How Do States Estimate Their Wolf Populations?

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PART 1:
The Upper Great Lakes and Pacific Coastal States

By RICHARD P. THIEL and DIANE BOYD

One blustery morning in late January 1978, on a remote road eight miles east of the Minnesota-Wisconsin border, Dick Thiel gazed down at a set of gray wolf tracks made by a breeding pack of wolves—the first discovered outside of Minnesota and Isle Royale, Michigan in more than 20 years. Wisconsin's wolf population has since grown to more than 800 animals, and breeding packs of wolves have returned to seven additional states.

Knowledge of these population numbers is vital to effective wildlife management, but gaining that knowledge is not easy. Free-roaming wolves are frequently concealed, may be more active at night, live in very wild spaces, roam widely and exist in low densities. All wolf counts are made during winter when the populations are close to their lowest in the annual cycle after reproducing in spring and sustaining mortality throughout the year.

Direct counts of wolves are difficult; they're attempted when the area of census is small, as in the case of Isle Royale National Park in Lake Superior. In Minnesota's 27,570 square-mile (70,579 square kilometer) wolf range, censuses occur in manageably sized subunits. Biologists extrapolate counts to estimate populations over the wolves' entire range.

Tools used to count wolves vary depending on funding, difficulty of terrain and weather conditions. Winter snow-track surveys, monitoring radio-collared wolves or a combination of these methods are standard. Citizen reports, carcass retrievals, trail cameras and other techniques are also used (see Table 1).

Managing wild animals is generally the business of individual states. Where wolves have been listed as federally endangered or threatened, the U.S. government allows states to select from scientifically accepted census techniques. A specific caveat exists in the intermountain west: censuses there must include the number of breeding packs present as of December 31 each year. Otherwise, each state has its preferred methods of estimating the numbers of wolves in it's jurisdictions.

Table 1. Techniques used in estimating state wolf numbers.

State	Size of Range (km²)	Interval	Snow Tracking	Radio-tracking		Reports	Aerial	Camera Traps	Extrapolate
				Number	Territory Size				
MN	70,579	annual[1]	X	X	X	X			X
WI	50,600	annual	X	X	X	X			
MI	43,000	annual[2]	X	X	X	X			X
IR	544	annual	X	X	X		X		
WA	~9,000	annual	X	X	X	X	X	X	
OR	~8700	annual	X	X	X	X	X	X	

[1] For several decades, Minnesota's wolf estimates were made approximately every 10 years. In recent years these have been conducted annually.

[2] Michigan censuses roughly half its wolf range annually and extrapolates the remainder based on statistics.

We queried state biologists, asking how estimates are made in their states.

Upper Great Lakes (Minnesota, Michigan, Isle Royale)

By 1960, wolves were present only in northeastern Minnesota and Isle Royale National Park, Michigan. Today thousands of wolves exist in the forested expanses surrounding Lake Superior in Minnesota, Wisconsin and Michigan.

Minnesota

Formerly, the Minnesota Department of Natural Resources (DNR) estimated its wolf population about every 10 years. Intervals between censuses have decreased since about 2010. Minnesota DNR biologist John Erb explains the present approach. "I view the estimate like determining the outer boundary of a puzzle; how many puzzle pieces (pack territories) are in the puzzle, and how many wolves are on each puzzle piece."

The size of Minnesota's wolf range is determined by querying biologists, foresters and observers. Using pack-territory size based on 37 radio-collared wolf packs scattered throughout the wolf range during 2015-2016 and average wolves-per-pack within subunits, biologists extrapolate the number of pack wolves. To count dispersers, they rely on study-area ratios of pack wolves to loners and add those data to arrive at their range-wide estimate.

Michigan

Lone wolves were detected in Michigan's Upper Peninsula (UP) in the late 1980s, and the first pack was discovered there in 1989. Due to the ruggedness of terrain and rapid expansion in wolf numbers, Michigan DNR recently modified its count technique. Wolf habitat is now segregated within the UP into high- and low-density units, totaling 21 units in all. Each year, half of the units (12 to13 units representing 50 percent of the UP land mass of 26,700 square miles) are randomly
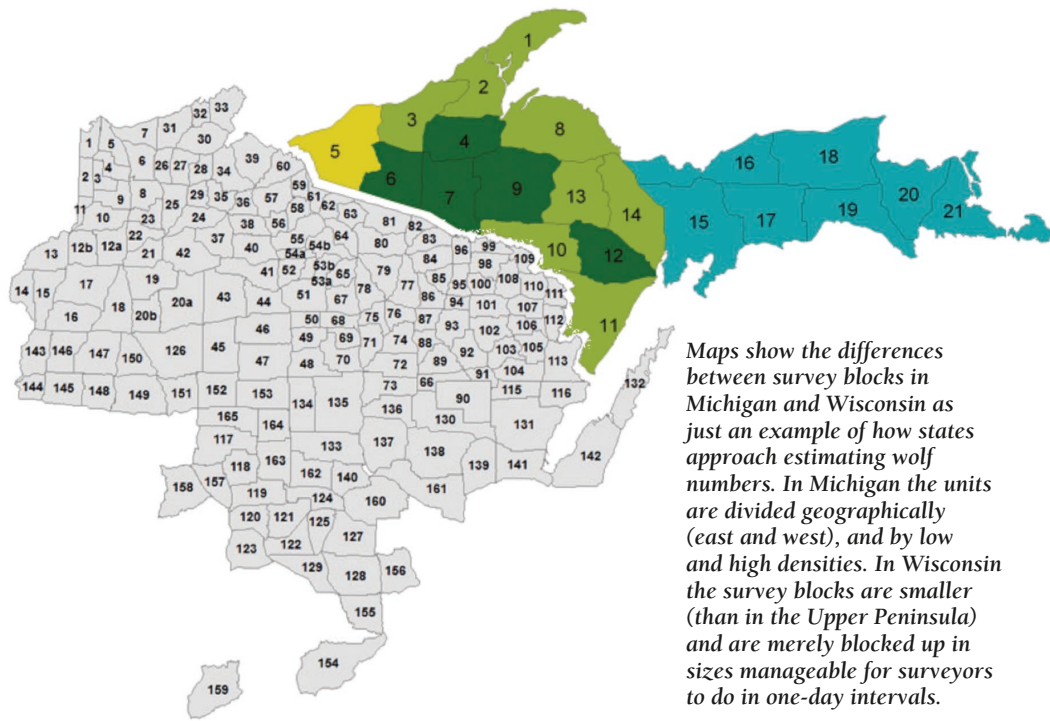
Maps show the differences between survey blocks in Michigan and Wisconsin as just an example of how states approach estimating wolf numbers. In Michigan the units are divided geographically (east and west), and by low and high densities. In Wisconsin the survey blocks are smaller (than in the Upper Peninsula) and are merely blocked up in sizes manageable for surveyors to do in one-day intervals.

selected, and field workers systematically count wolves using snow tracking and telemetry data. The design ensures that every unit is surveyed at least one time out of every three surveys, according to Michigan DNR wildlife biologist Dean Beyer. Field data is applied to the entire UP using a "stratified random sample" technique with radio-collared wolf packs supplying territory size and boundary data.

Isle Royale National Park in Lake Superior

The earliest and longest-lived census of wolves within the continental U.S. has been conducted annually on Isle Royale, Michigan, since 1959. It relies on aerial surveillance of wolf packs and a total count of individuals living on this remote island within Lake Superior.

Wisconsin

Packs returned to this state in the late 1970s, and state officials have plotted the number of breeding packs annually. Snow-track surveys are conducted by a suite of biologists from county, state, federal and tribal agencies, and trained citizen volunteers each December through March (with 17,759 miles driven in winter 2015-16) and augmented by long-term, radio-collared, wolf-pack-boundary data in an annual census that calculates the minimum number of wolves present.

Pacific Coastal States (Washington, Oregon, California)

Breeding packs of wolves very recently recolonized the area. State, federal and tribal agencies are developing tools to monitor wolves as they recolonize this region.

Washington

The first breeding pack in Washington was noted in 2008, likely composed of dispersers coming out of British Columbia, Canada; Montana or Idaho. The Washington Department of Fish and Wildlife monitors its wolves using telemetry of radio-collared wolf packs, aerial and ground-track surveys, remote cameras and winter snow-track surveys. Washington state estimates are based on winter wolf numbers. They include a minimum number of wolves along with the number of packs and breeding packs (packs with pups) present on December 31 each year.

Oregon

In Oregon, where winter censuses are conducted annually, the first breeding pack was discovered in 2009. The Oregon Department of Fish and Wildlife uses a combination of telemetry data from radio-collared packs, as well as trail cameras, snow-track surveys and

ground searches to census wolves in areas where none are presently collared. Banking on continued wolf expansion, biologist Russ Morgan of the Oregon Department of Fish and Wildlife says, "…With an increasing and expanding population we anticipate using a combination of direct counts and systematic sampling methods in the future."

California

California is just beginning to experience natural wolf recovery. In 2011 the now-famous wolf OR7 dispersed from northeastern Oregon into northern California, briefly residing there before returning to Oregon. In 2015, a camera trap picked up images of two adults and five pups in Siskiyou County, California. According to the California Department of Fish and Wildlife's Draft Wolf Management Plan (May 2016), the state agency plans to use a variety of methods including radioed wolf packs, scat/hair surveys, track surveys and howl surveys to keep tabs on wolves as they begin to repopulate California. ■

Coming up — the Southwest and the Northern Rockies

Clearly wolves are rebounding in the Upper Great Lakes and Pacific Coastal regions. Populations in each of these states are either stable or increasing (Table 2). In the next issue of *International Wolf* we will explore the methods of estimating wolf populations in the Southwest and Northern Rockies regions.

Richard P. Thiel retired in 2011 as coordinator of the Wisconsin DNR Sandhill Outdoor Skills Center. He was team chair of Wisconsin's wolf recovery project in the 1980s, and continued serving as a wolf population monitor until he retired. He authored The Timber Wolf in Wisconsin: the Death and Life of a Majestic Predator *(1993), and* Keepers of the Wolves *(2001), and is co-editor of the International Wolf Center book,* Wild Wolves We Have Known: Stories of Wolf Biologists' Favorite Wolves *(2013). He also serves on the Center's wolf education committee.*

Diane Boyd began her wolf-studies career in 1977, working with Dave Mech in Minnesota. She moved to Montana in 1979 to study wolf recovery in the Rocky Mountains, following the population growth from one wolf to the present 1,700 wolves. Diane has collaborated on wolf research in five states, three Canadian Provinces, and in Italy and Romania. She currently works for Montana Fish, Wildlife and Parks in Kalispell, Montana, as the Wolf/Carnivore Specialist.

TABLE 2. Recent estimates in Great Lakes and Coastal Pacific States.

State	Federal Minimum		Current Estimate			
	Recovery Goal	Year Met	Year Made	Number	Breeding Pairs	Packs
MN	stability		2015-2016	2,278		439[2]
MI	100	1994	2015-16	618 +- 50		
WI			2015-16	866-897		
IR			2015-16	2	1[1]	
WA	N/A		2015	90	8	18
OR	N/A		2015	110	11	12
CA	N/A		2015	7	?	?

[1] May not be breeding.   [2] Includes breeding pairs

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