Refuge Notebook

Volume 9 ● 2007

USFWS Kenai National Wildlife Refuge

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

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Share the Refuge with a child; it will open up a brand new world

by Richard Johnston

Previously printed 22 October 1999

Having worked on, played in and explored the Kenai National Wildlife Refuge for nearly twenty years, there are few Refuge experiences I haven't at least sampled or places on the Refuge I haven't explored. As a pilot, I think I've seen the Kenai Mountains in about every shade of beautiful that there is. It is easy to be humbled by the overall beauty and wildness of the Kenai Refuge, especially at 3,000 feet on a gin clear October morning with a V of sandhill cranes silhouetted against the eastern mountains. I recall certain wildlife sightings and hunts that some might say were once-in-a life time, but when friends and Refuge visitors ask me about my favorite Refuge experiences, I smile and reply, "Anywhere on the Refuge and sharing just about any activity with a child."

Kids have a very simple and powerful way of observing and experiencing the many wonders of nature. We often hear adult conversations about past trips or planned outings on the Refuge. These knowledgeable conversations might concern harvesting an elusive 60 inch moose, catching that once-in-a-lifetime trout, getting that perfect bear photograph, summiting a difficult peak or a twenty mile off trail traverse. But listen to the conversations of two children on the Refuge and you may really come closer to the heart of what the Kenai Refuge is really all about… and what any of us can experience on any day in the presence of a child.

The kids may be talking excitedly about a small squirrel they saw, or about a passing cloud reflection on the Kenai River and how it looked like a buffalo. Two very small cowboys may be astride horse-like aspen branches temporarily serving them as trusty steeds, with all this adventure in a small greenbelt between two campsites in a roadside campground. As far as they're concerned, they are Lewis and Clark and the sights, sounds and smells of their little exploration forest are on the edge of nowhere and the year is 1850. No doubt children love to see a large bull moose or to catch a big fish as much an adult, but I believe they are natural appreciators of the simple and ethereal, and are particularly expert at seeing and experiencing the more subtle side of the Refuge.

I recollect leading a school fieldtrip many years ago where I was distressed that we hadn't seen any of the normal wildlife that day. I kept coming up with explanations that would have shamed the best you-should-have-been-here-yesterday tales of a Kenai River fishing guide on a slow day. One of the kids started asking questions about this small fungus growth on a downed log. Pretty soon the focus of the entire fieldtrip switched from seeing moose to The Great Conk Hunt of the Kenai, 1983. It was then that I wished I'd paid more attention to the small stuff; I realized that I didn't need an obliging moose to make these kids' day. A small amount of "interpretive knowledge" on my part could really enhance their modest adventure. They were simply glad to take the day and the outdoor adventures as they might come. The naturalist interpreters on our Refuge staff have learned from such experiences to direct more attention to the small and subtle aspects of the trailside, such as insect effects, fungi, edible plants, wild smells, and bird calls. When they do this, every small trip can be a big adventure for the kids.

Young residents of Kenai Peninsula and their families are particularly fortunate to live with such an abundance of wildland and wildlife opportunities. Whether it's taking a child hunting, fishing or hiking, the Kenai National Wildlife Refuge has a place and season that is made to order for you. For example, the many short day trails within the Skilak Recreation Area and along Swanson River road are perfect for an outing and the exploration pace of kids. Small children like my four-year-old love to stop often and are much less concerned with the final destination than the "journey" and the infinite adventures that a mile of trail provides.

Skilak Lookout, Skyline, Bear Mountain, Hidden Creek, Kenai River are just a few of the Refuge trails that by virtue of length, degree of difficulty and natural features (e.g., things to climb on) are made to order for kids. Hidden Lake Campground is a very popular

destination; children of all ages find enough adventure in this campground to fill several days.

A kid-size trail called Bernie's Trail, named after a late Refuge biologist, is a great place to spend the afternoon. And nearby, the Refuge has a new trail called Hideout Trail that will be formally opened to the public next spring. It was recently completed after two seasons of volunteer labor by high school Student Conservation Association volunteers. It is a great trail for kids and if you can believe my four year old, it is destined to be one of the Refuge's most popular family day trails. On a recent September trip I accompanied three other adults and four kids ages four to thirteen to the top of Hideout Trail. There were berries, scenery and adventure for everyone, especially with the fall colors and smells.

One of the best kept secrets of the Kenai is the excellent trout fishing on many roadside lakes and other lakes within a mile of the road. It has been my experience that kids much prefer catching a stringer of frisky trout to less predictable king salmon safaris. And my kids just can't get the concept of stowing away their poles after Dad has helped them catch a Kenai king.

Small game hunting on the Refuge is a great way to introduce children to the responsibilities, skill acquisition and rewards associated with hunting. These clear cold October mornings are superb for spending one-on-one hunting time with a future woodsman. I'll wager that you may rediscover why you started hunting in the first place, and it probably wasn't to fill the freezer.

Bringing children afield should be taken very seriously, especially when hunting. There are many safety considerations for being out on land and water, particularly as temperatures drop and days grow shorter. A compass, warm clothes and a hunter education certificate addressing safety and hunter ethics are very good starting points.

There are many trust issues that an adult should fully consider while mentoring a young hunter or fisherman. Adults should be skilled and willing to share their land and hunting ethics with their young charges. As a Refuge Officer I find few experiences more rewarding than checking the bag of a successful young hunter who has done everything by "the book" and who is accompanied by a proud and thoughtful adult. Conversely, there are few experiences more disheartening for me than citing or arresting an adult who has encouraged a young hunter or fisherman to break game laws or has done so himself in a youngster's presence.

If you are thinking of taking a child on the Refuge this month, be well prepared: pack your smile, compass, sack lunch, warm clothes, and water. Don't be in too big a hurry, leave a trip plan behind, and keep an open mind. You just may find adventure where you least expect it and a lot closer to the road than that 50 miler you did with your neighbor last year.

For more information on great family hikes and other adventures on Kenai National Wildlife Refuge, contact Rick Johnston or other Refuge staff at Refuge Headquarters (262-7021). Rick Johnston is a Ranger/Pilot for the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Climate change on the Kenai Peninsula: Cooked moose?

by John Morton

When Franklin Roosevelt established the Kenai National Moose Range in 1941, it was to protect the habitat of the "giant Kenai moose," then considered a subspecies unique to the peninsula. Although we now know our moose were simply big and our name has changed to the Kenai National Wildlife Refuge, the moose continues to be our patron saint.

The refuge is home to almost 5,000 moose. During the summer, moose like to feed in wetlands and shallow lakes. During the winter, moose browse on young aspen, birch, and willow that sprout after fire. Fires in black and white spruce that are hot enough to burn down to mineral soil will "convert" conifer stands to hardwood. Good moose habitat is provided for 15 to 25 years after these mineral soil-exposing fires. This is one of the reasons why moose numbers were so high in Game Management Subunit 15A, north of the Sterling Highway, for so many years after the big fires in 1947 and 1969.

But the Kenai Peninsula is changing in response to a climate that is becoming warmer and drier. Treeline has crept up the Kenai Mountains over 50 meters since the 1950s. During the same period, water levels in closed-basin lakes declined by as much as one meter. Many of these same ponds are now grassy meadows that are being invaded by black spruce and hardwood shrubs. The Harding Icefield lost 70 vertical feet and 5% in surface area over the same period. Bark beetle outbreaks in Sitka and white spruce will likely be more frequent and last longer as temperatures increase. Similarly, wildfire in black and white spruce is expected to be more intense and more frequent than the current mean fire return intervals of 79 and 514 years, respectively, as the climate dries.

How will all these changes affect moose on the Kenai? The knee-jerk response is that more fire means more browse which begets more moose. But the answer isn't that simple. As fires get hotter and more frequent in spruce, conversion to hardwood will increase. This means that a greater proportion of forests will become birch and aspen. While this is good in the short run for moose, fires will eventually become less prevalent on the peninsula because hardwoods are relatively resistant to fire. Fires will continue to burn more frequently and hotter in spruce forests, but the total spruce acreage on the peninsula will diminish over time as the expanding aspen and birch forests mature.

Dr. Glenn Juday, at the University of Alaska Fairbanks, has suggested that our forests will become more like those currently in Alberta: more open (parkland-like) with a grass understory and perhaps invaded by lodgepole pine. We would still have moose, but perhaps not at the relatively high densities that we've seen in the past on the Kenai. And with shallow ponds and wetlands drying on the Kenai, the submerged aquatic vegetation that moose like to feed on in the summer will be less available.

Snow cover is expected to be more variable and less persistent than it has been historically. Indeed, a review paper published this past year in the Journal of Climate shows that snowpack in the western U.S. has diminished in the past 50 years, with more rain and earlier snowmelt in the spring. Despite the arctic winter we're experiencing this year, winters in the past few years have been all over the chart. Again, the knee-jerk response is that reduced snow cover or even no snow cover is easier on moose, particularly last year's calves. But moose have disproportionately long legs because they evolved in the boreal forest and its climate.

We can look to an example in the boreal forests of Minnesota, which is on the extreme southern edge of the moose range in North America. Moose have declined in the northwest part of that state since peak numbers in 1984.

After ruling out hunting, browse quality and quantity, and disease, research completed by Dr. Warren Ballard from Texas Tech University suggests that increased temperatures in September and March since 1984 caused heat stress in moose. This has resulted in lower reproductive rates and poorer body condition than what would be normal during these times of the year. Despite high calf survivorship, these researchers conclude that the moose population will continue to diminish in their part of the world as long as the current climate trends continue.

It also is likely that Sitka black-tailed deer will

get established and perhaps proliferate on the Kenai in years to come. Small populations that were transplanted to Prince William Sound in 1916 have expanded their range in recent years. Sightings of deer in the Portage and Placer River drainages since the 1990s have included both bucks and does.

Deer on the peninsula doesn't bode well for moose. An article by Arnold Boer in the *Ecology and Management of the North American Moose* states that where moose and deer overlap in range, they generally don't compete for browse because their different abilities to cope with snow keep them segregated. However, increasing variability in snowfall on the Kenai may mean that competition with deer may reduce moose numbers.

Moose have declined in many parts of the eastern U.S. due to meningeal worm, a neurological disease that can be fatal in moose. The white-tailed deer is the usual host of this parasite, and it currently is not known to occur in Alaska.

Of course, all of this is conjecture on my part. Moose may do well on the Kenai under a warmer climate. Climate change is interesting for that very reason. It forces us to re-examine why our natural world is the way it is.

John Morton is the supervisory fish and wildlife biologist at the Kenai National Wildlife Refuge. He also is an adjunct faculty member at the University of Alaska Fairbanks and Colorado State University. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Big back yard: Winter activities abound on wildlife refuge lands

by Bill Kent

Most folks who make use of the resources of the Kenai National Wildlife Refuge do so during our splendid Alaska summers. Fishing, hiking, camping and wildlife watching are favorite pursuits of refuge visitors.

I wonder how many of you are aware of all the opportunities available during our long, dark Alaska winters? The days are getting somewhat longer and warmer now, and this is the prime time for winter activities on the refuge.

One of the most popular winter activities is ice fishing; many of the lakes with good populations of trout are accessible with a short drive onto the refuge. Engineer and Hidden lakes in the Skilak Loop are very popular destinations, as well as lakes along Swanson River and Swan Lake roads. But as the weather warms, watch out for thin ice; it seems inevitable that someone manages to drop a vehicle or two through the ice as temperatures rise in the late spring.

Snowmobile enthusiasts make good use of the refuge areas that are open for snowmachining. A large portion of the popular Caribou Hills lies within the refuge, and there are excellent trails leading into the northern parts of the refuge.

I should note that we ask snowmachiners to stay below timberline in their travels. This restriction is intended help avoid disturbing the caribou and other wildlife that are feeding on the windswept high plateaus and exposed mountain slopes. You can pick up a map at our visitor center that shows which areas of the refuge are open or closed to snowmachines.

There are good cross-country ski trails at our headquarters and visitor center on Ski Hill Road south of Soldotna. These trails are not as wide as the heavily groomed Tsalteshi Trails at Skyview High School. Our trails are narrower and not groomed as frequently; however they are rolling, have some tight turns and offer you a different and quieter skiing experience—and your chances of seeing a moose or other wildlife are quite good.

At this time of the year, long-distance skiers can pick up good snowmachine trails that lead for miles into the backcountry, such as the Funny River horse trail, or the Pollard Trail from Kasilof to Tustumena Lake. On a bright, sunny day you can ski forever on these trails, especially if they have an inch or two of fresh powder or have been groomed by the snowmachiners.

Have you ever through about winter camping? Many of the refuge campgrounds remain open through the winter, and a good number of folks have discovered the contrast with the crowded summer days.

Winter camping exposes you to a new world—it is VERY quiet in the campgrounds, and the sounds of the refuge in winter are quite different from the hustle and bustle of summer. It's getting to be a good time for owl listening, for example, because owls set up housekeeping about this time of year. Check out the great horned owls along Swan Lake Road in the evenings.

Winter wildlife watching can be quite rewarding on the refuge, particularly for moose and bald eagles. Don't approach those moose too closely, however; they've had a tough winter and any excitement uses up valuable calories that they need to survive until green-up. They are getting a bit stubborn now and aren't too quick to move out of the way. If you take the family pet along with you, please keep it under control and away from the moose, also.

Hopefully, you have already discovered some of these great winter activities on the Kenai National Wildlife Refuge. Two million acres is a lot of back yard, and wintertime makes a lot of it much more accessible than it is in the summertime.

Bill Kent is the Supervisory Park Ranger responsible for visitor services at the refuge. He and his family live in Sterling. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Refuge ecologist visits the Bahamas

by Ed Berg

The idea of a trip to the Bahamas came to my wife Sara as we laid plans for a January visit to Florida to celebrate my father's 100th birthday. A roundtrip ticket for the 45-minute flight from Miami to Nassau costs a modest $160. We have often gone to Central America from Miami at this time of year but not so cheaply.

After the birthday celebration—and a trip to Disney World with our 6-year-old granddaughter—we landed on the 21-mile long island of New Providence which is mostly occupied by the old pirate and slave trading city of Nassau, capital of the Bahamas. Most of the 700 islands (40 are inhabited) of the Bahamas are remote and still more or less pristine. Nassau however is undergoing intense tourism development that would make even a coastal Floridian gasp with amazement.

We saw several huge cruise ships docking each day, disgorging hundreds of fellow tourists to explore the old town center and drop some small change in the duty-free diamond shops and casinos. Many of the tourists head for the huge Atlantis hotel complex on Paradise Island, across the harbor from Nassau. This 2317-room hotel was built at a cost of more than $850 million, and houses a large aquarium, water park, and 50,000 sq. ft. of slot machines, roulette tables and black jack tables.

The beaches of Nassau are considered some of the most beautiful in the world, with miles of white sand and extremely clear blue water, under intense sunny skies. For a day of premium snorkeling we went to nearby Rose Island, a popular retreat for both locals and visitors. The beautiful island so far has very little development, but we were saddened to learn that it has been recently bought for another mega-hotel.

One highlight of our visit was an afternoon tour with local naturalist Carolyn Wardle. She came from England with her accountant husband in 1964 and has witnessed the radical transformation of the formerly slow-paced island. Most of the changes have occurred since the Bahamian government opened the island for foreign investment in the early 1990s with a variety of tax-free incentives for developers.

The new builders planted many exotic ornamental shrubs and trees, some of which have escaped and become quite invasive. Tall wispy Australian Pines (*Casuarina*, which has segmented needles like a horsetail and is not a true pine) line the roadways but can grow like dog hair on beaches and wetlands. Fast growing Melaleuca trees, Brazilian pepper (*Schinus*), and white inkberry (*Scaevola*) shrubs are also found in great numbers, probably all originating from people's lawns and gardens.

Carolyn Wardle and other local conservationists are trying to get some old military land set aside as a nature preserve for native plants and wildlife, but just last week bulldozers lopped off an extra 200 feet along one side for a government housing project.

The Bahamas were a British colony up to 1973, so English is the official language. The population is 85% black, and we found everyone very friendly and helpful. We managed to get a room in the only low-cost guest house on the island ($50/night) run by a delightful elderly Greek couple. We took our daily restaurant meal in the evening, but rarely got fed for less than a $40 bill. The Bahamas are definitely not in the budget travel class like Central America.

I always ask the locals about climate change; is "global warming" a reality for them? In the southeastern U.S. people don't perceive the already hot climate getting any hotter, but they certainly talk about increased storm activity. Our favorite waitress Cherry (in her 50s) came from an outlying island. She said that for most of her life the weather had always been warm and sunny, with few storms. In recent years however the weather has "gone crazy;" she described how her sister's house was flooded in a storm surge and the family had to swim to higher ground.

Nassau showed little visible evidence of hurricanes; we saw no elevated buildings along the coast, no blown down trees, nor evacuation route signs. A check of the Nassau weather record showed that hurricanes brushed the island in 1992, 1999, 2001, and 2004. Hurricane Betsy in 1965 damaged Nassau with 126 mph winds, and hurricanes brushed the island in 1966 and 1979.

I typically associate underdevelopment with Third World countries. With tourism we now have the pos-

sibility of "overdevelopment" in countries like the Bahamas. This is a new variation on the "one crop economy" or "banana republic" theme. Tourism can provide lots of jobs, but the facilities infrastructure (hotels, condos, roads, harbors and docks, etc.) can destroy the natural environment in far more irreparable way than mono-crop agriculture ever did. The Bahamas vividly demonstrate that international tourism industry has amassed vast capital resources that can build mega-hotel complexes in any tourist-worthy part of the world. There are some very tourist-worthy spots in coastal Alaska, and I hope that future Alaskans will consider carefully the consequences of accepting such development, regardless of how many jobs it might bring.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will teach his one-credit course on Global Climate Change at the Kenai Peninsula College in Soldotna and Homer, beginning Feb 27 and Mar 1, respectively. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Guides services on the Kenai Refuge in 2007

by Tai Davis

Guides provide many valuable services to visitors on Kenai National Wildlife Refuge, such as big game guiding and hunter transporting, scenic white water and flat water float trips, sport fish angling, campground services, boat drop offs, air taxi service, canoe rental and drop off service, wildlife sight-seeing, hiking, and guided horseback trips. The most popular service is guided sport fishing.

The Refuge has a set of specific Special Use Permit conditions specific to various commercial activities in addition to general permit conditions that apply to all guides and/or outfitters. These regulations are in place in order to provide safety for guides and their clients, protect wildlife, and resources and in some cases limit congestion at Refuge facilities. All guides must comply with various regulations of the Refuge, Alaska State Parks, the Kenai River Special Management Area, and State hunting and fishing regulations.

Suppose that you were interested in providing some kind of guide service on the Refuge. There are a lot of hoops to jump through, and here is what you would need to do. You would start by filing an application by April 1st. The permit year generally begins on May 1 and extends until April 30 of the following year. After holding a one year permit that is in compliance with all Refuge regulations, the next year a five year permit is issued.

There is a non-refundable administrative fee of $100 for each permit issued. Guides are required to report services provided on the Refuge. In addition to the administrative fees, fees are also collected for actual client use days, based on various types of activities. A calendar use day is defined as one calendar day (24 hours or portion thereof). Client use days should be reported to the Refuge by November 15. Failure to report by November 15 will result in non-renewal and Notice of Violation for noncompliance with permit conditions. Once use reports are received, the Refuge is responsible for computing and issuing a bill for collection to permittees within 30 days. In turn, permittees are required to pay fees within 30 days of receiving the bill for collection. Special Use Permits will not be issued until all past due fees have been collected.

Instruction letters sent out with the guide packets explain the application process in detail. There is also a checklist to assist with compiling appropriate documents. Returning the application form and all required documents to the Refuge at your earliest convenience will ensure your application is processed and in a timely manner. Also, if there is reason there is a problem, there will be time to correct it, and a permit can be issued prior to the guide season. Once administrative fees are paid and documents received, stickers will be issued. The stickers are required to be placed on vehicles and watercraft to show proof that your organization is authorized to operate on the Refuge. Operating without a sticker will result in a Notice of Violation.

In brief, applicants can expect to provide a copy of the following:

- Completed KENWR Visitor Service Application Form, filled out in as much details possible describing proposed activities and experience
- State of Alaska Business License
- Liability insurance binder, naming Refuge Manager as co-insured. Insurance must cover all activities for permittee and employees
- United States Coast Guard operator's license for watercraft, intended to carry six or less persons for hire. Copy of Alaska Boat Certificate numbers. Copy of licenses for each employee working under the permit, vessel numbers.
- FAA Pilot License/Air Taxi Certificate for those interested air transport
- Other licenses or permits needed. (i.e., ADF&G Sport Fishing Guide & Business License #)
- List of all vehicles, aircraft, watercraft, and/or hauling equipment expected to be utilized and their registration numbers. Multiple year permittees must update this list
- List of all employees who will be working under the permit.

- Safety Plan (explains actions you would take in case of an emergency)

- Special Use Permit administration fee of $100.00 (cash, check, credit card, or money order accepted)

New applicants can contact the Refuge to obtain information. Packet can be faxed, emailed, mailed through the U.S. Postal Service, or picked up in person.

Current guides/outfitters can expect update information to be mailed to them that will need to be returned for processing prior to the season beginning.

If you have further questions regarding the Kenai National Wildlife Refuge and/or commercial Special Use Permit requirements, please contact Rick Johnston, (907) 262-7021 or FAX (907) 262-3599.

Tai Davis is the permit specialist at the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Owls: Formidable predators of the Kenai Peninsula

by Toby Burke

Late winter is the time of the year when residents of the Kenai Peninsula often become aware of our resident owls. Why? Because their annual breeding cycle begins a new when owls start vocalizing to attract mates and establish and defend breeding territories. There are eight species of owls that frequent the Kenai Peninsula either as winter visitants, summer breeders, or year-round residents. They are Great Gray Owl, Great Horned Owl, Snowy Owl, Short-eared Owl, Northern Hawk Owl, Boreal Owl, Northern Saw-whet Owl, and Western Screech-owl. While most species of owls can be characterized as nocturnal and a few as diurnal almost all of our owl species are crepuscular to some degree, exhibiting increased activity during the morning or evening twilight periods.

Owls belong to the order Strigiformes of which there are about 225 species world wide. Traditionally, ornithological systematists considered owls, as nocturnal birds of prey, to be the closest relatives to the order Falconiformes composed of diurnal birds of prey such as eagles, hawks, and falcons. But new taxonomy based on DNA-DNA hybridization has revealed that owls may be more closely related to the order Caprimulgiformes composed of whippoorwills, nighthawks, and their allies.

The world's largest owls, Blakiston's Fish Owl, the Eurasian Eagle Owl, and Verreaux's Eagle Owl, are all old world species. The females of each species may approach weights of 10 pounds, wingspans of nearly 6 feet and lengths of nearly 30 inches. On the other end of the spectrum, the world smallest owls are the Least Pygmy Owl of South America and the Elf Owl which inhabits Mexico and neighboring U.S. Border States. The Elf Owl typically measures 4.8 to 5.5 inches in length and weighs 1.3 to 1.9 ounces. It's equivalent in size and weight to a large sparrow.

Having evolved as predators of low light conditions, owls have several physical adaptations that make them fearsome hunters. Foremost, they have exceptional vision and hearing, they can fly silently, and they have powerful talons.

Owls have large forward facing eyes giving them stereoscopic, or three dimensional, vision like humans. Unlike humans though, their eyes are relatively large accounting for an incredible one to five percent of their total body mass, depending on the species. Their proportionately large eyes improve their sight especially under low light conditions by enabling them to collect more light. The eye itself contains an abundance of "rod" cells that aid them in processing the light. These cells are very sensitive to light and movement. Cells that are very sensitive to color are known as "cone" cells. Owls possess few cone cells and these cells are not very sensitive in low light conditions so most owls see in limited color or in monochrome.

Furthermore, the exceptional light gathering ability is enhanced by the reflective layer behind the eye called the tapetum lucidum. This layer reflects back onto the rod cells any light that may have passed through without hitting them the first time. The old world Tawny Owl is generally acknowledged as having the most well developed night vision not only among owls but probably all vertebrates and it is believed that their night vision is approximately 100 times more sensitive than a human's.

An owl's well developed eyes are not really eye "balls" as much as they are elongated tubes held in place by a boney structure called a sclerotic ring. Accordingly, they cannot be rolled or moved as humans move their eyes. An owl must rotate, raise, or lower its entire head to move its eyes. This is compensated by the owl's 14 cervical vertebrae, twice as many as humans, which allow it to rotate its head 270 degrees from side to side and turn its head straight up if desired.

The ears on an owl are located on the sides of the head. They are covered by the feathers of the facial disk which directs the sound waves toward the ear. In strictly nocturnal species the ear openings are set asymmetrically or unevenly to enhance their ability to triangulate the specific location or direction of the sound. If one were to look at the bare skull of one of these owls it would appear slightly lopsided. These owls also have a more pronounced facial disk that can be manipulated using its facial muscles to more efficiently direct sound waves into the ear in addition to altering the position of the head. The "ear tufts" found on "eared owls" are not ears at all but simply feathers

used for display.

The pinpoint accuracy of an attacking owl on its invisible prey is derived by its ability to discern left ear—right ear differences of about 30 millionths of a second. Owls use their remarkable auditory system to detect movement or vocalizations of it prey under organic debris, foliage, or snow and its range of hearing is similar to that of a human but it is more acute at detecting certain frequencies, those of its prey species.

The most unique adaptation of owl plumage is the flutings or fimbriae found on the leading edge of primary feathers of the wing. These comb-like structures disturb and thus reduce the turbulence that normally forms over the surface of a bird wing creating the distinctive rushing or swooshing sound of flight. The owl's fimbriae dampen this noise of flight and allow the owl to effectively fly in silence. Silent flight allows the owl to capture prey by stealth and also allows it use its hearing to locate or relocate prey as it flies. Several strictly diurnal owl species have lost this adaptation.

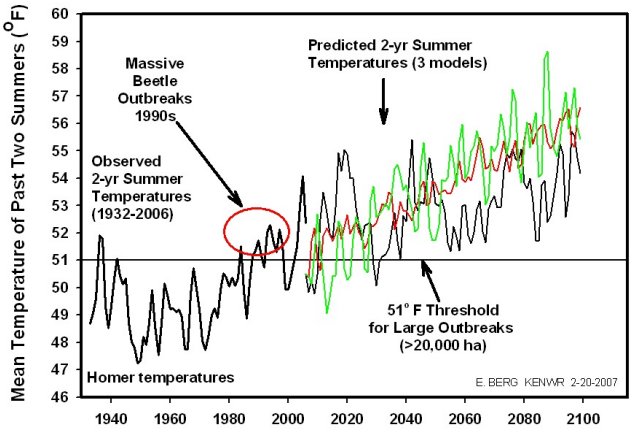
An owl's foot has four toes and a unique flexible joint. When the owl is perched or grasping prey two toes face forward and two face rearward. When flying the outer rear toe on each side swivels around to face the front so three toes are facing forward and one rearward. The talons are spread wide when the owls is attacking to increase the likelihood of contacting its prey. The bones of its feet are much stronger than most birds in order to withstand the force of impact as it strikes and initially stuns its prey. The underside of the foot also has a coarse, nubbly surface that helps it grip its prey and perch. Like most raptors, owls have talons with a mechanism that locks and ratchets down on their prey or perch avoiding the fatigue of continuous muscular contraction.

Keep all these remarkable adaptations in mind the next time you hear an owl calling through the gloom of night and be aware that a formidable winged predator is alert and on the prowl.

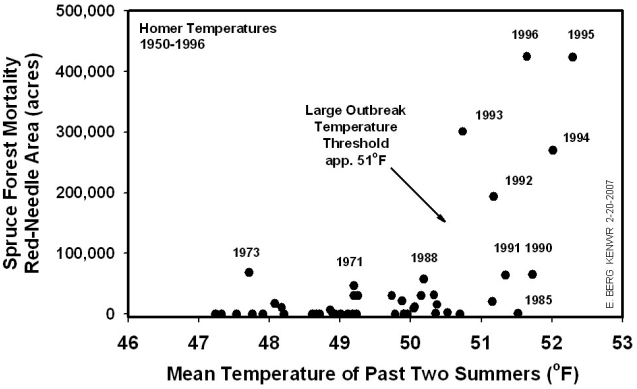
Toby Burke is a refuge biological technician who is intrigued by the status and distribution of Alaska and Kenai Peninsula birds and enjoys birding with his wife and family. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Bark beetles will shift Kenai forests toward hardwoods over next century

by Ed Berg



Past and predicted summer temperatures for southern Kenai (Homer). Summer temperatures of most of this century are predicted to be above the 51°F threshold for large spruce bark beetle outbreaks. Climate prediction models are ECHAM (Max Planck Institute, Germany), CCC (Canadian Climate Center), and CMS (National Center for Atmospheric Research, USA).



Large areas of forests are killed by spruce bark beetles after two or more summers with temperatures averaging more than 51°F. (Annual forest mortality areas from U.S. Forest Service aerial surveys 1950-1996. Temperatures were recorded at the Homer airport.

Beetle-killed spruce has become the dominant signature of upland forests on the Kenai since the massive 1990s bark beetle outbreak. Tall gray ghosts still tower above younger green spruce and leafy hardwoods, although many of the ghosts have fallen down by now.

Over the years my response has changed from saying, "Egad, look at all those dead trees!" to saying, "My, look at how many trees survived and are now thriving!" There is a healthy complement of smaller trees released from competition with the now-deceased big guys, and we see some seedling recruitment, especially in disturbed soils. So, the forest is recovering, albeit faster in some places than others.

Private landowners have replanted some of the logged areas, such as east of Ninilchik where you can see six foot tall spruce and lodge pole pines, with foot-long leaders on top. This is impressive growth for southern Alaska, where slow-growing spruce trees are expected to have a 120-year rotation for saw timber.

Our warmer climate thus appears to bode well for our recovering spruce forests, at least for the younger trees. But there is a hostile force waiting in the wings that will derail any longevity for these youngsters. The spruce bark beetles that killed the parent trees will likely be even more effective in killing their offspring, due to the same climate warming.

The spruce bark beetles are a time bomb that may take up to several decades to explode. The delay is due to a peculiar fact about the way the beetles work; they primarily attack larger trees and do not attack saplings. Bark beetles go after sugar in the inner bark (phloem), just like a porcupine or a bear. A beetle-worthy tree has to have phloem thick enough for beetles to make galleries (tunnels) for egg laying. Sapling-thin bark simply doesn't have enough room for mother beetles. Furthermore, young trees can produce more pitch than old trees, and they use pitch to cement the beetles Mafia-style into their galleries.

Thin phloem and abundant pitch protect young trees from bark beetles until trees are perhaps 40-60 years of age, depending on the site growing conditions. This creates the time bomb delay. The bomb however requires a weather trigger.

Spruce bark beetles thrive on warm summers, especially runs of two or more warm summers. Our

weather on the Kenai is strongly tied to the El Nino—La Nina cycle. In past decades a run of several warm summers would initiate a beetle outbreak, and then a run of several cool summers would shut it off. This happened, for example, with the outbreaks of 1962, 1971-73, and 1979-81.

I compared annual red-needle area (spruce forest mortality) with the summer temperatures for 1950-1996 and found a fairly distinct threshold of 51°F for large beetle outbreaks. If the average May-August temperature of the past two summers reached 51°F, we usually had outbreaks of more than 50,000 acres. The massive 1990s outbreak was driven by a record 11-year run of warm summers (1987-1997) where almost every summer was above the 51°F threshold. In 1998-2002, La Nina returned and the summers cooled somewhat, but still remained above average temperature. By then, of course, the beetles had "eaten themselves out of house and home" and there were few mature spruce trees left to eat.

Prior to the late 1980s, La Nina kept the bark beetles under control by bringing summer temperatures down to the 48 to 50°F range. Nowadays, a La Nina summer (like 2006) only makes the summers slightly less warm but still above 51°F beetle threshold. This means that the beetle bomb continues to tick as today's juvenile trees enjoy their youth.

I plotted summer temperature predictions from three well-known global climate models for the next hundred years. They predict that all summers will be warmer than 51°F after 2030. These predictions don't mean that white, Lutz and Sitka spruce forest will go extinct on the Kenai; they simply mean the trees will never grow very old. Bark beetles will likely hit the trees when they reach a size of perhaps 12-14 inches diameter, at least in stands where there are enough such trees to create a critical mass necessary to launch an outbreak. In any case, it unlikely that we'll ever again see old spruce giants of two to three foot diameter class, such as some of the coastal Sitka spruce of the past century.

Some will lament the passing of large, old spruce forest on the Kenai, but the new hardwood-dominated forests should provide a more diverse landscape friendlier to a wider variety of life, especially birds and insects. Fire will be less of a concern with less spruce forest, but the drier climate will still make grass fires a major threat in the spring before green-up.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will teach his one-credit course on Global Climate Change at the Kenai Peninsula College in Soldotna and Homer, beginning February 27 and March 1, respectively. You can check on new bird arrivals or report your bird sighting on the Kenai National Wildlife Refuge Birding Hotline (907) 262-2300. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Pins on the map: crash site reflections and practical considerations

by Rick Johnston

In past *Refuge Notebooks* I have written about the rich aviation history of the U.S. Fish and Wildlife Service. Much of the lore, adventure, and mystique of aviation in Alaska is too often defined by the accidents, disappearances, and crashes that have occurred throughout Alaska since the early days when aviation pioneers headed out to rural villages, often not knowing where they would land.

In a recent project evaluating the practicality of removing old aircraft wreckage on Kenai National Wildlife Refuge, I had occasion to examine most of the known accident sites on the Refuge. There are many sites, from the top of the Harding Icefield to the depths of Tustumena Lake.

Our ability to locate downed aircraft has improved dramatically with emergency transmitters and global positioning system (GPS) radios, so aircraft are seldom left unsalvaged nowadays. The ever-increasing value of small aircraft, as well as salvage regulations on remote public lands, has resulted in fewer abandoned crash sites.

Most crash sites on Kenai National Wildlife Refuge, for example, are pre-1965, with many fewer new locations. However, because of popular air routes, mountainous terrain, numerous landing sites, and proximity to Anchorage, the number of sites is imposing, as the map shows. While, the Kenai is less remote, hidden corners of the Peninsula with dense woodlands, numerous lakes, and glaciers host their fair share of Alaska's crash site history. Some long-known sites are practically landmarks, like the wave-tossed shell of a Sea Bee RC-3 in the shallows of Lower Russian Lake or the highly visible and haunting remains of the Alaska Airlines DC-3 N91006 wreckage near Ptarmigan Head in the Caribou Hills.

Occasionally, the mountains and forests will reveal a long held secret. The 10,000 acre King County Creek fire in 2005 removed much of the densely packed black spruce forest south of the Kenai River. Although, I had been piloting aerial wildlife surveys for twenty five years over the area, I had never seen the scattered wreckage of a small float plane near the shoreline of an unnamed lake.

Early in my pilot career, I attend a ground school for Fish and Wildlife and National Park Service pilots. We were given a tour of the Rescue Coordination Center (RCC), whose military personnel coordinate military and civilian aviation search and rescues in south-central Alaska. (A similar U.S. Coast Guard program is based out of Kodiak Island for marine and coastal aviation incidents.)

As we walked through the RCC command, I noticed a large wall-size Alaska map with hundreds of pins dotting the landscape. Noting the concentration of pins in such places as Lake Clark and Merrill Pass, it became evident that each pin marked the site of an aircraft accident or the remains of aircraft wreckage.

RCC personnel mark the map not out of fascination or memoriam, but to distinguish old aircraft wreckage from potential new wreckage for which a search is underway. Search coordinators on active searches must be able to provide maps of historical wreckage so that airborne observers can distinguish old wreckage from the missing target aircraft.

It was at once humbling and intriguing to pour over the many pins and note the heavy concentration of pins at certain locations that literally obscured the underlying map. Imagine being a search pilot in Rainy Pass looking for a missing aircraft. Without the historical map you would be wasting precious time pursuing false leads of dozens of ill-fated craft from before World War II.

My eyes were drawn to several locations where I had personally been involved in a search incident, or where I was familiar with very old wreckages on the Kenai National Wildlife Refuge.

Each incident seemed a story unto itself capable of generating a range of thoughts and emotions, not the least of which was the pin I soon located near Ursus Cove on the Alaska Peninsula, where I had crash-landed my beloved Aeronca Champ 7AC two-seat aircraft in 1980.

The long very quiet glide to the alders below that August day had been a real eye opener. Having a long-

trusted aircraft engine quit on you…has been compared to being jilted by a long-trusted lover… it's not suppose to happen and when it does… lost love, particularly that involving a 1947 Aeronca Champ is almost unbearable. Such love should be un-requited and last, well, forever…

The emotional shock of loosing an engine in flight, however, must be quickly replaced by practical considerations, like finding a good landing place with minimal violence during the stoppage. In my case we strategically and fortunately bounced off the alders in a relatively flat spot, bleeding off dangerous speed and energy.

I and my passenger were unhurt but my airplane was "totaled" and would become part of the landscape… and one of those pins on the RCC map, at least for a time. We were a long way from home in steep terrain and our line-of-site emergency transmitter was ineffective. Before the advent of satellite surveillance of emergency signals, we would expect to wait several days before being rescued by a helicopter from the Kodiak Coast Guard Air Base, an earlier version of the helicopter featured in the recent movie "The Guardian." The Coast Guard crew was cheered to be rescuing unhurt subjects and graciously flew us back to the Kenai Peninsula, after only a two night wait.

I sold the salvage to an aircraft mechanic from Kenai for $100 who had access to a helicopter and barge. By the time he attempted salvage several weeks later, the prop, magnetos and other valuable parts had been "sea gulled" or "stolen from the air," a common practice on temporarily abandoned crash sites.

In order to prevent such theft, and to protect historical artifacts and in some cases human remains, and to aid in safe and environmentally compatible removal, the Kenai National Wildlife Refuge, along with other federal lands in Alaska, has established aircraft salvage requirements and regulations. The Alaska National Interest Conservation Lands Act (ANILCA) prohibits unauthorized removal, and a permit is required for any aircraft salvage following an incident. In some cases even today removing aircraft can be unsafe or impractical, in which case the site becomes one of those pins on the RCC map and which may provide a reflective moment or perhaps a revealed secret deep in a future forest for many years yet to come.

For more information on Kenai National Wildlife Refuge Aircraft operations or regulations, contact Rick Johnston or other Refuge staff at Refuge Headquarters (262-7021). Rick Johnston is a Ranger/ Pilot for the Kenai National Wildlife Refuge. He has been a pilot in Alaska since 1978. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Biodiversity on the Refuge

by Mark Laker

The Kenai National Wildlife Refuge came into existence in 1941 as the Kenai Moose Range. In 1980, the Alaska National Interest Lands Conservation Act (ANILCA) changed the name and shifted our focus from moose management to the very broad purpose of conserving all kinds of fish and wildlife populations and habitats in their full natural diversity. This was a tall order, much taller than being a just a moose preserve.

Natural diversity, or "biodiversity" as we say nowadays, refers to the number of species (and their genetic variation) in a given ecosystem. Biodiversity has become a key concept for managing the health of ecosystems, such as wildlife Refuges and national forests. Generally, we try to preserve biodiversity in ecosystems, even if means protecting some pretty minor players, that sometimes may not yet be been named by science.

If we are going to protect biodiversity, we have to know what creatures are out there on the landscape. We need an inventory of the inhabitants, before we can know if they are increasing or decreasing, and potentially in need of management actions.

Much like the stock market, we have to know the historical or present value of our stock to measure how well the investment is doing over time.

In a general way, plant and animal species are the currency of biodiversity.

If species are the currency of biodiversity, then genetic variation represents the value of the currency. Genetic variation is good because it allows a species to adapt to changes in the environment. As an analogy, think of clothes and gear as genetic variation. If the temperature stays at 80° F all year, all you need is a T-shirt and pair of shorts, but if the temperature goes from 80° F to -60° F, you need a closet full of gear. We can measure genetic variation directly by taking DNA samples, but this is expensive. A rough indicator of genetic variation is the variety of habitats in which a species lives. Just like having a closet full of gear and clothes, the greater the genetic variation, the more places a species can exist.

This leads us to the question, what is a species? Philosophers since the ancient Greeks and biologists have argued about the nature species. Even to the casual observer there are numerous forms of life surrounding us—both seen and unseen. Even more remarkable is the great variety, from large white spruce trees to little lichens, from big bears to tiny bees.

Given this great diversity, how can we organize all these organisms into a system that shows how they are related? In 1735 Carl Linnaeus proposed his Linnaean system of classifying organisms in his book *Systema Naturae*. Linnaeus divided organisms into two kingdoms (vegetable and animal) and five ranks (class, order, genus, species, and variety). The basic Linnaean system of naming is still used today and Linnaeus has often been referred to as the father of taxonomy (classification of organisms into categories).

It was no doubt easier to declare a new species a few centuries ago than it is today. Relying on appearance and physical characteristics is no longer sufficient since the advent DNA analysis. The process of declaring a new species had become quite rigorous and can require extended study to pass scientific scrutiny.

There are various concepts of what defines a unique species. A present-day definition of a species requires that the members share similar appearance, are able to interbreed, are reproductively isolated from other populations, and have genetic similarity due to a common ancestor. Currently about 1.75 million species have been identified (about 2/3 of these are insects). Some scientists estimate that the total number of species on Earth is in the 10 to 15 million ranges.

How much biological diversity exists on the Kenai National Wildlife Refuge? To answer this and other questions, we initiated the Long Term Ecological Monitoring Program (LTEMP) in 2004. This is a cooperative project with the U.S. Forest Service's Forest Inventory and Analysis (FIA). We have conducted surveys of plants, birds, and insect on 255 plots, distributed evenly across Refuge lands on a grid. So far, we have identified a total of 1,073 species on the Refuge, including:

- 602 Plants
- 155 Arthropods (insects and spiders)
- 151 Birds

- 97 Fungi
- 29 Mammals
- 20 Fish
- 1 Ice worms

How close are we to determining the full biodiversity of the Refuge? In comparing our count with a few other projects in similar ecosystems, we appear to still have a lot of work to do. The number of species on the Refuge is likely over 5,000—not counting bacteria. The majority of these unidentified species will be insects and plants such as mosses and lichens. There are likely over 3,000 insect species on the Refuge. Our technique of using sweep nets, though very quick, probably only captures a fraction of the insect species.

As a tool for measuring the heath of the Refuge, these efforts to assess the Refuge biodiversity have been beneficial. Though we don't have comprehensive list of historical species present on the Refuge, we at least know what is not here. A total of 71 exotic species have been identified on the Refuge, out of hundreds of exotics that could potentially survive here. Usually the introduction of exotic species into an ecosystem has a disruptive affect. In some cases it can lead to the decrease or local loss of a species and have significant economic impact to the local economy. One purpose of our inventory is to keep an eye out for new invaders, so that we can take early action against them before they get out of hand.

Mark Laker is an ecologist, data manager and GIS specialist at the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Birding events celebrate spring!

by Candace Ward

Kenai Refuge staff learning about birds. USFWS/Candace Ward

Spring is in the air! Our resident birds are beginning their mating behaviors—woodpeckers drumming on tree trunks, owls hooting in showy cadences, and bald eagles pairing up in cottonwood trees. The first of the migrants, elegant white trumpeter swans, have arrived at the outlets of Kenai and Skilak Lakes.

From now through mid-June, a wide array of bird species will arrive to mate and nest using suitable sites from your backyard woods to a wide variety of habitats found on the Kenai Peninsula's public lands.

Alaska's wildlife refuges, parks, and forests, provide breeding, resting, and feeding sites for millions of resident and migratory birds. Our state has the right wild real estate to attract arctic terns from Antarctica, common loons from Baja California, and Golden plovers from Midway Island in the central Pacific.

If watching for these birds intrigues you, and you want to learn more about them, mark your calendar for upcoming spring bird events at the Kenai National Wildlife Refuge (NWR) and other peninsula locations.

The Kenai NWR Environmental Education Center will host a new Homeschool Discovery Room Program, "This One is for the Birds," from 10:00 am – 2:00 pm from Wednesday through Friday, April 11 – 13. Through games, crafts, and "hands on" bird activities, kids will learn about feathers, flight, identifying birds by song, and beak/feet adaptations.

This Homeschool Discovery Room Program is free and snacks will be provided.

If you are interested in participating in this program, you need to pre-register starting on March 28 with Education Specialist, Michelle Ostrowski, at 260-2811.

The community is invited to Spring Fun Day on Saturday, April 14, from 10 am to 3:30 pm at the Kenai NWR Visitor Center (VC) & Environmental Education Center (EEC). Refreshments are provided and all events are free to the public. They include:

10 am - Noon (EEC) – Families with kids of all ages can participate in activities, games, and crafts related to the amazing adaptations and behaviors of birds.

10 am - Noon (Port Road, Kenai River Flats) – Toby Burke and Todd Eskelin, Refuge biological technicians and bird experts, will host "drop-by" stations with spotting scopes to view waterfowl and shorebirds. Dress warmly, bring your binoculars, and enjoy birding with Toby and Todd.

11 am – Noon (VC) – Bird Treatment & Learning Center (Bird TLC) will host a bird "walk-by" with live birds including a great horned owl and a magpie.

Noon & 2 pm (VC) – Academy Award nominated film, "Winged Migration," will be shown. This 90-minute film has spectacular aerial photography fol-

lowing bird migrations throughout the seven continents of the world.

12:30 – 1:30 pm (EEC) - Bird TLC will host a sit down talk with live birds including a magpie and a great horned owl. Learn about these birds in-depth and the important work of Bird TLC from Anchorage.

2 - 3:30 pm - Todd Eskelin, Refuge biological technician and bird expert will guide a ¾ mile birding walk on the Keen Eye Nature Trail. Join Todd for an in-depth look at boreal forest birds. Pre-registration is required for this walk. Call Candace Ward, 262-7021, to make your reservation.

The 15th annual Kachemak Bay Shorebird Festival in Homer runs from Thursday through Sunday, May 10 – 13. This event provides easy roadside viewing of 25 migratory shorebirds, an art and education fair, and special guest speaker John Acorn, the Nature Nut from the Discovery Channel. To get all the details and to register for events visit www.homeralaska.org/shorebird.html

The 3rd annual Kenai Shorebird Celebration will take place Wednesday, May 16 & Saturday, May 19. These two days are filled with interesting discussions and fantastic field trips centered on shorebirds. This is great event for both beginner and advanced birders. Sponsored by the Kenai Watershed Forum, contact Josselyn O'Connor at 260-5449 for more information or visit http://www.kenaiwatershed.org/shorebird.html.

Join in these fun, educational birding programs. Discover more about our feathered friends and the importance of Alaska's public lands to their survival.

Candace Ward is an enthusiastic beginning birder, who works as a park ranger in the Refuge's information and education program. For more information, contact Kenai National Wildlife Refuge at 262-7021. You can check on new bird arrivals or report your recent bird sightings on the Kenai NWR Birding hotline at (907) 262-2300. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Hyperspace: From the Yukon River to the Kenai River

by Geoff Beyersdorf

Do you remember that scene in Star Wars when Hans Solo hits the hyperspace button on the Millennium Falcon and all the stars become blurred lines of light as the ship rockets forward through space? Well, that's about how I feel right now, after moving from Galena to the Kenai. I've been magically vaulted through space and time into a completely different Alaska.

Two weeks ago in Galena it was a balmy -40°F (it's a dry cold…), gas was $6 a gallon, milk $8, no restaurants, no cell phones, and groceries are still run on a tab, where you sign your name on a piece of paper. Oh, and now I know why they call it the "road system." You can actually drive far enough on the Kenai that you can run out of gas. Getting my gas gauge fixed has suddenly moved to the top of my list. In Galena the longest road was eight miles long.

There are definitely some things on the Kenai that I will have to get used to, such as stepping into a car and having no idea what brand or model it is. You didn't see many new vehicles in Galena, so it was hard to keep up on the latest makes and models. On the bright side I now know what a hybrid vehicle looks like. And oh, if you are driving down the road and some guy in a red Toyota pickup with a duct taped shell waves at you, it's probably me. It's a hard habit to break after sixteen years of living in villages and knowing everyone and what they drive.

In my previous job I was the pilot/subsistence biologist for the Koyukuk/Nowitna National Wildlife Refuge, based in Galena along the Yukon River. My plane is basically the same, but much like the complexity added to life by moving to the road system, so goes the rest of my job, now at the Kenai National Wildlife Refuge in Soldotna.

The staff has more than tripled in size. My former refuge had less than a dozen permits for hunting and fishing guides, the Kenai Refuge has a couple hundred such permits. The primary focus at the Koyukuk/Nowitna Refuge was subsistence hunting and fishing, whereas the Kenai Refuge is definitely multiple use. Along with our primary mission of managing wildlife, other activities like recreation, wildlife viewing, photography, environmental education, and interpretation rank right up there with hunting and fishing. In Galena people still talk about the Japanese couple who visited for a day and took a tour of our sole, five-aisle grocery store. On the Kenai there are hundreds of thousands of visitors each year, and I'm told that you can go fishing on the Kenai River and hear five different languages spoken at once.

And the fish themselves are more complex on the Kenai. The Yukon River has three salmon species, each with single runs, but rivers on the Kenai can have five salmon species, some with multiple runs. Fisheries management on the Yukon River focused on escapement, subsistence, and commercial fisheries. On the Kenai River you can include personal use and sport fishing. Getting your salmon to take home is also completely different. Drift nets, set nets, and fish wheels were the way to get your subsistence salmon on the Yukon River. Dip netting will be new to me, and I haven't used a rod and reel to catch salmon since my days on Lake Michigan.

As you can see I've got a lot of learning ahead of me. I expect it's going to be a steep curve over the next few months, especially learning all the different hunting and fishing regulations. I look forward to the opportunity to visit with many of you down the road; and if you happen to catch a wave from a duct-taped red Toyota pickup, don't hesitate to wave back, it's just me.

Geoff Beyersdorf is the new Subsistence Biologist/Pilot for the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Give caribou a break

by John Morton

Very soon, motorists in the Kenai-Soldotna area should be seeing some of the 130 or so caribou of the Kenai Lowland herd. Caribou are commonly seen on the Spur Highway, Bridge Access Road, and Kalifornsky Beach Road, where road signs caution motorists to watch for crossing animals. I often see them grazing in the gravel pit next to the Alaska Division of Forestry headquarters on the Sterling Highway east of the Mackie Lake Road intersection.

Of the four herds recognized on the peninsula, the Kenai Lowland herd is the only one that does not spend time feeding on lichens above treeline in the Kenai Mountains. Instead, this herd winters east of the Moose River, feeding on lichens that have regenerated in the spruce forests since the 1947 fire that burned 310,000 acres. In the latter part of May, cows from this herd calve near the Cook Inlet, from the Kenai Airport down through the Kenai Flats and south towards Kasilof along K-Beach Road.

Many folks new to the area may not be aware of the origin of these caribou. Caribou were traditionally hunted by the Dena'ina, who called them "vejex." Caribou from the peninsula were first described in the scientific literature in 1901 by Joel Allen from the American Museum of Natural History. He reports that caribou were "already very scarce on the Kenai Peninsula, and will doubtless soon be exterminated, the region being greatly frequented by visiting sportsmen, while native hunters kill [them] for their heads, disposing of them at good prices for shipment to San Francisco."

Truer words couldn't have been spoken. In 1912, Andrew Berg shot 13 caribou near Ptarmigan Head in the Caribou Hills, the last authentic report of caribou on the peninsula.

By the early 1950s, biologists from the Kenai National Moose Range (now the Kenai National Wildlife Refuge) and the Alaska Game Commission (now the Alaska Department of Fish and Game) were entertaining the idea of re-introducing caribou to the peninsula. The first 15 caribou were captured from the Nelchina herd near Glenallen and released at an airstrip near the Chickaloon River in 1965. Another 29 caribou were prematurely released at Watson Lake on the east fork of the Moose River in 1966 after the transport vehicle broke down. These two translocations resulted in the establishment of the Kenai Mountain and Kenai Lowland herds, respectively.

Additional releases of 80 caribou in 1985 and 1986 at Emma Lake, Green Lake, Tustumena Glacier Flats, and Caribou Lake eventually became the Killey (Twin Lakes) and Fox River herds. Despite the fact that the Caribou Hills (the last known site for native caribou) were deliberately targeted for reintroduction efforts, caribou failed to establish there, perhaps due to snowmachine traffic. Caribou Hills is the only area on the refuge where snowmachines are allowed above treeline.

The Kenai Lowland herd has remained around 130-150 caribou since 1998, although domestic dogs and vehicle collisions are looming problems as the Kenai-Soldotna area becomes urbanized. Two caribou were killed this past winter on the Sterling Highway in two separate collisions and as many as five have been killed in a single incident on Bridge Access Road.

The Kenai Mountain herd has stabilized at around 400 caribou over the past two decades. The Killey River herd exceeded 700 in 2001 until three snow avalanches killed almost 200 caribou, mostly cows, in 2002 and 2003. The Fox River herd peaked at 98 animals in 1998 but declined to fewer than 40 caribou in 2003, perhaps due to overgrazing and trampling of alpine feeding areas. In July 2004, two sightings of groups of caribou near Exit Glacier in Kenai Fjords National Park suggest that caribou are continuing to expand into new areas on the Kenai Peninsula.

Although caribou have been legally harvested for over 30 years in the Kenai Mountains, the Kenai Lowland herd has been closed to hunting since 1993. A permitted hunt was first held for this herd in 1972. Permits were not issued for harvest again until 1988 when animals were harvested for the next 5 years. Permits are currently issued for only the Killey River and Kenai Mountain herds.

In addition to dogs, vehicle traffic, overgrazing, and human disturbance, Kenai Peninsula caribou may ultimately be threatened by accelerated climate change. Treeline in the Kenai Mountains has risen a meter per year over the last 50 years, encroaching

into alpine tundra that three of the four caribou herds on the peninsula prefer. Although the recent caribou mortalities due to avalanches may be simply a fluke, they may also be a sign that snow pack in the mountains is more prone to slide because of more frequent thawing.

So the next time you see caribou along the highway, give them a break. Slow down and enjoy them. They represent one of the few successful reintroduction efforts for caribou in North America, and certainly help remind us of a wilder heritage on the Kenai.

John Morton is the Supervisory Fish & Wildlife Biologist at the Kenai National Wildlife Refuge. He is also adjunct faculty at the University of Alaska Fairbanks and Colorado State University. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Black bear baiting on the Kenai National Wildlife Refuge

by Chris Johnson

Black bear baiting season will begin on the Kenai National Wildlife Refuge, and it's time to review the rules and regs of this annual hunt.

Black bear baiting is allowed on the Refuge by special use permit only. Brown or grizzly bears are illegal to take over bait at any time.

The part of the Kenai National Wildlife Refuge that is open to black bear baiting is basically the area of the Refuge west of Swanson River Road and north of Swan Lake Road. A large map depicting the open area can be viewed at the Refuge Headquarters located on Skihill Road in Soldotna.

Permits are issued on a first-come first-serve basis. It's not uncommon to have perspective permitees camped out in the Headquarters parking lot waiting to pick up a Black Bear Baiting Permit when the Refuge opens for business at 8 a.m. on the first day permits are issued. This year the Refuge started issuing permits last Monday, April 16th.

Each Refuge Black Bear Baiting Permit is issued for an exclusive one-square mile section. Hunters can only maintain two active bait stations simultaneously, whether on or off the Refuge. Multiple hunters are allowed under each permit but only hunters listed on the permit and that have a signed permit in their possession may use the Black Bear bait station.

What do hunters need in order to get a Black Bear Baiting Permit? Perspective permitees need to have a valid State of Alaska hunting license and be at least 16 years of age, and they must have completed an ADF&G-approved Bear Baiting clinic. The clinic needs only to be done once in a lifetime, and ADF&G issues a certificate or bear baiting card to the attendee.

The permitee needs to be in good standing on past Refuge Black Bear Baiting Permits. This means past permitees who did not turn in their harvest report to the Refuge before September 30 of the last permit year, or who turned their harvest reports in late two years in a row will not be issued permits for one year.

Permitees also need to register their black bear baiting station with the Alaska Department of Fish & Game. This can be done at the Refuge headquarters when you pick up your Refuge permit or at any ADF&G office.

The Refuge Black Bear Baiting Permit does not allow taking bears over bait in numbers, times, places, or by methods not authorized by State of Alaska Hunting Regulations. The bear baiting season on the Refuge begins May 1st and ends on June 15th. For areas in Game Management Unit 15 outside the Refuge boundaries, the black bear baiting season starts April 15th and ends June 15th.

One of the reasons for the difference in season length between the Refuge and the State regulations is that in the past when the Refuge allowed black bear baiting to begin on April 15th, some hunters used snowmobiles to bring in their bait stations. These hunters often brought in too much gear or went in too far to set up their bait stations, and were not able to haul all the equipment out at the end of the baiting season, since ATV's are not allowed at any time on the Refuge. Furthermore, the harvest report data indicated no black bears were taken over bait on the Refuge before May 1st; the data also showed that the highest harvest occurred May 10 through May 25.

It is important to note that black bear baiting is not allowed within one-quarter mile of publicly maintained roads, trails and the Swanson River within the Kenai National Wildlife Refuge. Black bear baiting also is not allowed within one mile of a house, or other dwelling including seasonally occupied cabins, a developed recreational facility or campground.

Only biodegradable materials may be used for bait. The parts of game that may be legally used as bait are heads, bones, guts, skin, or other parts of legally taken game not required to be salvaged. On the Kenai Peninsula fish or fish parts may not be used as bait. Most black bear baiters on the Refuge use dog food mixed with syrup, pastries, and scents.

Bait stations must be clearly marked with a warning sign, on which must be marked the permittee's Alaska Hunting License Number and the hunting license of any one else hunting over the bait station, Alaska Bait Station Registration Number, and the Kenai NWR Bear Baiting Permit Number. This sign must be within 20 feet of the bait station and between 6 and 10 feet above ground level. We also recommend that the bear baiter put up several signs posting the

area as a bait station to avoid anybody inadvertently walking into an active bait station. It's also common for the bears coming into the bait station to tear down or eat the signs.

All materials and equipment including stands, bait and bait containers, contaminated soils from grease or other baits, and signs must be removed by the June 15 end of the black bear baiting season. And finally a black bear baiting Harvest Report Form must be completed and returned by July 15 of the year of the permit is issued. This needs to be done whether the permitee baited or not. Failure to report in a timely manner will result in the permitee not being eligible for a permit the next year.

Other regulations associated with black bear baiting on the Refuge. The use of nails, wire, screws or bolts to attach a stand to a tree, or hunting from a tree into which a metal object has been driven to support a hunter is prohibited. The Refuge recommends hunters use portable tree stands. Also the cutting of green trees is prohibited.

Chris Johnson is the Supervisory Law Enforcement Officer at the Kenai National Wildlife Refuge and has been an Officer at the Refuge for 18 years. He lives in Sterling with his wife Pam and three kids Chelsye, Tyler and Torrey. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Emergency care and rehabilitation of baby song birds workshop May 13, 2007: Knowing when to help, and when to stay away

by Liz Jozwiak

The warmer weather, longer days, and the quick snow melt is a good indication that spring is just around the corner. It's also the time of the year when the Kenai National Wildlife Refuge starts receiving calls from the public about injured or abandoned baby birds and nestlings.

Most songbirds such as the warblers, juncos, thrushes, and sparrows arrive on the Kenai Peninsula to breed by late May to early June. Flycatchers and pewees arrive a few weeks later. These songbirds are also known as "neo-tropical migrants" because they winter as far south as Central and South America, and migrate to Alaska to breed. All songbirds are born helpless, as are woodpeckers, hawks, owls, crows and ravens. Their eyes are usually still closed, and they have few or no feathers. They are completely dependent upon their parents for warmth and nourishment. Waterfowl and grouse-type birds, on the other hand, are usually feathered and able to feed themselves within a few days after hatching.

It is our human nature to help a baby bird which looks as though it has fallen out of a nest. The chick was either trying to leave the nest prematurely, may have fallen out, or was learning to fly. In some cases our help is appropriate, in other cases it is not.

If you spot an animal, particularly a young or juvenile animal that appears to be deserted or in difficulty, do not catch it right away. Take 20 minutes or so to observe its behavior. Try to locate its nest. It should be close by. Look in heavy brush, hollow tree branches, and in shrubbery. Some birds such as juncos and robins are ground nesters, so the nest may not be in a tree, but on the ground or in shrubs.

In the case of a young or juvenile animal, it may simply be waiting for a parent to return. Remember, adult animals will often leave their young to hunt for food and return within a short period of time to feed/care for the offspring.

If you believe the animal is injured, call the Kenai National Wildlife Refuge at 262-7021 BEFORE you pick up the animal.

Injured or baby birds need special handling. Keep an eye on its whereabouts and describe its condition to the biologist or bird rehabilitator you reach on the phone. They will give you the proper course of action to take for that particular animal.

Even if you find another nest of the same species with nestlings in it, you may be instructed to put the baby there. This is especially successful for swallows, or if the baby is still naked and blind. If the baby bird seems warm and active, put it back in the nest immediately.

Don't worry that because you have touched the chick its parents will abandon both it and the nest. The majority of birds do not have a highly developed sense of smell. They will not "smell" a human and reject the nestling if you replace it in the proper nest. The parent birds may abandon a nest that they are building if it is bothered, but they are not likely to abandon a nest once the eggs have hatched.

If you find a feathered baby bird that is not in a dangerous situation (away from dogs, cats, roadways), it is best to leave it alone. The parents are probably nearby and will take care of the baby. Several species of birds (i.e. jays, towhees, American Robins) continue to care for their young and, in fact, finish the fledgling's education at ground level.

Many baby birds leave the nest before they are able to fly. The reason they do this is varied. It could be that the nest became too small to accommodate all the babies (they've been growing at a rapid speed) or because parasites have invaded the nest, or because they sense they have a better chance against predators being out of the nest, but mostly because the parents have coaxed them, one-by-one, out of the nest because they knew instinctively it was time for their babies to take their first flight!

The parents have not abandoned them; they are close by, watching and caring for these babies. They bring food to them throughout the day and within a short period of time (days) the babies are flying, not gracefully, but flying short distances and then they fol-

low their parents who will show them the best sources of food and water.

The best thing to do is to leave the baby bird there. If you have picked the chick up, bring it back to the exact area you found it and place it in or under a bush. The parents have, most likely, been frantically looking and calling for this lost baby. You can wait and watch for a few hours to make sure the baby bird is OK, but do this from as far away as possible so you don't frighten the parents who are waiting for a safe time to approach the baby bird. If after watching from a distance for several hours you cannot see the bird's parents, follow the previous instructions and call the Kenai Refuge.

The one exception is if a baby bird is in an obviously dangerous situation like sitting in the middle of the road. Pick it up and place it in a nearby bush where parents will still find it easily.

If you find a baby duck, shorebird or grouse, try to locate the parents and the rest of the brood. Release the baby nearby and leave the area so that the adults and baby may find each other by calling. These babies are feathered and can feed themselves even if the parents do not find them right away.

The worst-case scenarios are where the parents have been injured or killed, the nest blown down or destroyed, leaving the baby injured, cold, or lethargic. In these situations you will need to contact a licensed wildlife rehabilitator who specializes in baby songbird care.

Remember, most species of birds are federally protected and therefore it is not legal to keep them unless you are licensed to do so. Beyond the legalities, these animals require specialized care and diets to grow up healthy and strong. It's important to turn them over to an experienced person as soon as possible.

In Alaska, as in most states, wild bird rehabilitation is governed by the U.S. Fish and Wildlife Service. Most large communities have established wildlife rehabilitation centers such as the Bird Treatment and Learning Center (BIRD TLC) in Anchorage. The Kenai National Wildlife Refuge has filled this niche locally with the help of a team of baby bird network volunteers. I'm one of the federally licensed bird rehabilitators on staff who trains and works with a few very dedicated private citizens in the Soldotna/Kenai area who are legally permitted to provide home care to baby birds that cannot be returned back to the wild.

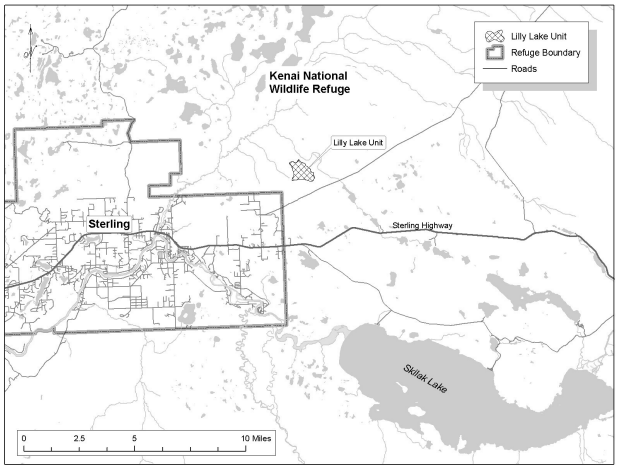
This year we will be recruiting additional baby bird volunteers who would like to join our rehabilitation network and receive training. There will be a Baby Bird Training Workshop on Sunday May 13, 2007 from 1pm to 5pm at the Environmental Education Log Cabin at the Kenai NWR Headquarters on Ski Hill Road in Soldotna. The class is limited to 20 individuals, and pre-registration is required. Please call 260-2818 to register.

While the Kenai National Wildlife Refuge is fortunate to have a small network of experienced baby bird rehabilitators, humans nevertheless make poor substitutes for bird parents. If you happen across a small ball of feathers learning to fly, resist the temptation to rescue it. Its parents are probably not too far away.

Elizabeth Jozwiak is a wildlife biologist and federally licensed bird rehabilitator at the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Refuge plans prescribed fire northeast of Sterling

by Doug Newbould



Map of Lily Lake Clarion. USFWS.

In our ongoing efforts to mitigate the adverse impacts of wildfire upon the communities of the Kenai Peninsula, the Kenai National Wildlife Refuge is planning to activate the Lily Lake Prescribed Fire Plan this year. The Lily Lake project is designed to reduce hazard fuels—in this case, black spruce—within the wildland-urban interface near the community of Sterling.

The 431-acre Lily Lake unit is a dense, continuous stand of black spruce on the Moose River Flats between the East Fork Moose River and the northeast corner of the Sterling Corridor (that area of private and public lands between and including the communities of Soldotna, Sterling and Funny River, and surrounded on three sides—north, east and south—by the Kenai National Wildlife Refuge).

For those of you who have lived in the area and witnessed management activities on the Refuge over the past 20-40 years, you might remember previous fuels treatments adjacent to the Sterling Corridor. In the 1970s and 80s, refuge employees mechanically 'crushed' and/or 'chopped' about 20,000 acres of black spruce within the Skilak Lake (1947) and Swanson River (1969) fire scars.

Those mechanical treatments were designed to break down the impenetrable, unsightly (to some) thickets of blackened spruce poles that remained after those wildfires burned across much of the northwest Kenai Peninsula. The treatments were also designed to improve habitat for moose and other species. Some of the crushed areas were subsequently treated with prescribed fire—to further reduce down, dead woody fuels and to improve moose browse.

After many years of research and treatment monitoring, we have found these combined treatments (mechanical and prescribed fire) to be the most effective in converting areas of black spruce to early- or mid-seral communities composed of grasses, forbs, shrubs and deciduous trees. These hardwood communities, in addition to the habitat benefits they provide, are fire-resistant. Fire resistance, in this context, means that the forward rate of spread of an approaching wildfire (often a running crown fire in black spruce) will be greatly slowed or stopped when it reaches the hardwood stand. And better yet, a healthy hardwood stand of aspen, birch or poplar can provide a 'natural' barrier to wildfire for 50 years or more.

The Lily Lake unit is actually the fourth unit to be treated in the Lily Lake area east of Sterling. The first three units were successfully treated—mechanically and with prescribed fire in the late-80s. Those units, as well as units within the Skilak Loop and near Mystery Creek have been converted to hardwood forest over the past 20 years. The fourth Lily Lake unit will complete the northern end of the planned 'chain' of converted forest stands between Skilak Lake and the Moose River—a living fuelbreak between the wildlands of the Refuge and the communities of Sterling and Funny River.

The Lily Lake Prescribed Fire Plan calls for the unit to be burned in two separate operations or phases. Phase-1 will burn the 184-acre crushed outer ring, the width of which varies between 300 and 600 feet. The first phase is designed to be a low-risk prescribed fire, with relatively short flame-lengths, little spotting potential and a low risk of escape. Phase-1 will create a secure fireline around the entire unit and lessen the relative risk of Phase-2.

Phase-2 will burn the 247-acre 'donut hole' or island of standing black spruce at the center of the unit. The first phase is planned for early in the fire season (early June). The second phase is planned for later in

the season, after the ground fuels have dried out sufficiently to promote consumption of the mosses and duff and expose soils in a mosaic pattern. Soil exposure is one of the essential ingredients in our recipe for converting black spruce to hardwoods. Without duff/moss consumption and soil exposure, the likely outcome of this project will be the regeneration of black spruce.

If for some reason we are unable to burn Phase-1 in early June, as planned, we may wait until later and combine the phases into one event. If that happens, we will still burn the outer ring first, creating a secure fireline, before igniting the island of trees in the unit's interior. And whether we conduct the prescribed fire project in two entries or one, there is the possibility of residual smoke in the area of the burn for up to a week after ignition, especially at night when local winds tend to subside and smoke settles in low-lying areas.

If you live in the Adkins Road area, in Sterling, or anywhere within the Sterling Corridor, we want to talk with you about our project plans and address any of your comments or concerns before we begin prescribed fire operations. Please call Dianne MacLean, the Refuge Assistant Fire Management Officer, or me at (907) 260-5994.

Doug Newbould is the Fire Management Officer for the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Kenai Shorebird Celebration flies for third straight year

by Todd Eskelin

The Kenai Shorebird Celebration is happening for the third consecutive year next week. What began as a small workshop hosted by the Kenai National Wildlife Refuge and the Kenai Watershed Forum has grown into an annual event. This year the sponsors include the Kenai Convention & Visitors Bureau and the Keen Eye Peninsula Birders. Initially designed as a workshop to help local birders with identification of the sometimes difficult shorebirds, the two-day event now offers speakers on many different shorebird subjects and two field trips to the Kenai and Kasilof River Flats.

At the field sites, local experts will have their scopes set up and will be on hand to explain the subtle differences between the many species of shorebirds that migrate through our area. In past years there were as many as 15 different species of shorebirds spotted during the field trips. While the event has focused on more dedicated birders in the past, there are opportunities for all ages this year. On the field trips there will even be a scope dedicated just to the youngsters and set up at an appropriate height so that they can see the birds comfortably.

Speakers this year will be talking about a multitude of subjects including the wonders of shorebird migration and explaining how researchers are using new technology to track birds every movement as they fly non-stop over the Pacific Ocean. You will learn the migration story of the Bar-tailed Godwit which recently set a record for a non-stop flight of over 10,000 kilometers in just over 7 days. There will also be a guest speaker from Grays Harbor National Wildlife Refuge discussing how the internationally traveling shorebirds affect human communities differently up and down the Pacific Flyway. You will learn how different communities embrace the event in a variety of ways and how the phenomenon of shorebird migration has an economic impact on these communities.

Other speakers will share their knowledge of photography, both traditional and digital. One photographer will explain how he has dedicated much of his recent efforts to capturing birds in flight and how you too might be able to photograph that Arctic Tern hovering over the pond before launching on an unsuspecting salmon smolt. This may help you learn how to capture that perfect shot that always seems to elude you. There will be a talk titled "Little Chicks." This speaker will discuss how he has raised his kids with an appreciation for birding and their accomplishments, and he will be recognized for this at the Kachemak Bay Shorebird Festival in Homer this weekend.

If you have any interest in birds, this is an event you cannot skip. The two-day event is on Wednesday, May 16th and Saturday, May 19th from 10 a.m. to 4 p.m. You can attend just one day or both. All activities are free, but you must register with the Kenai Watershed Forum so we can plan our lunches. To sign up, call the Kenai Watershed Forum at 907-260-5449 or email Josselyn O'Connor at josselyn@kenaiwatershed.org.

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

What can be done to prevent the spread of "invasive" plants on the Kenai Peninsula? Find out by attending Dandelion Sundae

by Toby Burke

Several exotic plant species have received national attention for the widespread havoc they have wrought on native plant and animal communities. In the arid west cheatgrass has displaced native sagebrush by making the region susceptible to frequent large scale wildfires that sagebrush cannot long survive. It has degraded vast areas of formerly productive rangeland impacting both native fauna and domestic stock. Purple loosestrife has degraded wetlands in the east by forming dense monocultures displacing diverse native wetland plant and animal communities, most notably impacting birdlife. Kudzu is overrunning the southeast smothering native vegetation as well as commercial forests and miles of electrical transmission lines. Unfortunately, several invasive plant species have the potential to become pests on regional and even continental scales.

With that in mind, the exotic or non-native plants persisting on your property may not be as benign as you think. They may have the potential to escape and become invasive plants affecting not only our urban landscape but the larger landscape as well. Accordingly, natural resource agencies and local citizens are becoming increasingly concerned about non-native, invasive plants and the many problems they pose for native flora and fauna and the quality life we residents enjoy on the Kenai Peninsula.

While not all non-native plants are necessarily invasive more than a few are and they can cause irreparable harm to an ecosystem and its constituent parts.

Invasive plants can adversely alter natural ecological processes. They may be capable of causing major, possibly irreversible, alteration or disruption of these processes by altering geomorphology, hydrology, or fire regimes. They can adversely alter natural community structure by changing the density of a layer of vegetation, creating a new layer, or eliminating one or more layers. They can adversely alter natural community composition resulting in the extirpation of one or more native species, reducing biodiversity or changing the community composition towards species exotic to the natural community. They can adversely alter higher trophic levels impacting animals, fungi, microbes, and other organisms in the community it invades.

More specifically they can alter geomorphologic patterns by increasing erosion by thinning or eliminating native plants that once formed a dense layer of roots holding sediments in place. Or conversely they can completely cover sediments that were naturally unvegetated. They can alter hydrological patterns by changing stream flow and sedimentation rates. They can change water chemistry and accelerate the eutrophication of lacustrine waters (lakes and ponds), fluviate waters (streams and rivers), and even marine (coastal) waters. They can change fire regimes by altering the temporal and spatial distribution and severity of fires. They can change the entire structure of plant and animal communities. They can extirpate species or populations of species and reduce biodiversity. They can also be unpalatable to domestic livestock and some aquatic invasives can physically clog lakes and streams impeding navigation. The list goes on and on.

The ubiquitous and exotic common dandelion, found on the margins of roads, trails, sidewalks, driveways, parking lots, campgrounds, and in lawns has become the "poster child" for invasive plants. Like many invasive plant species they readily colonize disturbed areas and can often be difficult if not impossible to eradicate once established in the botanical community. This plant is probably the most familiar invasive we have on the Kenai Peninsula and it can serve to introduce concerned citizens to a larger cadre of invasive plants especially ones likely to be encountered locally.

On Sunday May 20th, from 1 - 4 p.m., the Kenai National Wildlife Refuge along with the Kenai Watershed Forum, the Kenai Soil and Water Conservation District, the University of Alaska Fairbanks Cooperative Extension Service, and River City Books will host the third annual "Dandelion Sundae" at the Refuge Visi-

tor Center/Headquarters on Ski Hill Road in Soldotna. Come rain or shine and bring a grocery-sized bag of dandelions and any other invasive plants that you can readily identify and remove. Alternately, you may come and pick invasives around refuge headquarters to prevent their spread to adjacent refuge trails. Then, give us your bag of invasives and you will receive a free ice cream sundae.

Prizes will be awarded for outstanding effort and free invasive plant guides will be given away to aid in identification and control of invasives of local concern such as Canada thistle, reed canary grass, cheatgrass, common toadflax, oxeye daisy, orange and yellow flowered hawkweeds, brittlestem hempnettle, bird vetch, Scotch broom, white and yellow sweet clovers, Siberian peashrub and others. Become informed and contribute to the effort to prevent and control the spread of invasive plants in your community and adjacent wildlands. For further event details or recommendations on where to go "weed pulling" contact Kenai National Wildlife Refuge at 262-7021.

Toby Burke is a biological technician at the Kenai National Wildlife Refuge. He specializes in invasive plant surveys for the refuge and he will be one of the hosts of Dandelion Sundae. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Mother nature leaves Refuge fishing facility unusable

by Bill Kent

Ice damage photo at Moose Range Meadows fishing facility. Credit: Jim Neely/USFWS.

Ice damage to stringers and pilings at Moose Range Meadows fishing facility Photo Credit: Jim Neely/USFWS

Everyone living here on the Kenai Peninsula knows the Kenai River is an unrivaled resource for the local community. The thought of landing a record King salmon or a monster trout lures folks from around the country and indeed the entire world. Fishing on the river has always been popular, and the opportunities for harvesting the unparalleled fishery resources in the river are numerous and varied.

Visitors came from all walks of life and many countries to fish the Kenai. A variety of facilities have been constructed along the river in the past few years to reduce (and hopefully eliminate) the loss of riverbank vegetation resulting from trampling by fishermen. Thousands of visitors have utilized these facilities each year, and the riverbank generally has been protected from excessive trampling.

However, damage resulting from the flood of this winter has impacted many of these fishing facilities along the river, and Kenai Refuge's Moose Range Meadows facility was no exception. The ice floes stacked along the riverbanks in this area heavily damaged the support structures which underlie the light-penetrating walkways. Many of the six-inch pilings were twisted or bent, and a number of the 4x8 stringers were carried away.

Now that the ice has finally melted off, the Refuge staff has requested an inspection by our Engineering office in Anchorage. This will provide an evaluation of the damages and an estimated cost of replacement. Once the results are provided to us, we can request funds to get these facilities repaired and returned to public use. The Moose Range Meadows access boardwalks were constructed with funds derived from a variety of partnerships and had the strong support of Senator Stevens. However, no funds are available at this time to repair these structures, as budgets for the entire Department of the Interior including the Refuge System have not kept pace with the rising costs of utilities and other fixed costs over the past few years.

When we take all those factors into consideration, it becomes clear that the facilities will not be repaired this year, and may not get fixed for a few years since the work far exceeds the Refuge's annual maintenance budget, not just for one year but many, many years; repairs will occur only through "special" funding. Another facet of the repairs is that the original work was done in winter to protect sensitive riverbank vegetation and soils; repair work would follow the same criteria. This means a multi-season, if not multi-year, project to remove the damaged structures and construct new facilities.

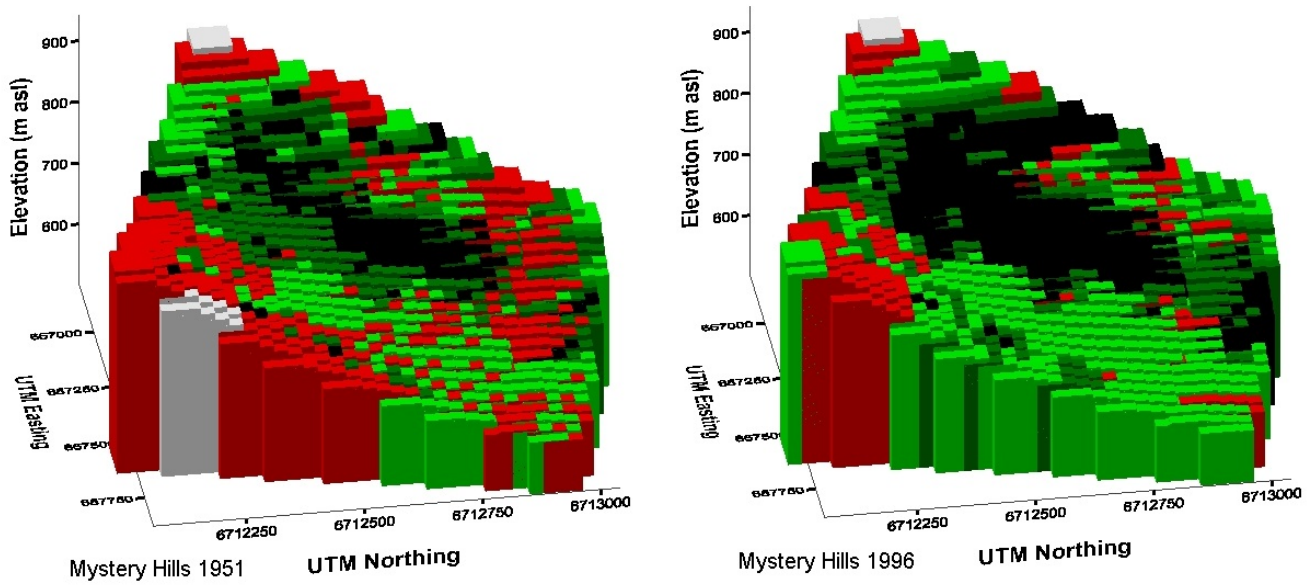
We are hopeful that repairs can be accomplished as quickly as possible, and are trying to determine what "emergency" funds may be available for such a large project. We will keep you posted in the coming months of our success or failure. Please, rest assured

that we want the facility repaired as quickly as possible and available once again to you and other Refuge visitors.

Bill Kent is the Supervisory Park Ranger at Kenai Refuge. The Kent's live in Sterling. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Kenai Mountain Treeline Advances Like Spreading Bread Mold, Not Like Rising Bathtub Water

by Roman Dial and Ed Berg



Vegetation and topography in the Mystery Hills. Closed canopy forest in the valley expanded substantially in the 1951-1996 period, as did shrubs on the valley slopes. Red = tundra; light green = shrub; olive green = open woodland; black = closed canopy. Square (pixel) sizes are 30 meters (100 feet). Longitude and latitude are in UTM meters; elevation is in meters above sea level.

Driving the Seward and Sterling Highways in the spring is a good time to see that tree-line is slowly but surely creeping up the Kenai mountainsides. The melting snow offers a contrast to the small, dark mountain hemlock and white spruce that poke through this year's shallow snow. Most of these little guys are trees that are invading the alpine shrub and tundra lands; they aren't stunted old-growth trees, but are new recruits to the alpine zone and they are spreading upward.

Because trees grow relatively slowly at tree-line, it's difficult to rely on memory to document how much trees have grown over the years. As with your children, it's easier to compare photos to observe the growth. For their thesis projects, two graduate students at Alaska Pacific University, Katriina Timm and Alissa McMahon, compared aerial black-and-white photos taken in the early 1950s to photos taken in the same area in 1996 to see how much tree-line has risen in the western Kenai Mountains.

The aerial photos Katriina and Alissa used were "orthorectified" and "georeferenced", meaning that landmarks (e.g., trees) on the photos could be precisely located by latitude and longitude. The aerial photos were digitally scanned, and displayed on a computer screen using a geographic information system (GIS). This way, the grad students were able to compare one photo to another as overlays and relate any vegetation changes to elevation and aspect.

To compare the two years in an unbiased fashion, Katriina spread a thousand random points across the GIS landscape. Because she was interested in

tree-line changes, the points were located at an elevation of 1500 or more feet above sea level (the average level of tree-line as shown on local topographic maps). She then classified each point as unvegetated, tundra, shrub, open-woodland, or closed-canopy forest. Because the points were located in the exact same location on both the 1951 and 1996 photos, Katriina could trace the history of each point from 1951 to 1996.

What Katriina found was quite striking. First, the number of closed-canopy forest points above 1500 feet doubled from 1951 to 1996, from 8% to 16% of the total area sampled. Most of the new closed-canopy points had been open woodland points in 1951. While the number of open-woodland points remained essentially constant, only about a quarter of them remained in the same place. By 1996 the other three quarters of the woodland points were located at mostly higher elevations. Formerly shrub and even tundra points had become wooded over the 45-year period. Perhaps the most dramatic change was in tundra, the dominant alpine vegetation type, where 20% had disappeared from 1951 to 1996, having converted to shrub or open-woodland.

Tree-line on the Kenai is not a level line, like a bathtub ring, but rather a ragged boundary of patchy woods and forest run through by avalanche paths. Katriina's analysis showed that most of the new woods and forests had advanced on northern exposures, with far fewer changes than expected on the drier south and west facing aspects. This is consistent with interior Alaska tree-line studies done by Dr. Glen Juday of the University of Alaska Fairbanks, where white spruce is actually growing slower as summers warm, because of drought stress.

One can visualize tree-line on the Kenai as spreading like mold across a slice of bread, with infilling between established patches of trees as well as new, small patches. Overall, the highest 25% of the 1996 wooded points on Katriina's GIS are 160 feet higher than the highest 25% in 1951. If we interpret tree line as the ragged edge made up by the highest 25% of the trees observed, then tree line has increased by nearly a yard each year since 1951. Yule Kilcher, the late patriarch of the Kilcher clan in Homer, once remarked that tree line had advanced "a few hundred feet" in the Kachemak Bay area since he first arrived there in the 1940s.

To be sure that the changes they saw using aerial photography were real, Katriina and Alissa also visited the mountain slopes. Hiking into the alpine zone, they found groups of young trees spreading both uphill and downhill from patches that first established themselves in the 1950s. Sacrificing a hundred or so trees to science and dating the trees by counting tree rings, they found that the largest cohort of their sample germinated during the warm but not-too-dry decade of 1985-1995. The still warmer and drier last decade, from the mid-1990s to 2005, when they conducted their field work, was the decade of least new tree recruits to the alpine zone, consistent with the patterns of drought-stressed growth seen in the Interior.

Together with warming sea water temperatures in Cook Inlet, Kachemak Bay, and Prince William Sound; drying lakes and wetlands across the Kenai Lowlands; spruce bark beetle and other forest tree pest outbreaks throughout the Peninsula's uplands; as well as the retreating glaciers and thinning icefields of the highest mountain ranges, rising tree-line points to a fundamental change in the Kenai's climate. Even if the climate were to reverse itself today, the changes we have already seen during the last 50 to 100 years would likely take more than that length of time to reverse themselves.

Roman Dial is a Professor of Biology and Mathematics at Alaska Pacific University and a long-time, Alaskan outdoor enthusiast. Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Burning Peat—a good source of energy and a firefighter's nightmare

by Doug Newbould

Back in September of 2005, my wife and I traveled to Ireland to celebrate our 25th anniversary and to explore some of her family's ancestral roots. Some of you might recall I shared some of our experiences from that trip in the Refuge Notebook (11/4/05).

One of the aspects of life in Ireland I witnessed but did not write about then, was the use of peat for fuel. As we traveled along the windswept and oft storm-battered western coastline, visiting various towns, inns and pubs, there were several occasions on which we were grateful to experience the warmth and ambience of a peat fire. And we learned how the Irish have been harvesting peat and warming their cold bones with it for millennia.

As I described in that earlier article, thousands of years ago Ireland was a forested isle, but population growth, farming and demand for wood products caused widespread deforestation. Lacking firewood and needing an energy source for cooking and heating, the people turned to peat 'logs'. As peat is abundant in the bogs, fens and moors of Ireland and as necessity is the mother of invention, someone must have observed peat burning during a period of drought and wondered if it could be used as fuel.

What someone discovered was that peat, when cut from the ground as chunks or 'logs' and piled or stacked above the water table, eventually dries out sufficiently to burn in a fireplace or stove. And dried peat burns very slowly and efficiently. By that I mean it smolders intensely, much like a cigarette or cigar when air is drawn through the tobacco, achieving nearly complete combustion and producing abundant heat energy. Conversely, peat produces only small quantities of ash and a pleasantly aromatic smoke with a sweet earthy bouquet.

During one of our excursions, driving east along the weathered coast between Clifden and Galway, we came upon a peat harvesting area. Gazing across the bogs we could see line after line of peat cuts, like two-foot high cliffs of obsidian glinting in the sun, each stretching out for a hundred feet or more. Near these escarpments were mounds of the four or five inch diameter black logs, each mound with enough volume to fill a pick-up truck or two. I stopped at one pile near the road to study the peat logs more closely. What I found was quite interesting.

When still wet, the logs were quite heavy – several pounds each. Dried, they weighed much less, only a fraction of their former mass and easy to handle with one hand. Upon closer inspection I could see the logs were composed of densely packed roots, stems, twigs and leaves from heaths and other dwarf shrubs and mosses. As one might expect, the individual plant parts were much more discernable at the top of the core than at the bottom. And even though the logs smelled like dank rich earth, there was no visible inorganic or mineral soil or sand present. Each log looked to be carved out of the face of the cut by some kind of semi-cylindrical spade or perhaps a coring tube like we use to catch razor clams.

In some of the buildings we visited a combination of wood, peat and sometimes—coal burned in the fireplaces. Where coal was burning the air reeked of sulfur and the black acrid smoke stung the eyes and throat. I tried to imagine what it must have been like in the cities where coal was once the fuel of necessity. To me, if given the choice, I would go for the peat and wood.

Living here in Alaska, I've often wondered if there are places where peat could be harvested and used in an environmentally-friendly manner. Besides the release of carbon into the atmosphere, I wonder what adverse environmental impacts would result from cutting and burning peat as compared to wood, coal or other fossil fuels.

As a firefighter and as a fire manager, I have often experienced the challenge of peat fires in the wildlands of the western states and Alaska. And I have to say I would much rather enjoy a peat fire in a fireplace or woodstove. Peat fires can be nearly impossible to extinguish once ignited and they can be quite hazardous to firefighter health and safety.

At the Clover-Mist Fire in Yellowstone in 1988, I was leading a crew of firefighters single-file across

what appeared to be a burned meadow or bog when one of my crew stepped into a deep hole where the ash was about three feet deep. Although we could smell no smoke nor sense any heat on the surface of the bog/meadow, the peat in the bottom of the hole was still burning intensely. The crewmember received second- and third-degree burns on one leg below the knee.

Other firefighters have been scalded by the steam that literally explodes directly back at them when they spray a straight stream of water into deep ash or burning peat. And many a wildfire has escaped control, rekindled or reburned after hiding away down deep in organic ground fuels.

The firefighters down in the Okefenokee National Wildlife Refuge in southern Georgia are currently experiencing the nightmare of these deep organic peat fires—nightmarish in the uncertainty and risk of trying to control such fires. Though in the greater scheme of things, these fires naturally occur during severe drought and can restore historic habitat conditions.

Here on the Kenai Peninsula, where peat mosses or Sphagnum grow under closed canopy spruce and hemlock forests, deep-burning peat fires tend to occur only in drought years or late in the season when ground fuels are at their driest. Fires burning deep in compacted duff, root-wads or peat can carry-over from one year to the next. This happened on the refuge last year within the King County Creek Fire perimeter, when the fire from 2005 over-wintered in ground fuels and popped back up to the surface during a brief dry period last summer.

While these deep-burning fires can have some beneficial ecological effects, they can also release tremendous amounts of carbon into the atmosphere. As with many land management scenarios, there are complex trade-offs between adverse and beneficial effects in the short-term and the long. Maybe the Irish are on to something—perhaps it is better to take the peat to the fire rather than the fire to the peat.

Doug Newbould is the Fire Management Officer for the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Kenai and Kasilof Flats: A resource to cherish and conserve—not trample

by Toby Burke

Two years ago I became a resident of the Kenai Peninsula and like most new residents was immediately impressed with the richness of its natural resources. In time I became particularly captivated by the Kenai and Kasilof Flats. These two "Flats" are in fact estuaries. An estuary is the tidally influenced broad lower course of a large river and the embayment at its mouth where salt and fresh waters mix. This mixing of fresh and salt water creates a transition zone between land and sea. Estuaries are renowned for their prodigious biological productivity. Along with tropical rainforests, and coral reefs estuaries rank as the world's most productive ecosystems, more productive than the river and ocean waters that act upon them from either side.

In an estuary, nutrient-laden river waters combine with shallow coastal waters and the upwelling of nutrient-laden deeper ocean waters to generate exceptional primary productivity which supports vigorous marine food chains. The mixing of lighter fresh water and heavier salt water trap and circulate nutrients, the majority of which are retained and recycled by benthic organisms to create an area of concentrated productivity in terms of number of individual organisms and species as well as total biomass and energy. An abundance of aquatic plants and various invertebrates provide food for fish, seabirds, shorebirds, waterfowl, and marine mammals.

Lately the Kenai and Kasilof Flats have been attracting more than just exceptional concentrations of fish and wildlife. While all motorized vehicles are forbidden on and behind the dunes of both estuaries, both areas are suffering from illegal trespass by four-wheelers, motorcycles, trucks, and snow machines. The Kasilof Flats have been trampled for years now, to the point that an extensive and spreading network of roads and trails exist on and behind the dune complex on the south side of the river. The Kenai Flats have up until the last few years escaped the trampling experienced on the Kasilof but a new road, several four-wheeler trails, and even an airplane landing strip have newly appeared on or just behind the dune line on the south side of this river. All these activities are forbidden and these activities are occurring on public lands, both state and municipal. Local government and resource agencies are aware of the illegal activities but insist they do not have the resources to stop them and prevent further degradation.

It should be noted that the majority of the degradation of these two Flats occur during the set-net and dip-net seasons. At this time there is a concentration of motorized vehicles at the mouths of both rivers and netters waiting for the next tide go for a lengthy joy ride behind the dunes to "kill" some time. Outside of these two periods motorized vehicle trespass is generally concentrated during mild weather and on the weekends.

While this is unfortunate, concerned citizens are not powerless when it comes to protecting and conserving the Kenai and Kasilof Flats. First and foremost individuals as well as civic organizations can contact their state and local elected officials and make them aware of the degradation of these two valuable estuaries and request that action be taken to prevent further degradation. Citizens that witness motorized vehicles trespassing on the Flats should continue to report them to state and local law enforcement authorities and insist that laws protecting these areas be enforced.

When practical I have even stopped offending motorists in these protected areas and made them aware of the illegality of their activities and suggested that they return to the beachfront where their activities are allowed. Once confronted these individuals typically leave the vegetated flats and return to the unvegetated beach to resume their motorized joy ride.

The biological productivity of Kenai and Kasilof estuaries should remain a lasting source of economic, recreational, and spiritual value. But it won't if concerned citizens look the other way. If you appreciate the Kenai and Kasilof Flats make your voice heard take an active hand in their long-term conservation.

Toby Burke is a refuge biological technician who enjoys long walks with his children on the Kenai and

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

When the family from Georgia comes for a visit

by Bill Kent

Hidden Creek and Skilak Lake on Kenai National Wildlife Refuge. USFWS

Originally ran July 1, 2005.

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

You could see the near disbelief when my sister-in-law saw what my wife and I have taken for granted for so long. She wasn't shy, and asked lots of questions. Many of our answers were a strain for her to grasp, as the immensity of Alaska is often overpowering for the newly arrived visitor. My wife and I have fallen into the same trap as many who live in Alaska—we are guilty of not seeing the forest for the trees. But, with every one of my sister-in-law's questions, more and more of the forest became visible once again; it sometimes takes watching another person trying to come to terms with the abundance of Alaska to regain one's perspective.

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

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

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

Bill Kent has been the Supervisory Park Ranger at Kenai National Wildlife Refuge since 1991; he and his family live in Sterling. Earlier in his career Bill worked at Okefenokee, Merritt Island, Parker River, and Klamath Basin National Wildlife Refuges. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Preventing bear problems is everyone's responsibility

by Liz Jozwiak

In the last few weeks, residents have been seeing bears frequenting their property, or traveling through their neighborhood. About half of the people I spoke to indicated that they were building a new home in a new subdivision this year. The other half who were in established neighborhoods mentioned that their neighbors were leaving trash cans or garbage bags outside, or had issues with overfilled dumpsters in the area.

Alaskans are faced with the challenge of sharing habitats with brown and black bears because of the increased human population, resource development, and other human-related activities. New subdivisions and new houses are encroaching into existing bear habitat that in the past has been used for denning, feeding, and raising their young.

Bears can be attracted into our communities and yards by a variety of attractants. As local Kenai peninsula residents, it is our responsibility to reduce the likelihood of bears being drawn to our neighborhood by taking an active role in reducing a variety of natural and human related enticements.

KEEP YOUR GARBAGE AND ANIMAL FEED SECURED. This is probably the biggest attractant for bears in our area. Store garbage and animal feed inside secure buildings or in bear-proof containers. Bears like pet food, horse feed, meat scraps and fish. Keep them in a secure place. Keep your garbage secured until just before scheduled pickup. If you take your garbage to a collection site, do so regularly. Make sure to place it in the dumpster and close the lid. These collection sites attract bears. Make sure that you do not store garbage outside or in your vehicle. Pickup truck toppers are not bear proof, and we must remember that it is the smells that draw the bears to a specific location.

CLEAN YOUR FISH AT THE RIVER. This is another big one. Fish remains attract bears. Do not throw your fish guts into a dumpster. It is much better to clean your fish at the river, and throw your fish guts and waste into the middle of the current where it can get "recycled" by another organism downstream. I have responded to residents who have reported a brown bear hanging around their house later to find out they were dumping their fish carcasses behind their house, or attempting to bury it there.

REMOVE BIRD FEEDERS FOR THE SUMMER MONTHS. Bird feeders have played a very serious role in attracting bears into residential neighborhoods. There is no legitimate reason to have feeders up in summer as there are plenty of natural foods available at that time. If you must have a bird feeder, be sure to wait until late November before filling it with seed, and don't forget to take it down before the bears come out in spring, usually by early March. Also, be sure not to store your bird seed outside.

It is not illegal to leave bird feeders filled when bears may be feeding, or to do other things which may attract wild animals to your back yard. At the same time, a neighbor that keeps a bird feeder out of season endangers everyone living in the community. A bear attracted by a feeder may end up injuring someone. If you have a neighbor that is not considering the safety of the bears and the community, try talking to them.

LIMIT WHAT GOES IN YOUR COMPOST HEAP. Many residents are ecologically minded, and compost can be a critical part of their waste reduction plans. At the same time, it is important to limit what we place in our compost heaps. Avoid placing any meat by-products such as fish, meat, bones, egg shells, dairy products or fruit into your compost. Adding some lime to your compost can also speed up the decomposition and reduce the smell.

KEEP A CLEAN BARBECUE. There's nothing like a summer barbecue on the patio. The smell of a juicy steak can permeate the air and attract much more than envious glances from non-barbecuing neighbors. These same smells can attract a bear to your deck once you head to bed. When you have finished eating, make sure to burn the food off of the grill, or at least clean the barbecue carefully. Also, if you store your barbecue outside, be sure to use a cover as this will reduce the smell emanating from it.

GARDEN PLACEMENT. Place your garden so it doesn't attract bears. Placing your garden in the open, away from cover and game trails, helps to discourage bears.

DOMESTIC ANIMALS DRAW BEARS. Keep

them where they are safe. Chickens and rabbits kept in outside pens are easy and attractive prey.

ELECTRIC FENCES. If used properly, electric fences can keep bears out of gardens, apiaries, and compost piles.

Preventing bear problems is everyone's responsibility. Work within your neighborhood and community to encourage others to manage their garbage, dog food, birdseed—anything that might attract a bear. Encourage your neighbors not to put out garbage for pickup the night before. If there is a bear in the neighborhood, let people know. Work together to protect your neighborhood and to conserve bears.

The Kenai NWR has several pamphlets available at the front desk on being "bear aware" in our community entitled: Living in Harmony with Bears, Fishing in Bear Country, and Bear Facts.

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

Keeping bears and people apart on the Russian River

by Bobbie Jo Skibo

Anyone who knows the Kenai Peninsula can tell you that the rivers and lakes give life to world-class salmon runs, which represent the ecological integrity and economic vitality of the entire region. They will also tell you that within the Kenai watershed one of the most highly visited sockeye salmon fishing destinations is the Kenai and Russian River confluence area. Archeological studies and oral history in the area also show that native Alaskans and early settlers used this ideal location for catching salmon for over 9000 years.

Today, the Russian River continues to sustain indigenous cultures, the modern Kenai economy, quality recreational experiences, and a diversity of fish and wildlife species. Unfortunately, the Russian River area has also become synonymous with negative human/bear interactions, widespread streambank erosion, irresponsible angling, and "combat fishing" where tens of thousands of anglers compete for space along the banks of the rivers.

The Russian and Kenai River area is like two worlds in one. Some visitors are drawn to the Russian River fishery to experience the solitude of fly fishing for rainbow trout through the upper stretch of the clear waters, while others come prepared for "combat fishing" at the confluence in hopes of catching their limits and not a hook in the eye. The Russian River can provide a pristine esthetic experience for visitors most of the year but during the two major runs of sockeye salmon in early June and early July, the river experiences a flood of visitors and wildlife all seeking the abundant food source.

For the 2007 season, the Russian River fishery opened on June 11th and anglers were anxious to head out to catch their first sockeye salmon of the season. The difference with this season wasn't the abundance of fish because fishing has been steady and successful. Instead the difference has been the presence of agency staff who are taking a proactive approach to protecting the natural and cultural resources in order to minimize risks associated with negative human/bear interactions.

Agency staff from the USDA Forest Service and U.S. Fish and Wildlife Service have been out on the river more-or-less seven days a week educating anglers and enforcing state and federal regulations. During this season, the message that you will hear when a federal officer or volunteer contacts you is about responsible handling of human-generated attractants when visiting bear country.

What is a human-generated attractant? Well, to give you a bit more background, the Russian River is similar to the rest of the Kenai Peninsula in that brown and black bears inhabit the area. The bears visit the river searching for food for themselves and their young. Unfortunately, the food sources they often find are backpacks, coolers full of lunches, and other stashes of food or beverages. These food sources are often left unattended on the banks while the anglers are catching their limits.

In addition to the food and beverages that anglers bring to the river, the most abundant and readily available human-generated food source for bears during June and July is filleted fish carcasses. When carcasses are thrown into the river, they pile up and create a concentrated food source which is irresistible to some bears. The filleted carcasses collect at river bends, in slow moving eddies, and get hung up on monofilament line in the river.

These are the main human-generated food sources that begin the process of wild bears associating people with food, which can lead to human-bear conflicts. Bears are being lured to the Russian River for an easy meal which usually starts with carcasses and graduates to a backpack or cooler for dessert. In order to keep bears wild and anglers safe, this cycle must be broken.

In 2006 federal land managers issued the *Russian River Possession/Storage of Food Items* emergency order which prohibited "possessing or storing any food or refuse further than three feet from the person along the Russian River Angler's Trail developed recreation area and banks of the Russian River." The order has gained a lot of support from many responsible anglers and will continue to be in effect throughout the 2007 summer season. In laymen's terms, this means that if you have any food, beverages, or smelly stuff with you while fishing, it has to be kept with in three feet of you at all times. Many anglers are simply keeping

their backpacks on and keeping bulky stuff like coolers in the car. While most anglers are supportive and complying with the regulation, others are simply not getting it. So far, a total of four tickets have been issued to irresponsible anglers. Throughout the second run, federal officers will continue to educate anglers but will also write more tickets if needed.

In addition to the regulation described above, education regarding disposal of filleted fish carcasses will be a priority topic that you are sure to hear about.

What can you do with filleted fish carcasses? We call it, "Stop, Chop, and Throw." Stop and immediately cut the gills to bleed your fish into the water. This will minimize fish blood on trails and river banks. After filleting, chop up your fish carcasses into small pieces. Finally, throw the small pieces into fast moving currents so they move easily downstream instead of piling up along the river.

Anglers are also doing their part by throwing carcasses back into the river which have washed up onto shore after another angler failed to Stop, Chop, and Throw.

While talking with anglers along the Russian River over the first sockeye run, I was pleased with the response regarding the food storage regulation, but have been disappointed that many anglers are not taking the carcass issue as seriously. The anglers who are doing the right thing are also disappointed in other anglers and often say something like, "Thanks, I have fished here for many years and want to do what is best for the bears and the people, so that's why I support the new regulations and approaches put in place this year." To those anglers who are doing the "right thing," I say Thank you and keep up the good work, and don't be afraid to educate your fellow anglers.

Bobbie Jo Skibo is working as the Russian River Interagency Coordinator while she completes a Master's Degree in Natural Resource Management and Policy from the University of Denver. Bobbie Jo has extensive experience working on diverse conservation and natural resource issues affecting the Kenai Peninsula. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Kids Don't Float, a successful program

by Rick Johnston

Smart parents put PFD's on kids of all types. Kahlia insures that her puppy will float too. USFWS/Photo credit: Rick Johnston

The recent drowning on the Kenai River at Naptowne rapids and other unfortunate drowning-related fatalities brought back memories and somber reflections of similar incidents on the numerous lakes and rivers throughout the Kenai National Wildlife Refuge. When I first joined the Refuge staff in 1979, it had been only a short time since several drownings and near drownings in Skilak and Tustumena Lakes. The cold glacier-influenced lakes and rivers of the Refuge have summer temperatures in the mid to high 40°F. Add an overloaded boat and/or unpredictable weather and tragedy can be near. Even a good swimmer has poor odds of survival without a life jacket (PFD). Children are particularly vulnerable, and no PFD or a mis-sized PFD on a child can be tragic.

I have always been puzzled by people venturing onto the swift Kenai River or a choppy lake with children in tow and with the life jackets stowed or absent. Most boating fatalities on the Kenai NWR involve not wearing a PFD. Simply put, personal floatation gives a floating victim more time to be rescued or for self-rescue before succumbing to Alaska cold water, period! Canoes and no PFD have on many occasions been a formula for disaster. Small flat-bottom lake boats with minimal free board have also been prone to capsizing. Such boats do poorly in open choppy water or on swift moving rivers. While boating tragedies can often be traced to less than suitable watercraft or inexperienced operators, boating accidents can happen to very experienced persons who are good swimmers and who are operating otherwise seaworthy watercraft in random and unpredictable situations.

I recall one unlikely incident where a boat operator dropped off his passengers at lower Skilak boat ramp. While a member of his party retrieved their vehicle, the boat operator made a wide circle to meet the trailer. The operator apparently made a misstep and ended up in the water as the boat careened off. Although help was near, the middle-aged man was not wearing his life jacket and slipped under the surface. What would have been a cold and embarrassing safety lesson recalled around the campfire with a PFD, turned out to be a family tragedy that altered many lives.

Then there was the incident where Larry Dutton, a career Division of Forestry employee and boating expert inexplicably fell out of his boat and drowned near Kenai Keys. Or the foreign tourist who stood up in her canoe at the Skilak outlet and fell overboard, not to be recovered for several weeks.

One of my first assignments after joining the Refuge staff was to reword an existing coldwater warning sign at the Skilak Lake ramps. I researched the accident history starting with assistant Refuge Manger Jim Peterson who drowned in 1955 in Skilak Lake and a more recent tragedy involving a family making the Kenai River to Upper Skilak crossing. In all, there had been over twenty five fatalities and most were equally cold water and failure to wear a PFD related. I proposed a shock factor version of the sign in an attempt to deter future poor judgment. I intentionally and insensitively described the Skilak Lake body count with an X through the latest tally and a new number posted. My supervisor reworded the draft sign with more tasteful wording, but with the same lifesaving goal. Fortunately, and in part, due to the warning sign and perhaps other factors, fatalities and capsizing incidents have decreased in recent years. I suspect the decreasing fatalities have also been due to other factors such as increased boating enforcement and to the innovative KIDS DON'T FLOAT program.

Alaska and U.S. Coast Guard boating regulations

provide the framework to reduce boating related incidents and fatalities. Along with specific vessel requirements, regulations require that functional and weight appropriate PFD's be available for each vessel passenger and that children under age 13 wear their PFD. Refuge Rangers are ordinarily a friendly sort, however, having a PFD on board is non-negotiable and failure to do so almost always will result in a Notice of Violation and an escort off the water. Officers are particularly diligent about the requirement for children to wear an appropriately-sized PFD. While, boating education and boating regulation enforcement are important aspects of enhanced safety, programs such as the KIDS DON'T FLOAT are in my estimation one of the real reasons for fewer fatalities on the Kenai Peninsula waters.

"KIDS DON'T FLOAT" is a highly successful program to provide child-sized loaner life jackets at various boat ramps, marinas, and river launches etc. The on-site life jacket loan program was originally started by Homer Fire Department volunteers in 1996 with a grant from The Alaska Department of Social Services in collaboration with Homer Safe Kids, the U.S. Coast Guard Auxiliary and the Homer School District to establish 15 bay side PFD loaner boards at Kachemak Bay communities. The program was initiated to reduce Alaska's historically high drowning rates among children.

The program was expanded to Kenai-Soldotna-Cooper Landing area boat launches with the efforts of Kenai Peninsula Safe Kids and Central Emergency Services and the Alaska Division of Parks, with expanded support from the state and U.S. Coast Guard. The expanded program included several Kenai National Wildlife Refuge launches. "KIDS DON'T FLOAT" has grown to 425 loaner boards placed throughout Alaska with overall coordination by the State of Alaska boating safety located in the Alaska, Department of Natural Resources, Division of Parks. The way the program works, is to have available various sized loaned PFD's for families that either forgot to bring or didn't have a functional and size-appropriate kids sized life jacket. Cooperators like the Kenai National Wildlife Refuge keep loaner boards stocked with kid PFD's and return jackets dropped off at downstream loaner boards to upstream loaner boards to once again be used.

While the occasional life jacket is not returned, for the most part the public has fully embraced the program with significantly increased frequency of kids wearing life jackets on Refuge waters.

Almost every time I have been on the water either for Refuge patrol or a personal trip in the last several years I have seen families taking part in the loaner program.

While it is sobering to think how many persons have arrived at Refuge launches without appropriate kids life jackets, it is equally gratifying to see that parents are at least taking advantage of this smart and successful program.

According to the Office of Boating Safety web page, http://www.dnr.state.ak.us/parks/boating/kdfhome.htm, since the programs inception at least twelve Alaska kids have survived a near drowning incident because of a KIDS DON'T FLOAT life jacket. I recall one incident on the Kenai River upstream from Russian River within Chugach National Forest where the kids wore the available KIDS DON'T FLOAT loaned PFD's obtained at the State Parks launch in Cooper Landing and an adult was not wearing a PFD. Tragically, but not surprisingly, the canoe capsized in a rapid section two miles downstream; the child survived and the adult did not.

The signs and loaner boards have also increased the overall awareness of the need to wear adult life jackets. I have seen an increasing number of boaters make good safety decision.

Hats off to the innovative persons who started the KIDS DON'T FLOAT PROGRAM and to those who continue to maintain loaner boards throughout the Kenai Peninsula and Alaska. And a special thanks to parents and boat operators who insist that PFD's be worn by all passengers, particularly each child on board.

Rick Johnston is a Ranger/Pilot at the Kenai National Wildlife Refuge. He has worked on Kenai Wildlife Refuge since 1979. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Putting out wildfires is not enough; defensive clearing and prescribed burn are also necessary

by Dianne MacLean

The summer of 2005 was a very busy fire season on the Kenai Peninsula. One of the many fires that year occurred near the area of this year's Caribou Hills Fire.

Coming in on a helicopter, we were able to see the fire burning through the tree tops, occasionally dropping to the ground. Our big concern was the group of houses scattered across the hillside just above the fire. Head-high brush and beetle-killed trees led straight from the fire up to the houses, and made for a potentially explosive situation.

The distant roar of radial engines announced the approach of a retardant plane, but not before a storm passed quickly overhead and dropped lightning strikes all around us, along with a significant amount of rain.

Even as the rain slowed the fire, we continued to take whatever assistance we could get with people and equipment coming and going to other fires. We obtained several smokejumpers on their way back to Fairbanks; we needed the additional chainsaw capability they would bring. A squad of eight firefighters arrived, bringing a valuable hose lay that they would be able to install. There was no telling how long the rain would last, or what we would be dealing with when it ended. Tomorrow, things would dry out again, and I wanted to be sure we did everything to keep this fire down, while the rain gave us a chance.

We held that fire to just a few acres, and had it mopped up by the end of the next day. Had we not gotten that shot of rain, would we have been able to stop it? Maybe, but not before those houses above us were threatened by fire racing up the hill.

Under the best of circumstances, this fire would have cleaned up the beetle-killed debris, and replaced it with new growth, less flammable than the old, and probably would have provided some much-needed food sources for moose, hares, and other wildlife.

The concept of "Wildland Fire Use" where a naturally ignited fire is used, under strict guidelines, to clean up hazardous accumulations of dead vegetation, allowed the Kenai Refuge to manage the Fox Creek Fire, also in 2005, for the habitat benefits it would bring.

Wildland Fire Use, however, is not an acceptable option close to homes and recreational developments. We could not allow this fire to run its course. We had to stop it, along with many other lightning-caused fires that year. There was too much at stake, too much development in the way to take any other course of action. But, as many who live here have seen, fire will eventually come, whether we want it to or not.

There are many places on the Kenai Peninsula where we will never allow wildfire to run unsuppressed, because of the threat to infrastructure. Thinning of trees near homes, along with prescribed burning in the wildland, can bring fire through an area in a controlled manner, according to a plan. With prescribed fire, we can remove old, highly flammable vegetation, or thin out trees that are spaced so close together that they would burn in an unstoppable crown fire.

When conditions are right, a prescribed fire will burn some of the decomposed organic "duff" layer, exposing mineral soil for birch and other hardwoods to germinate. This is one of the objectives of our prescribed burns: to encourage the succession of birch, willow, and aspen, just as it would occur naturally after a wildfire. In this way, we can capture the benefits of fire, in places where we cannot tolerate wildfires because of threats to human development.

With luck, the homes near the fire that we attacked in 2005 may still be there. The area was just enough south of Caribou Hills to possibly not have been swallowed up in this year's fire. I would like to think so. But without more preparation of homes and developments to withstand the passage of a wildfire, without more prescribed burning before the wildfires come, initial attack efforts like this little fire near the Caribou Hills in 2005 may only delay the inevitable.

Dianne MacLean is the Assistant Fire Management Officer at the Kenai National Wildlife Refuge. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Forest detective finally notices strange purple plants in muskegs, finds name, and more names

by Ed Berg

Exobasidium fungi. Credit: Kacy McDonnell/USFWS

The forest detective prides himself on noticing the small details of daily life in the natural world, and on knowing the names of a good many of them. He has, however, found that he probably will not see something if he doesn't have a name for it.

Take the case of this obscure purple plant (see photo with yellow background) that commonly grows in muskegs, along with Sphagnum peat moss, lowbush cranberries (lingonberries), blueberries and Labrador tea. I had no name for this plant and must have overlooked it for years, until one day for no obvious reason it caught my eye as something I couldn't identify. This was embarrassing, like meeting a familiar face and being instantly aware that you have never known this person's name.

I quickly set about digging up the plant to get a better look at it. The purple leafy stem was about 6 inches long, and it had simple soft, flat leaves about an inch long. There were no flowers, and indeed it occurred to me that I had never seen any flowers on this kind of plant. A single long stringy stem snaked down into the peat moss. I followed the long stem, determined to dig up the whole plant, and to my surprise found that the stem was connected to a nearby flowering bog rosemary plant. Bog rosemary has the scientific name of *Andromeda polifolia*, for the beautiful princess Andromeda of Greek mythology, and it is indeed a beautiful dwarf shrub in wetlands in the spring, with clusters of delicate pink urn-shaped flowers.

Lowbush cranberry plants. The green shiny foliage (background) is normal; the red foliage is infected with the fungus Exobasidium juelianum, which changes the color of the leaves but does not alter their basic shape. (Photo by Ed Berg)

So, what then was this flowerless purple plant, with larger, flat deciduous-looking leaves? Normal Andromeda leaves are evergreen, with rolled edges, like Labrador tea. These plants couldn't be related, yet they were obviously growing together. I collected more of the purple plants, and showed them to several botanist friends, and even sent some to a plant pathologist. They all admitted that they had seen it, but no one had a name for it. Finally a visiting Norwegian sphagnologist (a peat moss specialist) recalled that he had seen a name for this thing, and looked it up for me when he returned home.

It turns out that the purple part of the plant is a caused by an infection of the fungus *Exobasidium karstenii*. The fungus takes over the plant's normal growth mechanism like a cancer, and causes the plant to produce larger, flimsier leaves of a purple color. Late in the season, black fungal spores can be seen on

the bottom of the leaves. The spores are dispersed by the wind to infect new host plants.

Insects often produce galls on leafs and twigs to house their offspring, and the Exobasidium shoots can be thought of as a kind of gall. In both cases a foreign organism takes over the growth mechanism of a plant and creates a new structure to facilitate its own reproductive success.

Once I had a name for this condition, I started searching the literature, and found that there are many other species of Exobasidium that affect common members of the heath family (*Ericaceae*) in the North. Indeed, armed with more names I started seeing more species of this type of fungus, which I had indeed never noticed.

For example, have you ever noticed the reddish purple leaves on blueberries during the summer? Blueberry leaves should be green during the summer, but the reddish purple ones are infected by *Exobasidium vaccinii-uliginosi* (a name pirated from the scientific name for blueberries *Vaccinium uliginosum*).

Likewise, on lowbush cranberry I sometimes see stunted shoots with small red leaves with white undersides; this is *Exobasidium juelianum* growing on our much-loved *Vaccinium vitis-idaea cranberries*. (See photo #2.) Lowbush cranberries also host *Exobasidium vaccinii*, which produces a gall-like thickened welt with a red center on the leaves.

Have you ever picked the so-called "true cranberries" (*Vaccinium oxycoccus*) in muskegs? These plants have scattered large plump berries growing on thread-like stems with tiny leaves. Kids love these cranberries because they overwinter well, and can be picked in the early spring. The leaves should be evergreen, but some of them are red with the fungus *Exobasidium rostrupii*.

Likewise, crowberry plants (in the *Empetraceae* family) often show a single stem with bright purple or red leaves among a sea of stems with green leaves. This is *Exobasidium empetri*. (See photo).

A Google image search on the Internet will pull up nice photos of many of these fungal conditions, especially if the search is not limited to English language sites.

Crowberry plants. Upright purple stems are infected with the fungus Exobasidium empetri; the spiky green leaves (near the ground) are normal. (Photo by Ed Berg)

The *Exobasidium* fungal conditions don't usually kill the host. Indeed, in the world of parasites, it's bad form to kill your host because the host is your meal ticket. Given the wind-blown spores, it's not surprising to find many of the boreal forest *Exobasidium* species on both sides of the oceans. One recent study of the *Exobasidium* on bog rosemary and mountain heather (*Cassiope tetragona*) in Europe found that the frequency of infection increased at lower elevations, suggesting that the fungus likes warmer temperatures and that we may see more of it with increased climate warming.

Carl Linnaeus, the Swedish founder of modern genus-and-species scientific names, is quoted saying, "If you do not know the names, your knowledge of the things perishes." (Linnaeus, *Critica Botanica*, 1737). This is well put, but I would add that without names, our knowledge can't even get off the ground, because we probably won't recognize that we are looking at something worth a name. There is more to seeing than meets the eye.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Ed will teach his one-credit Cycles of Nature course at the Kenai Peninsula College in Soldotna and Homer, beginning September 11 and 13, respectively. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Fall fireweed brings reflections and transitions

by Michelle Ostrowski

Fireweed. Photo Credit: Kenai Refuge Staff/ USFWS

The tell-tale sign of fireweed now blooming closer to the tip of the plant reminds me that summer is rapidly approaching its end. When fireweed has gone to seed they say that snow is six weeks away. Just this past weekend I felt the air changing and I noticed the mountain peaks are starting to change color. Fall is just around the corner.

Working at the Kenai National Wildlife Refuge, this time of year is often one for reflection and transition for me. Reflecting back on some of this past summer's highlights I am reminded that once again we have reached a considerable number of Refuge visitors through our interpretive programs. At our Hidden Lake Campfire programs Cheri Pavia and Nikki von-Hedemann creatively educated visitors about the lynx and hare relationship by dressing volunteers up as lynx and snowshoe hares, while Sarah Siefken taught visitors how to build a fire and use signal mirrors in emergency situations. At our Discovery Room in the Environmental Education Center the self-led interactive tables allowed the public to learn about plant identification, mammals, trees, and birds through playing games and doing experiments. Our summer interpretive programs concluded with a "berry" successful Wild Berry Fun Day here at the Refuge on Friday August 17th. We had 158 people attend, one of our highest attended events which included 91 people on our scheduled guided hikes.

Sadly, we have begun to say good-bye to our seasonal volunteers who were instrumental in running our visitor centers and helping create, facilitate, and staff the variety of entertaining and educational interpretive programs we offer. Their smiling faces and creative minds will be missed. As many of them head back to college or off on new adventures, things quiet down in the visitor center and I begin to transition to fall duties.

Fall is not a time for rest for me here at the Refuge. In fact I often need to have more energy. The starting of school on Wednesday marks the beginning of field trip season. We offer seven kindergarten through sixth grade environmental education programs based on grade level and curriculum standards. The linking factor of all of these field trips is getting kids out into the Refuge and learning about Alaskan wildlife and their habitats. From learning about Animals and Their Senses (kindergarten) to Leave No Trace (sixth grade) students walk away learning why the Refuge is a special place and how they fit into the "big picture." Seeing nature through the eyes of these children reminds me why I love being an environmental educator and their curiosity rekindles my "sense of wonder" for this magnificent place we live in. Fall is my favorite time of year and I am thankful I get to spend almost every day outside teaching and sharing it with children.

Mark your calendars for the end of September. Our annual Refuge Open House, Saturday, September 29th will include activities, crafts, and guided walks.

Fireweed represents a calendar for the seasons in Alaska and my calendar is definitely busy but not completely filled yet. Please call 260-2839 to book a field trip or for more information on other environmental

education opportunities at the Refuge. Hopefully we still have a little more than six weeks before termination dust (snow), so I can complete few more of those unfinished things left on my "to do" list.

Michelle Ostrowski is the education specialist at the Refuge and has assisted with educational school groups since 1997. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Yellow spruce needle rust looks bad, but usually not fatal

by Ed Berg

Spruce tree with rust needles. Credit U.S. Forest Service

I have been seeing lots of bright yellow foliage on spruce trees this summer. The yellow color is due to spores of the spruce needle rust (*Chrysomyxa ledicola*), a fungus which infects spruce needles. We have outbreaks of this showy fungus every few years.

In the spring this fungus sets up shop in pustules on spruce needles, which release the yellow spores in mid-summer. The fungus infects only the current crop of new needles, so it is concentrated at the tips of branches where new needles are produced.

Like many rusts, the spruce needle rust has a two-host life cycle, where the rust goes back and forth between alternate hosts. The alternate host in this case is Labrador tea (*Ledum*), which is a common shrub in wet areas. Hence most of the spruce needle rust occurs in more or less wet areas, with plenty of Labrador tea.

The yellow spores on spruce needles cannot spread and infect additional spruce needles; they can only infect Labrador tea leaves, so there is no point in cutting off yellow branches to save other trees. The yellow spores can however produce rusty patches on Labrador tea leaves. The rust overwinters on Labrador tea, and in the spring the rust produce a second kind of spore which cycles back to infect the tender young needles on spruce trees.

All species of spruce in this area—black, white, Lutz, and Sitka spruce—can have spruce needle rust. There are about 30 species of this kind of rust (*Chrysomyxa*) worldwide, affecting a wide variety of conifer trees, with alternative hosts in the heath shrub family (*Ericaceae*).

I remember the first time that I saw this yellow fungus back in the 1970s growing on Sitka spruce in my front yard. It was pretty alarming, sort of like seeing a small fire starting in your forest. How far will it go? Will it kill all my trees? As I recall, I contacted the Co-op extension and was told not to panic. The rust only occurred on a few branches. It was gone the next year and never reappeared, and the trees suffered no permanent damage.

A few weeks ago I was flying over an island in Naknek Lake in Katmai National Park, and could see that many acres of trees were bright yellow with the rust. On the Kenai this summer I have seen the rust from the Soldotna-Kenai area, south to Kachemak Bay, but never in great abundance.

As always with this kind of outbreak, I wonder what prevents it from simply running to completion, and affecting every possible host, every year, until the supply of hosts is simply exhausted. There are some reports in the literature that needle rust outbreaks follow a cool damp spring, which would promote the spread the spread of spores from Labrador tea to spruce needles. April and May were basically warmer than average, and not especially wet, according to data from the Kenai and Homer airports, so the cool damp spring theory doesn't seem to apply, at least for this year. Here's yet another unsolved mystery for the forest detective!

There is a nice article and photos by Forest Service plant pathologist Paul Hennon on the Web at: http://www.fs.fed.us/r10/spf/fhp/leaflets/Sprneerus.htm

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Lessons from Scotland

by John Morton

I vacationed with my family in July on Barra, an island in the Outer Hebrides off the west coast of Scotland. Although this was my third time to Barra, it was first time that I embarked from Alaska. And it was wonderful. We landed at low tide near Eoligarry on what is billed as the only commercial airport that is, in fact, on a tidal flat.

The first living things I noticed after going ashore, besides the ubiquitous sheep, were the multicolored fields of wildflowers: buttercups, forget-me-nots, heather, fireweed, harebell, bog asphodel, ragwort, cow parsnip, bedstraw, selfheal, dandelion, Scottish thistle, tufted vetch, clover, bird's foot trefoil, knapweed, and oxeye daisy.

The second thing I noticed, being a biologist, is that many of the plants that are native to Barra are our exotics on the Kenai. As I spend more time on Barra, I find that what goes around, comes around. Japanese knotweed, clearly not a native in bonny Scotland, recently established itself on southern Barra, just as it has in southeast Alaska.

We enjoyed the next couple of weeks eating cockles and lobster, hiking, biking, visiting castles and other archaeological sites, and birding. Just outside our cottage, which was built by the Duchess of Bedford early in the last century as her special place to go birding, we saw stonechats, blackbirds, black oystercatchers, sanderlings, blackbacked gulls, ringed plovers, lapwings, corncrakes, pipits, pied wagtails, and curlews.

But we also saw mute swans and European starlings, two species that were introduced to North America sometime after Columbus. I've spent a fair amount of time as a biologist controlling populations of starlings in Napa Valley vineyards and mute swans in the Chesapeake Bay.

We returned to our home in Soldotna in mid-August only to find pineapple weed spreading over our graveled driveway, oxeye daisy filling the roadside ditch, and hemp nettle creeping across the unmowed lawn. A patch of timothy sticks out from where we had kept a friend's rabbit last winter. These are all exotic plants that were first brought to the Kenai as ornamentals or forage. I spent the next few evenings trying to get these plants under control.

When I returned to work, I learned that a 2000-acre wildfire was burning on the south shore of Skilak Lake. Fire crews were staging out of our hangar at the Soldotna airport where, at this time of year, the surrounding gravel pads sport a flowering population of *Crepis tectorum*, a modestly invasive hawkweed from the Old World. With fire fighters launching from here to visit newly disturbed sites, it doesn't take much imagination to realize the potential for introducing an invasive plant to Congressionally-designated Wilderness. We immediately treated the hangar area with glyphosate, a common herbicide with low toxicity to animals.

Shortly thereafter, as part of a small group of natural resource professionals, I visited sites in the Swanson River oil and gas field that have been colonized by reed canary grass. Reed canary grass was originally introduced to Alaska for erosion control. Hosted by the local offices of the Soil & Water Conservation Districts and led by two experts from the Lower-48, we were alarmed to learn how badly the Platte River in Nebraska has been choked by a European strain of reed canary grass in the last few years. We were also relieved, however, to learn that its spread on the Kenai might be slowed and even reversed with an aggressive control program and some luck.

This tour prompted Refuge staff to conduct a quick inventory of exotic plants on the 62 oil and gas pads within the Swanson field the following week. In addition to white sweetclover and reed canary grass that we already knew were there, we found that two highly invasive species of hawkweed (*Hieracium umbellatum* and *H. caespitosum*) had begun to spread beyond the pads down utility right-of-ways. On one pad, we found flowering common tansy and yellow sweetclover growing side by side, the first time that either invasive species has been documented on the Refuge. Both weed patches were pulled.

Then, over Labor Day weekend, I drove up to Anchorage with my family. We often stop at the rest area near the Hope junction, and stretch our legs on the path that runs down to Canyon Creek below the bridge on Seward Highway. As we turned around to walk back to the car, I spotted a yellow flower that I

last saw on Barra! It was birds-foot trefoil, the first time I've seen this exotic legume on the Kenai, growing among our native alder. I have since found out that biologists from Chugach National Forest had tried to eradicate it here two years ago. They plan to come back in the next couple of weeks to try again.

Almost 100 species of exotic plants are now documented on the Kenai Peninsula. Many are well established, some are truly invasive, and a few can be truly injurious. By invasive, I mean that they are capable of invading undisturbed natural habitat. By injurious, I mean they have the potential to alter soil chemistry, change the natural fire regime, compromise stream flow, or replace entire natural communities. Last summer, I was dismayed to see the common dandelion displacing native alpine flora in undisturbed meadows off the trail to Hideout Mountain.

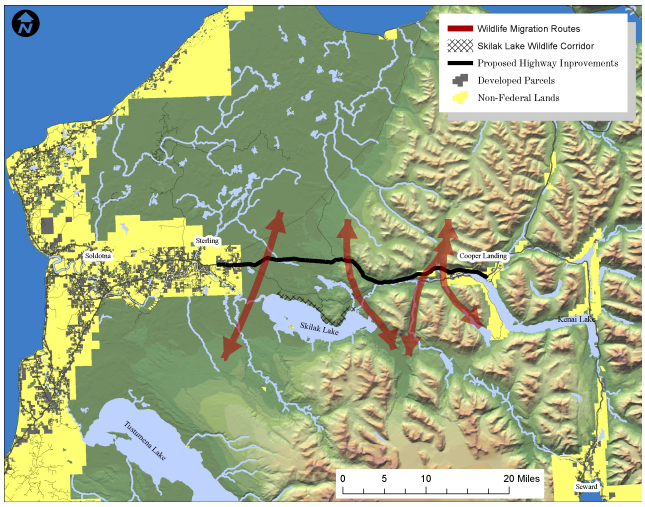
You can take the high road or the low road to Scotland, but we are clearly and rapidly approaching a crossroads on the Kenai. Invasive species management in the Lower-48 indicates that control and eradication efforts are most effective and least expensive when new populations are nipped in the bud, figuratively if not literally. We have lots of budding new populations on the Kenai that could be nipped, if interest and energy can be mobilized.

There are many things we can do, but time is short if we want to put a damper on the introduction and spread of exotics. We should all learn how damaging invasive plants can be, learn to identify invasive plants, stop planting invasive ornamentals, feed our livestock certified weed-free forage, participate in community weed-pulls, mow our lawns frequently to prevent the development of seeds, brush the seeds off our dogs, ATVs, and clothing before heading into the bush, and lend our support to agency-led efforts to manage invasives.

John Morton is the Supervisory Fish & Wildlife Biologist at the Kenai National Wildlife Refuge. He is also adjunct faculty at the University of Alaska Fairbanks and Colorado State University. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Splitting the Kenai: two halves don't make a whole

by John Morton and Rick Ernst



Increasing human development is slowly dividing the Kenai Peninsula into northern and southern halves, with reduced wildlife migration corridors connecting the two halves. USFWS/ Mark Laker

I read an interesting essay by Lance Petersen, called the Fragmentation of Kenai. Published in 1983, he bemoaned the loss of community that was the result of rapid population and economic growth after he moved to Kenai in 1953. Mr. Petersen was writing about the human community. But the same notion can be applied to wildlife populations, as they adapt to a world with a heavy human footprint.

When the Kenai National Moose Range (now the Kenai National Wildlife Refuge) was created in 1941, there was little to impede wildlife from moving around the peninsula. The Alaska Northern Railroad stretched from Seward to Turnagain Arm, a highway ran from Hope to Seward, and a narrow road connected Cooper Landing to Seward.

For the most part, the peninsula was still wide-open country for wildlife. As the raven flies, there were 65 miles of timbered country from the mouth of the Kenai River to the eastern shore of Kenai Lake (along the Seward Highway). The Kenai and Skilak Lakes are wide enough to be natural obstacles to most wildlife, but that still left 38 miles of a mostly unaltered landscape for wildlife to move north and south across the peninsula.

The Kenai began to really change when the Sterling Highway opened in the fall of 1950, connecting Seward and Hope to Homer. A year later, the last section of the Seward Highway, connecting Anchorage and Seward, was completed along Turnagain Arm. Fragmentation of the Kenai had begun in earnest.

Then in 1964, in response to a Public Land Order issued by the Bureau of Land Management, three townships west of Skilak Lake were removed from the Kenai National Moose Range. This area became the 6-mile wide development corridor that runs along the Sterling Highway from Soldotna almost to the Skilak Lake Loop Road.

Even at that time, it was recognized that this removal from Federal management was compromising the ability of wildlife to move north and south across the Kenai. An interagency report written in 1964 directed our attention to the remaining lands along the Sterling Highway that were still within the Moose Range. This report stressed that perhaps the most essential feature of this tract to moose is that of a migration corridor between the north and south sections of the Range; it is essential to retain the three-mile corridor to permit the unimpeded travel movement to and from their winter and summer ranges and through the winter area as required by forage and snow conditions. Elimination of this corridor would jeopardize the value of the Range for moose. This report was referring to the three mile stretch from the east end of the Sterling corridor to the Skilak Lake outlet (see map).

Now, four decades later, life has gotten tougher for wildlife. In 2006, more than a million vehicles traveled down even the remotest sections of the Sterling Highway. On average, that's 2 vehicles every minute of every hour of every day! Traffic volume of this magnitude helps translate to an average of 250 moose killed annually by vehicles, most of which are adult females or calves.

As many as 28 brown bears in a year have been killed in defense of life and property, many in the Sterling corridor that includes the subdivisions around the Mackey Lakes, Browns Lake and Robinson Loop Road. Over time, continued subdividing of private lands along the Sterling and Spur Highways will make

the area extending from Kenai to east of Sterling effectively impermeable to much wildlife. Satellite and GPS transmitters from collared moose and caribou indicate that both species already tend to avoid these areas.

Further east on the Sterling Highway, two new projects propose to widen the road from MP 45-58 and MP 58-79. In addition, there are plans underway to create a 100-unit subdivision in Cooper Landing. Cumulatively, these projects leave only two potential corridors without significant human interference: a 3.5-mile wide segment immediately west of the mouth of Skilak Lake and a four mile wide segment from the headwaters of Skilak Lake to the west end of the MP45-60 Project. These two corridors combined represent only 20% of the 38 miles historically available for north-south movement by wildlife!

The Refuge is clearly concerned about this gradual severing of the Kenai Peninsula into two distinct parts. In the Skilak Wildlife Recreation Management Plan, published this past January, we established a 0.5-mile wide travel corridor for wildlife along the north shore of Skilak Lake in which no new development (i.e., trails and campgrounds) will occur. This buffer connects the two corridors on either side of Skilak Lake (see map).

In the long term, there are no easy answers to balancing human and wildlife needs. The fragmentation of the Kenai, while a relatively new phenomenon in Alaska, is a problem that is at the forefront of environmental concerns elsewhere in much of North America. Although Mr. Petersen was writing about the town of Kenai, I think his last couple of lines ring true for the Kenai Peninsula: The changes I've witnessed in the past 20 years have been too complicated and too complete to allow Kenai to return to the kind of community it was in the early 50s… Geographically, it is still a good place to live. The sweeping sky and the solid mountains haven't changed. Kenai has. We'll have to be pretty proactive and progressive in our thinking and management to keep the peninsula a good place for people and wildlife.

John Morton is the Supervisory Fish & Wildlife Biologist at the Kenai National Wildlife Refuge. He is also adjunct faculty at the University of Alaska Fairbanks and Colorado State University. Rick Ernst is the pilot-biologist for the Kenai National Wildlife Refuge. He is conducting a study to identify potential wildlife crossings between MP58-79 on the Sterling Highway. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Birds changing with the environment

by Todd Eskelin

With frost nipping at my fingertips, I clutched my trusty drake Mallard call and gave a couple of inquisitive honks. No response, and for that matter I have not seen a duck fly in the three hours I have been sitting in this wet, muddy blind. I can see it in the eyes of my golden retriever, "where the heck are all the birds?" As many of the regular duck hunters will profess, the locals are gone and the "Northerns" have not arrived yet. That may or may not be the case. Plastered across the news we constantly hear about the effects of global climate change. Rising oceans, melting sea ice, changing habitat, receding glaciers, the list goes on and on with the predictions our future environment holds for us.

What we don't hear is how these major shifts will affect some of the smaller life forms that we take for granted. How will the ducks and geese do with a changing environment? Or how will these changes affect the migrant songbirds that are coming from northern Peru to spend their breeding season in Alaska? These are likely questions we won't be able to answer until the changes have already happened. What we can do is try and track these changes in the beginning and maybe that will allow managers to prioritize or manage for changes that will be coming down the pike. Confused? Me too.

Here is a scenario. Let's say it is predicted that sea level is going to rise by several feet over the next 50 years. I am a manager in charge of a large saltwater marsh complex that is home to dozens of species of dabbling ducks. The elevation of my marsh is only eight inches above sea level and the entire area would likely be underwater in my lifetime. My gut human reaction would be to fix it, build dikes, build them higher, and control the water coming in. But if you think about it, our manipulation of habitats has likely contributed to the climate problems we are experiencing now. So rather than make more changes and more potential mistakes, another approach would be to react to the changes. Knowing my marsh will likely flood, I should roll with the punches and manage it for diving ducks rather than dabblers. This would avoid a catastrophic situation like New Orleans from happening to all my nesting puddle ducks and wading birds.

Back to Earth, or more specifically to the Kenai Peninsula, we have been tracking the arrival dates of all the bird species that reside or even pass through our area. We use reports from the Central Peninsula Bird Hotline (262-2300), from eBird (www.eBird.org), and from the birders that work at the refuge. We combed the past literature for the earliest arrival and latest departure date for every species we could find. This year we actually set records for the earliest arrival date for 29 different species.

That seems like a lot of different species that all arrived earlier than normal. There does not seem to be any pattern to the species that came early. Ducks, songbirds, gulls, shorebirds, and raptors all had members that came to the Kenai early. Migrant species from Ecuador, like the Semipalmated Sandpiper, and short distance migrants like the Ruby-crowned Kinglet wintering in Washington found their way to the Peninsula ahead of schedule. Following these species on an earlier journey were predators like the Peregrine Falcon I spotted chasing ducks at the Kenai Flats on April 14th.

What does it all mean? Well, the jury is still out on that one, but one thing is certain. Without keeping detailed records we would never know that the Snow Geese are a week earlier than usual, or that White-fronted Geese are coming through the area in unprecedented numbers. I encourage everyone to report even common birds to the Bird Hotline if you think they are out of the normal time period you usually see them. Or even more fun is to enter your bird sightings in eBird. It is fun, free, and some bird nerd like me is sitting at a computer somewhere crunching the numbers and looking for irregularities in the movement patterns of Mallards. Who knows, that flock you saw at Skilak Lake in February may be the missing piece of the puzzle predicting that a huge wintering flock of ducks will be a regular event on the Kenai.

The other thing I know is that after sitting in this duck blind for four hours, with nary a duck flying by, I am going to have to find another way to fill the freezer or I will starve to death. At least next year when I am sitting here freezing my toes off, I will be able to look back at the dog and say, "this is normal" remember last

year when we did this on Oct. 1st and saw no ducks?

Todd Eskelin is a Biological Technician at the Kenai National Wildlife Refuge specializing in birds. He has worked throughout the state studying birds and has worked at the Refuge since 2001. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

The anticipation and enjoyment of watching loons rear young

by Ted Bailey

Despite experiencing three decades of Alaskan winters, the winter of 2006-2007 seemed unusually cold and exceptionally long for me. But perhaps it was merely my increasing age and impatience for warmth outdoors, enhanced by the daily visual reminder of our rapidly dwindling firewood supply. Like many others this past winter I longed for spring and warmth. And I also longed to again hear the haunting calls of loons and to watch them rear their young on the nearby lake.

In early May the ice had been softened by the feeble but increasing sunlight and it lay loosely in long vertical crystals on the lake surface. Now it would only take a brisk wind to transform the lake once again into loon habitat. The loons would likely not be far away. They probably had already flown an aerial reconnaissance over the still frozen lake, perhaps several times, waiting patiently on nearby open water either on the Kenai River or Cook Inlet.

Finally the long awaited day arrived and according to my journal I first saw the loons bobbing together on gentle waves of the lake on May 7, 2007. They too had probably been waiting for this day for a long time.

The loon pair apparently arrived together, although according to Judith McIntyre a Minnesota, loon expert and author of the excellent book *The Common Loon: Spirit of Northern Lakes* and the Internet's Birds of North America online series *The Common Loon*, it is sometimes a single loon, the male, who is first to arrive on a lake used for nesting. But I really didn?t care if they arrived separately or together, I was just thankful they had returned and that I too had survived another Alaskan winter to hear their calls and watch them again.

I assumed they, or at least one of the pair, were longtime residents of the lake. But this was merely an assumption without having direct evidence of individually recognizable or marked loons. Since loons have been known to live at least 25 to 30 years and often the same ones return to the same lake each year, I would like to think that they, like many of us older residents, were also "old timers." But regardless, even if they were younger newcomers, I still enjoyed their presence and count it as one of the quintessential outdoor Alaskan experiences.

But with each successive year, with increasing boat and personal watercraft usage, water skiing, and shoreline development on and around the lake I feared—and still fear—that loons would eventually find the lake unsuitable for rearing young, as they have done on lakes in Anchorage and other human-dominated landscapes and that eventually the lake would become sterile—sterile in my mind from the lack of once-present loons.

Later I eagerly anticipated late June and early July when after about 26 to 31 days of incubating their eggs the young would hatch and within hours appear on the lake with their protective parents. I first saw the chicks—two black fuzzy balls—on Independence Day, July 4, bouncing in the water behind and so close to the adults that I had to watch several minutes before I was convinced that yes indeed I was seeing chicks; it was not merely my hopeful anticipation of their nesting success.

I periodically watched them grow up during the summer as other loon chicks had done on the lake in previous years. From black fuzzy balls, sometimes hitching a ride on their parents' backs to brownish elongated, loon-like creatures that they were destined to become. The parents, like most good loon parents, dived continuously and faithfully fed their chicks seemingly without ever resting, with the chicks always eager to gulp down the next small fish their parents brought to the surface. They grew rapidly but by July 12 it became obvious to me that one of the chicks was slightly smaller and less aggressive when being fed than the other chick. And it was often alone or far from the larger chick, which got more attention and food from the parents. But the smaller chick hung on and I wondered about its fate.

The first time I saw the larger chick trying to dive was on August 3. It could then only remain underwater for a few seconds before quickly bobbing unsteadily to the surface like a cork. The chicks now seemed to spend more time apart and with only one

of the parents. On August 6, I could only find one chick—the larger one—on the lake. The smaller chick had vanished, its fate unknown. I pondered; did it become prey of one of the bald eagles that periodically patrolled the lake for unwary victims? Was it predisposed to predation because of its smaller size and greater separation distance from its parents? Or was its fate sealed unknown to me by some indifference-to-loon human-related behavior of which there was plenty on the lake? Such are the unknown fates of many species of wildlife in human-dominated environments. By August 14 the larger surviving chick was able to remain underwater up to 26 seconds during its dives for food.

With only one chick left, the parents spent less time close together. One of the adults, again probably the male according to McIntyre, often remained far way from the chick and the female. Then the distant loon left the lake sometime in early September, leaving behind the chick and presumably the female who continued to feed it despite the fact that the chick was nearly adult sized. Then the female left the lake either late in the evening of September 22 or early the following morning. Although many young ducks learn migration routes by following knowledgeable adults and young trumpeter swans accompany their parents to the wintering grounds, loon parents leave their young behind without guiding them to wintering areas. It is puzzling to others and to me how loon chicks know where to go during the winter?

Radio transmitters placed on two adult loons on the refuge in the summer of 2003, one from Dolly Varden Lake and the other from Fish Lake, sent signals to orbiting satellites indicating those loons spent that winter in the Pacific Ocean, one near Cape Douglas on the Alaska Peninsula and the other near Afognak Island. The surviving loon chick I watched throughout the summer of 2007 floated gently on the calm waters of the lake by itself on the late evening of September 26, its head tucked under its wing. That night happened to be the first cold night of the season with the temperature dropping below freezing. The next morning in the slanting early sunlight I searched the lake in vain with my binoculars but the loon chick had apparently already departed into the frigid air toward some distant destination known only to wintering loons.

Ted Bailey is a retired Kenai National Wildlife Refuge wildlife biologist who has lived on the Kenai Peninsula for over 30 years. He is an adjunct instructor at the Kenai Peninsula College and maintains a keen interest in the Kenai Peninsula's wildlife and natural history. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

"Milk chocolate crunch weevils" often seen in houses, especially in bathtubs

by Matt Bowser

A side view of the common weevil Trichalophus alternatus. Photo Credit:Matt Bowser/USFWS

The faint pitter-patter of little brown weevils dropping from walls to the floor and their louder crunch underfoot are familiar sounds in many homes of the western Kenai Peninsula. These hard-shelled, 1/2 inch long beetles can be abundant in the summer, crawling up walls, entering houses, and often ending up in bathtubs and sinks. As an entomology student serving the Kenai National Wildlife Refuge, I get more questions about these beetles than any other animal. I spoke with Janice Chumley of the UAF Cooperative Extension Service in Soldotna, who also receives numerous inquiries about these weevils. Below I have listed the questions most frequently asked of us regarding these beetles and have provided the best answers that I have.

What are they?

Dr. Charles O'Brien, a world authority on weevils recently retired from Florida A&M University, identified specimens from the Kenai as *Trichalophus alternatus*. "Crunchy bugs" and "milk chocolate bugs" are names for them I have heard used by area residents, good descriptions of their texture and color, respectively. They have no recognized common name, so perhaps we could propose a name such as the "milk chocolate crunch weevil".

What do they eat?

Weevil damage to mountain ash leaflets. Photo Credit:Matt Bowser/USFWS

Our *Trichalophus* weevils appear to be true generalists, munching on just about any deciduous shrub. On the western Kenai, they eat willow, alder, birch, aspen, dwarf dogwood, prickly rose, highbush cranberry, and mountain ash. The adults are most active at night and can be observed feeding with the use of a red-filtered light (Most insects do not perceive red light). They feed at the edges of leaves, chewing distinctive, roughly 1/3 to 1/2 inch wide semicircular divots out of leaf edges. They are harmless to people.

The larvae of *Trichalophus* alternatus have not been studied, but larvae of this group of weevils gener-

ally feed on roots of deciduous shrubs. They are probably generalists as are the adults. I have found beetle grubs among the roots of a cottonwood tree in my yard that were likely the larvae of Trichalophus. I have also found damage to willow roots probably attributable to this species.

While the feeding of the adults may slightly affect the appearance of ornamental shrubs, they seem to have only a minor impact on the health of their host plants. I have not seen instances of severe defoliation due to these beetles even where their abundance was quite high. The ecology of the larvae is unknown, but at least I have not heard of or seen instances of death or decline of host plants attributable to these weevils. I have seen willows with some root damage, but they appeared healthy in other respects.

Why are they in my house?

I do not know why these weevils enter houses. They may be dispersing in search of host plants, seeking out moisture, looking for mates, or trying to find nice places to hide during the daylight hours. Because they have shortened flight wings (hidden under their shield-like first pair of wings), they only travel by foot. This is why they cannot escape from smooth-sided bath tubs and sink basins. Regardless of why *Trichalophus* weevils enter houses, they fare poorly indoors, usually exhausting themselves and dying in a corner.

My guess as to why they so commonly ascend walls is that this is their natural response to vertical surfaces. In their normal environment, the only vertical surfaces extending from the ground are the trunks and stems of their food plants. Like many arboreal insects, *Trichalophus* weevils respond to a perceived threat by quickly dropping from foliage to the forest floor where they blend in with leaf litter, an effective strategy in the wild. They behave the same way when disturbed on walls. Once alarmed, these beetles usually "play dead" for some time.

How can I get rid of them?

Janice Chumley had several recommendations. Gaps, such as spaces around doors, should be sealed. Double-sided sticky tape along thresholds and other points of entry can also be an effective barrier. Once in the home, the beetles may be swept or vacuumed up. Further measures should not be warranted since they are generally no more than a nuisance. They are native beetles, denizens of our natural environment that inadvertently and unfortunately tend to make their way into our man-made environments.

Matt Bowser is a graduate student in entomology at the University of Alaska Fairbanks. He has worked at the Kenai National Wildlife Refuge since 2004, and lives with his family in Soldotna. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Leaving the Kenai!

by Jim Hall

Photo of Jim Hall. Photo credit: Robin West/USFWS

After living in one of the most beautiful places on Earth for the last 7+ years, and working at one of the most exciting National Wildlife Refuges in the United States, I will be leaving the Deputy Refuge Manager position of the Kenai NWR on November 25, 2007. I'm leaving the Kenai for an exciting job opportunity in Washington, D.C. as the new Chief of the Branch of Law Enforcement Operations for the National Wildlife Refuge System.

With this new job opportunity will come many new experiences, and many regrets from leaving such a special place. The Kenai NWR truly is one of the "Crown Jewels" of the National Wildlife Refuge System, and I will miss working and living here.

What will I miss the most about the Kenai? Besides the stark beauty of the Peninsula, I will miss the people the most. The employees of the Kenai NWR are some of the most dedicated, professional and hard working folks that I have ever had the opportunity to be associated with. Their efforts, everyday, make the Kenai NWR one of the top places in Alaska where people like to come and visit. I appreciate all of their hard work and dedication. Another that I will miss will be my boss, Refuge Manager Robin West. Robin is one of the most competent and professional managers in the entire National Wildlife Refuge System, and I can honestly say that I have gained as a leader by working for him.

Then there's all of the others. Those men and women working for the Kenai Peninsula Borough, Alaska Dept. of Fish & Game, the Kenai Fish & Wildlife Field office, Alaska State Parks, and Division of Natural Resources, USFWS Regional Office and other Service field stations, EPA, the Kenai River Center, Alaska State Troopers, Alaska State Forestry, the Chugach National Forest, Kenai Fiords National Park, Alaska Fire Service and others. You folks help make the Kenai the special place that it is, and you keep it safe for us and our children! Thank You!

I also want to thank all of the folks that I have worked with through the years that are outside government agencies: Marathon Oil, Chevron Texaco, UNOCAL, Chugach Electric, Homer Electric, Alaska Dept. of Transportation, Federal Highways, and the numerous contractors that work for these and other groups. Thanks for being willing to look and think "outside the box" on resource issues that affected the Refuge and your groups. It has been a pleasure working with you!

There have been many high points in my stay here in Alaska, but the ones that stand out the most include: leading the Service for the Refuge System Centennial Celebration in 2003, and celebrating the day with 3,000 friends and partners at the Ninilchik State Fair Grounds; working with multiple state, federal, local and private partners to develop a program to mitigate wildlife/ vehicle collisions on the Sterling Highway to try and protect people and critters; and planning and assisting in the transition and development

of the management divisions for the Refuge. There were many, many other notable events that transpired while I was here at the Kenai including my involvement in the large wildfires that have occurred in the last few years, but, alas, I'm running out of room in my article!

I will be trading vistas of mountains and lakes for historic buildings and museums, the Sterling Highway for the D.C. Metro, and wildlife for another form of wildlife altogether. With that said, I will miss the Kenai, and look forward to new adventures.

In closing, know that I have very much enjoyed my stay here in Alaska (It was always a life dream for me to come to Alaska), and that I will stay in touch with a great many of you. For well over a hundred years folks have talked about the resources of the Kenai Peninsula, and the need to protect those resources (e.g., *Outdoor Life*, 1898). The Kenai Refuge finally came into existence in 1941, and the Refuge is now over 66 years old! My grandson was born at the Central Peninsula General Hospital in June of 2006, and I trust the lands and critters of the Kenai NWR will still be here for his grandchildren to enjoy when they grow up. Farewell!

Jim Hall and his wife Elaine moved to the Kenai National Wildlife Refuge in 2000 from St. Catherine Creek National Wildlife Refuge in Natchez, Mississippi. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Marten rediscover the western Kenai Lowlands

by Andy Baltensperger

The American marten, once a rarity on the Kenai National Wildlife Refuge, appears to have expanded its distribution across the western Kenai Peninsula over the past 20 years. An aerial survey of winter tracks using videography in March 2006 detected 32 sets of marten tracks widely distributed across the Refuge from as far south as the Caribou Hills, as far north as Point Possession and the Chickaloon Flats, westward to the Swanson River drainage and eastward to the Mystery Hills.

Furthermore, 19 marten have been trapped or captured in the northwestern Peninsula since 2006, and a collection of incidental reports of marten sign have revealed another 9 locations on the Refuge during the same period. Together these detections indicate that at a minimum, marten are now dispersed widely across the western Kenai Peninsula, though population densities in most locations are still quite small.

Although historic lowland populations may have never approached the high densities commonly found in the Kenai Mountains, at least 11 marten were trapped on the western peninsula around the turn of the 20th century. However, between 1910 and 1960, just three marten were recorded on the entire Refuge, and these were just west of the mountains in 1940. This conspicuous gap in observations could represent a historic decline in marten densities, or it may simply reflect a reduction in trapping and sampling effort during that time period. However, tracks near Botenintin Lake in 1955 were considered by Refuge biologists at that time to be the first record of marten west of the mountains in the previous 30 years.

Between 1970 and 2004, reports of marten on the Refuge increased. Six marten were trapped and 12 sets of tracks were recorded during this period. Although they occurred widely across the western Peninsula, many of these observations were not well documented. Until 2006, marten were still considered effectively absent from Refuge lands, outside of the mountains.

It looks like 2002 may have been a pivotal year. In that year, a juvenile marten was accidentally captured by Refuge staff in the Swanson River oilfield, and some local trappers reported new observations in the western Lowlands around this same time, stirring the notion of an expanding marten population. The aerial videography survey in 2006 was the first systematic marten survey conducted on the Refuge and has now confirmed the wider presence of marten across the western Kenai.

The reasons for any decline in marten densities on the Refuge over the past century are likely to remain speculative at best, but the recent expansion may have some plausible explanations. Until recently, marten were presumably not commonly found on the Refuge because habitat, snow conditions and prey abundance were unsuitable to sustain a breeding population. The recent widespread sightings, however, indicate that these factors may be changing in ways that are more favorable for marten.

Marten tend to prefer mature, closed-canopied forests containing large amounts of course-woody debris (downed trees, logs, stumps, etc). The smaller diameter black spruce-dominated Lowlands and shallow snow cover seemed to provide the most plausible explanation for the absence of marten. Indeed, black spruce forests alone do not provide marten with the level of canopy closure and course-woody debris that they prefer for protection and resting sites, although they may offer decent foraging opportunities. In contrast, upland white spruce/birch forests that are common in the Lowlands do provide ample forest structure and canopy closure conducive to the survival of marten. The patchwork of mature white spruce/birch and black spruce forest across the Lowlands appears to provide marten with suitable habitat in many areas.

The large fires in 1947 and 1969 likely played an important part in determining the amount of habitat available for marten on the Refuge during the past half century. Marten generally do not respond well to forest fires, as they dramatically reduce overhead cover and debris, and can limit prey numbers. The 1947 and 1969 fires collectively burned 390,000 acres and created early successional forests that, while great for moose, were poor for marten.

It has been 60 years since the 1947 burn, and its white spruce forest has matured to the point where marten are utilizing the area again. Small mammal

densities may have also rebounded as the forest matured, providing marten with more prey as well as better cover. The aerial video survey detected three times as many tracks proportionally within the 1947 burn as within the 1969 burn, suggesting that the 1969 burn forest is still not mature enough to support a significant marten population.

Ample snow cover was also hypothesized to be a limiting factor for marten, because marten must have rest sites capable of insulating them from cold temperatures. Snow depths greater than six inches are capable of providing this insulating layer. In the eastern Kenai Mountains where marten populations are well-established, maintaining this minimum layer of snow is not normally an issue throughout the winter. However, on the western peninsula, where freeze/thaw cycles are more common, relying on snow to insulate resting marten becomes more of a problem.

Average snow depths on the western peninsula vary wildly from year to year and do not appear to demonstrate any significant trends over the past 40 years. Nevertheless, marten have managed to persist and indeed expand across the Kenai Lowlands during this period despite unreliable snowpacks and cold temperatures. This suggests that marten are in fact highly adaptable and may be relying on alternate forms of insulation (resting in squirrel middens, for example) in order to mitigate thermodynamic stress during years of shallow snowpack.

As with so many landscape-level phenomena, the explanations behind the recent marten expansion are complicated and will require further investigation. While marten appear to have expanded their range across the Peninsula, I nevertheless urge an awareness of conservation. Marten are easily over-trapped and excessive harvesting pressure could be devastating to these newly emerging populations. Marten population numbers are, at this time, still small and will undoubtedly continue to be dynamic both in size and range in the future, especially as Kenai's climate and habitats change.

Andy Baltensperger is a graduate student at Colorado State University, currently working on his M.S. thesis on the Kenai National Wildlife Refuge. You can report historic or current marten sign observations (907) 260-2827. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Checklist of Alaska bird species: growing by leaps and bounds

by Toby Burke

In 1959 Ira Gabrielson and Frederick Lincoln published the monumental ornithological work *Birds of Alaska*. This comprehensive work includes an annotated list of 311 naturally occurring bird species that had been observed in Alaska through June 1958. In 1978 Brina Kessel and Daniel Gibson updated the list through November 1977 totaling 381 bird species. In 1991 Gibson and Kessel again updated the list documenting 436 species. Gibson, Steven Heinl, and Theodore Tobish compiled 468 species through 2002. And as of January 1, 2007 the *Checklist of Alaska Birds* stood at a remarkable 478 species. If that isn't impressive enough as of January 1, 2008 it increased by seven to 485 species not to mention 26 additional unsubstantiated species.

The *Checklist of Alaska Birds* is primarily founded on the collection of voucher specimens but in the absence of an actual physical specimen audio, photographic, and video recordings are used to substantiate the state's naturally occurring species. Unsubstantiated species are those not meeting this rigorous documentation standard their presence being founded solely on compelling written details by one or more expert observers. Thus, through 2007, at least 511 naturally occurring bird species have been reliably observed in Alaska.

This year was an incredible year for new bird species in Alaska. Strays from Eurasia included Gray Heron and Brown Hawk-Owl observed on St. Paul Island and Sedge Warbler and Yellow-browed Bunting observed on St. Lawrence Island. Bullock's Oriole and Vesper Sparrow are North American breeders also newly documented in Alaska. Additionally, the checklist gained a new species as the result of a taxonomic division of Bean Goose, a Eurasian vagrant, into Taiga Bean-Goose and Tundra Bean-Goose.

Eurasian Collared-Dove, an Old World species, was also observed in Alaska in 2007 but observers did not submit supporting documentation in time to be considered for the latest checklist update. Interestingly, the Eurasian Collared-Dove escaped from captivity in the Bahamas in the 1970s, has become firmly established in the southeastern United States, and through natural dispersal as well as deliberate releases has rapidly colonized North America. There is a good chance that we on the Kenai Peninsula may see the vanguard of this invasion within a few years.

The checklist does not include species whose occurrence in Alaska is considered unnatural, the result of human assistance, known or presumed. This includes captive birds, escaped or deliberately released, as well as ship-assisted arrivals. Accordingly, you will not see Humboldt Penguin on the checklist even though a Humboldt Penguin was captured alive in a southeast Alaska fisherman's net in 2002. It is strongly suspected that the penguin was transported to Alaska waters aboard a South American ship. Chilean and Peruvian fisherman commonly keep these docile penguins as shipboard pets. Nor will you see Brown Booby on the checklist even though one accompanied a yacht sailing 2,200 miles from Hawaii to the port of Kodiak in August 1999.

Other notable birds you will not see on the checklists are ones that are becoming increasingly common on the human landscape such as Rock Pigeon (domestic pigeon), Wild Turkey, Northern Bobwhite, and Ring-necked Pheasant. Considered commensals these species are not known to persist independent of humans and their altered environments. But it should be noted that we likely will see Ring-necked Pheasants included on some future Checklist of Alaska Birds. After numerous introductions it appears that they are breeding and expanding in the greater Homer area to the point that they may some day persist independent of humans.

Though also not native to Alaska, European Starling is already on the state checklist, not merely because it is believed to have made it to Alaska on its own, where it typically lives in urban and agricultural environments, but because it also persists, though not commonly, in the larger wilder landscape. European Starling along with the newly arrived Eurasian Collared-Dove and the rarely encountered House Sparrow and House Finch have the com-

mon and dubious distinction of being our only invasive bird species yet encountered in Alaska.

It must be noted that like most comprehensive bird checklists the *Checklist of Alaska Birds* reflects not only the contributions of many highly skilled and passionate professional ornithologists and wildlife managers but also the contributions of many highly skilled and passionate citizen scientists whose eyes, ears, and minds are open to the diversity of our Alaska avifauna.

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

"It's been more than sixteen years ... really "?

by Bill Kent

April 21st, 1991... I drove onto the Kenai Peninsula for the first time. However, it wasn't my first trip to Alaska; in January, 1971, my military charter flight refueled in Anchorage before continuing westward (or is that east after crossing the International Dateline?) to a significantly warmer climate. My clearest memory of that brief "visit" is seeing the white-capped mountains through the terminal windows, thinking I wouldn't see anything like that for a while, and that I'd like to come back for a closer look.

The usual career progression for a refuge employee is to move on to a new station every five to six years. That was generally how my career had progressed over the preceding fourteen years, and driving onto Kenai Refuge that April day, I had no idea my career was about to take a sixteen year diversion. The refuge manager that had hired me to work at the Klamath Basin Refuges literally stopped sidewalk traffic in Portland, Oregon when I was voicing some indecision about whether I should apply for this position. "Do you want to go to Alaska," he quite forcefully asked me while we were walking back to the regional office there. "Well, yes, I do," I replied. "There's only one refuge there you want to work—that's the Kenai, and don't go anywhere else," he concluded.

I knew that my duties at Kenai Refuge would be a test of all my previous assignments at refuges across the country and I wondered if those positions had prepared me for the responsibilities I was soon to face. However, I also knew that being selected for this position on Kenai Refuge would be a wonderful experience for my wife and daughter, and that the time spent here would be an adventure.

While my wife and I make final preparations to leave Alaska for my new position in south Georgia, I have reflected on the past 16 years, and how quickly the "adventure" began. During my first summer, the Pothole Lake Fire required evacuation of Hidden Lake Campground during Memorial Day weekend; in late July and early August, the Hidden Creek Dipnet Fishery required Refuge staff to be on duty around the clock for nearly three weeks, and the event was covered by the national news media and appeared on CNN and other national networks. Immediately after the Pothole Lake fire, I was quickly introduced to the Russian River Ferry... oh my, was that a shock to a Georgia boy who thought fishing got crowded when I saw another bass fishermen within 100 yards. But, I came to the conclusion that what I was seeing was a social phenomenon, and the folks who return year after year truly enjoy and even revel in that proximity to others.

Although I found myself desk-bound more than I ever expected, I continued to enjoy speaking to visitors whenever I got the opportunity. For one thing, these conversations reminded me how proud I am of the Kenai Refuge and of the National Wildlife Refuge System; there is no other system of lands like it anywhere in the world. My family has lived in some of the most beautiful parts of this country, and we have been able to hunt, fish and observe wildlife at each of these stops along the way; those activities were available because there was a local National Wildlife Refuge nearby. Here in Alaska, I have heard people complaining that there is too much land "tied up" in refuges, parks, and national forests. A couple of trips to the Lower-48 might cure that view, as human development continues its exponential growth down there, and less and less land is available to enjoy the hunting, fishing, hiking, boating or other recreational activities that we pursue so handily here in Alaska. We will certainly experience a new reality when we arrive in Brunswick, Georgia.

My sixteen years working on Kenai Refuge have been unbelievably rewarding, primarily because the Refuge staff has been the very best I've had the pleasure to work with anywhere. Each one of them is professional, dedicated to the refuge's resources, and more than willing to insure that our visitors and visitors have the very best experience.

Our daughter was only five years old when we arrived and grew up and received a great education here. She recently graduated from the University of Washington and is living and working in Seattle; the values she possesses came from not only her parents, but from everyone she came into contact with here on the Kenai Peninsula. Thank You for helping her become the fine young woman she is today.

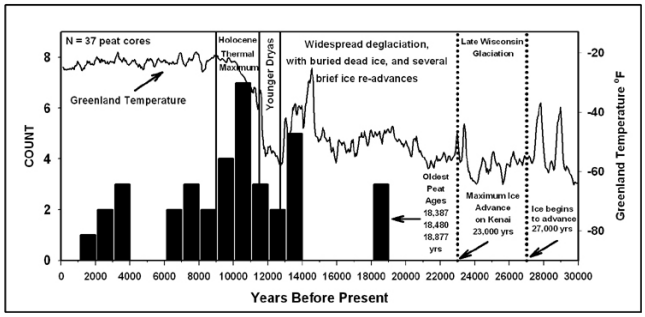
Lisa and I will depart the Kenai Peninsula knowing

we have made lasting friendships, and that our sixteen years will be forever in our fondest memories.

Bill Kent began his duties as the Supervisory Park Ranger at Kenai National Wildlife Refuge in 1991; he and his family lived in both Soldotna and Sterling. Earlier in his career Bill worked at Okefenokee, Merritt Island, Parker River, and Klamath Basin National Wildlife Refuges. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Peat deposits record postglacial climate history of the Kenai

by Ed Berg



Greenland data from Richard Alley, Penn State University.

Old timers who came to the Kenai after World War II have seen glaciers like Portage, Tustumena and Grewingk steadily pulling back into the mountains. These glaciers are small relicts of the ice sheets that extended out across the Kenai lowland and filled Kachemak Bay, and locally merged with even larger glaciers that came across Cook Inlet from the Alaska Range. The action climaxed 23,000 years ago at the height of the last glaciation.

The steady retreat of present-day glaciers provides a somewhat misleading picture of how the big glaciers departed. The truth is, the last glacial period ended with a bang, or several bangs, not a whimper, relatively speaking. It took about 3-4,000 years for the glaciers to spread from the Harding Icefield and the Alaska Range to cover up the Kenai lowland and the broad river valley to the west that was the ancestral Cook Inlet.

After 23,000 years ago the Earth's climate began to warm rapidly, not uniformly but with major warmings and coolings, until the last warming leveled off about 10,000 years ago. (This thermal history is recorded in the 10,000-foot ice-core punched through the Greenland icecap, which provides a detailed record of the Northern Hemisphere climate for the last 110,000 years.) Between 23,000 and 11,500 years ago, the Kenai glaciers literally fell apart; they didn't have time for genteel retreat. The result was a landscape covered with huge blocks of foundered ice. As these blocks melted they left depressions called "kettle holes" which contain most of our lakes on the Kenai.

During the maximum glaciation, large lakes formed between the east and west lobes of the glaciers. The glacial lakebed remnants can be seen today running from the extensive muskeg northeast of Sterling, down through Coal Creek east of the Sterling Highway and intermittently east along the Sterling Highway all the way to Anchor Point.

These glacial lakebeds and many kettle holes have filled with peat since the end of the last glacial period. As part of our studies of long-term climate history on the Kenai we have been taking peat core samples from many sites around the Peninsula and obtaining radiocarbon dates on the peat age. This is part of the graduate thesis studies of our two graduate students Kacy McDonnell and Allana DeRuwe at Alaska Pacific University.

When we take a peat core, we drive a three inch stainless steel tube down through the peat, rotating the tube back and forth so that its serrated teeth cut through the peat. We stop when we hit mineral soil. This process gets harder as you go deeper, and sometimes the peat is very thick. We have cored peat as thick as 20 feet and still not hit bottom, but usually the peat is more like eight to 12 feet thick.

The graph shows the basal (bottom) ages of the peat for 37 cores, collected by ourselves and other investigators. The basal age, determined by radiocarbon dating, represents the time when peat began to accumulate at the site. In some sites shallow lakes dried sufficiently for vegetation to begin filling in a pond or lake basin. At other sites dry surfaces (e.g., drained glacial lakebeds) were colonized by Sphagnum moss, which can store water and create a wetland where there was none previously. (In past wars Sphagnum moss was used as a wound dressing because one dry ounce of Sphagnum can hold a pint of blood.)

On the graph the three oldest peat deposits are more than 18,000 years ago. Two of these (No Name Creek and Funny River Horse Trail) are in glacial sluiceways that drained runoff waters from melting

icesheets. The third is from the flank of the Caribou Hills (Tall Tree Rd), which were not glaciated during the last glacial period.

Serious peat formation on the Kenai got underway after 14,000 years ago, as the graph shows. Most of the landscape was pretty well exposed by this time. There was a dramatic cold snap starting 12,700 years ago, that lasted for 1300 years. This cold period (called the Younger Dryas) was due to a full shut down of the Atlantic Ocean heat conveyor belt (including the Gulf Stream) that brings heat to Europe and northeastern North America. We have seen this cold snap expressed in pond sediments in the Swanson River oilfield, and it appears to have slowed new peatland recruitment on the Kenai (11,000 to 13,000 years ago on the graph).

Eleven of the 37 sites began to accumulate peat during the warm Holocene Thermal maximum, which in Alaska roughly spans the period 11,500 to 9,000 years ago. Peat only forms in cool climates, but this period, even though warmer, likely had heavier winter snowfall which provided more growing season water for poorly drained flat surfaces and kettles and thus initiated peat accumulation.

The next pulse of peat recruitment starts about 4000 years ago. We know from the sediment record at Paradox Lake that black spruce pollen became more abundant and forest fire charcoal decreased at this time, both of which indicate a cooler and wetter climate.

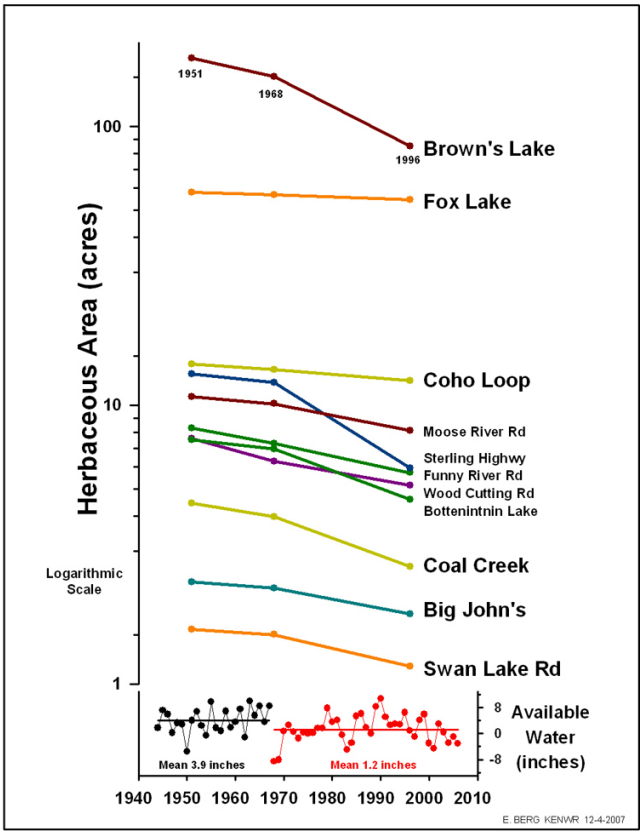
I am puzzled by what was growing at these later sites during the thousands of years between the time that the glacial ice left and peat began to accumulate. For peat to accumulate, the vegetation growth rate logically has to exceed the rate of decomposition. At relatively dry sites perhaps the vegetation simply couldn't grow faster than it rotted, until the climate got cooler or wetter. It is also possible that fire could have removed vegetation, once or many times. At wet sites (former lakes or ponds) the climate must have gotten warmer or drier to lower the water level enough for vegetation to accumulate as peat. In any case there is a time gap at the bottom of most of these peat cores, which poses yet another mystery for future investigations.

I would like to thank geologist Dick Reger for providing dates for the glacial events, as well as some of the peat radiocarbon dates.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. He is an adjunct instructor at the Kenai Peninsula College and lives with his wife Sara in Homer. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Historical aerial photographs show Kenai open wetlands shrinking at an accelerating rate

by Ed Berg with Kacy McDonnell



Graph shows the shrinkage of open herbaceous area (with no shrubs or trees) at eleven wetlands in the central Kenai Peninsula. The open areas of all these wetlands are shrinking, mostly at an accelerating rate. Note that the vertical scale reduces the larger areas. Lower panel shows the decline in available water (precipitation minus evapotranspiration), as calculated from Kenai airport weather data for 1944-2006. (Graph by Ed Berg)

I always enjoy looking at old family photo albums to see the pictures of how my kinfolk and I have changed over the ever-accumulating decades of our lives. Time and tide wait for no man, and these family photos show the inexorably flight of time's arrow through the generations of our family.

Time's arrow also passes over the landscapes on which we dwell, although the photo album may not be so easy to view. On the Kenai we are privileged to have aerial photography dating back to the early 1950s. A second set of aerial photos covers the central Peninsula in 1968, and the entire Kenai was photographed in 1996.

The most noticeable change recorded on these photos is the spread of human infrastructure: the roads, subdivisions, and logged areas. The human footprint is large indeed, and reflects the Peninsula population growth rate of 2.2% per year, a doubling of people every 30 years or so. But beyond the expanding human footprint there are more subtle changes occurring on the landscape. Much of the forest has turned grey from spruce bark beetle mortality, although the forest is now greening up with more hardwoods and thriving young spruce.

The aerial photos also show a drying landscape, especially between 1968 and 1996. Many ponds have vanished since 1968, and closed basin lakes have shrunk, exposing a "bath tub" ring of naked shoreline. A halo of small black spruce around wetlands shows that the forest edge is advancing into areas previously too wet for trees. We have counted tree-rings of these black spruce and found that the oldest ones were recruited at the end of the Little Ice Age in the 1850s.

Most striking is the shrub invasion of the wetlands. Small shrubs like dwarf birch, Labrador tea, and sweet gale have proliferated over wide expanses of muskeg. We have counted tiny tree-rings in dwarf birch stems at three sites, and found that they are generally quite young, mostly dating back to the 1970s.

As part of our studies of landscape drying on the Kenai we worked with graduate student Kacy McDonnell and professor Roman Dial at Alaska Pacific University to do a comparative study of wetland shrinkage on the aerial photos of 1951, 1968 and 1996. We have digitized all of these photos so that they can be viewed on a computer. The photos are spatially synchronized so that it is possible to precisely overlay them on the computer, as if they were plastic films.

For eleven wetlands Kacy was able to draw a line on each photo (on the computer screen) around the edge of the wetland, demarcating the boundary

between woody vegetation (trees and shrubs) and open herbaceous vegetation (grasses, sedges, and peat moss). Once the line was drawn around the wetland, the computer calculated the area enclosed by the line. This process was repeated on aerial photos from 1951, 1968 and 1996, and the areas were compared (see graph). Kacy examined wetlands ranging from a few acres to several hundred acres. In all cases the open herbaceous area was shrinking. Furthermore, in most cases the rate of shrinkage increased after 1968.

Strictly speaking, these graphs do not represent wetland loss. The wetlands are drying out and becoming shrubby and forested, but they are still wet, at least part of the year. The Corps of Engineers would still classify them as wetlands (and you would still need a construction permit) because of the hydric soils, high water table, and presence of many obligate wetland plant species, like Sphagnum moss.

The drying wetlands are a result of our warming Alaska climate. The warmer summers increase evaporation from the soil and transpiration from plants (evapotranspiration). One measure of this drying is the "available water," which is the difference between precipitation and potential evapotranspiration. This is the water available for stream flow, groundwater recharge, and plant and animal growth. It is the net profit, the "bottom line" in the water budget for an ecosystem.

According to the weather record from the Kenai airport since 1944, the long-term water balance took a dive during the drought of 1968-69 and never fully recovered. (Old timers will recall the 79,000-acre 1969 Kenai fire which burned the dried out vegetation right down to mineral soil, and promoted terrific birch regeneration and all-time moose highs for years).

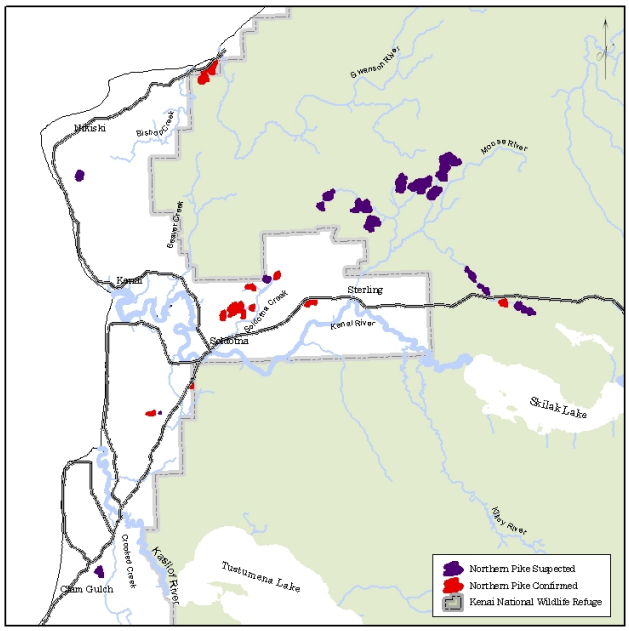
For the Kenai airport, the average water balance for 1944-1967 was 3.9 inches of water; the average balance for 1968-2005 was 1.2 inches, down by 70%. This is a major decline. (See graph)

One practical consequence of the drying landscape is that wetlands that were fuel breaks in the past will become fuel bridges in the future, as they fill in with black spruce and grass. This continuity of fuels will allow wildfires to propagate more efficiently over larger areas. A warmer climate in general will probably promote more fire activity. On the other hand more fires will promote more hardwood browse production, which should promote more moose. One might say that this is a silver lining in the climate change cloud that may favor an important prey species in our local food chain.

Ed Berg has been the ecologist at the Kenai National Wildlife Refuge since 1993. Kacy McDonnell is a graduate student at Alaska Pacific University. She attended Soldotna High School and has a Bachelors Degree in Biology from University of Alaska Anchorage. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

A fish, an opposable thumb, a bucket, and 18,000 years

by Mark Laker



Northern pike on the Kenai Peninsula. Graph Credit: Mark Laker/USFWS

The Kenai Peninsula began to emerge from the Wisconsin glaciation approximately 18,000 years ago. As streams and lakes developed, pioneering fish species such as salmon and trout began to settle into the newly available aquatic real estate. Multiple salmon and trout species may be found in the same river because they occupy different habitats and exhibit different life history strategies. For example, pink salmon spawn in the lower Kenai river and their offspring enter the ocean after hatching, while coho salmon spawn in the upper river with their young spending a few years in fresh water. Not only have these differences allowed multiple species to coexist, salmon have indeed thrived on the Kenai Peninsula. We have inherited a wealth of food and a renewable resource which provides a living for thousands of people, and simple enjoyment for many more.

Now enter the protagonists: a fish, a primate with an opposable thumb, and a bucket. In the mid-1970s someone made the unfortunate decision to illegally introduce northern pike into Derks Lake in the Soldotna Creek drainage. From here the pike spread quickly throughout Soldotna Creek and connected lakes including East and West Mackey, and Sevena Lake. Since the initial introduction pike have been illegally introduced into the Moose River drainage, Crooked Creek drainage, and Stormy Lake near the mouth of the Swanson River drainage. The Alaska Department of Fish and Game (ADF&G) has confirmed the presence of northern pike in 14 lakes, and they are suspected in an additional 17 lake (see map).

The northern pike (*Esox lucius*) is named after its long pointed form resembling the ancient iron-tipped weapon—the "pike." Pike can grow very large; the record for Alaska is 45 lbs. (taken near Circle). The average pike taken in Alaska weighs two to six pounds. Given the folk name "water-wolf," pike have a reputation as voracious predators, attacking prey 1/3 their size. Northern pike are circumpolar in fresh and brackish waters. You can find pike in a variety of places such as cold clear rocky waters, slow moving streams, and weedy shallow areas in lakes. Pike hunt by lying perfectly still for extended periods of time then at the right moment, they bend their body into a "C" or "S" shape and strike with impressive acceleration. Their main diet is fish which they catch sideways, kill or stun, then swallow lengthwise. Pike are also known to be an important source of mortality in young waterfowl. On the Seney National Wildlife Refuge in Michigan pike were estimated to have consumed 1.5 million waterfowl per year (10% of the waterfowl population), and fish were their primary meal.

I'll have to say after reading reports of the voracious appetites of these fish, I was wondering how any fish could coexist with them, let alone birds. Now being from Minnesota, I know that fish such as sunfish, bass, perch, crappie, muskellunge, and my personal favorite walleye, can live with pike. The explanation is simple; these fish have had hundreds of thousands to millions of years to evolve physical and behavioral adaptations to survive that quick bite from a pike. The prey fish (sunfish and crappies) are oval shaped, making it harder to bite them; pike prefer elongated fish. The other predatory fish (walleye and muskellunge) grow fast, making themselves difficult to eat, and inhabit different spawning and hunting grounds.

In their native range in Alaska, pike are not overly

destructive. Interior prey species, such as: blackfish, burbot, chinook, and sheefish, have adapted to the presence of pike. Although pike are common throughout the northern hemisphere, there are many watersheds without them. When pike are introduced into these watersheds, the results can be devastating. Pike have been shown to prefer juvenile coho, sockeye, and rainbow trout as prey species. Other prey common to the peninsula include: pink, chum and chinook juveniles, Dolly Varden, Arctic grayling, Arctic char, burbot, and sticklebacks. Because pink and chum fry swim to the ocean after hatching, they have limited availability to pike. In the Soldotna Creek drainage pike are now the dominant species, with the exception of Denise and Sevena Lakes. Historically, there were coho, rainbow trout, and Dolly Varden in healthy populations throughout the drainage. The deep waters of Denise and Sevena Lakes offer refugia for cohos and rainbow trout.

In Alaska, the Susitna River drainage has probably suffered the worst. As managers watch helplessly, areas once abundant with juvenile salmon now contain only pike. Not only are salmon important to the fisheries, but they are a keystone species effecting the health of the entire ecosystem. Although the degree of damage from pike introductions here and there can be debated, there is no argument that our native fisheries will suffer in number, diversity, and dollars.

Unfortunately there is no silver bullet to remove pike. The Southcentral Alaska Northern Pike Control Committee recently produced a comprehensive report covering the history and status of invasive northern pike in Alaska, and methods for control and removal (http://www.sf.adfg.state.ak.us/region2/pike/pike_management_plan.pdf). The Alaska Department of Fish and Game has initiated control measures such as netting pike and installing fish passage control structures. These measures help decrease the probability of further spreading, and reduce the predatory pressure on native fish and waterfowl, but do not completely remove the pike.

To eradicate a fish takes pretty extreme actions. For relatively small lakes or reservoirs the general practice has been to use a chemical treatment of a piscicide such as rotenone, or to drain the lake. The most difficult part of these actions is typically the public process. As you can imagine there have been a few public relations nightmares "You drained the what?..." However, some of these tough discussions and decisions will need to take place if we want to sustain the incredible resources from which many of us make a living, or simply live here to enjoy.

Mark Laker is an ecologist with the Kenai National Wildlife Refuge and former fisheries biologist with the U.S. Forest Service in Alaska. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Local riders dreaming of a White Christmas

by Rick Johnston

This photo shows a homemade "snow traveler" used by early Refuge inholder and homesteader Robert Mathison, long after its useful life. Mathison used the machine to service his trap line in the Chickaloon River area. (Photo by Bob Richey, Kenai National Moose Range Annual Narrative, 1970)

The moderate temperatures and lack of snow this fall and early winter over much of Kenai National Wildlife Refuge have delayed the opening of snowmobile season on the Refuge.

While such delays are not uncommon, the snow base this year is less than most years.

Some years snow conditions can be relatively poor in the lowlands, but much better at higher elevations. With a few exceptions Refuge managers have tended to open the Refuge as a single unit. This year the higher elevation snow base is low and was not helped by two recent warm and wet weather systems, so the rationale for a delayed opening is obvious, with few calls to Refuge Headquarters inquiring about an official opening.

Refuge regulations authorize snowmobile use from December 1 to April 30, provided adequate snow cover exists to protect the underlying vegetation. Other factors also go into making December 1 the earliest opening date. The highly variable temperatures of our maritime weather pattern make early season snow subject to repeated melting in November before permanent snow cover takes hold. Furthermore, moose rutting in lowland open areas is common in November. Managers believe that reducing snowmobile-moose interaction in November is in the best interest of the moose conservation. Lastly, our numerous lakes are collectively less safe and unlikely to have adequate ice thickness prior to December 1. For these reasons we have established December 1 as the earliest possible snowmobile opening.

Snowmobile use has evolved on the Refuge since it was first permitted. In the earliest years of the Kenai National Moose Range, commercially manufactured snow travelers/snow goes/snowmobiles/snowmachines did not exist, and the Moose Range was closed to motorized travel off established roads. Commercially manufactures snowmobiles became available to the public in the early to mid-1960s.

National Wildlife Refuges in Alaska and other northern areas faced a decision on whether to authorize the use of this new "snow traveler" technology. A determination was made nationally that use would be authorized, but with regulations and restriction to protect wildlife and other Refuge resources. Early use on the Kenai National Moose Range was permitted and managed by new regulations as early as 1966, although some records and photographs show earlier use including some homemade contraptions. Relatively little formal analysis was made of the potential impact to wildlife or habitat, but managers were already concerned about this new conveyance and restricted the size of machines, and time and type of use.

Snowmobile use then and now remains a balance between legitimate access for recreation and potential loss of natural resources and other non-motorized recreational opportunities. Early regulations prohibited snowmobile use within certain portions of the Refuge, including areas important to wintering wildlife and/or other non-motorized Refuge uses. Many of the alpine areas and areas within the Swanson River and Swan Lake Canoe Routes were closed to snowmobile use.

Managers have sought to balance snowmobile use with other established uses such as cross country skiing and dog mushing. Safety was also a concern at sev-

eral locations. In 1972 for example, areas popular with skiers and mushers adjacent to the Soldotna headquarters were closed, and snowmobile racing and use of snowmobiles on roads was also prohibited. Restrictions on the size of snowmobiles (must be less than 40 inches wide) were maintained and additional adjustments to restrictions in alpine areas and within the Skilak Loop area were later instituted.

Over the years Refuge files document both the growing use of snowmobiles and the growing concern over potential impacts to wildlife and habitats. While the body of general knowledge has increased, the balancing act between opportunity and resource protection remains a work in progress. Much like early discussions and correspondence, our current Comprehensive Conservation Plan (CCP) planning process is a dialogue on both the recreational opportunities and the protection needed to meet our sometimes conflicting trust responsibilities and purposes.

Today approximately 1.25 million acres (6%) of the Refuge remain open to snowmobile use each winter after the Refuge Manager determines that adequate snow cover exists.

The following list illustrates the actual times of snowmobile opening and closing dates for the past 30 years and show the significant variability of snow cover of Kenai Peninsula winters:

WINTER	OPEN	CLOSE
76/77	12/20/76	4/30/77
77/78	01/25/78	4/30/78
78/79	12/07/78	4/30/79
79/80	12/14/79	4/30/80
80/81	NOT OPENED	NOT OPENED
81/82	12/01/81	4/05/82
82/83	12/01/82	3/23/83
83/84	01/06/84	3/17/84
84/85	03/06/85	4/26/85
85/86	NOT OPENED	NOT OPENED
86/87	01/10/87	4/01/87
87/88	12/01/87	4/22/88
88/89	12/01/88	4/19/89
89/90	12/01/89	4/16/90
90/91	12/05/90	4/12/91
91/92	12/01/91	4/27/92
92/93	01/04/93	2/27/93
93/94	01/05/94	4/03/94
94/95	12/01/94	4/30/95
95/96	02/09/96	4/07/96
96/97	12/01/96	4/13/97
97/98	12/24/97	3/22/98
98/99	12/04/98	4/21/99
99/00	12/26/99	4/30/00
00/01	02/13/01	3/25/01
01/02	12/22/01	4/30/02
02/03	NOT OPENED	NOT OPENED
03/04	12/13/04	4/18/04
04/05	12/18/04	3/19/05
05/06	01/22/06	4/09/06
06/07	12/24/06	4/12/07

Due to variable weather conditions, the dependability of having suitable snow cover to allow snowmobile use at any given date each winter is uncertain. This seems to have been even more the case in recent years with warmer early winter conditions. However, looking at past opening dates shows that late openings in the early 1980s including the 1980/81 and 1985/86 seasons when the Refuge was never opened due to lack of snow cover. Only once in 30 years has the Refuge been open to snowmobile use for the entire period potentially allowed by regulation.

Because snowmobiling on the Refuge is so popular as a recreational activity, as well as providing access for such things as small game hunting, trapping, ice fishing, travel to private cabins, and winter sightseeing, the Refuge Manager's annual decision on this matter is subject to considerable discussion and has become a closely watched date.

If you would like information about snowmobile opportunities, regulations, or other winter refuge recreational opportunities contact Kenai National Wildlife Refuge Headquarters at 262-7021 for information.

Rick Johnston is a Ranger/Pilot at the Kenai National Wildlife Refuge. He has worked on Kenai National Wildlife Refuge since 1979. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.

Soldotna area Christmas Bird Count slated for Saturday, December 29, 2007

by Liz Jozwiak and Jack Sinclair

Read-breasted nuthatch. Photo Credit: Photo by Todd Eskelin

The 108th annual Christmas Bird Count season is under way; tens of thousands of volunteer birders are scouring their designated areas in over 2000 circles this Holiday season throughout North America. Once again local birders from the Kenai/Soldotna area are invited to participate in the Soldotna Annual Christmas Bird Count to be held tomorrow.

The Audubon Christmas Bird Count (CBC) 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 across North America, including Canada, are conducted in the period between Dec. 14 to Jan. 5 (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 history of how the Christmas Bird Count began is quite interesting! The CBC began over a century ago when 27 conservationists in 25 localities, led by scientist and writer Frank Chapman, changed the course of ornithological history.

On Christmas Day in 1900, the small group posed an alternative to the "side hunt," a Christmas day activity in which teams competed to see who could shoot the most birds and small mammals. Instead, Chapman proposed that they identify, count, and record all the birds they saw, founding what is now considered to be the world's most significant citizen-based conservation effort—and a more than century-old institution.

Since Chapman's retirement in 1934, new generations of observers have performed the modern-day count. Today, over 55,000 volunteers from all 50 states, every Canadian province, parts of Central and South America, Bermuda, the West Indies, and Pacific Islands, count and record every individual bird and bird species seen in a specified area.

The data collected by observers on these Audubon Society 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 1980s, 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.

Another important milestone has been reached in the ongoing analysis of Christmas Bird Count data by Audubon scientists and other ornithologists. Audubon's 2007 WatchList has been released in the 107th Christmas Bird Count summary issue of American Birds. Trend information from the Christmas Bird Count and the Breeding Bird Survey are used, when available, to evaluate the status of species both in the breeding and non-breeding seasons. Birds found to be at risk are included on the WatchList. With the release of both Common Birds in Decline and the 2007 WatchList, CBC analysis will begin to focus now on how birds may be reacting to global climate change.

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 with the dedication of local birder Jack Sinclair who has been the official compiler of the data each year.

Some of the more common birds seen during the Soldotna CBC have been the bald eagle, black-billed magpie, common raven, common redpoll, pine grosbeak, pine siskin and boreal and black-capped chickadee.

Some uncommon and extremely rare species observed on the 2006 Soldotna count last year was the Ivory Gull (the first and only individual ever recorded in the history of the Alaska CBCs), a Slaty-backed Gull (rarely encountered on Alaska CBC) and an American Tree sparrow.

Birders, or anyone interested in participating in this year's Christmas bird count, should meet at the Kaladi Bros. Café in Soldotna between 8:30 - 9:00 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 4 p.m.) or when weather precludes any measurable returns.

CBC participants are organized into groups—or field parties—by the organizer or Compiler of each Count. Each field party covers a specific area of the 15-mile diameter circle on a specific route. 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 dress warmly, and try to bring a good set of binoculars and a bird identification book for species most often found in Alaska. You may also want to bring a camera to document any rare or unusual sightings. There is a $5 fee per field participant which will help defray the cost of production and publication of the 108th Christmas Bird Count issue of American Birds

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. All you will need to do is contact your local Compiler so that you may report your results on the Count Day. No fees are charged for persons under 18 years of age, or for those planning to survey their backyard bird feeders during the Christmas Bird Count.

For anyone wanting to pre-register, 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 available to view here as well as every other bird count in North America during the last century.

After a great day of birding, all participants are invited to submit their tally sheets and birding photos during a potluck social at 6:00 p.m. at the Kenai National Wildlife Refuge's Environmental Education log cabin located next door to the Kenai NWR headquarters/parking lot on Ski Hill Road.

For more information, contact Liz Jozwiak at the Kenai NWR 260-2818 or Jack Sinclair at 262-7817.

Also, if you come across a chickadee or northwestern crow with an upward elongated curved (i.e., deformed) bill, please report it to us at the Kenai National Wildlife headquarters (262-7021). This information will contribute to an important regional study on the causes of bill deformities in southern Alaska.

Elizabeth Jozwiak is a wildlife biologist for the Kenai National Wildlife Refuge. Jack Sinclair is the area superintendent of Alaska State Parks. Previous Refuge Previous Refuge Notebook columns can be viewed on the Web at http://www.fws.gov/refuge/kenai/.