed the drought of 1967-69. Most of the bark was gone and you could plainly see the beetle scars. When we cross-dated the tree-rings, we could see that many of the trees died in 1970 (and that they had survived earlier beetle attacks in the 1850s and early 1900s).

The key point for this discussion, however, is that many (perhaps half) of the trees were still standing, even after 25 years, and the wood was sound, not rotten.

I spoke with former logger and saw miller Tim Smith, whose family has been logging out of Cooper Landing since the 1960s. He recalled logging beetle-killed spruce after a big 1974 blowdown in Cooper Landing, and said that the dead trees at that time were not rotting anywhere nearly as fast as the present beetle-kill in the forest.

Here is an even more extreme example: in the summer of 2001 we cored standing beetle-killed trees from the 1930s in Kluane National Park in the Yukon. The wood was hardly rotted at all, although the bark had long since fallen off. The Yukon has a dry climate: Haines Junction has 12 inches annual precipitation, whereas Kenai has 19 inches and Homer has 25 inches. It was a great pleasure to do our tree-ring studies over there because we had solid wood, and we were able to date burns to 1721, 1750, 1758 and 1850 (give or take a year or two) using unrotted burned wood.

I proposed my idea about accelerated Kenai rot rates to Mark Harmon, a visiting professor from Oregon State who is starting a research project on wood decomposition on the Kenai. He suggested that the

warmer summers of the last decade might be responsible.

Mark drew the analogy of a wooden fence post: exactly where does a fence post become rotten? The rot occurs right at the soil-air boundary, where the post experiences both wetting and warming. The below-ground part stays permanently damp and cool, and the aboveground part dries quickly after a rain. The collar at the soil-air boundary, however, wicks water from below and from the surrounding vegetation, but it is warmed by the surrounding air temperature.

Warm and wet is the perfect fungus combination, so that is why fence posts rot off at the ground level.

On this interpretation, the warmer summers may simply be providing a few degrees more heat in the summer, and the rot fungi have cranked up production. One test of this hypothesis would be to look at other fungi, such as soil mushrooms and athletes' foot, to see if these fungi have also increased in the last decade.

An additional factor might be that spore production and dispersal has greatly increased. Each conk on dead spruce produces billions of spores, and more conks are appearing every year. Each spore that somehow penetrates the bark can start a new rot infection in a host tree.

Bark beetles are known to carry blue stain (*Lep-tographium*) fungal spores on their bodies, so they probably carry various rot fungal spores as well. Other insects such as woodborers and carpenter ants, and even woodpeckers that attack dead trees, could also be vectors for spore dispersal.

Furthermore, the open dead forest canopy should allow wind to move spores around more effectively, and there certainly are plenty of holes in the beetle-killed trees through which spores might enter.

Regardless of whether or not our trees are rotting faster nowadays, it is probably a good thing that they are rotting as fast as they are rotting. We have a lot of dead wood to get rid of around here, all politics aside. The fire hazard of trees is greatly reduced with rotting, and it appears that our dead fuel load is rotting away at a much higher rate than it did after the outbreak of

the 1970s.

Ecologically speaking, tree rot is every bit as important as tree growth. As I discussed in a recent Refuge Notebook article, rotten wood produces the nurse logs and nurse stumps upon which seeds of the new forest germinate.

This is especially important in areas covered by thick grass sod or heavy moss ground cover. In mature white spruce and Sitka/Lutz spruce forests of the Kenai, you can see that many of the trees germinated "up in the air." The roots are forked at the base of the tree, and there is often a hole under the tree.

If you are brave and stick your hand down into this hole, you can often bring up the old rotten wood upon which the present tree germinated and took root.

When we examined hundreds of throw mounds of blown over trees in the logged areas of the central Peninsula, we found old nurse wood under most of these trees, both white/Lutz spruce and birch.

On the longer time scale, we know from the pollen record in lake sediments that white spruce came into the central Peninsula about 8,000 years ago, and that Sitka spruce came into Kachemak Bay about 2,200 years ago. If we figure that these forests are substantially thinned every 100 years or so by bark beetles (and much less frequently by fire), we might say that 80 generations of forests have come and gone in the central peninsula and 22 generations in Kachemak Bay.

Can you imagine what this place would look like if those trees never rotted, or what kind of fires we might have with such a fuel load? Let's hear three cheers for the wood rot fungi!

Further information on wood rot and bark beetles can be found in the Forest Service's excellent manual *Insects and Diseases of Alaskan Forests* (2001) which is now available online with color photos at <http://www.fs.fed.us/r10/spf/fhp/idbook/>

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Strange visitor questions keep Kenai National Wildlife Refuge staff hopping

by Brenda Wise

You might think that the job of an office worker at the Kenai National Wildlife Refuge is not very exciting. You might even think that doing the same job for over 12 years would be very boring and routine. Not so, dear reader.

When I started working at the refuge in January of 1989, I was a newcomer to Alaska. The only preconceived notions that I had about my new home were that it “didn’t get all that cold” and “it doesn’t snow all that much.”

Both these silly notions were soon tossed out the window when all it did was snow constantly for over a month, and then the temperature hit 67 degrees below zero.

It was back then that my friends and family in the Lower 48 started asking me strange questions. You know the ones, “Is it dark all the time?” and “Do people live in igloos?” I discovered that we “Alaskans,” the majority of whom have come from somewhere else, like to perpetuate the belief that we do live in igloos in order to deter the hords of people that would move here if they knew what a truly wonderful place Alaska is.

My first summer at the refuge had me looking forward to meeting and greeting people from all over the world who traveled here to visit. You may know them as the dreaded tourists that crowd our roads with their RVs and take up space on our riverbanks. These are the very same tourists that asked me the same questions, over and over, all summer long, regardless of where they came from. “Where can I see a moose? What are those plants with the big green leaves and red berries? Where can I catch a fish? What is that mountain across the water from Kenai? What is there to do here?” are just a few of the questions I answered on a daily basis.

By the next summer, I began to dread tourist season. I wasn’t looking forward to all those questions. Of course, I tried to take it all in stride, and developed some pretty standard answers. It wasn’t until I got my first really dumb question that I started looking forward to the dumb questions people ask. Once I started sharing my collection of funny tourist questions with

my co-workers, I discovered that we have all answered our share of strange questions.

Could you answer these questions, in a polite, professional manner and not give a smart answer or laugh?

Where do you keep the wild animals?

What color dye do you put in the river to make it that pretty color?

What time do you let the bears out?

What time of day is early morning (or late evening)?

Where can I see polar bears on the refuge?

Don’t you have the animals out back in cages?

At what mile marker will I see the bears?

Where are the wild animals? Well of course they are wild, so they are outside, not in cages. We have to explain where people can go to maybe get a chance to see what they are looking for, if they’re lucky.

What time of day is early morning or late evening? It varies, but most often you can base your answer on when sunrise or sunset occurs.

People that visit here often have no idea how vast and wild the Kenai National Wildlife Refuge is. The refuge is almost 2 million acres and is roughly the size of the state of West Virginia or two and a half times the size of Rhode Island.

At what mile marker will we see the bears (moose, wolves, etc.)? Last year, I had the opportunity to do some traveling outside, and visited the National Bison Range in Montana, operated by the U.S. Fish and Wildlife Service. There it finally dawned on me why so many people ask for specific mile markers and their desired critter.

The Bison Range is less than half the size of our Skilak Wildlife Recreation Area. There is a 19-mile drive (the length of Skilak Lake Road) and the staff knows exactly where their 350 to 500 bison are at any given moment and can tell you exactly where you can see them. Nice life, if you can lead it.

Some folks rightly complain that we answer in generalities about where they can see the wildlife. This isn’t a vest pocket Bison Range. It’s hard to pinpoint

the exact location of a caribou herd, brown bears eating salmon, moose, wolves, and elusive lynx in two million acres.

We give it our best shot, however, and we must be doing something right because the visitors keep coming back. And sometimes they come back with really

spectacular stories about what they have seen!

Brenda Wise has been a refuge clerk at the Kenai National Wildlife Refuge since 1989. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

The A-B-C's of prescription burning: Careful planning goes into process

by Dianne Maclean

A fairly nice early July day in South Central Alaska, one can just imagine it. Sunny and downright warm, the first reds are in, flowers are out, and the motor homes are honking their way into town.

Everywhere you look it is summer, sun and sure to be fun.

But what is that ugly brown smudge on the horizon that looks like smoke?

Someone in town says the refuge is doing a prescribed burn. Some eyebrows rise. Why in the world now? People are here to visit, and isn't it fire season? And what about all those news stories from prescribed burns that "got away" in other parts of the country?

These are questions that need to be asked, and actually are asked by fire managers themselves before the decision is made to conduct a prescribed burn (an Rx burn for short). The process begins months, sometimes years before a burn takes place. Public knowledge of and support for prescribed burning and how burn projects develop is important to the success of the entire program.

The first step is the identification of areas that would benefit from prescribed fire. Fire's role on the Kenai Peninsula is very different from what it is in the drier forests of the Lower 48, or even from other regions of this state. Many habitats in Alaska are adapted to fire. The landscape of the interior shows a lot of fire activity over the years, in fire scars and vast swaths of new trees.

Our landscape is more limited in size, and receives less lightning. But our spruce and hardwood forests have developed with occasional, fairly intense fires. The hardwoods especially depend upon that sort of disturbance to begin new stands that in turn provide browse and cover for many species of wildlife.

Identifying areas to consider burning begins with biologists from our own and other agencies giving direction on what they would like to achieve (objectives) through prescribed burning. It also begins with public input, with the overall plan for management of the refuge that tells the public where we will or won't use fire. Many areas are identified in formal

plans that cover a period of years. Other areas come about through discussion with neighboring agencies, and some are identified as a result of national focus on reducing hazardous amounts of dead and down trees, other woody debris (fuels) that pose a threat to homes, subdivisions or towns.

Once we have objectives in mind and we assess the fuels in an area, we begin to look at the specifics of how an Rx burn might be accomplished. We look at surrounding terrain, proximity to private or other lands, the likelihood of smoke impacting highways or homes, and the measures we would have to take to secure the boundaries. Areas that already have some natural boundaries, like rock ridges or rivers, that provide a good barrier to fire are always good because there is less impact to the land and less cost if we don't have to construct a barrier (control line).

We use both experience and computer models to give us the range of fire behavior we might see out there under a variety of conditions. Fuel moisture, the amount and size of the fuel, wind from several directions at different speeds, the slope of the land and how much sun it gets (aspect) are the conditions that affect fire behavior. Many different combinations of these conditions go into the mathematical formulas that tell us how fast the fire is likely to spread and how intense it will be.

From this we can get a range of limits to these conditions, or parameters within which to conduct the burn. The overall description of objectives, reasons for the burn, parameters, expected fire behavior and its effects on the vegetation or wildlife is called the prescription. Computer models are pretty precise, but they are still models and we will adjust the parameters that go into our final burn plan according to the experience of our fire managers, scientists and weather forecasters. Our climate affords relatively narrow windows for getting a burn accomplished.

We are often looking to get hardwoods to come in for a period of 20 or 30 years, much as they often would after a wildfire. We need the top layer of broken down material, the duff, to be dry enough to burn

well so that birch and willow have some soil to start out in, but not so dry that we have problems controlling the burn. The conditions that allow us to do this usually fall within the normal fire season, so reaching the right conditions and having personnel at the same time is a balance that, in some years, we cannot reach. Those conditions and requirements are all set forth in the burn plan.

The burn plan is a document that is a set of instructions, a recipe of sorts, for accomplishing the prescribed burn. The burn plan lists the acceptable limits to all parameters, the wind speeds, relative humidity, etc. These objectives, parameters, boundaries, and back-up planning if some aspect of the burn starts to go “out of prescription” are reviewed and must get approval by the regional office in Anchorage.

The minimum number of personnel and firefighters required to accomplish the burn and to provide for any contingencies or problems will also be listed, and will be available on the day of ignition. All parameters must be within the approved prescription in order for the Burn Boss to go ahead with the burn. Measurements will be taken of those items listed in the parameters section of the burn plan before any match can be lit. Winds, fuel moistures and humidity are recorded, a spot weather forecast will be requested to get a weather report from the National Weather Service in Anchorage that is tailored to just the specific area that the burn is going to take place. A helium balloon might be released if there is any question about the winds aloft that would transport smoke.

If the burn is a go, then Kenai Base at our main refuge headquarters in Soldotna will be notified that ignition is proceeding. They will in turn notify the Alaska State Troopers and make any other necessary contacts.

A Burn Boss does every prescribed burn that is conducted by any agency. This individual has generally had years of training and experience and meets standards of approval for that qualification. The Burn Boss is in charge of that burn and is responsible for meeting objectives and keeping the burn within the boundaries outlined in the burn plan. The Burn Boss will have a Holding Boss to assist with control of the burn and possibly an Ignition Specialist if the burn is so large or so complex that the ignition firing will be

almost a separate operation with the Burn Boss over all.

The Holding Boss will in turn supervise the engines and holding crew, and will make decisions on deploying people and water, hoses, etc., to areas of the burn unit that might present a containment problem. The Ignition Specialist, if there is one, or the Burn Boss themselves will direct the lighters, both those on the ground that are lighting by hand with drip-torches and the pilot of the helicopter if aerial ignition is used. Aerial ignition requires specialized equipment and training for the ground crew and for the pilot of the aircraft if one is used.

The prescribed burn crew also consists of many people behind the scenes, those handling the radios, shuttling fuel, the weather forecasters, even security if needed for an aircraft or road closure.

Once the firing of the burn unit is completed, the crew will monitor the burn, and continue to clean up any significant smoldering along the lines until the active burning period is over. A patrol will continue to monitor for further activity for days, weeks or whatever it takes until the burn is declared out.

But the work doesn't end there—the biologists and fire effects specialists will continue to review the burn over time for achievement of those objectives that started the whole process to begin with. Researchers from the Pacific Northwest Research Station in Seattle did pre-burn and post-burn monitoring plots on our Mystery Creek units this past season to learn more about how fires burn and consume ground fuels and duff in these spruce and hardwood forests in this unique coastal climate.

The Kenai Refuge was pleased with the success of 1,100 acres of prescribed burning in the Mystery Creek area this past season. Several prescribed burn projects are scheduled for the coming year. If you have an interest in observing a burn in progress, contact Doug Newbould, Kenai Refuge Fire Management Officer at 260-5994.

Dianne MacLean is a prescribed fire technician with the Kenai National Wildlife Refuge. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Wolf color patterns: Why do some gray and black wolves turn white?

by Ted Bailey

I recently co-authored a report on wolf color patterns, which is the first study of wolf colors covering western North America and Alaska. The report included over 14,000 wolves from Alaska, and 125 wolves that we live-captured and monitored on the Kenai National Wildlife Refuge between 1982 and 2000. We also looked at wolf color patterns in Canada, Montana and Wyoming. We were particularly interested in why some “normal-colored” wolves turn white.

First, what are “normal-colored” wolves? On the Kenai Refuge, 87 percent of wolves that we live-captured between 1982 and 2000 were gray, and only 13 percent were black. A similar study of 64 wolves captured by Rolf Peterson from 1976 to 1981 found 67 percent gray and 33 percent black. Statewide in Alaska, most of the 14,702 records of wolves provided by the Alaska Department of Fish and Game were gray wolves, varying from 82 percent in the Southern Region to 72 percent in the Interior Region of the state.

Indeed, throughout most of North America, from eastern Canada to Alaska and with only a few exceptions, the predominant color pattern of the wolf is gray—hence the name “gray wolf.”

White is the dominant color of wolves only in the Canadian High Arctic tundra region of North America. For example, in the Northwest Territories of Canada, 90% of 58 captured wolves were white. In contrast, in the Arctic Region of Alaska, only 6 percent of 527 wolves were white. The incidence of white wolves generally increases from the sparsely forested regions of southern Canada northward to islands of the High Arctic.

There is little consensus about the advantage of one color pattern over another in wolves, but the color pattern of wolves that are born white and remain white is probably genetically inherited.

But what interested us was why some normal-colored wolves, both gray and black, throughout North America eventually turned white or near white, because white wolves are so rare south of Canadian Arctic.

Only seven of the 189 normal-colored wolves

that we live-captured on the Kenai National Wildlife Refuge turned white during the time that we were monitoring them. Six of these wolves were initially gray or grayish-brown and one was black.

I also vividly remember another white wolf that we never captured but that I repeatedly saw from the air. It was in a wolf pack we monitored in the 1980s in an area northwest of Tustumena Lake. Since this wolf usually was leading the pack with its tail held high I presumed it was the alpha, or head wolf, of the pack.

It remained in the pack for years, then one year a trapper reported that he had captured a large white male wolf in the pack’s territory. He had the pelt tanned and allowed us to photograph it. It was typical of a gray wolf that had turned white. Most of the hairs on these “turned-white wolves” are indeed white but there is sometimes a slight band of dark hairs running down the mane and along the top of the tail.

We speculated that there might be three reasons why gray and black wolves turn white. The first possibility is that some wolves turn white with old age. This is similar to old dogs that turn white around their muzzles. An old wolf is generally 8-10 years old or older; the maximum age of wolves is about 16 years.

But most wolves never reach such a ripe old age to become white. On the Kenai Peninsula, humans kill most wolves before they are 10 years old, and sometimes wolves kill other wolves. Our telemetry data indicated that only rarely does a wolf on the Kenai die of the complications associated with “old age.” One of the seven Kenai wolves that turned white was at least 12 years old and one at least 8 years old. Some of the gray and black wolves that turned white elsewhere in North America were also very old wolves.

A second possible reason for a wolf turning white might be physiological stress or trauma associated with injury or disease. All seven of the “turned-white” Kenai wolves were in poor condition, with six having atrophied legs, missing toes and teeth, or blindness in one eye. We also monitored one gray wolf with a leg injury whose coat had started to turn white, then after the injury healed, the coat returned to its normal gray

color.

Furthermore, nearly a third of the historically famous depredating wolves that turned white in the continental United States in the early 1900s also suffered from missing toes and teeth and deafness.

A final cause of why some gray or black wolves turn white is probably genetics. Although only partially understood, some wolves apparently possess genes that contribute to rapid and premature graying.

A similar phenomenon is also seen in humans who, unlike wolves, sometimes take extraordinary and expensive actions to mask this unusual but natural oc-

currence.

Ted Bailey is a retired refuge wildlife biologist who has worked on the Kenai Peninsula for over 25 years. He is now an adjunct instructor at Kenai Peninsula College and maintains a keen interest in Kenai Peninsula wildlife and natural history. His article "Color Patterns Among Wolves in Western North America" appeared in the latest Wildlife Society Bulletin (Vol. 30(3): 831-843), with Phil Gipson as the senior author. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Refuge ski trails get summer makeover

by Bill Kent

All of you cross-country skiers are probably getting a little frustrated with the current lack of meaningful snow. If you are anything like some of my skiing friends the skis, boots, and poles have been inspected and cleaned at least twice, and you hang on every syllable of the weather forecasts. Perhaps you even bought some of those skis with rollers—so you can get that stride perfected in the school parking lot before the snow arrived.

Well, friends, do not despair! Remember where we live; in Alaska the snow WILL arrive in more than sufficient quantity for you to travel the ski trails on the peninsula to your hearts' content.

This summer, we worked on the six miles of ski trails at our Visitor Center to (we hope) eliminate some traffic flow problems. Some 90-plus-degree turns which had been causing difficulties were also modified. Except the beginning and end of the Nordic Lake Loops and the spur to Headquarters Lake, all ski trails have a one-way traffic pattern. The new traffic patterns are displayed on posters located in our parking lot and small bulletin boards along the trails.

Please take a few minutes to look at this map before heading out on the trails; if you have any questions, check with someone in the Visitor Center.

In addition to the Nordic Lake Loops, two other routes at the Visitor Center will better serve snowshoers. The Keen Eye and Overlook Trails receive less frequent grooming than the Nordic Lake routes, and consequently snowshoe users will find these more suitable than skiers.

Refuge trails are varied in length; the shortest route for groomed ski trails is 1.5 miles, and the longest is six miles. All of these trails or routes are for skis and snowshoes only. Dogs are not allowed, for visitor and wildlife safety.

Okay, that is the latest news on the trails—we hope you find the summer's work to be an improvement. Now you can do your snow dances!

Bill Kent has been the Supervisory Park Ranger at Kenai Refuge since 1991. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Delayed winter provides pluses and minuses for peninsula animals and plants

by Ed Berg

This warm fall weather is strange, indeed. Just when I was hoping to put down some ski tracks in fresh powder, we get another round of heavy rains, mudflows, road closures and howling northeast winds.

Flowers (of the non-native variety, such as red clover, calendulas and English daisies) are still blooming in Homer gardens, and Canada geese are dawdling in their departure from Anchorage.

Although we humans are strongly affected, both to the good and bad, by the warm, wet fall, we might ask how is the fauna and flora of our fair peninsula affected by this delayed winter?

Well, it's an ill wind that blows no man (or beast) good. Animals that are normally out and about all winter should be benefiting from the lack of snow and cold. Moose and caribou don't have to burn extra calories punching through the snow and keeping warm. This should keep the moose out of town and off the roads for a while longer. Pregnant cows should be carrying more fat, so we should see higher twinning rates and better calf survival next spring.

The lowland caribou herd is still scattered around the area from the Kenai River flats to Soldotna, and usually doesn't begin its winter migration over to the Moose River flats until snow stays on the ground.

Bears are a more questionable case. When last checked two weeks ago, some of the radio-collared bears were generally hanging out in the vicinity of their past denning areas, but hadn't settled in yet. We are still seeing fresh bear tracks, e.g., in the Marathon Road area. Active bears are burning up more calories than they would if asleep. A few bears may be catching late run salmon.

Most, however, are probably eating an occasional root and dipping into their fat reserves. This living on the summer "wages" shouldn't be a problem if we move into a normal winter, but it could be tough if it becomes a long, cold winter with poor snow cover.

In a recent Anchorage Daily News article (Nov. 22), Sandi Gerjevic pointed out that snowshoe hares are changing color now, driven by the shortening day length rather than air temperature, and that a white

hare in a brown environment is highly vulnerable prey.

This may be true, but it doesn't signify any glut of food for local predators. We are at the bottom of the hare cycle now; it has been weeks since I have seen a hare, even though by now they should be easy to spot. The several-year low of the hare cycle (which is 12-14 years on the Kenai, rather than 8-11 years over most of northern North America) is a difficult period for lynx. The lynx numbers should be quite low at this time, and will probably remain low for the next few years, even as the hare numbers start to rise.

Small mammals, such as voles and shrews, are probably finding their lives "on hold" for the moment. Normally, they would be well protected in their snow tunnels. The voles would be sawing through grass tussocks, and the shrews would be eating insects, voles and one another.

Without snow cover, they are probably confined to underground tunnels, where food is not so abundant. The heavy rainfall could swamp these tunnels, driving the animals out and exposing them to additional predation and hypothermia, and a hard freeze would be really bad news.

As denizens of forest in Kenneth Grahame's *Wind in the Willows* might say, it's not a good time to be out and about in the Wild Wood.

Bird feeder observers report only modest activity at the feeders to date, presumably because the birds are still able to forage effectively for seeds and insects on the ground. Like the moose, birds probably unequivocally benefit from mild weather. Most of the lakes are still open on the refuge, at least at lower elevations, so waterfowl such as swans could still be on the lakes.

Refuge bird surveyors Liz Jozwiak, John Morton and Todd Eskelin saw very few bald eagles while floating the upper Kenai River this week, probably because the eagles are still foraging well away from the river. Once the lakes and small tributaries freeze over, the eagles will concentrate along the open portions of the Kenai River to feed on late runs of coho salmon.

But that hasn't happened yet.

An Anchorage caller wondered if the warm weather might promote more spruce bark beetle activity next spring. This one I think we can safely put to rest: Our temperatures in the 30s are well below the operating range of most insects.

Beetles and many other insects (and native plants) go through a several-week cold-hardening or dormancy process in the fall, where water is moved out of cells into spaces between the cells to avoid ice crystal damage to the cell membranes. Insects furthermore produce antifreeze-like chemicals (e.g., glycerol) that substantially lower the freezing point of cell contents. It would take a major warming of many days to get most insects out of their deep-freeze dormancy mode.

If such a “false spring” occurred, the insects would be totally unprepared when the cold weather returned, and they would die. So, the weather may seem pretty warm now, but it is still the dead of winter, from the bark beetle point of view.

It is interesting to see how differently native plants are responding to the weather as opposed to non-native plants. It is, for example, particularly foolish for a plant to flower at this time of the year, because it may not be able to complete the reproductive cycle and bring its seeds to maturity. If the seeds don’t mature, the plant has just wasted a lot of energy—energy that, if you are a perennial, should have been stored in the roots for growth next year.

If you are an annual, however, what the heck—a last-minute blast of sex can only add to the good of the species.

In any case, we don’t see the native plants—annual or perennial—putting up any flowers in this overly warm period; they know better, having evolved in a climate where late bloomers routinely get frozen out.

Some non-natives, however, are still cheerfully blooming in southern exposure gardens, and my wife is threatening to get out the lawn mower for a second “final” mowing of our (non-native) grass.

The bad aspects of this weather probably have more to do with the wetness than with the warmth. Floods have probably scoured out the current generation of salmon eggs of Deep Creek, Ninilchik River and possibly the Anchor River.

Homer has a long history of mudflows, and has recently experienced two separate periods of mudflows (and resulting road closures) following the heavy rains. I recall a mudflow in a particularly wet October of 1983 that flowed like a three foot tongue of lava across East End Road near Kachemak Drive.

Indeed, if you look at exposed stream bank cuts on many of the small stream channels crossing the Homer bench, you will see topsy-turvy deposits of pieces of coal and logs turned at every angle.

This indicates that most of the Homer bench is made up of a layers of mudflows, probably formed in wet falls such as this ever since the last glacier pulled back 13,000 years ago.

One of the most dramatic wet fall events in Kachemak Bay was the Grewingk Glacier landslide in October 1967. September of that year was the second wettest on record, with 5.4 inches of rain recorded at the Homer airport and probably a lot more rain up in the mountains. The bedrock in the mountains is heavily fractured and can fill up with water; this increases the hydraulic pore pressure and buoys up the individual rock fragments, making them potentially mobile.

On about Oct. 14, the cliff on the right (south) side of Grewingk Glacier collapsed, dropping 110 million cubic yards of crushed rock into the lake at the foot of the glacier. The impact generated a 200-foot high wave that swept down Grewingk outwash plain into Kachemak Bay.

Fortunately no one was in the path, but the wave did take out the entire pink run from Humpy Creek.

Finally, we have the distressing possibility that the weather could suddenly turn cold and deeply freeze the waterlogged soil. This happened last winter, at least in Homer.

Longtime Homer News garden columnist Rosemary Fitzpatrick described last year’s winterkill of several beautiful “Arnold Red” tatarian honeysuckle bushes, which had previously survived 15 to 20 years, even though their (southern) life expectancy is only 10 to 15 years.

Frozen saturated soil conducts heat four times better than does frozen dry soil, so it freezes bulbs and roots much more efficiently. Frozen saturated soil is also more prone to frost heaving, which can rip roots apart and squeeze planted tree seedlings right out of the ground, much to the horror of foresters.

Homer gardeners lost quite a variety of other non-native perennials last year, but the native perennials held their own quite well, as they are designed to do.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Plenty of things to be thankful for on Kenai National Wildlife Refuge

by Robin West

Having entered the holiday season, and getting ready to wrap up another year, it is a great time to reflect on all the many things I have to be thankful for.

I am especially reminded of this due to the short notice I just received to prepare this article, in that Dr. Ed Berg, a frequent contributor and the refuge editor for this column, just had an emergency appendectomy earlier this week.

No, I am not thankful that Ed had to have surgery (or that he couldn't write an article this week), but I am thankful that he is recovering well, and most of all I am thankful for the wonders of modern medicine. If Ed had suffered from this ailment 100 years ago ... well, he wouldn't likely have survived. This same scenario applies to me (who had an emergency appendectomy at age 10) as well as the Deputy Refuge Manager Jim Hall (who underwent the same procedure at age six).

I am sure this applies to many others in our community who have benefited specifically from modern medicines and medical techniques.

Of course there is much more to be thankful for. While the economy has taken a hit of late, our country overall has never been richer. We have the relative ease of jet travel; quality opportunities for recreation, education, and personal growth; and the freedom to speak our minds, vote for who we wish to represent our interests, and worship God in a manner we individually choose. It is great to be an American!

I am especially thankful for my family, my community, and the job I have. Yes, I am a "Fed," but I am proud of it. Our government may not be perfect, but it is the best one going, and I am proud to be a part of

it, even in a small way.

I am thankful for the refuge where I work. It is not "my" refuge; it belongs to all Americans. I have only been entrusted for a short time to oversee its management.

To me the refuge represents many things. It provides opportunities to enjoy a quality of life through hiking, camping, hunting, and fishing. It provides a place to get away from the hustle and bustle of our busy lives to enjoy wilderness and wildlife.

It provides a keystone to a large sustainable economy by protecting our salmon spawning and rearing areas and where a large number of local people can make a portion of their living.

The Kenai National Wildlife Refuge celebrates its 61st birthday this month, and the National Wildlife Refuge System will turn 100 next March.

I am thankful to live in a country wealthy enough, free enough, and thoughtful enough to have set aside these kind of public lands for all of its people to enjoy.

I am thankful for the staff at the refuge and for all of the support of the local community.

And as the winter season progresses I am at least a little thankful for the warm weather, although I must admit I might be a little more thankful if there was some snow coming our way in the not too distant future...

Robin West is the Kenai National Wildlife Refuge Manager. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Oral history project documents interesting past of refuge and peninsula

by Rick Johnston

You know you're getting old when you get asked to be interviewed for a Kenai Peninsula and National Wildlife Refuge oral history project.

The old adage "time flies when your having fun" has certainly proven true in my case. One day you're the new kid on the block and then "poof" you are the "old timer," and in my case, the second longest veteran or "the dinosaur" on the staff. Thankfully, refuge heavy equipment operator Dick Kivi postponed his planned retirement several years ago and has now saved me the distinction of being the official Kenai National Wildlife Refuge "sage."

Because Dick is usually out on his trusty grader and unavailable to tease, I seem to be increasingly the brunt of all the geriatric jokes or "old as dirt" jokes. I am also the one approached with the endless inquires about what happened in this or that year, or with this or that project or game board meeting, or some other event in 1979, 1982, 1987 and so on.

Many of the computer generation "youngsters" on the refuge seem to be allergic to good ol' fashioned file research, and are more than content to use my fading memory as the hard drive or starting place for basic historical research for a particular project.

Although, I always feign being annoyed, I generally don't mind... really.

Using me as a historical resource allows me to expound on my version of events and tell them about the world as it should be according to Ranger Rick. Putting one's own spin on events is really therapeutic for the aging mind and one of the rites of passage. Being asked about past events also allows me to interact with many of the future leaders on the refuge staff on a broad range of issues and subject areas.

I wasn't kidding about being interviewed for an oral history project. Lately, many former refuge managers and employees have been interviewed as part of the Alaska segment of a nationwide U.S. Fish and Wildlife Service oral history research project.

Most people don't realize it, but here on the Kenai, we have our own version of "Indiana Jones" or the "Relic Hunter." Kenai Peninsula resident Diana

Thomas, an anthropologist by training, has been commissioned to interview and record oral history information from several peninsula residents associated in some way with the Kenai National Wildlife Refuge.

In part, the goals of the project are to record and document previously undocumented oral historical information and facts before they are lost, or those with the knowledge become too elderly to accurately pass on the information.

In my case, however, I like to think that these folks are way, way ahead of themselves and they might be better off to interview me forty years from now.

During my "premature" interview with Diana I had the rare chance to reflect a short twenty years back to my initial visit and impressions of the Kenai National Wildlife Refuge, its staff, and the Kenai Peninsula.

It seems like just yesterday when on a sunny April day in 1978 I flew my Aeonica Champ 7AC from Merrill field to the Kenai airfield for a job interview with the legendary and now retired refuge manager Jim Frates. At the time, I had little knowledge of the National Wildlife Refuge System or the Kenai National Moose Range, but a lot to say about how I loved Alaska and everything in it. I was really excited about the prospect of working on the Kenai Peninsula and fulfilling a childhood dream of working as a wildlife officer or ranger in Alaska.

My enthusiasm was fueled by a recently completed private pilot license and my "new" 1947 two-seat airplane. The Kenai Peninsula from the air was a new and exciting adventure and I took every opportunity to tell Frates about it! At the time, I was only vaguely aware of the long and colorful aviation history of the Kenai and of several former refuge pilots. Although I did not become an official Department of the Interior pilot until sometime later in 1986, my love affair with flying over the Kenai National Wildlife Refuge began on that April morning 23 years ago.

At the time, the refuge headquarters was still located in Old Town Kenai and had expanded from a Quonset hut to a small but livable office and compound

from which the 1.7-million acre Kenai Moose Range was managed.

One thing that impressed me during my first visit to the refuge office, and often during my first year on the job, was the enthusiasm and sincere dedication of the small over-achieving staff. Most of them worked nights and weekends and never considered putting in for overtime.

The pending Alaska Lands bill bounced through Congress and added both a level of excitement and apprehension. Being a government employee was not exactly popular back then, but the majority of the staff seemed to know down deep that the purposes of the refuge and its wildlife conservation mission were important and would become increasingly accepted, even by critics, as time passed.

Not only has the oral history project given me an opportunity to reflect on many wonderful years on the Kenai, but more importantly it has given me a chance to contribute to this historical process. This oral history project as well as other recent efforts to document refuge and Kenai Peninsula history by backcountry ranger Gary Titus has added to the growing body of Kenai historical information.

The significance of documenting otherwise unrecorded historical information or reviewing historical records is sometimes not apparent until some

future time. The benefits of historical documentation can range from the ethereal or merely interesting reflections to life and death considerations such as documenting historical accident histories in order to change protocols or regulations to protect lives in the present. Not repeating mistakes is one of the more practical benefits of being a student of history.

Diana Thomas, a skilled and friendly researcher has interviewed numerous Kenai Peninsula residents. She utilizes a standard set of questions as well as impromptu questions by her, or reflections by the interviewee.

Most of her interviews have taken place over several days and are thorough and sensitive to the age and health of many of the elderly persons she has recorded. If you have an opportunity to be interviewed as I did, I hope you have a chance to reflect on your priceless memories, as well as add to the rich historical record of the Kenai Peninsula and the Kenai National Wildlife Refuge.

Rick Johnston is a ranger and airplane pilot at the Kenai National Wildlife Refuge and has been on the job at the refuge since January 1979. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

For the birds: Soldotna area Christmas Bird Count slated for Saturday

by Jack Sinclair and Elizabeth Jozwiak

This is a great time of year to get away from the hectic holiday hustle, and set aside some quality time for birding.

Taking a day to look closer into the trees or upon the water or up into the sky also tends to counteract our natural tendency to “hibernate” in the cooler weather and shorter daylight hours.

It’s another reminder to stop and smell the flowers, or in this case, watch the birds!

Once again local birders from the Kenai/Soldotna area are invited to participate in the 103rd Annual Christmas Bird Count (CBC) to be held Saturday.

The Christmas Bird Count is an early-winter nationwide bird census, where volunteers follow specified routes through a designated 15-mile (24-km) diameter circle, counting every bird they see or hear all day. It’s not just a species tally—all birds are counted all day, giving an indication of the total number of birds in the circle that day.

All individual CBCs are conducted in the period from Dec. 14 to Jan. fifth (inclusive dates) each season, and each count is conducted in one calendar day in a given area.

Birders from Seward, Anchorage, Homer, and other areas of Alaska also participate in this annual event.

The Soldotna Christmas Bird Count originated in 1983 with the center of the 15-mile diameter circle being the Kenai National Wildlife Refuge headquarters and covering most of the Soldotna area, including a good stretch of the lower and middle Kenai River.

Although the count was discontinued in 1992, it restarted in 1999 and has been running ever since.

Some of the more common birds seen during the Soldotna CBC have been the bald eagle, black-billed magpie, common raven, assorted gull species, common redpoll, pine grosbeak, pine siskin and boreal and black-capped chickadee.

Due to our recent warm weather and high water on the Kenai River, we anticipate observing more water-friendly birds this year. Those birds may include the common and Barrow’s goldeneye, common and

Red-breasted merganser, mallard, bufflehead, belted kingfisher and an occasional American dipper.

Birders, or anyone interested in participating in this year’s Christmas bird count, should meet at the Kaladi Bros. Café in Soldotna at 8:30 a.m. so that birding groups can be assembled and observation areas assigned.

Participants do not have to be experts, but only have a desire to get outside and look for birds. The birding effort normally concludes at dusk (about four p.m.) or when weather precludes any measurable returns.

Inexperienced birders will be grouped with more seasoned CBC veterans to help familiarize them with where to go and what to look for.

Each participant should try to bring a good set of binoculars and a bird identification book for species most often found in Alaska. There is a \$5 fee per field participant.

No fees are charged for persons planning to survey their backyard bird feeders during the Christmas Bird Count. Anyone having an active bird feeder in the count area is encouraged to help. Counting the single highest number of a species at a feeder at any one time, including any unique feathered visitors, is a big help to the count.

Please contact Jack Sinclair to let us know if you would like to participate.

Also, if you come across a chickadee with an upward elongated curved (i.e., deformed) bill, please report your sighting to the Kenai National Wildlife Refuge at 262-7021.

The first CBC was done on Christmas Day of 1900 as an alternative activity to an event called a “side hunt” where people chose sides, then went out and shot as many birds as they could. The group that came in with the largest number of dead birds won the event.

Frank Chapman, a famed ornithologist at the American Museum of Natural History and the editor of “Bird-Lore,” recognized that declining bird populations could not withstand this kind of over-hunting, and he proposed to count birds on Christmas Day

rather than shoot them.

The data collected by observers on these Christmas Bird Counts over the past century have allowed researchers, conservation biologists, and interested individuals to study the long-term health and status of bird populations across North America.

In the 1980's, CBC data were used to document the decline of wintering populations of the American black duck, after which conservation measures were put into effect to reduce hunting pressure on this species.

For anyone participating or just interested in the Christmas Bird Count, there is a wealth of information available online at www.audubon.org/bird/cbc/.

The Soldotna bird count totals since 1984 are avail-

able to view here as well as every other bird count in North America during the last century.

For more information on participating contact Jack Sinclair at 262-5581 or e-mail at jsndt@alaska.net.

Jack Sinclair is a guest contributor to the Refuge Notebook, and has been a resident on the Kenai Peninsula for 18 years. He works as a district ranger for the Alaska State Parks managing the State Marine Parks of Resurrection Bay and Prince William Sound. Elizabeth Jozwiak is a wildlife biologist for the Kenai National Wildlife Refuge, and takes every available opportunity to go birding. For more information about the Refuge, visit the headquarters in Soldotna, call (907) 262-7021. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.

Kenai National Wildlife Refuge head biologist encounters the ‘Alaska Contradiction’

by John Morton

I am now four months into my new post as the supervisory fish and wildlife biologist at the Kenai National Wildlife Refuge. In that brief time I have sold and bought a house and have experienced many of the concerns that long-time residents have been grappling with for years.

My wife Leslie and I checked out the quality of the schools for our two daughters. We looked at health services and real estate prices. We looked at the road system and what it would take to live outside of town and still make a reasonable daily commute to Soldotna. We looked where the health clubs and supermarkets were located and where to buy books, hardware, and sporting goods.

Like most folks, we wanted to live in a nice place and still have access to all of the amenities that the Kenai-Soldotna area provides. Essentially, we looked at the Kenai Peninsula as any resident and parent would, evaluating the issues that frame and impact our quality of life.

At the Kenai National Wildlife Refuge, I work with a great group of dedicated, well-trained biologists and managers to maintain the ecological integrity of a mostly intact natural system that sprawls over 2 million acres. A big chunk of this area—1.3 million acres—qualifies as wilderness, both by Congress designation and by the fact that wolves and brown bears and wolverines continue to make their home there.

It’s obviously a wonderful place to experience and to live close to, and it goes a long way toward explaining why the human population on the peninsula has increased 22% in the past decade. There are only superlatives to describe the wilderness resources on refuge.

But it also strikes me that this is a wilderness under siege, and herein lies the contradiction. There is the long history of oil and gas activities, increasing development along the Sterling Highway corridor and on private lands south of the Caribou Hills. We have expanding highways and more traffic, concerns about water quality in the Kenai River, and extremely high levels of recreational activity and tourism. The

white spruce forests show the effects of a massive spruce beetle epidemic, and signs like malformed black-capped chickadees and wood frogs suggest that something is not quite right with Mother Nature.

This is the contradiction that I face as a private citizen and public servant. It’s similar to how our society as a whole deals with nature and natural resources: I want my cake and I want to eat it, too. Put another way, how do you manage a refuge that is mostly wilderness but is being impacted by what most folks would call “Lower 48 issues?”

Strictly speaking, I am not a manager and I don’t make the final judgment calls. Nevertheless, as a refuge biologist, my job is to provide the best scientific information for keeping a reasonable balance between the wilderness and our human needs and interests. And as I look back over my varied career as a well-traveled wildlife biologist, I see that most of my work has focused on studying the effects of humans and wildlife on one another.

In my last job, at Blackwater National Wildlife Refuge in Maryland, I worked on projects to control the damage that introduced rodents, called “nutria,” were inflicting on tidal marshes. (Nutrias were introduced in the 1940s from South America to boost the sagging fur trade.)

In the Mariana Islands, I studied endemic bird species that were endangered because of the accidental introduction of the brown tree snake in military equipment salvaged from other South Pacific islands after World War II.

In Vermont, I evaluated the impacts of human development on hemlock and white cedar stands that were used as winter yards by white-tailed deer.

In Wisconsin, I wrote a handbook on enhancement techniques to reduce the impacts of the lock-and-dam system on fish and wildlife resources of the upper Mississippi River.

In northern Mexico, I returned to study a population of hook-billed kites, only to find that what had been native scrub habitat the year before was now row crops as far as the eye could see.

In California, I studied how bird depredation reduced commercial grape yield in Napa Valley vineyards.

In the Ecuadorian rainforest, I worked with the Cofan Indians to study white-lipped peccaries, and saw how localized hunting forced howlers and organ-grinder monkeys to switch their feeding from day to night. Similarly, while studying the wintering ecology of American black ducks on Virginia's coast, I found that their use of the Chincoteague National Wildlife Refuge was dictated by hunting and boating activity in the adjacent saltmarsh.

In the Arctic National Wildlife Refuge, I studied how aircraft overflights had the potential to reduce the accumulation of pre-migratory fat on snow geese.

In the North Pacific and Bering Sea, I monitored the incidental take of Dall's porpoises and seabirds by Japanese salmon driftnets. Out of Barrow and Deadhorse, I flew aerial surveys over the Chukchi Sea to assess how bowhead whales responded to offshore oil rigs during the fall migration.

All of this work fascinated me so much, I eventually earned a doctorate in wildlife ecology, studying the effects that human recreation was having on sanderlings and other shorebirds wintering at Asateague Island National Seashore.

The point of these examples is not to show how well my chosen profession has treated me. (In truth, I spend a lot more time nowadays in front of a computer than I like to admit.)

Rather, my point is that interactions between humans and wildlife take a lot of different forms in different places. Many of these interactions can become conflicts, but the good news is that there can be creative solutions for many of them.

In the details every wildlife-human interaction is unique. We have different levels of knowledge about each system, different cultural perspectives, different species, different players, and different societal values.

Nevertheless, there is a commonality among these situations. It comes down to what we humans are willing to give up in order to maintain a certain quality of life, for both our fellow creatures and ourselves.

Nobody has a lock on the "right" answer. The best solutions I've seen often arise from a hodge-podge of research, management, regulations, agencies, grassroots environmental groups, sportsmen's clubs, bird-watching groups, concerned citizens, and Chambers of Commerce.

And, in the short time that I've been on the Kenai, I've seen some good collaborative problem solving underway, whether it be a moratorium on the number of commercial fishing guides or working out the best alternative for the Cooper Landing bypass.

Everybody has a different perspective on what makes the Kenai Peninsula a nice place to live. What is critically important is that people think about what makes it nice, remembering what originally attracted them to this place, and why they continue to stay.

I'm thrilled, as a private citizen, as a wildlife biologist, and as a civil servant, to be part of the process that is working to keep the Kenai one of the best places to live.

What a great place to be at the start of the New Year!

John Morton is the new supervisory biologist at the Kenai National Wildlife Refuge, taking over for retired supervisor Ted Bailey. Previous Refuge Notebook columns can be viewed on the Web at <http://kenai.fws.gov>.