

the practice was stopped in 1995 to allow the wolf population to experience more natural biotic conditions. Since that time, Ivermectin has been administered only to captured wolves with severe cases of mange. In the future, Ivermectin and vaccines will be used sparingly on Wisconsin wolves, but will be used to counter significant disease outbreaks (Wydeven *in litt.* 1998).

Mange has not been documented to be a significant disease problem in Minnesota. Several packs in the Ely and Park Rapids areas are known to suffer from mange, and a pack at Agassiz NWR in northwestern Minnesota was reduced from at least five wolves (the pack may have numbered six to eight in the early 1990s) to a single animal over the last few years, primarily resulting from mange.

Lyme disease, caused by a spirochete, is another relatively recently recognized disease, first documented in New England in 1975; it may have occurred in Wisconsin as early as 1969. It is spread by ticks, that pass along the infection to their various hosts during feeding episodes. Host species include humans, horses, dogs, white-tailed deer, white-footed mice, eastern chipmunks, coyotes, and wolves. The prevalence of Lyme disease in Wisconsin wolves averaged 70 percent of live-trapped animals in 1988–91, but dropped to 37 percent during 1992–97. While there are no data showing wolf mortalities from Lyme disease, it may be suppressing population growth through decreased wolf pup survival. Lyme disease has not been reported from wolves beyond the Great Lakes regions (WI DNR 1999a).

Other diseases and parasites, including rabies, canine distemper, canine heartworm, blastomycosis, brucellosis, leptospirosis, bovine tuberculosis, hookworm, dog lice, coccidiosis, and canine hepatitis, have been documented in wild gray wolves, but their impacts on future wild wolf populations are not likely to be significant (Brand *et al.* 1995, Johnson 1995, Mech and Kurtz 1999, Thomas *in litt.* 1998, WI DNR 1999a). However, continuing wolf range expansion likely will provide new avenues for exposure to several of these diseases, especially canine heartworm, rabies, and bovine tuberculosis (Thomas *in litt.* 2000), further emphasizing the need for vigilant disease monitoring programs.

In aggregate, diseases and parasites were the cause of 25 percent of the diagnosed wolf deaths from 1960 through 1997 in Michigan (MI DNR 1997) and 19 percent of the diagnosed mortalities of radio-collared wolves in

Wisconsin from 1979 through 1998 (Wydeven 1998).

Since several of the diseases and parasites are known to be spread by wolf to wolf contact, their incidence may increase as wolf densities increase in newly colonized areas. However, because wolf densities generally are relatively stable following the first few years of colonization, wolf to wolf contacts will not likely lead to a continuing increase in disease prevalence (Mech *in litt.* 1998).

Disease and parasite impacts may increase because several wolf diseases are carried and spread by domestic dogs. This transfer of diseases and parasites from domestic dogs to wild wolves may increase as gray wolves continue to colonize non-wilderness areas (Mech *in litt.* 1998). Heartworm, CPV, and rabies are the main concerns (Thomas *in litt.* 1998).

Disease and parasite impacts are a recognized concern of the State DNRs. The Michigan Gray Wolf Recovery and Management Plan states that necropsies will be conducted on all dead wolves, and that all live wolves that are handled will be examined, with blood, skin, and fecal samples taken to provide disease information. All handled wolves will be vaccinated for CDV and CPV and treated for parasites before release (MI DNR 1997).

Similarly, the Wisconsin Wolf Management Plan has a section on wolf health monitoring. It states that as long as the wolf is State listed as a threatened or endangered species, the WI DNR will conduct necropsies of dead wolves and test a sample of live-captured wolves for diseases and parasites. The goal will be to capture and screen 10 percent of the State wolf population for diseases annually. Following State delisting (after the State wolf population grows to 250 animals), disease monitoring will be scaled back because the percentage of the wolf population that is live-trapped each year will decline, but periodic necropsy and scat analyses will continue to test for disease and parasite loads. The plan also recommends that all wolves live-trapped for other studies should have their health monitored and reported to the WI DNR wildlife health specialists (WI DNR 1999a).

In summary, several diseases have had significant impacts on wolf population growth in the Great Lakes region in the past. These impacts have been both direct, resulting in mortality of individual wolves, and indirect, by reducing longevity and fecundity of individuals or entire packs or populations. Canine parvovirus stalled wolf population growth in Wisconsin in the early and mid-1980s, and it has been

implicated as a contributing factor in declines of the isolated Isle Royale population in Michigan. Sarcopic mange has impacted wolf recovery in both Michigan's Upper Peninsula and in Wisconsin in this decade, and is recognized as a continuing problem. However, despite these and other diseases and parasites, the overall trend for wolf populations in the western Great Lakes States is upward. The wolf management plans of Minnesota, Michigan, and Wisconsin include monitoring components that are expected to identify future disease and parasite problems in time to allow corrective action to be taken to avoid a significant decline in overall population viability. We do not believe disease impacts will prevent the continuation of wolf recovery in these States. The reclassification of Wisconsin and Michigan wolves from endangered to threatened will not change the incidence or impacts of disease on these wolves.

*Western DPS.* Wolves in the northern U.S. Rocky Mountains are exposed to a wide variety of canid diseases, common throughout North America. Some of these diseases and parasites have been documented to significantly affect wolf populations, usually temporarily, in other areas of North America. To date, canine parvovirus, canine distemper, and mange have been documented in wolves from the northern Rocky Mountains. Wolves in the Yellowstone area have almost certainly been exposed to brucellosis. However, in the studies of wolves in Montana, Idaho, and Wyoming to date, disease and parasites have not appeared to be a significant factor affecting wolf population dynamics. Just like wolves in all other parts of North America, wolves, usually pups, in the northern Rocky Mountains will occasionally die from a wide variety of canid diseases. However, it is doubtful that wolf populations in the northern Rocky Mountains could be significantly impacted, because wolf exposure to these diseases has been occurring for decades. The EIS on gray wolf reintroduction identified disease impact as an issue but did not evaluate it further, because it appeared not to be significant (Service 1994a). Likewise, in the "Wolves for Yellowstone?" reports to Congress in 1992, Johnson (1992a and 1992b) reviewed the relationship between wolves and rabies, brucellosis, and tuberculosis and found canids were not likely to be a reservoir for those diseases.

*Southwestern DPS.* There is no evidence suggesting that disease was a significant factor in the decline of the Mexican wolf. Likewise, there is no