THE ROOST

Annual Newsletter of the Owl Research Institute

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Year of the Long-eared Owl

Photo © Clayton Boyd

Denver Holt, ORI Founder and Owl Researcher
Photo © Clayton Boyd

Message from the ~~President~~ THE OWL GUY

Greetings from the ORI Field Station! It was a spectacular autumn here in western Montana. From about mid-September until early October, days have been sunny and warm, nights clear and cool. We only dealt with a short week of smoke from the western forest fires, though our hearts went out to those in California, Washington, and Oregon where the fires were most devastating.

As we all know, it's been a challenging past seven months with COVID-19. Nonetheless, the ORI managed to keep most business running as usual with a few precautionary adjustments. We reduced office attendance at our field station almost completely and communicated remotely, as much of the world did. Although we never skipped a beat with field research. Due to the nature of our research, we continued to be outside conducting field studies. Unfortunately, our programs, talks, tours, and the TEDx presentation were all cancelled.

It was an up and down year for owls. Snowy Owls did not breed in our study area, but Long-eared Owls had their best year ever. Short-eared Owls were abundant, but nesting success low. We found a fair number of Great Gray Owls, but only one nest. It was also a low nesting year for Barn, Boreal, Pygmy, and Saw-whets.

On other ORI fronts, our Osprey returned for the 6th year. But because Canada Geese had occupied the nest upon arrival, the pair moved to our neighbor's yard – the Rogers' Place. Our lemming study in conjunction with Snowy Owls is now one of the longest lemming studies on record in North America. And, after years of talk and planning, we initiated our first winter raptor survey. We're even considering starting our own online peer reviewed journal.

Finally, during the COVID-19 shutdown, the ORI elected not to apply for government assistance. We had positioned ourselves fairly well to get through these tough times. However, as the pandemic drags on, we now need your help. As a nonprofit organization, we rely on your generosity to support our research projects, education programs, and wildlife conservation messages. We can't do it without you. I hope you consider us and donate today.

Lastly, when you're done reading this newsletter, please pass it on to a friend. Thanks and enjoy the upcoming winter season.

Sincerely,

Denver W. Holt

Snags are dead trees which are important components of forest ecosystems. Here, Denver stands next to an old Engelmann spruce which has lost most of its bark but remains stable. The top has formed a natural bowl and has been used as a Great Gray nest in years past. This tree is teeming with life!

Standing and fallen, dead trees have many vital roles to play. Standing, they house the nests of countless bird species, including cavity nesting owls. Once fallen, they return nutrients to the soil and provide important hiding and climbing spots for owl chicks who have left the nest but cannot yet fly.

Trees, in all stages of life and death, are the foundation of healthy forest ecosystems. Natural and complex, forest structures are important for the survival of many species, including owls and their prey species. For ORI, that is why snag conservation is a huge focus of our work.

We talk a lot about the importance of snags for nesting, but they serve a multitude of roles and critical functions.

Snags, beautiful snags!

INTRODUCING *OWL NOTES*! JOIN US IN THE FIELD WITH DAN COX

The timing couldn't have been better. Just when COVID-19 was shaking up our normal field programs and educational activities, Daniel J. Cox was facing the cancellation of his photography tours that would normally have his travel schedule booked. His unexpected free time and our desire to share our work in new ways found a happy partnership called *Owl Notes*. Dan says, "as a filmmaker, I wanted to figure out how to bring more people to the field and introduce them to ORI's amazing studies and the wonderful subject of owls. It's great to work with Denver again."

We'll never give up our Day in the Field programs, which allow our supporters to join us in-person as we work. But virtual programs like *Owl Notes* open the door to countless viewers and participants from all over the world who may not be able to attend field programs.

Owl Notes brings you into the field with Denver as he and his team discuss challenges to Short-eared Owls, follows researchers as they survey for ground nests, watches as Great Gray chicks are banded, and more.

While we intend to offer in-person field days in 2021, we also hope to continue this fruitful partnership! You can find *Owl Notes* on the homepage of our website.

Photo at right: Intern Madi Henrie packs up nets after a day of field work with Denver, Beth, and Dan for *Owl Notes.*

Beth Mendelsohn, ORI Wildlife Biologist
Photo © Clayton Boyd

The ~~Tiny~~ Northern Saw-whet Owl
TENACIOUS

The upside to being the only chick in the nest? Lots and lots of food! This thriving chick was returned to the nest right after being banded.

Breeding Season

The Northern Saw-whet Owl is arguably the most adorable owl around. One of my most memorable moments this spring was seeing that first Saw-whet head pop out of her nest cavity in an aspen tree to check us out. What makes this species so delightfully charming? Maybe they remind us of human babies, with large forward facing eyes, small beaks and heart shaped faces we are predisposed to love. As small as a robin, don't let their size and sweet face fool you – these owls use their sharp curved talons to strike and kill mice and voles up to 40% of their body weight!

Like the other small cavity nesting owls we study, this year we were a little disappointed to locate only two nests. In a stroke of luck, one of the nests we found was occupied by a female banded during fall migration 6 months prior! She was nesting very close to where we banded her, indicating she may be a year-round resident or had simply returned to the area to breed. She only raised one owlet, but it was a whopping, well-fed chick!

Fall Migration

Our Missoula banding station near Blue Mountain has been running for nine consecutive years. Monitoring and banding owls at the same time and location each year helps us understand yearly variations. In wildlife biology, it is difficult to conduct traditional "experiments" with well controlled environments where variables of interest can be manipulated and tested. So by keeping as much as possible consistent (e.g. location, date, observer effort, capture methods) we are able to better analyze differences.

Elsa Jehle and her dad Alex volunteer at the banding station. This busy night marked the season's nightly high with 20 Saw-whets captured and banded!

This year we surpassed 1,000 Northern Saw-whet Owls banded at this migration station over the course of our study – bringing the total to 1,055. Some years saw significantly higher numbers of migrants than others. Although we don't know exactly why this variation occurs, we are starting to get some ideas. First year birds make up the majority of our captures (about 60-80% depending on the year), followed by second-year birds (10-30%), then after-second-year (1-9%). This indicates that the migration numbers are driven by breeding success of the current year, as well as survival of birds from the previous year. See graph and description at right.

Where do these owls come from and where do they go? Band re-encounters help us answer this question. This year, we had our fourth recapture at Lucky Peak near Boise, Idaho, making up about 25% of our re-captured owls. This starts to draw a picture of an important migratory route. However, other birds from our station have gone as far as California and Alberta! One owl banded at our site in 2019 came through again this year, which is always nice to see!

Just like a Jack-in-the-Box, a female Saw-whet that pops her head out of a cavity can take your breath away! Why does she do this? To assess danger from predators and protect her chicks.

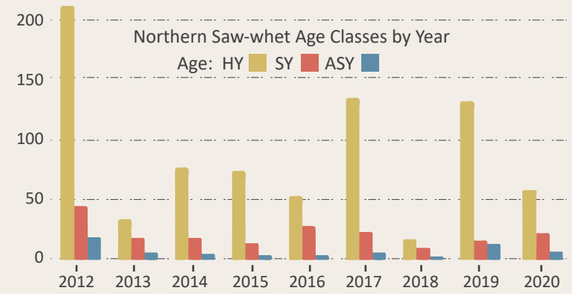
Most breeding information on this species comes from nest box studies. While vaulable, one must wonder if data from nest box studies are true reflections of data from Saw-whet Owl populations nesting in natural sites, such as woodpecker holes, like the cavity seen here.

Photo © Kurt Lindsay

AGING NORTHERN SAW-WHET MIGRANTS

Northern Saw-whet migration numbers fluctuate from year to year and are largely driven by hatch-year (HY) owls, or owls that were born the previous spring, making them approximately 5 months old. Second-year (SY) owls that were born the year before are also fairly common migrants, while older birds, or after-second-year (ASY) are less common on migration.

Right: Owls are aged by looking at the molt patterns in their flight feathers. Sometimes we utilize the help of UV light to reveal fluorescence of a pigment called porphyrin. This pigment fades over time with sun exposure, so older feathers will exhibit less fluorescence, as seen here in the middle section of the wing.



By Steve Hiro, ORI Volunteer Researcher
Photo © Clayton Boyd

~~A Passion~~ PATIENCE for Pygmies

The theme of the 2020 Northern Pygmy Owl season would best be summed up with the statement "the more you think you know something, the more you have to learn." It was humbling and even a bit disappointing.

The season began in mid-February and was rewarding initially. We had quite a few birds respond in our initial surveys and rather quickly identified at least four pairs that seemed solid. As we pursued these pairs in search of their nest cavities, we were treated to a surprising sight. Two of the four pairs appeared to have chosen cavities that had been used as nests in the past, one in 2017 and 2018, and one from 2016. Additionally, three of the four pairs were observed entering cavities and copulating outside these presumed nests over multiple (2-3) days. This was a sign, we thought, that these were indeed going to be the nesting cavities. Regrettably, all three of these pairs must have moved on to other sites, and our early excitement faded. This experience reinforced how difficult it is to pinpoint the nesting cavity, despite chasing pairs for hours.

We did eventually, more by happenstance, find a nest. It turned out to be somewhat unique in our experience for several reasons. First of all, the nest was in an area that we have not had one in, at least recently. Usually we find nesting cavities in proximity to a stream or other riparian zone. This cavity was in a very dry area, and one in which there were few, if any, other cavities. Perhaps because of the dryness, the prey delivered to the female and chicks was also quite different. Usually we tend to see prey equally spread between birds and small mammals (heavily weighted toward voles). At this nest, it was rare to see a vole delivered, the majority of food consisting of birds, chipmunks, and even skinks and lizards.

It was instructive to witness this pair's adaptability. We also had two episodes of vigorous nest defense, once against a red squirrel by both adults, and once against our peeper camera by the female, who actually wacked the camera many times. In the end, only one nest but it was still an educational season. There's always more to learn when you get out and get your boots dirty!

The female Pygmy Owls is never far from her ponderosa pine cavity nest.

Northern Pygmy Owls are found in a variety of forest habitats. From dense coniferous woodlands, cottonwood riverbottoms, and isolated Aspen patches, the nests of this obligate cavity nester are seldom found. It needs natural holes in trees or holes excavated by woodpeckers in order to nest. Interestingly, in North America it does not seem to use nest boxes, while its European counterpart, the Eurasian Pygmy Owl, does.

Photos © Avery Maxwell

IN THE FIELD WITH HIGH SCHOOL VOLUNTEER AVERY MAXWELL

Living and playing outside in Montana is a gift I cherish. I have been fortunate to hear the staccato hoot and see Great Horned Owls near my home. Once, the day before I lost two chickens, I saw a Great Gray in a ponderosa in our garden. I have been amazed at the silent and stealthy flight of owls and interested in their plight. One year, as a birthday present, my parents 'adopted' a Pygmy Owl from a rescue center. Its name was Dot.Com and we were able to follow the owl's recovery and ultimate release into the wild. I was astonished to learn that Dot.Com was about the size of a large sparrow and would be capturing other birds similar in size for food! The Pygmy Owl is fierce!

I had mostly forgotten about Dot.Com until Steve Hiro, a family friend and Pygmy expert, invited me to join him at a Pygmy Owl nest. I was excited and thankful to help observe. A nest had been identified and Steve had verified the presence of a clutch of Pygmy chicks. He made daily visits and knew the chicks would fledge soon. He took the arduous early morning observations; mine would follow after morning swim practice and before homework. My shifts looked something like this: I would travel to the nest, a four-inch cavity about 30' off the ground in a ponderosa pine. I would set up my observation post - a lawn chair, binoculars, a camera, and notepaper. Steve coached me on the owl's vocalization and feeding behaviors so I could take field notes and identify prey. With time, the chicks became curious about the outside world and peeked out of the cavity to look around. We could briefly see their yellow eyes peer out. In the last week of nesting, the mother was most often outside of the nest, though never more than 100' away. After bringing food, she would exit the nest and fly in the vicinity, sometimes appearing to hunt, other times feeding herself on leftovers. Always close by, she guarded her chicks from the outside world.

I took hundreds of photos trying to capture moments with this growing family, including the one to the left, but owls are reclusive and only a few turned out. Opportunities for observation were brief. When the male brought food from a hunt, generally announced with a chittering call, we would try and identify the prey and follow the exchange from male to female, female to nest.

Unfortunately, I did not get to see the chicks fledge on that final day, though I was able to identify chicks near the nest. Their first flights were short, maybe 50 feet, before landing. Within an hour of identifying the chicks on that morning, they seemed to be gone from the area. As were the adults. I did not observe flight lessons or hunting instructions. I saw some hikers but am sure they did not see the Pygmy Owls or hear their calls as I never would have prior to my week with the Owl Research Institute.

Pygmy Owls are typically quiet and solitary except during the breeding season, when their vocalizations come alive.

Photo © Kurt Lindsay

Toots, Trills, and Chitters – PYGMY LINGO

Long-term field research provides many benefits, most important of which is observation. When out and about, the patient observer will see and hear all sorts of "stuff." While sometimes anecdotal, over time, they increase our understanding of owl behavior. Over the past decade we've witnessed many Northern Pygmy Owl vocalizations and thought we'd share our thoughts about what they might mean.

TOOTS - The sound typically associated with the Pygmy Owl is the repetitive single toot, usually spaced three to five seconds apart. This song can be heard anytime during the year, but is most common during the breeding season. Outside of that time, the call is probably some type of territorial signal, perhaps a territorial defense. Around mid-February, however, the start of the breeding season in Montana, the sound takes on a different purpose. The male sings a loud repeating single toot, usually from a high visible perch, usually spontaneously. During this time he will also respond to a broadcast call. This singing is prolonged, more common in the morning, but can be anytime during the day, and, occasionally, accompanied by a trill. The only other time we hear this call is later in the breeding season, after pair bonding has occurred, which also seems to be a type of territorial or nest defense in response to our broadcasting.

DUETTING - This is perhaps the first vocalization associated with pair formation. We don't hear duetting with every pair, but when we do, it consists of alternating male (lower pitch) and female (higher pitch) single toots offered at a distance. The pitch difference is easily appreciated. Duetting is most common in the morning. There is occasionally an accompanying trill.

SOFTER TOOTS AND TRILLS - Once pair selection and bonding occurs, vocalization becomes quieter, more intimate, and moves to mid-canopy. It begins early in the day, and consists of mostly softer double and single toots and trills and lasts most of the day. This interaction is intermittent, as the pair remains in contact through the day, and through the nest selection process. Once a cavity is chosen, the vocalization tends to center around the nest, beginning at first light. It also occurs with food deliveries to the cavity, once the female has committed to the clutch.

CHITTERS - Chittering is a sound we associate with food; food delivery and food begging. There is, however, a very brief chitter often heard with copulation. When food related, a chitter can be voiced by an adult or a chick. Somewhere around the tenth day after the chicks have hatched, the female increases her time out of the cavity, mostly monitoring the nest and receiving food from the male. It is still unclear how much she hunts at this time, and also unclear is whether she retrieves cached food. In any case, a new vocalization is heard. A coarse chitter is offered by the male when he returns to the cavity area with prey, for her to eat, or for her to give to the chicks. The female also, at times, makes the same sound, as an adult food begging call. We have also heard the female chitter with food close to the nest, when it is time for the chicks to depart the cavity, as a seeming enticement to leave. The chicks themselves have a softer chitter used for food begging, from the cavity opening and from a perch after exiting. It has been described as similar to an insect call. This chick food begging sound continues for at least several weeks as the adults provide food.

Kellen Beck, ORI Social Media Coordinator
Photo © Clayton Boyd

Staying Socially ~~Distanced~~ CONNECTED

In a year where personal contact has been extremely limited, we have had to come up with new and innovative ways to engage and educate the public. This year we made many unexpected pivots to carve out a successful year, as public education is an important pillar of our mission. Social media has always been a part of this public outreach, but it has also been supplemented by the ability to educate and engage with our community through days in the field and seminars. Of course, none of this was possible this year, and so we had to rely almost solely on technology in order to keep us connected.

Early in the year, when most of the United States was experiencing quarantine, we found that our live cams with explore.org were becoming a wonderful reprieve for so many from the monotony of staying at home. They brought the sounds of nature into our living rooms, and we were lucky enough to witness the successful rearing of a new generation of Great Horned Owls for one family. We were able to bond with our cam community through these shared experiences and invest ourselves in something positive.

Engaging with our community of followers on our social media platforms has been an extremely rewarding experience this year. We have focused heavily on educational posts, and with such a busy breeding season, it has been a hoot to keep you all updated on all the good news we had to share from our experiences in the field!

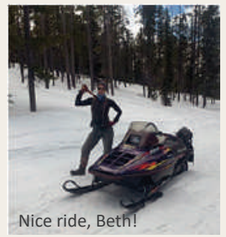
We've gotten some help from friends along the way, too! Dan Cox, an old friend and partner of ORI's put together an incredible video series called *Owl Notes.* KECI and NBC Montana featured ORI's 30 years of Long-eared Owl research in the Missoula area on *Montana Moment.* Host Kevin Maki joined us in the field and created a great video segment which aired on the nightly news.

A special highlight for us this year was Great Gray Owl week. This was one whole week in May devoted to all things Great Gray and our followers raised almost $10,000! We shared so many fun facts, talked A LOT about snag conservation (one of our favorite drums to beat) and even shared some incredible photos of a leucistic Great Gray Owl that was certainly our most popular post of the year, reaching over 230,000 people!

We want to thank all of the photographers who have allowed us to use their striking images this year. Our partnership with these artists is so important to us as we know how important instructive visuals are to grab the attention of our followers and growing our reach.

This year more than ever, social media has been such an incredible tool to have at our disposal to interact with and reach out to our community of supporters. Thank you to all of you who have followed along and became a part of the conversation. If you haven't already, check us out on Facebook and Instagram: @owlresearchinstiute. See you there!

BOREAL OWL STUDY



Nice ride, Beth!

Since 1985, we have conducted nest surveys for Boreal Owls in high elevation spruce and fir forests in western Montana. Now in its 25th year, our nest box study had a disappointing year. Like last year, despite days of snowmobiling to access known habitats and areas of past success, no nests were located. Over the course of our study, ORI has found 28 nests and banded about 80 Boreal Owls, mostly nestlings and females, gathering important data on natal philopatry and site fidelity.

The Boreal Owl was once thought to be an infrequent visitor from Canada. Despite being one of North America's most difficult owls to observe, we now know that Borealss can be found breeding at high elevation forests throughout the Rockies and other western mountain ranges in the lower 48. Still, the vast majority of known North American Boreal populations reside in Canada and Alaska.

Liberty DeGrandpre, ORI Development Director
Photo © Clayton Boyd

Great Gray Owl ~~Survey~~ Data COMMUNITY

Above: One of two chicks from the cam nest. Below: Denver holds the male who was banded the same day; the female eluded us. Watch as ORI bands these owls on *Owl Notes.*

Our Great Gray study expands each year and this spring we initiated our first standardized surveys on the Flathead Indian Reservation. In response to public requests, we received several reports of sightings and nest locations, both past and present. Working from these tips, our own encounters, and areas of preferred habitat, 30 miles of survey routes were plotted and scheduled to coincide with early breeding season, when vocalizations are frequent.

Unable to utilize volunteers, Denver and Beth conducted the surveys on their own and followed guidelines outlined in ORI's new North American Owl Survey Protocol. Survey nights were cold and dark, often without a single Great Gray call. No active nests were located, but several new Great Gray areas were identified, suggesting breeding territories. Denver notes that the early years of any large-scale survey are as much about learning the land and how to access habitats of interest, as the survey itself.

Despite the low return on survey efforts, much was accomplished for Great Gray research in 2020! This is owing to our live-cam partnership with explore.org and a team of incredibly dedicated volunteers. Our Jim's Place Great Gray nest cam went live in April and streamed a nest of two chicks from incubation to fledge. During the entire season, scheduled volunteers maintained 24/7 observation of the nest and recorded events through an online survey portal. Frequency of food deliveries, preening, vocalizations, and more were recorded. Footage from past years is being analyzed with the help of student volunteers. All in all, it represents a wealth of information! In fact, it's so much data that we haven't gotten through the analysis of it yet. We hope to have it complete by the upcoming breeding season. Thank you to the special volunteers who participated in both the Great Gray and Great Horned Owl Remote Nesting Behavior Projects, to the land owners for their generosity, and to explore.org for making it all possible!

BETH MENDELSOHN, FIRST AUTHOR

When Beth Mendelsohn joined our team, she brought a special interest and research background in Great Gray Owls. Some of this work was recently published in the journal *Conservation Genetics*:
Population genomic diversity and structure at the discontinuous southern range of the Great Gray Owl in North America, 2020. Beth Mendelsohn, Bryan Bedrosian, Sierra Love Stowell, Roderick B. Gagne, Melanie LaCava, Brady Godwin, Josh Hull, Holly B. Ernest.

The research focuses on population differentiation and genetic diversity in Great Gray Owl populations that exist on the periphery of the species' range. Beth and her fellow researchers found that some of the populations on the edge of the species range had lower genetic diversity and were genetically isolated, reducing their future adaptability.

Understanding population structure, diversity at genomic levels, and evolutionary potential are relevant to conservation status and management decisions about Great Gray Owls and their habitat. This study constitutes the first genomic work on Great Gray Owls and the first genetic analysis that includes Wyoming, which represents the southern extent of the species range in the Rocky Mountains and is impacted by habitat loss. Great work Beth! For a PDF of the article, request by email at owlresearchinstitute.org.

A Great Gray female perches on the edge of her snag nest. This nest fledged two young during the 2020 breeeding season and was enjoyed by thousands of explore.org viewers around the world. Additionally, it was the subject of our remote monitoring project - an effort that put citizen scientists to work, right from their homes, with minimal disturbance to the owls.

Photo © Daniel J. Cox/ NaturalExposures.com

A Long-eared chick waits on the forest floor with its four siblings to be banded. At this age, chicks are most commonly still in the nest, though branching can begin at any time, usually around three weeks.

Photo © Clayton Boyd

Photo © Clayton Boyd

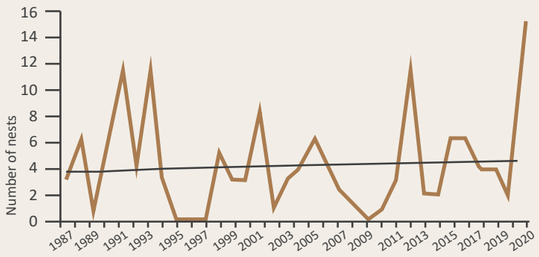
Year of the ~~Pandemic~~ LONG-EARED OWL

We are thrilled to report that we located 25 Long-eared Owl nests in 2020 - the highest count so far in 34 years of research! This was especially exciting news after the last 3 years saw only one successful nest total. About 90 young owls fledged, so we had our hands full banding chicks.

Interestingly, the nesting season stretched out longer into the summer than it usually does. Some females laid eggs as early as the first week of March, while others waited until the end of May. That meant that we were still monitoring nests and chicks into early July. Due to a relatively long nesting season (courtship, incubation, nestling growth, fledging and development), owls need time before the winter for their young to become fully grown and self-sufficient, so they generally initiate nests in the early spring. The long breeding season of 2020 indicates that prey numbers remained consistently high, allowing ample food resources for more owls to nest, and even compelling late nesters to try and raise a brood. In fact, every day we were out in the field, we spotted numerous voles, the Long-eared Owl's food of choice.

Previously we have suggested population declines in Long-eared Owls in our study area, as well as reported overall steep declines in the North American population. After this "boom" year, we are actually seeing a slight overall increase, or upward trend, in the number of nests over the last 34 years in our study area in Missoula (see nest plot, lower left). We cannot emphasize enough the importance of long-term studies when monitoring owl species. Had our research only spanned a few years, it would have taken a small "snapshot" of the population, and could have easily misinterpreted the longer-term changes. Even after 30+ years, we still cannot say with certainty that this population is increasing or decreasing; future high breeding years would be a good sign, whereas more low breeding years would bring the trend line back below zero.

LONG-EARED OWL NESTS FROM MISSOULA STUDY SITES, 1987 - 2020



This year's numbers have shifted the trend line slightly upward from 2019 indicating that the population, although it fluctuates from year to year, may be fairly stable for now. Annual variations are a natural and common occurrence for many species – especially those that rely on small mammals as their main food source. Voles, for example, are known to have large population fluctuations impacted by food resources, predator presence, habitat changes, and other factors. Note: while we found a total of 25 nests in 2020, this graph represents those from our Missoula study sites where 15 nests were located.

A NOTE ON BANDING AND RECAPTURES

Banding is an important practice for long-term data collection. This is especially true of recaptures, though for most species, they are uncommon. Within our Long-eared study sites, however, and over the many years we have been banding in the same areas, we've reencountered many owls. Over time, each recapture adds to our understanding of the species. Banding has been in practice for hundreds of years and remains an effective and minimally invasive means of data collection.
Photo: Beth gently attaches a band around a young Long-eared Owl's leg. Timing is important. At ORI, we band when the chicks are still young enough to be in the nest, but developed enough to ensure the band will not slip off or catch.

We spent many great days in the field with photographer Kurt Lindsay this year. He's as big an owl fan as you'll ever find, which is evident in his work. But his photos are more than just beautiful. Take this photo, for example. After ORI located this Long-eared Owl nest, Kurt returned daily to help document, via photography, growth and development rates for this species. Working partnerships like this continually expand what is known about owls and we are so grateful for them! Thanks Kurt!

Photo © Kurt Lindsay

The breeding season is a critical part of owls' lives, but we have to keep in mind that owls are capable of relocating at any time. Seasonal and yearly movements in Long-eared Owls are not well understood, but after 34 years, we probably have more knowledge than anyone on the subject. By banding over 2000 Long-eared Owls and re-encountering 25% of those birds at least one time, we have figured out that considerable seasonal movements are common for this species. Whereas one might assume that owls would return to the same nesting and wintering grounds year after year, we do not have data to support that. Rather, we find that it is only the rare Long-eared Owl that breeds in the same location year after year.

More commonly, we encounter individuals who return to the same wintering areas for multiple years, but still, winter roosts in the exact same location are usually utilized by completely different owls. Long-eared Owls are consistently attracted to our study sites year after year, indicating that individuals are homing in on the same characteristics for good roost sites, nesting areas, and hunting grounds. Since nest availability, roost quality, and prey abundance change over time, we can expect owl occupancy to also vary. We suspect that they search for the areas with the best food supply to support a brood or survive the winter. Still, the full spectrum of the Long-eared Owl's migratory strategies remains somewhat of a mystery. Outside our study area we have had few recaptures, but have learned that some have moved less than 100 miles, and others as far as Nevada, Utah, and even Mexico! These complex and varying migration strategies make conservation of the species much more complicated.

Even after a big nesting year, we still fear the future of this species. We know that open country habitats are threatened across the country. Housing developments, buildings, golf courses and an airport all surround our study area and have altered and encroached upon the prairie habitat remaining in Missoula. Long-eared Owls require not only open fields for hunting, but nearby trees or shrubs with thick cover for nesting and roosting. These two habitats are threatened by urbanization, agriculture, overgrazing, fire suppression, poor management, herbicides and pesticides. All of these threats are human-caused. Much of our study area holds an unknown future – it may be sold for development, in which case owl habitat there will no longer exist, and the owls that utilize those areas will have to find other places to winter and nest.

Small habitat patches make up an intricate network of Long-eared Owl habitat that is increasingly fragmented and destroyed. As these places disappear, it will be more difficult for the species to thrive. We believe it is important for Long-eared Owls (as well as other species of owls) to move to where the prey populations are robust in a given season, to find enough food to survive the winter or to produce offspring. The more available habitat the better the options will be, but unfortunately this open country habitat is extremely threatened and disappearing.

Photo: Denver Holt discusses population changes from an ORI study site.

NEW Mission Valley Winter Raptor Surveys

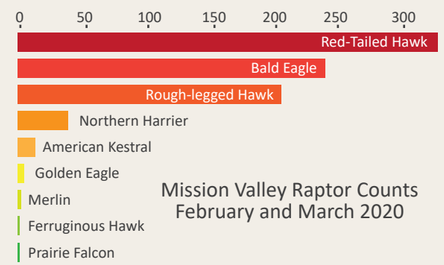
The Mission Valley in western Montana is situated within the Flathead Indian Reservation, about 50 miles north of Missoula, MT. The valley is an important wintering site for birds of prey, both year-round residents and migrants from northern habitats. It may have one of the highest densities of wintering raptors in the northwestern states and the highest concentrations of Rough-legged Hawks wintering anywhere in the U.S. has been recorded there.

During the 1980s, wildlife biologists from the Confederated Salish and Kootenai Tribes, Dale Becker and Pat Mullen, along with Denver Holt, observed a substantial flight of Rough-legged Hawks moving from the valley to the base of the mountains during the early evening. This led to the discovery of an area where Rough-legged Hawks appeared to roost in large groups at night. Later, Holt brought graduate student Chad Olsen to the area, who located the specific sites where groups of hundreds of Rough-legged hawks roosted while conducting his Master's research.

Over several years, ORI researchers Matt Larson, Beth Mendelsohn, and Denver Holt have developed a standardized survey method to identify the species and their relative numbers that use the Mission Valley as a wintering area. In February and March 2020, we conducted the first official surveys. Our aim is to assess the habitat utilization, demographics, and abundance of raptors in this wintering area.

During our surveys, Red-tailed Hawks were the most abundant species observed (see graph). Almost 10% of these were the Harlan's subspecies, believed to be far-northern breeders. Bald Eagles were also very abundant, possibly because of spring calving. Rough-legged Hawks followed closely behind as the third most abundant raptor sighted. Northern Harriers were spotted frequently as well. American Kestrels were more uncommon, and large falcons were a rare sight. We spotted a few Golden Eagles, and were lucky enough to detect one rare Ferruginous Hawk.

These surveys would not be possible without the help of a great group of raptor enthusiasts. A huge thank you to everyone who volunteered! We are excited to continue these surveys each winter to learn more about the diurnal raptor populations in the valley. Long-term, standardized monitoring projects like this one are key to understanding raptor populations, especially as changing environmental conditions and land-use practices may cause fluctuations over time. We are also happy to engage citizen science volunteers, who play an integral role in collecting this data and gain stewardship in research and conservation.



Mission Valley Raptor Counts
February and March 2020

Only lone males - most often adullt males on territories - were seen across our study site in Utqiaġvik, Alaska this year.

Tundra mounds, like the one seen here, are important nest sites for Snowy Owls and lemmings alike. While this season was unusually dry, mounds often provide a respite from boggy troughs which can cover the landscape.

Photo © Melissa Groo

Snowy Owl ~~Breeding~~ Season 2020

NON-BREEDING

Each year we prepare for the Snowy Owl breeding season with cautious optimism. We may not be able to predict what lies ahead, but we hang on to hope that the upcoming season will be the next big boom. A colleague recently asked Denver, “are you really still waiting for another big lemming year?” The short answer is, Yes. How can we not? This hope helps to drives our research, motivates us to trade in sunny summers for arctic conditions, and helps fuel our belief in a future for Snowy Owls.

2020, a year marked by so much turmoil in the world, has also marked a disappointing breeding season across our 100 sq-mile study site in Utqiaġvik, Alaska (formerly Barrow). Denver Holt, lead researcher, sent back early reports of an unusually quiet tundra – most obviously void of researchers, but also of the many species who follow lemming waves. A serene and beautiful tundra, but eerily lacking in the sights and sounds of a productive breeding season. Last year was so wet we were never out of hip waders; this year’s conditions were very dry and required nothing more than knee boots to survey the tundra. Denver ultimately located about 15 males of varying ages, but not a single nest, not even a single female was seen.

Dramatic highs and lows in nesting rates are not uncommon for Snowy Owls. The project’s 29-year history has documented many non-nesting years at our study site. Likewise, several years have seen more than 30 nests, one year over 50. So while peaks and valleys are natural (see lemming Q & A), there is cause for concern. This year’s data will tip an already declining trend line further down. In other words, the highs just aren’t as high as they used to be and this season’s lemming surveys revealed one of the lowest counts to date.

Due to travel restrictions, the season was late to start and early to end. There were no nests to monitor, chicks to band, nor fledglings to record. It wasn’t the season we hoped for, but years like this are an equally important part of the puzzle. Long-term data is the key to understanding the challenges Snowy Owls and lemmings face, and how a warming Arctic will impact the species who live and breed there. For our part, this work to understand and protect their future will never stop. We hope that Snowy Owls had a strong breeding season somewhere in the world, even if no one was there to record it.

Q & A with Denver Holt, Snowy Owl Researcher
Photo © Clayton Boyd

Where Have all the ~~Snowy Owls~~ LEMMINGS Gone?

The population trend line for Snowy Owls in the Utqiaġvik region has been declining for years. This year, not a single nest was found across ORI’s study site; the tundra was quiet and still. So where are the Snowy Owls? Most likely, in search of food and favorable nesting conditions elsewhere. But the bigger question we need to be asking is where have all the lemmings gone?

Why are lemmings so important?

Because they impact so many species in the Barrow region, especially their reproductive success. It’s all driven by lemmings, in direct and indirect ways. Directly, the animals who eat lemmings – like Snowy Owls, Arctic foxes, gulls, pomarine jaegers, weasels – all produce more young when lemmings are abundant. Sea ducks, like the threatened Steller's eider and shorebirds, experience indirect effects. During a good lemming year all the predators are so busy eating lemmings, they don’t eat as many eggs and chicks. So ducks and shorebirds can also have a good reproductive year. When lemmings are abundant, the whole tundra is alive. After being up there for 29 years, I see how much impact they have. And not just to Snowy Owls, but to the whole tundra ecosystem.

Give a little overview on lemmings.

There are many species of lemmings, but people tend to think of Arctic lemmings most often, the ones who have boom and bust population fluctuations. A lot of people still think lemmings commit mass suicide, which came from a Disney movie, but that isn’t true. Though their populations do crash. And when they do, it can take several years for them to rebound. There’s a period of exponential growth in their numbers, then they crash again. But it doesn’t fit the definition of a cycle. We just like to describe things in terms of cycles for some reason – whether it’s sun cycles, extinction cycles, hurricane cycles. I guess we just want things to be predictable.

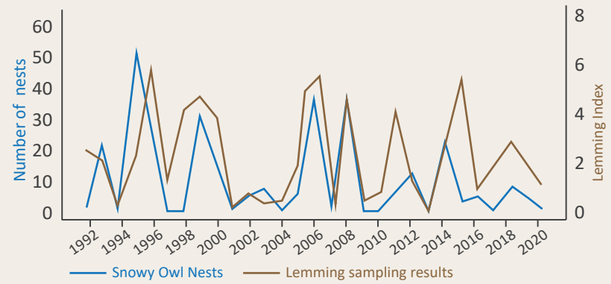
Can we call the fluctuations natural, or part of lemming biology?

Yes, I think we can say that it’s part of the natural life cycle for both populations – lemmings and Snowy Owls – which fluctuate in synchronicity at Barrow. That is the only consistency we see. But, you know, it’s the same thing with owls and voles here in Montana and elsewhere south of the Arctic. The Arctic just generates a lot of attention.

If you look at the historical literature, some of which is anecdotal, of explorers who visited the Arctic and communicated with native peoples, there are so many stories – from

LEMMING ABUNDANCE AND SNOWY OWL NEST FREQUENCY

The brown lemming is an important indicator of Arctic health in our study area. As the graph illustrates, the number of Snowy Owls nests in a breeding season nearly mirrors lemming abundance, or lack thereof. Lemmings are dependent on Arctic grasses, sedges, and forbs for nesting and reproduction. Any changes to this vegetation due to climate change or other factors will directly impact Snowy Owls and many other Arctic species, as will the quality and quantity of winter snowpack.



back in the mid 1800's – that describe lemming highs and lows. What's interesting is that these accounts came before we thought about climate change or knew it was going on. So they support the idea that these fluctuations have always been happening and, consequently, Snowy Owl populations have always fluctuated, too.

Are there any factors you've found that indicate a good or bad lemming year?

I think if you start making predictions on lemming population fluctuations you might get one right once in a while, but you're going to be wrong most of the time. One year, many years ago, I predicted it was going to be a big lemming year – and it was – but it was totally luck. At that time, I thought because we had seen good numbers during our fall sampling, that it could follow through to the spring. But now, after doing it for so long, I know it doesn't work this way. Because you never know what can happen over the winter. So my prediction was dumb luck. I think if you do make a guess and get one right, you should quit while you're ahead. I now believe each year for lemmings is independent of each other.

Your data shows a decline for both the lemmings and the Snowy Owls of this area. What could be causing it?

I wish I could say. We're looking at it, but don't have any definitive answers. The downward trend is clearly there; the fluctuations are still there, but the highs for both species aren't as high as they used to be. But, you know, it only takes one really good year, once in a while, to bring it up, like we just saw with Long-eareds Owls in Montana. Making these determinations, when there are countless factors involved, is very complicated.

Are there other studies out there that record the same downward trend you've recorded?

There was a recent paper that looked at all the lemming data in the world to determine if there was a downward trend, and the author's concluded that there wasn't a decline over the past 25 years. It was more a survey of existing data. But in a case like this, where nothing is standardized because everyone does things differently, it's really hard. They did their best to normalize the data.

The only long-term brown lemming research in the US is our 29-year study. In Canada they've got some long-term data from Bylot Island and there are a few in Europe, but really not many.

What do you think the biggest threat to lemmings is?

Right away, a person just wants to say it's climate. And something *is* affecting the lemmings and, in turn, the owls. But right now, we just don't have the correlations. There's no doubt that in our study area, lemmings are a big indicator of the health of the environment. But it's hard to monitor lemmings. It's hard in the summer, which is what we do, but it's never been done successfully in the winter. Attempted, but not successful. They're underground, it's freezing, dark, and it just doesn't work. So right away, we have less than half of the story, less than half the data.

With lemming studies, you've *got* to do them for 20 years, at least. You have to go through multiple population fluctuations. We've got 29 years and it's not enough. To get a picture of populations, you really need to monitor for a lifetime. And most researchers don't want to do that anymore.

So back to threats. I think it's climate – which effects snow quality and quantity. Habitat loss, by way of Barrow's growth, really only impacts a small area. We've looked at so many variables but none of them gives us a clear answer. But we'll never stop documenting, monitoring, and trying to figure it out.

Our brown lemming research is something I'm proud of. It's one of our most difficult and most complete studies, but until recently, nobody paid much attention to it. People have now realized that if you're worried about Snowy Owls, you have to look at lemmings, something we've been saying for years. I think our brown lemming work will prove to be one of our greatest contributions to Arctic research and conservation.

The Brown Lemming - critical food source during the breeding season, comprising up to 98% of a Snowy Owl's diet.

Based on the weights and measurements we take on lemmings, both in the general population and those cached at the nest, we know that male Snowy Owls generally bring the very biggest lemmings to the female and chicks. The cached lemmings we find are often the largest we see, outweighing many individuals in the general population. Now that's the mark of a great dad!

Photo © Daniel J. Cox/ NaturalExposures.com

MEET MADI, ORI'S SUMMER INTERN

Madison Henri
© Clayton Boyd

ORI Internships are almost entirely on the job training with steep learning curves to be expected (and lots of fun to be had!). This year, with a busy season already underway, we needed someone with a great attitude who could catch on quick! Enter Madison Henrie, Madi for short, a University of Montana student studying wildlife biology. Madi worked under Beth's supervision where most days were spent in the field.

Madi says her favorite species has always been the Barn Owl, but adds "since starting at ORI, the Short-eared Owl has stolen my heart." Madi is now back to life as a full-time student, but says "I tried to soak up as much knowledge at ORI as I could so I can apply it to future endeavors working with wildlife." Thanks for your efforts, Madi!

GREAT READS FOR OWL LOVING KIDDOS!

ORI children's books have been out of stock for years, but no more! *Snowy Owls Whoo Are They?* and *Owls Whoo Are They?* are now available through our website. Each book is a collaboration between Denver and elementary educators and illustrators who have worked in the field with ORI. They are fun to read and packed with biologically accurate owl facts.

You may also remember that last year we announced Mark Wilson's upcoming children's book: *Studying Ukpik: the Snowy Owl Scientist.* While publishing was pushed back due to COVID-19, it looks like we should see it on shelves this spring! In the meantime, check out Mark's other comprehensive kid's book on owls: *Owling, Mysterious Birds of the Night.*

A young Short-eared Owl is released after banding. At this stage, chicks have dark feathers and are remarkable bipedal; it will still be a couple of weeks before they have the feathers, and the coordination, to fly.

A few ways you can help look out for Short-eared Owls:

Restore or maintain suitable habitat on your land.

Don't walk your dog in grasslands during the breeding season.

Support conservation research.

Participate in WAfLS study as a volunteer.

© Daniel J. Cox/ NaturalExposures.com

Project ~~Waffles~~ WAFLS: Year Three

This past year was the 3rd season of our involvement in Project WAfLS or the Western Asio flammeus Landscape Study. This program, funded by a grant from the U.S. Fish and Wildlife Service, is a collaboration of numerous agencies and organization which coordinate and implement Short-eared Owl surveys across 8 western states to gain valuable information about their habitat associations and populations estimates across the region.

Like nearly everything else in 2020, a global pandemic offered plenty of roadblocks and challenges to completing this year's surveys. In the end, 42 of the 50 randomly distributed grids in Montana were surveyed by 33 participants. A special thanks to all the participants whose hard work and persistence made this project possible!

To learn more about the project and to read the forthcoming report from this year's results click the "citizen science" tab at: www.avianknowledgenorthwest.net.

Short-eared Owls: An ~~Encouraging~~ UNCERTAIN Future

One of our favorite spring evening activities is surveying for Short-eared Owls, otherwise known as Shorties. Observing their buoyant, agile flight and impressive courtship displays over the dim prairies never ceases to amaze. This year, we were happy to get the Short-eared Owl nesting study up and running again. Fortunately, we had the help of our summer intern, Madi Henri, to vigilantly search over two thousand acres of grassland using the 'rope dragging' method developed by ORI. After weeks of sweat, sunburn, thorns and grass pollen, we located 16 extraordinarily well-hidden nests. One even had a record 11 eggs!

As a ground nesting species, Short-eared Owls choose nest locations that are surrounded by tall grass, and blend in so well that you often do not see the nest until you practically step into it. The females sit tight on their eggs, using camouflage and concealment in the vegetation as protection against being found.

Unfortunately, the Shorty's amazing capacity to blend in did not result in reproductive success this summer. Many of the eggs and chicks were lost, and about half of all nests failed prior to fledging any chicks. Given the abundance of voles, food shortage seemed to be an unlikely explanation. We found evidence of predation at many of the nests, and suspect carnivores such as skunks played a large role in nest failure, and possibly large birds such as ravens, gulls, and raptors that can snatch eggs or young owls. As always, we minimize our presence at nests, returning only as necessary to band the birds and check on their progress, so it can be impossible to know for certain what happened at each nest. A two-day heavy rainstorm in the middle of season likely added hardship for these ground nesters – females may be forced to abandon nests during prolonged rain if males cannot capture enough voles. Chicks also go through an extra vulnerable period around 2 weeks of age, where although unable to feed themselves, they depart the nest on foot weeks before they can fly. Under normal conditions, early departure from the nest gives the little Shorties a better chance of survival by spreading out to reduce the chance that a predator gets the entire brood, but leaves them extremely vulnerable to harsh weather because they are still partially covered in down that offers little protection from heavy rain.

There is reason to be concerned about Short-eared Owls. Unaltered open country habitat has drastically declined nation-wide over the past 100 years due to agriculture, including chemical application, mowing, grazing, development, and recreation. Although our study area is a hotspot that consistently sees high numbers of owls, its grasslands are far from pristine. Land use, management practices, and habitat fragmentation make Shorties susceptible to habitat loss and increased predation pressure. Especially in areas where larger predators are removed, lower level predators such as skunks have less competition and can take over the food chain, ravaging ground nesting birds and other species.

This year reminded us of the importance of breeding studies in addition to surveys, because what appeared to be an abundant spring owl population did not translate into abundant or high reproductive success. Shorties are not easy to study, partly due to difficulty in locating nests, as well as their tendency for nomadism, meaning individuals likely move around extensively and rely on many different areas for survival. Even so, we never shy away from a research challenge, and we will continue working hard to uncover the mysteries of Short-eared Owls!

OWLS AND SEMI-ALTRICIAL YOUNG

Owls need enough time for their young to become fully grown and able to hunt effectively on their own before the winter. When owls hatch, they are considered "semi-altricial"- meaning they have minimal down and require nourishment, warmth, and cover from their mother, have their eyes closed, and are unable to leave the nest. They then grow very rapidly, requiring lots of food for quick development. By the time they leave the nest, some species of young owls are already 90-100+% of their adult mass, and quickly gain the remainder. Depending on the species, they may take a few extra weeks to develop flight capabilities, and even longer to master the art of hunting. **Photo:** a nest with newly hatched Short-eared chicks covered in downy fluff. You can also see that eggs hatch asynchronously, or not at the same time.

Pete Ripmaster, Runner

Runnin' Across America FOR OWLS!

It was February of 2018 when Asheville based athlete Pete Ripmaster crossed the finish line in Nome, Alaska, winning the Iditarod Trail Invitational (ITI). But it isn't the Iditarod you might be thinking of. The race may follow the legendary route of dog sledding fame – but there are no dogs. It's an 1,000 mile race that is entirely human-powered. An ultra-marathon, that is, where only "the most experienced, rugged and intrepid competitors" dare to compete. The ITI is widely known as the world's longest and toughest winter race.

Pete's race story and his journey to get there will scare and inspire you. Harrowing tales of falls through ice, giardia, minus 60-degree temps, relentless snow, ruthless wind, and that's just a taste. Among such moments which span his three ITI race attempts (he won his third race with a winning time of 26 days, 13 hours, and 44 minutes), was a chance encounter with a Snowy Owl. Maybe it was exhaustion, isolation, loneliness, or simply the power of owls, but nothing about this encounter felt like chance to Pete. From that moment on, he was all about owls.

Upon meeting Pete, it takes about 3.5 seconds to know he's a guy who throws himself into life in an "all in!" kind of way. Have a conversation with him and a smile naturally forms across your face. And while he's got toughness and motivation in spades, he's at his best when working for a cause he's passionate about. This is where he finds his greatest inner strength.

In 2013, he completed a goal of running a marathon in all 50 states, raising over $60,000 for breast cancer research along the way. Pete lost his mom to the disease and this was his way to honor her memory and advance work for its treatment. Throughout his running career, he's supported many other worthy charities, all fueled by his feet hitting the ground and his unique ability to inspire others.

This year, Pete was ready for a new challenge, a cause to get behind. He thought back to his Snowy Owl encounter, to his love of running and his growing interest in owls. And, in lightning bolt fashion it came to him - *Owl Run 100s* was hatched! Pete's goal is to run a 100 mile race in every state and raise $50,000 for owl research and conservation along the way! Not only will he be the first person to accomplish this, but he's partnered with the Owl Research Institute to see it through! It will take years to get there, but Pete's in for the long haul.

Each dollar donated to Pete's campaign goes directly to the Owl Research Institute for our priority programming. In fact, a donation through Pete's website is just like a donation through ours, except you're giving Pete some extra encouragement and a pat on the back for those long – wait, VERY LONG – runs across America! We couldn't be more honored and grateful for Pete and his mission. What a gift. To quote Pete, "YeeHaw! Let's do this!" Visit www.peteripmaster.com.

BARN OWL STUDY

The Barn Owl is also known as the "agricultural" owl, as it has historical ties to farmlands where it uses man-made structures for nest sites. Barn Owls hunt local farm fields for small rodents that potentially damage crops. In most areas, Barn Owls are welcomed by farmers and ranchers to nest in old barns and buildings.

This year we completed our 16th year of our Barn Owl study. We were able to monitor one nest this season thanks to a landowner who built a Barn Owl box in his barn many years ago. He was inspired to do so after occasional sightings, but found the box occupied by pidgeons year after year. This year voles were abundant in the area and a pair utilized the box, fledging seven chicks! We've now banded over 50 Barn Owls and found approximately 25 nests.

This year we were also happy to help a group of friends symbolically adopt all seven chicks from this nest in loving memory of John "Kiffy" Purvis who loved Barn Owls. Photo: the seven fast growing chicks in their nest box.

Owl Goods

The ORI swag shop is open for business - ready to outfit newborns to grannies in the coolest owl gear out there! From mugs to sweatshirts, tote bags to stickers, and everything in between! Visit our website to check out all the latest goods!

Nice shirt, Quin! This eager little helper is researcher Beth's daughter and #1 field tech!

ORI Wish List

In 2019 generous donors came through with a GMC Trailblazer for back country research, a riding lawn mower for the field station, and parkas for winter projects. We are so grateful for these much needed items and they are all in use! This year we are in need of:

Suburban or Pick-up truck – haul crews and research trailers
Skid-steer or small tractor – grounds work at field station
Camper Trailer – Saw-whet Owl migration study
Binoculars and Scopes – students and volunteers
Snow Blower – clearing paths around grounds

Thank you!

Although COVID-19 hindered our ability to utilize field volunteers as normal, we'd like to send a big thanks to these intrepid souls who made it work:

Bill Norton, Brenna Cassidy, Karen Chickering, Rob Domenech, Linda Helding, Brendan Howell, Alex Kearney, Matt Larson, Adam Potts, Cathy Tilly, Fred Tilly, Lesley Rolls, Brendan Howell, Andrea Williams, Cameron Steurer, Elsa and Alex Jehle, Shane Kappler, Hannah Beyl, Judith Mendelsohn, Zoey Greenberg, Kylie Mohr, Kaitlyn Okrusch, Elizabeth Moore and children, Karen Biron, Michelle Long, and STEVE HIRO THE KING!

Dave Samuelson, Wildlife Artist (1945-2020)

Conservation Art FOR OWLS!

This fall we lost a man known to most as wildlife artist Dave Samuelson, though to our own Development Director Liberty, he was simply *Dad*. To Denver, he was a friend who shared stories from the field, something best accomplished over a drink at Ninepipes. Dave never missed an ORI Hat Party and especially loved the old-fashioned fiddle music that filled the night sky.

Dave's art brought joy and beauty to many, often telling a campfire story and honoring life in Montana. An avid outdoorsman, wildlife and wild spaces were his muse. Of special interest was exploring the relationships between animals and the habitats they share, both geographically and visually, through similar markings, color or patterning, and survival skills. This would become the inspiration for his Kindred Spirits series – seven paintings where Dave observed these close connections. The final of the series, *Windows to the Soul,* pairs a Snowy Owl and Arctic Wolf.

Throughout his career, Dave's paintings have directly raised thousands of dollars for wildlife conservation. Commissions and collaborations with organizations working to protect a future for wildlife and wild lands were always near and dear to his heart. Donations to the Rocky Mountain Elk Foundation, US Forest Service, International Bear Association, National Parks Service, Mule Deer Foundation, Pheasants Forever, and many others have advanced these missions.

In keeping with Dave's legacy, his wife Trudy and family have donated the remaining limited edition prints of *Windows to the Soul* to ORI. It is their wish that proceeds help fund the Snowy Owl Project in the Alaskan Arctic. Dave would be smiling.

Dave signed all his paintings as they went out the door. As such, these prints bear the signature of the original, but are not signed or numbered.

ORI is offering these prints - full of rich golds, yellows, and meticlous detail - for a donation of $350 (includes shipping). Order online or by specifying it on remittance envelope, enclosed in this newsletter. Quantities are limited.

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Donate on-line at: www.owlresearchinstitute.org. Thank you for your support!

PARTNERS IN CONSERVATION

Conservation is about land preservation, stewardship, and cooperation. Partnerships with the groups and individuals listed below represent a commitment to work collaboratively. We can't do our work without them; together our efforts are stronger and more effective.

MONTANA
Confederated Salish & Kootenai Tribes, Flathead Indian Reservation
Five Valley's Audubon
Flathead Lake Biological Station
Glacier Institute
Mission Valley Audubon
Montana Academy
Montana Fish, Wildlife and Parks
Montana Natural History Center
Montana Raptor Conservation Center
Montana Wild Wings Recovery Center
National Bison Range Complex
Natural Exposures Photography
Ninepipes Lodge & Great Gray Gifts
Ninepipes Museum of Early Montana
Polar Bears International
Raptor View Research Institute
Sacajawea Audubon
U.S. Fish and Wildlife Service
U.S. Forest Service: Beaverhead, Bitterroot, Lolo National Forests
Wild Planet Nature Tours
Wild Skies Raptor Center

LAND OWNERS
Charlie and Nancy Deschamps
Fred Deschamps
Rosemary McKinnon and family
Susan Rivers and family
Jim and Delores Rogers

Thanks to all our awesome cam watchers for your interest & support!

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North Slope Borough, Dept of Wildlife
UIC Science and Logistics
Ukpeaġvik Inupiat Corporation (UIC)
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Mark Wilson
Max Lowe and Sam Lowe Anker
Melissa Groo

Front and back cover: Long-eared Owl adult and chick, western Montana.
Photos © Clayton Boyd