Message from the President

Greetings from the Owl Research Institute (ORI) Field Station! We survived our 30 year anniversary and, as usual, it’s been a busy year. Our many research projects are stronger than ever: longer-running studies (>20 years) earn more authority with time; younger ones (8-10 years) gain relevance.

I still feel like I just got back from nine weeks on our Snowy Owl and Brown Lemming project where, amazingly, we reached our 28th continuous year of research in the Alaskan Arctic. Unfortunately, it was another low lemming and owl population year. A bright spot, however, was establishing a live Snowy Owl cam. This was only the second Snowy Owl cam in the world; we did the first one in 2014. The live stream was spectacular and all five chicks fledged. We were also joined in the field by award-winning photographer and author, Mark Wilson, for most of the season. Mark became part of the team as he chronicled our work, Snowy Owls, and more.

Back in Montana, it was difficult year for most species of owls. The 2018/19 winter was brutal. Record deep snow and extreme cold contributed to high mortality among owls, eagles, and hawks. Wildlife officials and citizens found many dead and dying birds. Starvation was the leading culprit, although those that hunted along plowed roadways were often hit by cars. The difficult winter, no doubt, contributed to some of the low breeding numbers we reported this spring.

In other news, after 12 great years with the Owl Research Institute, lead researcher Matt Larson is moving on. While Matt is irreplaceable, the door has opened for new opportunity, including bringing raptor biologist Beth Mendelsohn on board. Read more about all the topics I touched on here, as well as highlighted species and projects, in the pages that follow.

Lastly, I want to thank you for your support. Many of you have been with us since our beginning; some have just come on board. Either way, thanks to your generosity, our work for owls is possible. We are proud to be the most active owl research group in the world and remain passionate about field research and long-term, year-round studies. Only by working together, and through your contributions, can we continue this important work. I hope you donate today. And when you’re done reading this newsletter, please pass it on to a friend.

Sincerely,

Denver W. Holt
ORI Senior Researcher and Founder

Photo above: ORI offices and field station, Charlo, Montana. While ORI has been in operation since 1988, this house, barn, and outbuildings have served as home-base since 1998. ORI is located on the Flathead Indian Reservation in the Mission Valley, and surrounded by a diverse landscape that contains habitat for most of Montana’s 15 owl species. Important neighbors are the National Bison Range, FWP state conservation lands, and Ninepipe WMA refuge.

ORI WISH LIST FOR 2020

People like to give in different ways to support causes and organizations they believe in. In each newsletter, we provide our readers a list of items that will help us with our research projects and facility maintenance – also known as a Wish List. And each year, we are fortunate enough to be granted some of these wishes. In addition to donations and grants, ORI is in need of the following items:

- Tractor, for field station road maintenance and winter plowing
- Riding lawn mower, for field station lawn
- Snow blower, for field station clearing
- Binoculars and scopes
- Camper trailer to serve as a mobile banding station
- Flatbed trailer to haul ATVs
- Snowmobiles and trailer
- Grant for new graphing software
- SUV (large GMC, Suburban or pickup truck to haul campers and trailers)
- New laptops
- Down parkas for Snowy Owl project
- Outdoor gear - boots, jackets, etc.
- Specialized research equipment
- New laptops
- Snowmobiles and trailer
- Grant for new graphing software
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- Specialized research equipment

ORI conducts long-term research and monitoring (in varying degrees) on:

- Barn Owl
- Flammulated Owl
- W. Screech Owl
- Great Horned Owl
- Snowy Owl
- Great Grey Owl
- N. Pygmy Owl
- Boreal Owl
- N. Saw-whet Owl
- N. Hawk Owl
- Long-eared Owl
- Short-eared Owl
- Brown Lemming
- Collared Lemming

ORI is dedicated to owl conservation through research and education:

- Comprised of 3 researchers, 1 admin/development staff
- Responsible for many of the longest running research projects of their kind
- Operate year-round, full-time research in MT, Alaska in breeding season
- Featured in Smithsonian, Nat’l Geographic

ORI operates conservation projects and collaborative work:

- N. Saw-whet Migration Project
- Live-cams with explore.org
- Project WAfLS
- Great Gray snag conservation
- Effects of wind farms on owls
- Snowy Owls & climate change
- Cavity nester snag conservation

FACTS ABOUT ORI

- Denver Holt bands Snowy Owl chicks that are around three weeks of age. All seven chicks fledged from this nest during the 2018 breeding season (one is hiding behind Denver). Don’t miss the helicopter-sized mosquito!
Northern Hawk Owl Study Published

While our 22-year study on Northern Hawk Owls, primarily based in post-burned forests of Glacier National Park, concluded in 2015, the results of this research were recently published in the February 2019 Journal of Raptor Research.

This nest characteristic study remains one of our most challenging and rewarding projects to date. Working in the incredible landscape of Glacier National Park and interacting with these charismatic, stumpy owls is something none of us will ever forget. We are proud to have made important contributions to what is understood about Northern Hawk Owls and its implications to snag conservation in forest management. The abstract and data table are published below; full manuscript available with journal subscription, or by contacting us.


https://doi.org/10.3356/JRR-17-87

ABSTRACT — We studied Northern Hawk Owls in Montana from 1994 through 2015. We report 36 breeding records, 18 of which included a known nest location. Owls reused one nest in subsequent years, but this nest was included only once in our analysis of nest-site characteristics. All nests were in moderate to severely burned forests from 1–11 yr post-burn. Nests were found in black cottonwood (Populus trichocarpa; n=140). Only 1 of 72 banded owls was recaptured or recovered over the course of this 22 year study, suggesting a non-sedentary or nomadic behavior. The abstract and data table are published below; full manuscript available with journal subscription, or by contacting us.


https://doi.org/10.3356/JRR-17-87

Top left photo: an adult male Northern Hawk Owl delivers a starling to the nest, Glacier National Park. Left: paper authors at work, from left: Jessica Larson, Denver Holt, and Matt Larson.

FACTS ABOUT SURNIA ULULA

- In N. America ranges throughout Alaska and Canada; usually non-migratory; often winters in northern U.S.
- Considered nomadic, dispersing from their normal range when local vole populations crash; erupting in response to high vole numbers.
- Habitat: taiga, spruce forests, burned areas.
- Flies with a mix of slow wing beats and long glides, like hawks. Will chase prey in flight, will also plunge into snow.
- Diurnal; perch and pounce hunter; frequently hovers; can seize prey in flight, will also plunge into snow.
- Usually quiet, except during nesting; males: fast, bubbling trills; females: short, high-pitched trills.
- Tends to inhabit remote areas far from cities and towns.
- Often seen perching like hawks - on the tops of tall trees, often near clearings, watching for small mammals, mostly voles.

Table 1. Northern Hawk Owl (Surnia ulula) nest characteristics from North America and northwestern Montana.

<table>
<thead>
<tr>
<th>Variable</th>
<th>North America</th>
<th>SD</th>
<th>Montana</th>
<th>SD</th>
<th>SE</th>
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<tbody>
<tr>
<td>Tree height (m)</td>
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<td>14</td>
<td>4.5</td>
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<tr>
<td>Nest height (m)</td>
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<td>4.5</td>
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<tr>
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<td>9</td>
<td>30.2</td>
<td>43.3</td>
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<tr>
<td>Nest type</td>
<td>Cavity (%)</td>
<td>33</td>
<td>58</td>
<td>53</td>
<td>17</td>
</tr>
<tr>
<td>Bowl (%)</td>
<td>60</td>
<td>58</td>
<td>47</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Stick (%)</td>
<td>7</td>
<td>58</td>
<td>0</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

© Chris Peterson

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A medium-sized owl with a broad head, yellow eyes, yellow beak, and a tapered tail resembling a heart. Back is dark brown, with white spots on breast, and belly white with dark barring.

Other names: Hawk Owl

Order: Strigiformes

Family: Strigidae

Common name: Northern Pygmy Owl

Classification:

- Order: Strigiformes
- Family: Strigidae
- Genus: Surnia
- Species: ulula

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FACTS ABOUT ASIO FLAMMEUS

- Open country range: tundra, marshes, grasslands, savannas.
- Partially migratory, nomadic.
- Usually nocturnal, sometimes crepuscular; flies low over the ground in search of prey; very agile in flight.
- Usually silent, except during breeding season, or when warning intruders.
- Females usually darker; colors resemble dry grass and aid in camouflage.
- Sometimes polygamous - one male with two nests.
- Nests on the ground; scratches out a bowl-shaped nest.
- Lays 5-6 eggs on average; sometimes up to 10.
- Will flog a broken wing to lure potential threats from nest.
- One of the most widespread owls in the world.
- Can be found on every continent except Australia and Antarctica.
- Has many subspecies; most notably one native to Hawaii.
- Flight described as “moth-like” with high and floppy wing beats.
- Sometimes polygamous - one male with two nests.
- Feeds on: Mostly small mammals like voles, moles, mice and rats; sometimes bats, weasels, shrews, or birds.
- Wingspan, both: 106cm (41.7 in)
- Height, both: 37-38cm (14.6-15 in)
- Weight, males: 200-450g (7.1-15.9 oz)
- Weight, females: 280-500g (9.9-17.6 oz)
- Population: 660,000 +/- (95% confidence interval). This number does not include sub-adult owls, so the actual population could be higher.

Population and habitat-use data needed to direct conservation and management of Short-eared Owls in the West. This project is believed to be the largest species-specific survey of Short-eared Owls in the world and is helping us gain valuable baseline population and habitat-use data needed to direct conservation and management of Short-eared Owls in the West.

HAPPY TRAILS TO ORI’S MATT LARSON

Using his dry sense of humor, and a master of his domain, people now wanted to hear Matt speak. He rose quickly as one the more experienced owl field researchers in North America - writing professional papers and reviewing manuscripts and books for professional journals. Watching Matt grow from a 20-something with little experience owl field researchers in North America - writing professional papers and reviewing manuscripts and books for professional journals. Watching Matt grow from a 20-something with little experience, to a true owl expert, has been a rewarding journey. I will miss his expertise and his ability to figure anything out. But more, I will miss him as a great friend. He is a true gentleman: polite, kind, thoughtful, trustworthy. Thanks for all your efforts Matt - Denver

The table below shows the total number of regular grids surveyed and grids with detections of owls, broken out by which visit, whether the grid was a random grid (regular) or hotspot grid, and by state. See the full report at www.avianknowledgenorthwest.net or contact Matt Larson at owlinsitute@outlook.com for information or to find out about volunteering. Table from Project WAfLS 2019 report.

<table>
<thead>
<tr>
<th>STATE</th>
<th>REGULAR GRES</th>
<th>REGULAR w/ OWLS</th>
<th>REGULAR ROUND 1</th>
<th>REGULAR ROUND 2</th>
<th>HOTSPOT ROUND 1</th>
<th>HOTSPOT ROUND 2</th>
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</thead>
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<td>1</td>
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<td>0/35</td>
<td>2/6</td>
<td>0/5</td>
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<td>8/52</td>
<td>4/17</td>
<td>1/3</td>
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<td>18/43</td>
<td>1/36</td>
<td>1/1</td>
<td>1/1</td>
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<tr>
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<tr>
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<td>4/57</td>
<td>1/5</td>
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<td>4</td>
<td>1/60</td>
<td>3/31</td>
<td>0/3</td>
<td>0/3</td>
</tr>
</tbody>
</table>

TOTAL 344 57 40/140 33/273 6/21 3/18
LONG-EARED OWL

A medium-sized owl, buff colored facial disks, yellow eyes, white eyebrows, black beak, and conspicuous, upright ear tufts. Males tend to be more dark brown than males.

Other names: Northern Long-eared Owl, Common Long-eared Owl
Closest relative: Short-eared Owl
Class: Aves
Order: Strigiformes
Family: Strigidae
Genus: Otus
Species: Otus
despite the initial excitement.

Feeds on: small mammals (35.4-39.4 in)
Wingspan, both: 90-100 cm (9.1-15.3 oz)
Males: 260-435 g (7.8-10.8 oz)
Females: 220-305 g (14.6-15.7 in)
Height, males: 35-38 cm (13.8-15.0 in)

The Long-eared Owl has an estimated 91% decline since 1970. It is estimated that Long-eared Owls are declining faster than any other North American owl species. While this graph illustrates the highs and lows typical of open country species, a slight downward trend can be seen. The decline of the Missoula population is not as drastic as in some other areas of the country, or even other areas in Montana, yet we are working to understand the causes behind these declines.

FACTS ABOUT ASIO OTUS

- North American ranges from Southern Canada through most of U.S., south to New Mexico; migratory.
- Do not build their own nests but use abandoned stick nests built by other species, such as magpies or, rarely, on the ground; lay 5-7 eggs.
- Young jump from the nest and climb to safety by pulling themselves up trunks and bushes with beak, wings, or talons.
- Roost communally in the winter where non-familial (typically) groups of 2-20 owls (in N. America) group together among thick branches.

A Season of Highs and Lows

When highs and lows are reported among populations, it’s easy to assume that these markers are indicative of a species’ overall health. Sometimes, of course, they are; but it’s important to remember that annual variations in numbers are a natural occurrence for some animals. This is especially true for open country species of owls, which often show dramatic annual variation in breeding numbers within a given area. Until data from any one season can be contextualized among many years, we don’t know if the findings are part of a larger trend, or an anomaly.

In North America, open country species are: Barn Owls, Snowy Owls, Burrowing Owls, Long-eared Owls, and Short-eared Owls. They rely on a variety of expansive habitats to hunt small mammals, ranging from the Arctic tundra, to prairie, to shrub-steppe. The dramatic highs and lows of Snowy Owl populations in response to lemming abundance are perhaps most well known - yet this boom and bust phenomenon is not unique to Snowy Owls. 2019 has seen extremes in two closely related species at our study sites in western Montana: Long-eared Owls and Short-eared Owls.

For Long-eared Owls, it has been an unusually poor breeding season, producing just two nests. One nest failed during incubation (cause unknown); the second nest saw only one chick (from five eggs) disperse from the nest, although it did not survive to fledge. For perspective, these same study sites have seen up to 12 nests in a season and only a few other times in 32 years have no chicks survived to fledge.

While it appears to be a bust year for Long-eared Owls, Short-eared Owls seem to have had a better year. Survey results from our Project WAFLS involvement detected Short-eareds across much of the state and in larger numbers than last year. At a route we’ve formally surveyed since 2008, we detected 50 Short-eared Owls - more than double our previous high.

While comparing nest success of one species to survey results of another is a bit like comparing apples to oranges, the point is simply this: it takes many years - through several natural peaks and valleys - to begin to accurately detect population trends. It’s natural to want to draw conclusions from a couple years of data, but the truth is, these data are a perfect example of the need for long-term research and monitoring. It’s the principle the Owl Research Institute was founded on, and we remain as committed to this approach today as we did over 30 years ago.

Our Long-eared Owl study is the longest running study of its kind in North America - research and monitoring that takes place year-round. Over 32 years, we have banded almost 2,000 birds, located over 235 natural nests, and published numerous papers on the species. Watch for our Long-eared Owl roost camera this winter and nest camera in the spring! Visit explore.org and click the ORI tab at the top of the page, or find links on our website. Right: ORI researchers and volunteer Angie Marbaits band a Long-eared Owl at a Missoula study site.
It all begins with lemmings. When lemmings are abundant, the entire tundra comes alive. For Snowy Owls, this food source represents 90% of their breeding season diet (based on our analysis of 43,000 prey items from pellets). Yet lemming populations fluctuate widely from season to season and, as a result, so do Snowy Owl nesting rates. Snowy Owls are so dependent on this food source that in low lemming years, the owls may move on, or not nest at all. What drives these highs and lows? According to ORI’s Denver Holt, “we look at various things, one at a time, but none of them give us a clear answer. So it has to be a combination of factors. But in every case, the success of Snowy Owls is directly related to lemmings. What’s interesting is how quickly the owls can assess lemming numbers and respond. They just don’t miss.”

2019 Snowy Owl Breeding Season

ORI’s Snowy Owl study site is a 100-square-mile area, and around, the town of Utqiaġvik, Alaska. Located more than 300 miles above the Arctic Circle, it is the northern-most point in the United States, the only region in the U.S. where Snowy Owls breed and raise young. Over the span of our 28-year study here, we’ve recorded years that produced over 50 nests, and years when the owls do not nest at all. And while dramatic highs and lows are a natural part of Snowy Owl breeding biology, overall our trend line is downward for both the owls and lemmings. See graph below. Comparatively, the 2019 breeding season was on the low end of nesting occurrence; although, those nests we monitored saw strong fledging rates. In total, we monitored five nests. One, with seven eggs, failed during incubation when the male died for unknown reasons. Fortunately, the other four nests were successful with each producing four to five fledglings. All these chicks were banded at the nest and, as with all owl species we band, their individual information is registered with the U.S.G.S. Bird Banding Lab in Maryland.

We made strides on our climate change analysis with initial results not revealing correlations between June temperature and the downward population trend of Snowy Owls and lemmings. We have not proven to be a reliable indicator of how lemming numbers will follow in spring. For Snowy Owls, this food source represents 90% of their breeding season diet (based on our analysis of 43,000 prey items from pellets). Yet lemming populations fluctuate widely from season to season and, as a result, so do Snowy Owl nesting rates. Snowy Owls are so dependent on this food source that in low lemming years, the owls may move on, or not nest at all. What drives these highs and lows? According to ORI’s Denver Holt, “we look at various things, one at a time, but none of them give us a clear answer. So it has to be a combination of factors. But in every case, the success of Snowy Owls is directly related to lemmings. What’s interesting is how quickly the owls can assess lemming numbers and respond. They just don’t miss.”

Our data does not support the theory of lemming cycles: the interval between peaks is highly variable and the amplitude and density are never the same from year to year. Nonetheless, our data documents the relationship between Snowy Owls and lemmings.

FACTS ABOUT BUBO SCANDIACUS

- Height: 30–35 in (76–89 cm)
- Weight: 1.1-1.8 lbs (500–800 g)
- Wingspan: 67–74 in (170–188 cm)
- Nest on the ground, atop low mounds or other promotories.
- Only adult males, 3+ years, have all white plumage (or nearly so); females retain dark markings throughout their lives.
- Mostly diurnal, but will hunt any time of day in the constant daylight of Arctic summer.
- Lays 3-10 round, white eggs, laid asynchronously one every 2-3 days; incubation period: 31-33 days.
- Nests can have chicks that are two weeks apart in age. Chicks depart the nest at three weeks and spend about a month toddling around the tundra un-till fledging.
- Nest on the ground, atop low mounds or other promotories.
- Bright yellow eyes, dark brown beak, and thickly feathered feet.
- Other names: Ukpik (Inupiaq), Snow Owl, White Owl, Oolaght, Oolik.
- Closest relative: Great Horned Owl
- Order: Strigiformes
- Family: Strigidae
- Genus: Bubo
- Species: scandiacus
- Range: North America (since 1970)
- Partners in Flight Estimated 64% decline since 1970

© Mark Wilson

© Mark Wilson
Mapping Nest Distribution
This past year, ORI partnered with Henry Mros III, a Network Design Engineer for 5G wireless systems and Geographic Information System (GIS) analyst for Science and Conservation. His GIS expertise includes remote sensing and processing hyperspectral satellite imagery to gather information about the earth’s surface. From there he creates maps. Henry developed a map that pinpoints all 279 Snowy Owl nests ORI has monitored over the project’s 28 years. He used Landsat mission’s imagery to create the maps, and spatial statistics to analyze and infer data. Henry’s maps and input helps us determine if certain areas in Barrow are important for nesting, as well as nearest neighbor (i.e. another nest) distance estimates.

STEM Series Children’s Book Coming Soon!
Houghton Mifflin Harcourt has published a long line-up of children’s books in a series called Scientists in the Field. While the series has profiled researchers in many disciplines and various field settings, the series will now focus on well known owl researcher, Denver Holt. Wildlife photographer and author Mark Wilson spent five weeks this past summer on Alaska’s North Slope shadowing and interviewing Denver Holt and his research assistant, Liberty DeGran. As they went about the daily work of studying Snowy Owls. The results of their efforts will appear in Studying Ugly: The Snowy Owl Scientist (this is the current working title which may change), a hardcover book to be published in 2020.

Why are Snowy Owls White?
It seems like a simple answer. Snowy Owls occur in the Arctic and have evolved the color white to match the snow covered environment in which most of their life occurs. The next question however, is more complicated. Why are adult male Snowy Owls almost pure or fluorescent white, and females a white base color with mottled brown bars and spots? Since my early research began on breeding Snowy Owls in 1992, I have explored this question. Does this sexual color dimorphism have some function? No other species of owl in the world has such distinct plumage difference between adult males and females. My hypotheses for these differences originates in social function, and my leading conclusion is that they play a role in sexual selection. This idea stems from our data which shows that female Snowy Owls only breed with almost pure white males - coloration which takes at least three years to develop. Younger males, who resemble females in plumage, have brown, spotted and barred marking on their feathers, and do not breed. This bright white coloration could also have functions in social signaling such as male-male competition or territory boundaries.

Quin’s Snowy Owl Birthday Wish
Quin McCormick is not your average 8-year old. This year for his birthday he wanted to help Snowy Owls (Harry Potter may have had something to do with this). So he and his mom, Alicia, started researching and found ORI. They created a Mighty Cause fundraising page and - in lieu of birthday gifts - Quin asked that donations be made to ORI. Thanks to his birthday wish for Snowy Owls, Quin raised $3,500 for research and conservation. Quin, we think you’re awesome!

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This year an adult breeding male was found dead at a nest. No injuries were noted and cause of death unknown. This gave us an opportunity to examine the plumage for spectral reflectance. We worked with colleagues Sergio Vargas from University Texas El Paso, and Karl Huenemr, from NASA, who have specific expertise in this field, and the equipment which measures spectral reflectance. We used a Spectral Vista Corporation (SVC) HR-1024i spectrometer and score the owls’ plumage in laboratory and natural light conditions. We scored several regions of the body, including: face, chest, shoulders, belly, legs, back, and so on. We made over 30 scores. In short, our results indicate this male Snowy Owl showed variation in spectral reflectance for different areas of the body. For example, the face, upper chest, and shoulder had the highest reflectance scores. The results showed that the Snowy Owls feathers were low in the UVA range, but very high reflectance in ambient light, making them almost as bright - 80% as bright - as fresh snow. I believe the bright whiteness of these body parts function in social signaling for a variety of reasons including to advertise their relative age and social status to both other males and females; and to advertise genotypic quality to females. - Denver Holt
**NORTHERN PYGMY OWL**

A very tiny owl with short wings and long tail. Yellow eyes, yellow with black, dark, white-ringed “false eyes” on back of head. Females tend to be slightly darker than males.

Other Names: Mountain Pygmy Owl, California Pygmy Owl

Closest relative: Cape Pygmy Owl

Class: Aves
Order: Strigiformes
Family: Strigidae
Genus: Glaucidium
Species: gnomus

**Height:** both: 38 cm (15 in)  
**Weight:** males: 62 g (2.2 oz)  
**Wingspan:** both: 65 cm (25.6 in)

**Facts About**

North American Population: 140,000 +/-  
Estimated 2% decline since 1970.

Wingspan, both: 38 cm (15 in)

**Feeds on:** varied diet inclucing small to medium sized birds, such as waxwings and chickadees; small mammals, such as mice and voles; shrews; sometimes insects, such as beetles and moths, occasionally small reptiles and amphibians

**Wingspan, both: 38 cm (15 in)**

**Weight, males: 62 g (2.2 oz)**

**Height, both: 16-18 cm (6.3-7.1 in)**

**N. Pygmy and N. Saw-whet Owls**

Use of excavated vs natural nest cavities of N. Pygmy and N. Saw-whet Owls

- Excavated cavity (created by another species, e.g. woodpecker)
- Natural cavity (created by decay)
- Unknown (reason for cavity formation unknown)

Main photo at left: a female N. Pygmy Owl peers out from her natural cavity nest. Above left: Matt Larson climbs a ladder and - with the help of a boroscope mounted to a long handle - projects the image inside the nest to a screen below. Middle: Boroscopes allow for minimally invasive checks to incubation, growth, and development. Right: Steve Hiro examines the very flight feathers of a Northern Pygmy Owl for wear and age. Photo below: while Steve focuses most of his energy on Pygmy Owls, he finds time for all our projects - here, scouting for Snowy Owls on the tundra, 2019.

**Snag Conservation & Obligate Cavity Nesters**

Thanks to the persistent efforts of Steve Hiro, we were afforded the opportunity to monitor a Northern Pygmy Owl nest again this breeding season, from incubation to fledging. The natural cavity nest was located about 9 feet off the ground in a small larch tree with multiple cavities. The nest held six eggs, five of which hatched. As with our research on all cavity nesting owls, the use of a long-handled boroscope allows us to routinely monitor inside the cavity with minimal disruption to the owls. From here, we can document all stages of nesting: incubation, hatching, growth, development, and fledging. All five chicks fledged the same day, flying directly from the cavity, reconfirming our premise for synchronous hatching and development in Northern Pygmy Owls.

Over the past 30 years, we have documented natural nest sites for five species of small cavity nesting owls: Northern Pygmy, Northern Saw-whet, Boreal, Western Screech, and Flammulated owls. We have found over 100 natural nest sites for these species - some of the largest sample sizes for North America. Our data indicate that several of these species have unique and specific nest site needs, demonstrating the importance, not only of snag retention, but of retaining a diversity of snags and cavities in forest management. If we only conduct studies at nest boxes, we overlook natural nest tree characteristics that are essential to our understanding of these obligate cavity nesting owls. Our nest tree data helps provide information necessary to manage for these critical elements of their breeding biology - to help plan for their future success. Additionally, small cavity nesting owls serve as important indicators of healthy forests and adequate snag density, and diversity, for all wildlife species who are ecologically dependent on them. See figure on opposite page.

**Facts About Glaucidium gnomus**

- Range: western North America, from southeastern Alaska and British Columbia south to California, Arizona, and northern Mexico.
- Habitat is mostly coniferous and deciduous forest edges.
- Primary song is a series of evenly spaced high pitched “toots”, but a variety of trills, twitters, and chirps can be heard, especially by nest.
- Have feathered “eye spots” on the back of their heads. Researchers believe these spots confuse both predators and songbirds that might mob them.
- Incubate and hatch eggs synchronously - very unusual among owls. Chicks fledge - or fly - directly from the nest nearly synchronously.
- Diurnal - hunts during day but also during crepuscular period. Primarily a perch and pounce hunter, also known to raid bird nest.
- Safer in nest cavities than other owls because the small diameter of entrances keep predators out.
- Have recorded with prey larger than twice their size.
- Cavity nest: nests in small holes made by woodpeckers or decay; will occasionally use nest boxes where the female lays 5-7 eggs.
- Lacks asymmetrical ear openings & facial disks of nocturnal species.

**Use of excavated vs natural nest cavities of N. Pygmy and N. Saw-whet Owls**

- Excavated cavity (created by another species, e.g. woodpecker)
- Natural cavity (created by decay)
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**Northern Pygmy Owl**

A very tiny owl with short wings and long tail. Yellow eyes, yellow with black, dark, white-ringed “false eyes” on back of head. Females tend to be slightly darker than males.

Other Names: Mountain Pygmy Owl, California Pygmy Owl

Closest relative: Cape Pygmy Owl

Class: Aves
Order: Strigiformes
Family: Strigidae
Genus: Glaucidium
Species: gnomus

**Facts About**

North American Population: 140,000 +/-  
Estimated 2% decline since 1970.

**Height: both: 38 cm (15 in)**

**Weight: males: 62 g (2.2 oz)**

**Wingspan: both: 65 cm (25.6 in)**

**Feeds on:** varied diet including small to medium sized birds, such as waxwings and chickadees; small mammals, such as mice and voles; shrews; sometimes insects, such as beetles and moths, occasionally small reptiles and amphibians

**North American Population: 140,000 +/-  
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**Habitat is mostly coniferous and deciduous forest edges.**

**Primary song is a series of evenly spaced high pitched “toots”, but a variety of trills, twitters, and chirps can be heard, especially by nest.**

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**Safer in nest cavities than other owls because the small diameter of entrances keep predators out.**

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We first met Steve through our Day-in-the-Field program. In 1995, ORI donated this experience to a local fundraiser and Steve was the winning bidder. He booked his trip. And it turned out he really liked owls. And the crew. And the process of field research. As a busy heart surgeon, tracking owls all over the countryside offered a welcome change from the sterile life of the operating room. From that first day in the field, Steve’s involvement with ORI just grew and grew.

Now, a quarter of a century later, Steve is an integral part of our team. Receiving from medicine simply opened the door for a second career in owl research. His early interest in N. Pygmy Owls led him to focus his energies here: tracking, observing, and recording the behavior of these unique owls. Every year he logs in hundreds of hours searching forests for Pygmy nests, now leading the project. Today, Steve is one of the foremost experts in the U.S. on the breeding biology of this elusive little species.
Natural Exposures.com

Early season prey delivery
95,000 +/- population estimate:
shrews; rarely birds such as voles and mice;
Feeds on: Small mammals
females: 1267g (2.8 lb)
Weight, males: 890g (2 lb)
61-84cm (24-33 in) Height, both:
Strix Family: Strigidae
Order: Strigiformes
Class: Aves
Ural Owl, Barred Owl
Owl, Lapland Owl
Other names: Dark Wood
yellow eyes and beak
the facial disks; bright with several dark rings on barring; face is light gray
A large owl with a big, pokey head; adult brown with darker mottling and barring; juvenile dark gray with several dark rings on facial disks; body has yellow eyes and beak
Other names: Dark Wood Owl, Lapland Owl
Closest relative:
Eagle Owl, Barn Owl
Size:
Order: Strigiformes
Family: Strigidae
Genus: Strix
Species: nebulosa
Height, both: 69-78cm (24-31 in)
Weight, males: 896g (2 lb)
Female: 575-797g (2.0-2.8 lb)
Weight, both: 117-153cm (46-60.2 in)
Feeds on: Small mammals such as voles and mice; rarely birds
North American population estimate: 64,000 +/- Partners in Flight
Early-season prey delivery (cockerel; rougher): a nest outside of Bozeman, MT.
Daniel J. Cox
NaturalExposures.com

A Tough Winter for Owls

Owl species who live in northern climates have adapted to withstand cold and hunt in snow. This past year in western Montana, however – a late winter with deep snowpack and prolonged cold – tested the limits of some. So what are the impacts of a hard winter to owls? Well, that depends on the species.

In general, owls are more impacted by the deep snow than the cold, and larger owls are more resilient than smaller owls. For example, Snowy Owls wintering in Montana are well-adapted to the cold and can maintain normal body function down to -40°F. They are also very capable predators. Although they show a preference for small rodents, they will eat a variety of prey, including larger birds and mammals when deep snow makes hunting small mammals more difficult.

The same is true of Great Horned and Great Gray owls. Their large size and insulative, downy feathers combat the cold, and both are known to be able to detect and capture prey through the snow. However, even the most resilient of species can be affected. Throughout the winter, but especially late in the season, we received many reports of dead owls. Some were found without obvious injury and starvation was the likely culprit, while others were hit by cars. The deep snow drove the owls to road-hunt where the snow was not such a barrier.

The small to medium-sized owls, however, are most impacted. Long-eared and Northern Saw-whet owls were seen hunting during the day near houses, perhaps an indication that they were hungry and desperately trying to make a meal out of small birds or mammals attracted to bird feeders. Barn Owls, Northern Saw-whet Owls, Long-eared Owls, and Short-eared Owls all had a hard time of it.

But who do you suppose often tolerates these conditions just fine? Rodgers! Beneath the protection and insulation of snow – in what’s known as the subnivean zone – food supplies are right underfoot, the air remains a consistently warmer temperature, and the snow affords a barrier of protection against predators like owls.

Unfortunately, the spring of 2019 that followed did not see the strong small mammal numbers we were hoping for, and breeding season numbers were low for several species (we are not currently trapping small mammals in our Montana study sites).

A few interesting things noted so far: the female can go up to 14 hours without a prey delivery; the female generally leaves the nest two times per 24 hours for a few minutes; the male calls to female before delivering food; and the pair utilizes a series of calls at each prey delivery using up to 6 different vocalizations.

As with all our live-cams, we hope they increase the public’s scientific knowledge about owls and inspire conservation-interest. While our Great Gray cam-partnership with explore.org provides endless hours of enjoyment, its benefits to research are many.
Northern Saw-whet Owl Migration

Northern Saw-whet Owls are known to be highly migratory with numbers that fluctuate widely from year to year and place to place. Whether these fluctuations are in response to prey densities is currently unknown, but banding efforts across the country, like ours, help understand patterns in movement, identify important habitats, and map migration routes.

It was a comparatively high year for Saw-Whet Owl migration in the western United States and at our banding station near the confluence of the Bitterroot and Clark Fork Rivers in Missoula. We banded 158 Saw-whet Owls and one Barred Owl in 22 nights of trapping – averaging 2 owls/hour. Our highest numbers were in 2011, when we banded 518 owls between two sites. Our low was 2018 when we banded fewer than 50 owls. In the project’s ten years, we’ve banded over 1,500 Northern Saw-whet Owls during migration. Most captures (around 80%) are birds that hatched the previous spring; however, a few individuals are in their second year of life and beyond. Further, most captures are female. This may be because the females are more attracted to the male territorial hoots we use as a lure, or it may indicate that females are more migratory than males.

This year, a young bird we banded on September 24 was recaptured 17 days later on October 11 at lucky Peak, Idaho, the Intermountain Bird Observatory’s research station. This female owl was just a few months old and flew a distance of 240 miles in about two weeks, or 14 miles a day. Back in 2012, another Saw-whet Owl we banded made the same journey in 11 days. We also re-captured a second-year female on October 15, which was 18 days after we banded it in the same location on September 27, indicating this bird may be a resident or wintering resident. While recaptures are rare, we have had banded birds encountered as far as N. California, and recaptured birds from Alberta and Saskatchewan.

Saw-whet Owl Breeding Season

June finds us hiking in high elevation forests during our annual search for nesting Boreal Owls. While no Boreal nests were located this year - likely the result of deep snow at their nesting elevation – finding an incubating Saw-whet in one of our nest boxes was an interesting surprise. In 28 years, this is the latest Saw-whet nest we have ever recorded with the first of five chicks hatching on July 16th. Whether this nest is a second clut after a failed first attempt, or simply a late season nest in response to weather conditions, is unknown.

Since 1983, we’ve located over 57 natural nest-sites and a handful of nests in nest boxes, the largest sample of natural nest sites in North America. Our study has documented nests from elevations of 3,700’ and occur in all forest types we survey. Our cavity nest data is part of our ongoing conservation efforts for Saw-whet Owls, see p. 13 for table.

FACTS ABOUT AEGOLIUS ACADICUS

• Inhabits much of North America; from southeast Alaska and Queen Charlotte Islands in the west, to Newfoundland in the east, south to Arizona and North Carolina, mountainous regions in central Mexico.
• Preferred habitat is coniferous forests; sometimes wooded riparian areas, swamps, and bogs; appear to be habitat generalists.
• Heard mostly during breeding season.
• Males make a monotonous series of whistles, all on the same pitch, and a conspicuous Y-shaped white marking above and between eyes.
• Females voice is softer and less consistent than males.
• Cavity nester; often nests in holes made by woodpeckers; will also use nest boxes. Females lay 4-7 eggs.
• Mostly nocturnal, occasionally diurnal; eats prey in chunks, starting with the head.
• Young Saw-whets have a dark brown head and chest, reddish belly; and a conspicuous Y-shaped white marking above and between eyes.
• Will thaw frozen food through incubation before consuming.
• A highly migratory species; may migrate at night.
A Walk in the Woods with ORI

Walking through the woods with Denver Holt means experiencing a different forest than I have ever known. Where most people hear a cacophony of birds, Denver hears each specific species. He often mimics the call under his breath, reminding himself how to call it in the future, and who it belongs to.

I grew up with a forestier for a father, so categorizing trees and being quizzed on their species was how I learned to feel at home among them. I felt closer to them when I could call them by name. Denver knows the whole forest this way, flora and fauna. Each flower is categorized; he knows each by name. Those he doesn’t know are immediately looked up in the traveling library of natural history which occupies two seats in his old, white suburban.

Once, mid-sentence and enroute to a study site, he suddenly pulled over, looked at me eyes-a-glint and said, “this is going to be a colorful moment spent in the company of owls. I cherish each day I spend learning from them; a gift to see Steve’s passion for Pygmy’s, Beth’s unflappable response to an injured bird, or Liberty’s enthusiasm when a donation comes in, knowing that it keeps their work going. The natural world needs stewards like them. People who not only care, but purely enjoy the time they spend doing this work, each moment spent in the company of owls. I cherish each day I spend volunteering with ORI because, in the words of Denver, “not every-one’s doing this today.”

When identifying owls in the field, we listen for songs, calls and, of course, observe physical characteristics. For example, do they have ear-tufts or are they round-headed? What is the bill color? Eye color? Curious about the frequency of some of these physical traits, in the 1990’s Denver began to break them down. Among the currently recognized 268 species of the world’s owl species, he assessed for eye color, bill color, and tufted versus round headed owls for each genus. He derived his categorization from photographs and descriptions from many field guides, and most recently Mikkola's Photographic Guide to Owls of the World (1st & 2nd Eds.). Here are the eye color results for all 268 species:

<table>
<thead>
<tr>
<th>Yellow</th>
<th>Brown</th>
<th>Orange</th>
<th>Red</th>
<th>Whisht</th>
</tr>
</thead>
<tbody>
<tr>
<td>268 spp. [% total]</td>
<td>55% (58%)</td>
<td>34% (35%)</td>
<td>17% (6%)</td>
<td>1% (1%)</td>
</tr>
</tbody>
</table>

As you can see, the eyes of owls primarily come in three colors, however, slight variation within each color occurs. Why do some owls have yellow eyes and some orange? We’re not sure, yet. Here are some things we do know about owl eyes.

Some species that live in North America have bright yellow eyes, while the same species or cousin in European species have orange eyes. For example, Long-eared Owls (Asio otus) in Europe have orange-ish eyes. All Barn Owls (Genus Tyto) have brown eyes; all New World Pygmy owls (Genus Glaucidium) have yellow eyes; while members of the Genus Strix in United States have both brown and yellow eyes.

Like humans, owls have front facing eyes which give them binocular vision – a rare trait among birds. But while humans can look to the side just by shifting their eyes, owls cannot. They must turn their entire head to look left or right. Indeed, each eyelash is locked in one position within bony pitlike socketed the sclerotic ring. They can, however, rotate their head about 270° in both directions to more than compensate for eyeball immobility.

Unlike humans, it is believed owls do not see color very well. In fact, the photo-receptor cells in owls’ eyes are packed with more rods (that help to see in dim light or night), than cones (what enables color vision during day). As a result, most species probably see very well in the dark. Because light-enhanced cones are not as big, owl species hunt in low light levels at night, what humans see in color looks mostly black and white to owls.

It was once thought that owls were blind during the day, but yet distal species hunt in broad daylight. Indeed, even the most nocturnal species maneuver through thick vegetation without hitting branches in daylight.

Owl Eyes

For years we have recorded the eye color of Long-eared Owls and have documented just two subtle variants: yellow and lemon. We have not, however, found a relationship between eye color and sex, age, health, or anything else. It might simply be variations between individuals, much like us. Right: while yellow eyes are the most common color we see, this Long-eared Owl has lemon eyes. Yellow is dearer like the sun on an old school # 2 pencil.

A New Face on the Snowy Owl Project

Liberty DeGrandpre is our dedicated, behind-the-scenes manager of many things at ORI. While most of her workdays are spent at a computer, this year she joined Denver in the Arctic to help with the Snowy Owl and lemming project. Working on the tundra proved to be a steep learning curve. Here are a few of her take-aways from what she describes as “one of the coolest experiences of my life.”

• Watch your back. Male Snowy Owls attack silently from behind.
• Always wear a backpack. It’s a much needed barrier between you and the talons.
• Look ahead. Pomarine jaegers come at your face.
• It’s always colder than you think.
• Trail mix never tastes as good as it does when you have a snowy owl at your feet.
• Unbelievably, Snowy Owl chicks are even softer than they look.
In Memory - Corky Vance

Father, husband, doctor, veteran, birder, gardener, golfer, mentor, life-long learner, and so much more, James Corwin Vance, MD, was loved and respected by all who knew him.

At ORI, we had the pleasure of getting to know Corky and his wife, Karen, when they participated in the Victor Emmanuel Nature Tours (VENT) Owl Workshop in the spring of 2019. Avoid travelers and naturalists, sadly, this was the last of many exploratory trips they took together. Upon meeting Corky, it was hard to imagine that he was in the advanced stages of pancreatic cancer. He readily absorbed owl facts (though knew most of them already) and was anxious to check another species off his life-list. He was sharp, present, warm, and energetic. Corky notoriously dove head first into all of his life's passions, we got to experience him living this way until the end.

Not long after the workshop we received an email from Karen. Our hearts sank knowing the news it would bring. We were so sad, but deeply honored, when she told us that she and their children were banding these tiny, highly nocturnal owls.

A DAY IN THE FIELD

Our Day in the Field is an experience we donate to schools, community groups, and charitable fundraisers. These groups receive the donation and we provide their donors with a day in an outdoor classroom, learning about research, owls, natural history, and wildlife conservation.

In Memory - Nan Harris

During my teenage days in Massachusetts, two women influenced my career choice more than any other people. Nancy Claffin and Nan Harris. The Nancy Claffin story has been told and published. Nancy and Nan were neighbors, friends, and bird watchers. I was a high school teenager when I was introduced to them. I saw Nan now and then; she kept apprised of my life in nature and raptors.

On the advice of these two women, I established the ORI when I was 30. I knew nothing about running a non-profit, but knew I wanted to be a field researcher. Shortly after Nancy's passing, Nan would say, 'well, I guess I've inherited Demers.' She took me under her wing, coached, advised, and befriended me.

Although I was in Montana much of the time, Nan occasionally came out birding, and I would visit her whenever I was home. There was never a time she didn't great me with an enormous smile, and questions of genuine interest. First, how was it? How's it going? Then, how's the ORI? How's your research going? In fact, Nan read my papers published in peer reviewed journals. She asked about my methods, results, and my interpretation of the results. If she questioned my approach, she did it in a gentle, intellectual manner. She encouraged me to read more and not to dismiss historical research - to think about various methods of avian research and remain objective to all approaches. She even attended a few of my lectures.

Nan was an ardent supporter of me personally, but also a financial supporter of the ORI. She seemed to marvel that the Institute was able to remain field-based and stay connected to nature. Also, gratifying, was that her husband Bill, a noted hip surgeon, researcher and inventor, as well as Nan’s entire family, also took an interest in my career. They all became my friends.

Dedication to two outstanding biologists, Nan and Bill supported many important causes. But with me, they took a personal interest – a chance, if you will. I am forever indebted to Nan for helping a young man realize his dreams. And because of Nan and Nancy, the ORI has become the most active field-based owl research group in the world. - Denver Holt
Look What You Made Possible!

As an important voice in Snowy Owl and Arctic conservation, in 2019 we created the first ever Snowy Owl Week to celebrate, educate, and raise awareness around the challenges faced by Snowy Owls. In tandem, we launched our first crowdfunding event: Snowy Owl Strong. Taking place across social media and on the ground, what an incredible success it was! Nearly $40,000 in donations funded the 2019 Snowy Owl research season and allowed us to purchase much needed equipment and supplies. We are so grateful to the generosity of everyone who contributed. THANK YOU!! Watch for Snowy Owl Week the first week of May 2020. Learn more about the Snowy Owl Project by watching the video on our homepage. A huge thanks to Daniel J. Cox for creating it!

“The importance of this work cannot be overstated. Without the support for scientific research, our understanding of the threats to Snowy Owls, and what is needed to protect them, would be impossible. ORI's efforts make a substantial contribution not just to the sustainability of the Snowy Owl, but quite literally to the sustainability of all life on Earth.” Krista Wright, Executive Director, Polar Bears International