



There's No Place Like Home: Clark's Nutcracker Home Ranges and Whitebark Pine Regeneration

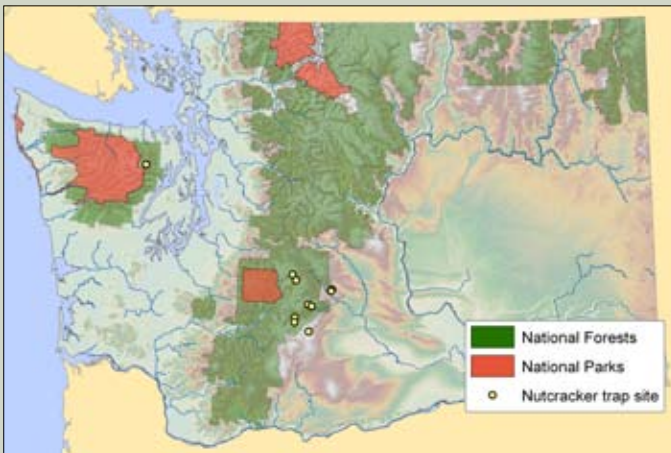
FOR CLARK'S nutcrackers, "home" is a year-round hub. Although nutcrackers show tenacious fidelity to home ranges in winter, spring, and summer, they spend every autumn traveling around to harvest seeds. Nearly all seeds are transported back home for storage, a process that has vast implications for forest regeneration.

BACKGROUND

We investigated habitat use, caching behavior, and migratory patterns in Clark's nutcrackers in the Pacific Northwest using radio telemetry. Over 4 years (2006–2009), we captured 54 adult nutcrackers at 10 sites in the Cascade and Olympic Mountains in Washington State. We fitted nutcrackers with a back-pack style harness. The battery life on the radio tags was 450 days, and we tracked nutcrackers year-round, on foot (to obtain behavior observations) and via aircraft (to obtain point locations). We obtained more than 6,000 telemetry point locations on radio-tagged nutcrackers, and we observed more than 1,000 seed-harvest events and 655 seed-caching events.

Of nutcrackers captured in this study, we classified 20 nutcrackers as residents and 21 as emigrants wintering on our study area. Among residents, 11 had home ranges in whitebark pine stands and 9 had home ranges in ponderosa pine stands.

The future of whitebark pine is of serious concern because of the species' vulnerability to white pine blister rust, mountain pine beetle infestation, wildfires, and climate change. The Clark's nutcracker is the primary means of whitebark pine seed dispersal.



THE STUDY'S Clark's nutcracker trap sites.

What do we mean by "space use" and "home range"?

"Space use" describes how animals use a landscape. The term is most commonly used to discuss home range characteristics and the selection of resources (habitats, food items, roost sites) within home ranges.

In our study, we used the term "home range" to describe the area used by a resident nutcracker for all year-round activities except seed harvest. This is because areas used for seed harvest in autumn were ever-changing and temporary—birds showed no fidelity to forests used for seed harvest, but rather used these forests only as long as seeds were present on trees.

What do we know about nutcracker space use?

Vander Wall and Balda (1977) and Tomback (1978) were the first to report that nutcrackers harvest large-seeded pines in autumn and often range over large areas and multiple elevation zones seeking concentrations of conifer cones. Vander Wall et al. (1981) also found that short- and medium-distance migration was more common than conventionally thought. However, there had been no formal, quantitative studies of home range size or summer space use prior to our study.

What did we learn about home range size?

In our study, average home range size for resident nutcrackers was 13.3 km² with considerable variation in home range size (from 1.4 to 52.1 km²). Although home range size in animals is typically correlated with body size, nutcracker home ranges in this study were exceptionally large, likely reflecting life history traits and habitat quality rather than body size. For comparative purposes, the average nutcracker home range in our study is similar to the common raven home range measured in western Washington (12.1 km²), even though ravens are six times larger than nutcrackers.

For Clark's nutcrackers, home ranges are the year-round hub for all activities except seed harvest—in spring for nesting, in summer for foraging, and in autumn/winter for storing seeds. Since nutcrackers are not territorial and fairly social, they will leave home ranges for foraging if necessary, especially in autumn when they may seek distant cone-producing stands.

Even if they sought seed elsewhere, resident nutcrackers in our study almost always returned "home" to store those seeds. Among 655 seeds cached in autumn, 97 percent were cached within the boundaries of the summer home range—including seeds harvested up to 33 km and up to two mountain ridges away.



CLARK'S NUTCRACKER #505—shown here within its home range—transported whitebark pine seeds nearly 33 km between distant harvest trees and cache sites within its home range. However, the home range was located in a ponderosa pine burn, so, despite this dispersal activity, no whitebark pine seeds were established because the caches were placed in a ponderosa pine stand at low elevations.



CLARK'S NUTCRACKER #746 preening in the early morning sun in its home range. Home ranges represent secure areas where animals know the locations of the best hiding spots from predators and the most profitable food patches.



SPACE USE describes how animals use a landscape. For wide-ranging species like Clark's nutcracker, telemetry is generally considered the least-biased way to obtain space use data.



ADULT NUTCRACKER fitted with a radio tag prior to being released.

CASE STUDY: A Comparison of Space Use and Behavior by “Floaters” and “Non-Floaters”

We compared two kinds of resident nutcrackers: floaters, represented by wide-ranging birds (average home-range size 29.9 km²); and non-floaters, with neat, small home ranges (average 4.4 km²). Their space use and behavior differed remarkably.

Differences in home range size

Nutcrackers #632 and #294 were captured within the same week but at different trap sites. Other than a difference in body weight (139 and 129 g, respectively), there was no indication that these two individuals would differ so dramatically in space use. However, within 2 months of capture, the home range of #294—clearly a “floater”—was larger by a factor of 26, with a home range of 50.6 km². Nutcracker #294’s summer home range was more like that of a golden eagle than a songbird!

TABLE—Characteristics of floaters and non-floaters and their home ranges

	Bird ID	Weight (g)	Home range size (km ²)	Home range size (acres)	Proportion of home range size with ponderosa pine	Proportion of home range size with whitebark pine
FLOATERS	020	135	5.1	1252	0.00	0.49
	031	128	14.4	3546	0.07	0.13
	681	111	14.9	3686	0.06	0.04
	345	124	30.1	7429	0.00	0.21
	091	122	42.1	10397	0.01	0.13
	294	129	50.6	12502	0.04	0.11
	845	119	52.1	12862	0.00	0.16
	Mean	124	29.9	7382	0.03	0.18
NON-FLOATERS	505	151	1.4	342	0.23	0.00
	746	140	1.4	343	0.03	0.28
	061	131	1.8	447	0.01	0.20
	043	121	1.8	453	0.01	0.08
	632	135	1.9	466	0.42	0.00
	719	123	2.5	616	0.05	0.07
	122	131	2.6	645	0.00	0.10
	211	144	2.9	717	0.29	0.00
	893	134	3.6	879	0.06	0.08
	312	141	3.7	905	0.06	0.06
	781	132	4.6	1136	0.30	0.00
	332	135	7.8	1917	0.06	0.05
	193	134	20.7	5125	0.50	0.00
Mean	135	4.4	1076	0.16	0.08	

Differences in autumn seed caching

In autumn, floaters like #294 vacated their home ranges and established new home ranges close to seed harvest stands. In our study, floaters established new home ranges in upland, mixed forests within 10 km of seed harvest stands; seeds were then cached within these newly established home ranges.

Conversely, non-floaters like nutcracker #632 did not give up their home ranges in autumn but were willing to travel up to 33 km from home ranges to harvest seeds.

Differences in body weight and home range composition

In our study, floaters were typically lighter weight than non-floaters, implying they occupied low-quality habitat compared to non-floaters; their home ranges might have been large because they were forced to search over large areas to meet daily energy needs. Floater home ranges had proportionally more whitebark pine and less ponderosa pine than non-floaters—suggesting that whitebark pine is important for its large seeds (to be enjoyed when available), but ponderosa pine is important for its reliability and abundance.



NUTCRACKER #632 was one of the lucky birds with a home range in the ponderosa pine zone. For the entire year (excluding the autumn seed harvest season), it was able to find all of its energy requirements within a 2-km² home range. It was classified as a non-floater, having a small home range and high body weight.



NUTCRACKER #294 had a huge home range of 50 km²—comparable in size to that of a golden eagle—with proportionately more whitebark than ponderosa pine.

THE BOTTOM LINE: MANAGER'S PERSPECTIVE

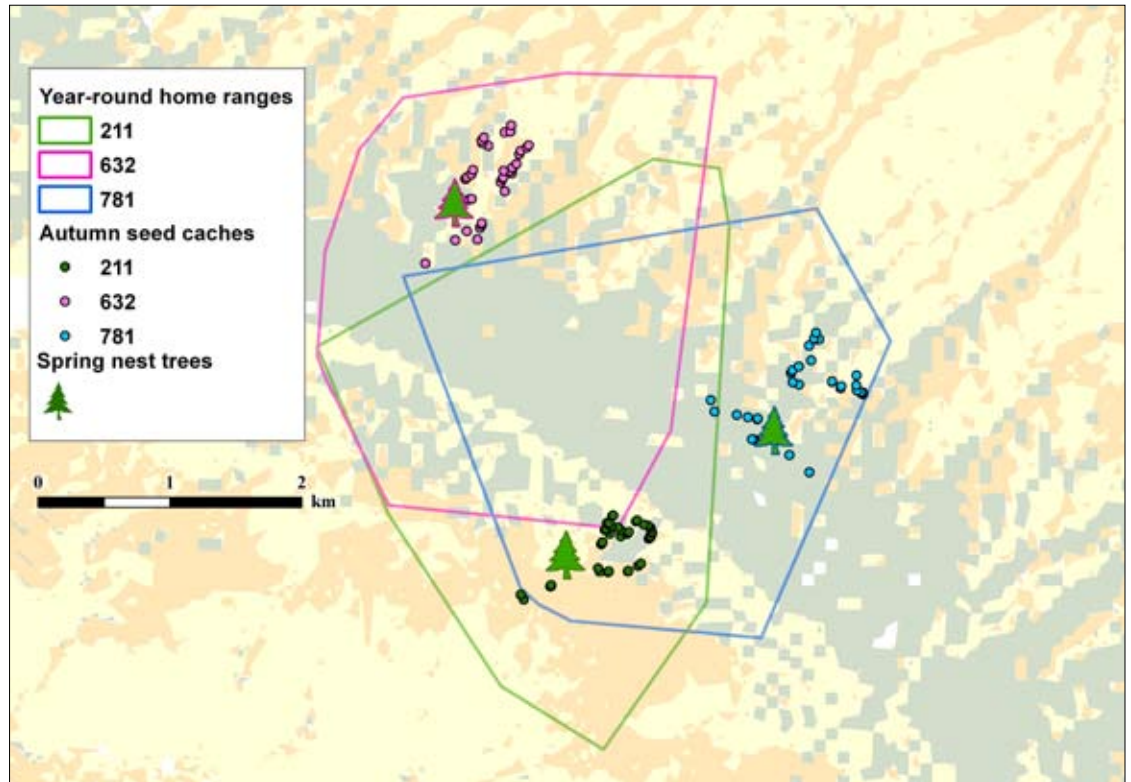
Connecting the dots: nutcracker home range fidelity and whitebark pine regeneration

It may come as a surprise that home range fidelity in Clark's nutcracker directly affects whitebark pine regeneration. This is because nutcrackers show such strong fidelity to home ranges when caching seeds in autumn.

Why do nutcrackers show such strong fidelity to home ranges for caching, anyway? Nutcrackers that store their caches centrally can conserve energy in winter when conditions are most severe and fresh food is scarce, and they can enhance their fitness if they cache seeds within their own, familiar home range.

But home-range fidelity has implications for whitebark pine restoration.

It can be beneficial because the presence of adult whitebark pine trees is not required for nutcracker caching; thus, isolated stands and those threatened by white pine blister rust, mountain pine beetle, or both can be effectively restored by nutcrackers if residents occupy the region. And nutcrackers with home ranges containing mostly whitebark pine habitat will be effective seed dispersers.



AMONG RESIDENT nutcrackers, home ranges were used for all yearly activities except autumn seed harvest, when, if necessary, the birds traveled away in search of seeds. Still, they transported seeds back to the home range for caching many times each day. This map shows home ranges of three ponderosa pine residents, depicting the home range boundary, the placement of autumn seed caches, and the locations of spring nest trees. Within the home range boundary, spring nest sites were often placed near seed caches, which were clustered in relatively small areas. Note that this map does not show autumn seed harvest trees, which occurred mostly outside of the home ranges.

However, it can also be detrimental because, as whitebark pine declines, nutcrackers are more likely to establish home ranges in stands of alternate seed sources (such as ponderosa pine or Douglas-fir), and more and more whitebark seeds are likely to be transported into inappropriate low- or mid-elevation home ranges.

Such complications underscore the importance of managing whitebark pine in the context of the larger ecosystem.

FURTHER READING

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FOR FURTHER INFORMATION

Carol Aubry
Olympic National Forest
1835 Black Lake Blvd., Suite A
Olympia, WA 98512

Phone: (360) 956-2361
Email: caubry@fs.fed.us

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