Friends of the Norbeck

PO Box 2003
Rapid City, SD 57709
www.friendsofthenorbeck.org

Professional Statistical Analysis of Black Hills Data Questions Pine Beetle – Fire Risk Link

**** * * For Immediate Release – February 12, 2012 * * ****

For more information, contact:

Brian Brademeyer
Executive Director, *Friends of the Norbeck*
605-574-4152
brademey@dishmail.net

Friends of the Norbeck recently commissioned professional statistician Grant Foster, of *Tempo Analytics*, to look at possible relationships between large fires, on the one hand, and weather, logging, and beetle tree-mortality levels on the other.

We provided Mr. Foster with a century of data from the Black Hills National Forest, 1910-2009, and asked for his professional statistical analysis of any possible relationships between these variables and large fires. We had no further input into his study.

On February 10, 2012, Mr. Foster completed his analysis, and produced the attached detailed "white paper" (28-pages, 2.7mb pdf):

Pine Beetle Infestation and Fire Risk in the Black Hills

Section 1 provides an Introduction, reviewing the attitudes and public statements of politicians, landowners, and Forest Service officials regarding concerns expressed over the latest mountain pine beetle outbreak in the western US, including the Black Hills National Forest. **Section 2** discusses the data used, and the processes used to obtain and process these data.[1]

Section 3 assesses trends in fire history over the century of data, investigating fire size and number of large fires per year over time, and the factors influencing wildfire. Several statistical models are investigated to explain this evolution of fire size and number over time. A "base model" was developed relating number of fires and fire size to climatic variables (drought, spring-summer temperatures). This was supplemented by adding additional parameters, such as thousands of beetle-killed trees per year.

The analysis found it noteworthy, given public perceptions, that the data indicate "there is no significant indication of a relationship between pine beetle tree kill and fire risk." In fact, when pine beetle data were included, "the *sign* of the effect was opposite to expectation, indicating that greater tree kill actually reduces the expected number of large fires." [p. 16, emphasis original]

While the effect was quite small (statistically insignicant) it was clearly at odds with the rhetoric surrounding the current beetle outbreak and associated alleged fire risks:

> However, if a causal relationship [between beetle-killed trees and fire risk] were as extreme as has been often suggested, amounting to a "tinderbox primed for wildfire," then these data would have revealed it. Certainly a relationship cannot be ruled out – but just as certainly, the extremity which has been claimed in public and policy discourse *can* be ruled out. [p. 16, emphasis original]

Section 4 investigated the possible causative factors influencing an increase in the number of large fires per year, and investigated whether "fire regimes" had changed in break-years of 1985 (the year in which the number of annual fires shows marked increase), 2000 (the year beginning the "second wave" of large

---

[1] *Friends of the Norbeck* provided the 1910-2009 annual timber volume, large fire acres, and beetle trees-killed data, which eas gleaned from BHNF FY 2002-2009 Monitoring Reports.

fires, including the Jasper Fire), or 2001 (the year in which pine beetle tree mortality increased dramatically on the Black Hills National Forest). The analysis concluded:

> As far as the data indicate, the greater number of very large fires in recent years is simply due to the greater number of fires. [p. 17]

Section 5 discusses recent scientific research on pine beetle infestation and wildfire risk. Most of this research is on lodgepole pine forests in the western United States, but it also shows possibly reductions in overall fire risk caused by canopy-thinning by beetle tree mortality.

Section 6 then looked at possible causes of the current outbreak on the Black Hills National Forest, including environmental parameters. It is widely known that a "hard freeze" can be influential in disrupting beetle outbreaks. Temperature data from the Black Hills region was examined to determine whether there had been a change that might be related to the most recent outbreak.

Monthly averages of mean temperatures in the 21st century have shown considerably less extreme cold during winter months than 20th century data, and especially fewer very cold Januaries since about 1980 and much less January cold since 1998 (Figures 14 and 15). This was captured by a measure of "persistent overnight hard freeze" capturing below-zero degree-days.

The result (Figure 16 from the report) is reproduced below, with the statistician noting that the "lack of persistent hard freeze since 1998, compared to prior years, is nothing less than remarkable," and adding:

> By no means does this prove that the recent [pine beetle] infestation in the Black Hills is due to warmer wintertime temperature, in fact more than one factor is likely at play. But it is highly suggestive that warming temperature, especially the decline is sustained hard freeze during winter, is an important factor in the dramatic increase in pine beetle populations noted over much of Western North America. [p. 23]

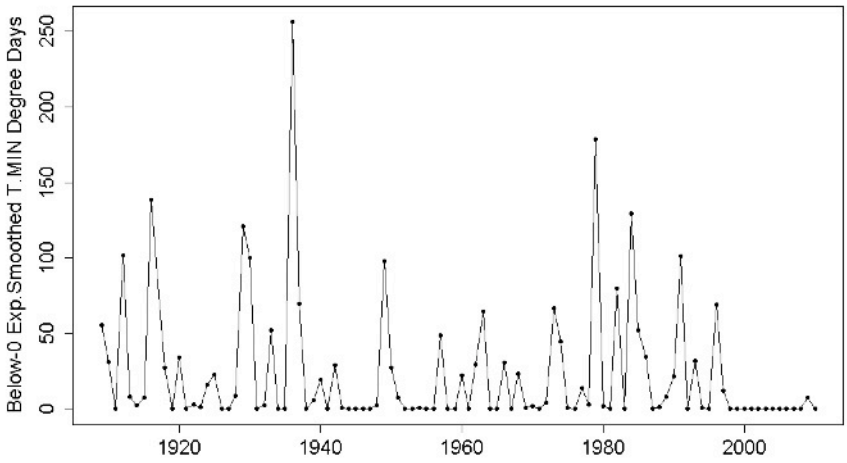

Figure 16: Below-zero degree days for exponentially smoothed overnight low temperature.

Section 7 minces no words in providing the conclusions from the professional statistical analysis:

> The data for the Black Hills region of South Dakota shows significant increase in fire hazard in recent decades, but that increase is attributable to known causes including climate change and drought conditions, and probably also related to other factors not included in the study, such as fire suppression. While many questions remain unanswered, and fire hazard due to pine beetles cannot be ruled out, it is overwhelmingly likely that any hazard which may exist due to pine beetles is dwarfed by other factors. [p. 24]

The extreme public fear of fire hazard due to pine beetle tree kill cannot be supported or justified by the data available from the Black Hills. This common intuition, shared even by professional foresters and firefighters, is not supported by the available data, and recent research actually contradicts the idea of major pine beetle influence on overall fire risk. Increased fires are occurring throughout the Rocky Mountain west, but these fires started before the latest beetle attacks. Even on the Black Hills, the extreme fire year of 2000 is a year before the dramatic increase in pine beetle tree kill observed in 2001. Summing up:

> It is our conclusion that there is simply no evidence to support the idea that the massive tree kill due to mountain pine beetle attack has

> significantly enhanced the risk of wildfire in the Black Hills National Forest. Wildfire hazard is a crucial issue which must be addressed with as clear as possible a perception of the actual risk factors. A focus on pine beetle infestation seems misplaced, threatening to draw attention away from factors which have strong and demonstrable impact on fire hazard and to divert limited resources to less productive strategies. Surely, excessive rhetoric about the urgent fire danger posed by pine beetle infestation, sometimes to the point of hysteria, does not serve the public interest. [p. 24]

* * * * *

Mr. Foster also posted a more "accessible" (i.e., less mathematical) online version of this analysis at his Climate Blog Open Mind, entitled:

Pine Beetles and Fire Hazard in the Black Hills

that is available for public review and comments.