Prediction Failure of a Wolf Landscape Model

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Abstract

I compared 101 wolf (Canis lupus) pack territories formed in Wisconsin during 1993–2004 to the logistic regression predictive model of Mladenoff et al. (1995, 1997, 1999). Of these, 60% were located in putative habitat suitabilities <50%, including 22% in suitabilities of 0–9%. About a third of the area with putative suitabilities >50% remained unoccupied by known packs after 24 years of recolonization. This model was a poor predictor of wolf re-colonizing locations in Wisconsin, apparently because it failed to consider the adaptability of wolves. Such models should be used cautiously in wolf-management or restoration plans. (WILDLIFE SOCIETY BULLETIN 34(3):874–877; 2006)

Key words

Canis lupus, landscape, model, recolonization, Wisconsin, wolf.

Results

I compared 101 wolf-pack territories discovered in Wisconsin between 1993–2004 (Fig. 1) with the Mladenoff et al. (1999) habitat-suitability map. Of these, 60% were located in areas of putative suitabilities <50%, including 22% which were in areas of 0–9% suitability (Table 1). When I compared only the 54 territories based on radiotracking, I obtained similar results (Table 1). Additionally, more than a third of the Wisconsin area with putative suitability >50% (Mladenoff et al. 1999:39) remained unoccupied by known packs of wolves during the 24 years of recolonization (cf. Mladenoff et al. 1999 and Fig. 1), even though the areas were well within dispersal distances for wolves (Wydeven et al. 1995) and wolves repopulated many areas of putative low probability (Table 1).

Discussion

The Mladenoff et al. (1995) model was derived to predict areas wolves had the greatest chance of re-colonizing. It was based on characteristics of areas inhabited by 14 wolf packs in Wisconsin between 1979–1992 and tested on 13 packs that colonized Wisconsin between 1993–1996 (Mladenoff et al. 1999). The model was then applied to both the northeastern United States to assess potential wolf habitat there (Mladenoff and Sickley 1998) and in the Wisconsin Wolf Management Plan (Wisconsin Department of Natural Resources 1999) to assess potential wolf habitat.

My results, based on 101 packs colonizing Wisconsin between 1993–2004, indicate the logistic regression model (Mladenoff et al. 1995, 1997, 1999) failed to predict extensive areas, both where wolf packs would colonize and where they would not. Because the model is supposed to be predictive, it was anticipated most wolves would colonize the areas of highest probability. Instead 60% of the packs colonized areas of <50% probability, including 22% in areas of the lowest probability. In addition, about a third of the available area of high probability was not known to be colonized. Wisconsin provides an ideal area in which to assess the model because it was originally derived from the Wisconsin wolf population. If it does not work there, there might be little reason to believe it would work elsewhere.

How could the model have failed to predict where Wisconsin wolves would re-colonize just a few years after it was devised? The
model clearly was descriptive, rather than predictive, merely characterizing areas where wolves were living during 1979–1992, not necessarily where they would live. The areas first colonized tended to be wild areas with low road densities (Thiel 1985) because 1) wolves living elsewhere were killed by humans, both illegally and accidentally (Wydeven et al. 1995), 2) the original colonizers came from Minnesota (Mech et al. 1995) where they had lived primarily in wild lands, and 3) wolves tend to colonize areas by proliferation from core areas (Fritts and Mech 1981, Ream et al. 1991, Wydeven et al. 1995). Since core recolonization areas tended to be wild lands, then early proliferation from those core areas tended to be in similar areas.

It is clear that wolves do not require wilderness (Boitani 1982, Mech 1995). Originally they inhabited almost every kind of habitat in the northern hemisphere (Young and Goldman 1944). The reason wolves remaining in the contiguous 48 states after a major extermination campaign inhabited only wild lands is because that is the only place where they avoided human persecution. In effect, humans relegated wolves to wild lands (Mech 1995).

In many parts of Europe, however, wolves frequent villages at night (Boitani 1982), roam through cities to scavenge at garbage landfills (Promberger et al. 1997) and den in wheat fields (Vila et al. 1993). Signs of similar behavior have long been noted in the United States as well (Mech 1995). In Minnesota wolves have been colonizing areas where road densities exceed the 0.6 km/km² that Thiel (1985) found characterized areas inhabited by remnant wolf populations and early colonizers (Mech 1989, Fritts et al. 1992, Berg and Benson 1999, Merrill 2000). They have even denned and raised pups in areas of high human disturbance (Thiel et al. 1998).


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**Figure 1.** Wolf-pack territories formed in Wisconsin, USA, 1997–2004 (Wydeven and Wiedenhoeft 2004).
wolves could result in considerable conflict with humans if not restricted by management to wild lands.

These findings also caution that 1) other models of putative wolf habitat suitability that fail to consider the adaptability of wolves and attempt to draw inferences from areas of artificially induced wolf-range restrictions may also be similarly flawed, and 2) wolf-range projections in wolf management plans, such as those in Michigan (Michigan Department of Natural Resources 1997) and Wisconsin (Wisconsin Department of Natural Resources 1999) that are based on unrealistic assumptions of the Mladenoff et al. (1995, 1997, 1999) model, should be reconsidered.

Acknowledgments

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<table>
<thead>
<tr>
<th>Putative suitability probability (%)</th>
<th>New territories</th>
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<tr>
<td></td>
<td>All</td>
<td>Radiotelemetry-based only</td>
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<tr>
<td>95–100</td>
<td>9</td>
<td>7</td>
<td>13</td>
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<tr>
<td>75–94</td>
<td>18</td>
<td>9</td>
<td>17</td>
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<td>50–74</td>
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<td>25–49</td>
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<td>6</td>
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<td>10–24</td>
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<td>17</td>
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<tr>
<td>0–9</td>
<td>22</td>
<td>14</td>
<td>26</td>
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Figure 2. Map of putative wolf-favorability classes in northern Wisconsin, USA, including wolf-pack territories used in creating the model (white boundaries) and territories originating from 1993 to 1996 (Mladenoff et al. 1999).

Literature Cited


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ERRATUM


Figure 1 in this article was incorrectly labeled. The title in Mech (2006) was

Figure 1. Wolf-pack territories formed in Wisconsin, USA, 1997–2004 (Wydeven and Wiedenhoeft 2004).

The correct title should have been

Figure 1. Wolf territories known to be present in Wisconsin, USA, in winter 2003–2004 (Wydeven and Wiedenhoeft 2004).

The map includes some territories that have been present since the 1970s, and some of the territories that appeared since 1997 had disappeared by winter 2003–2004. The full report where the figure originated is available at <http://dnr.wi.gov/org/land/er/publications/reports/WERR%20Timber%20Wolf/WERR_Status_of_Timber_Wolf_03-04.htm>.

WSB apologizes to the authors for this error.