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REVIEW
of

The Wildfire Risk Assessment
Prepared by Steven Bassett of The Nature Conservancy
For the Greater Santa Fe Fireshed Coalition

by
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Prepared at the request of
The Santa Fe Forest Coalition

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EXECUTIVE SUMMARY

i. The Nature Conservancy (TNC) recently prepared a Wildfire Risk Assessment for the Greater Santa Fe Fireshed Coalition[2] as "a useful tool for planning wildfire risk reduction treatments."

ii. This report presents a review of the TNC Wildfire Risk Assessment by Paul Davis of EnviroLogic, Inc.

iii. EnviroLogic, Inc. is supportive of the Greater Santa Fe Fireshed Coalition's effort to use wildfire risk in analyzing the costs and benefits of any proposed wildfire risk reduction treatments.

iv. The first step in using wildfire risk to analyze wildfire risk reduction treatments is to know the current risk of a wildfire. The current risk could be significant enough for us to consider wildfire risk reduction treatments, or the risk could be acceptable without any consideration of wildfire risk reduction treatments.

v. Wildfire risk, like all risk, is the combination of probability and consequence. Wildfire *risk* is the combination of the *likelihood* of a wildfire occurring coupled with the *consequences* of a wildfire.

vi. The cost side of the cost/benefit analysis is the costs associated with wildfire risk reduction treatments, such as the cost of forest thinning, the cost of performing prescribed burns, etc.

vii. The benefit of these wildfire risk reduction treatments should be the elimination of, or at least a reduction in, the risk of a wildfire.

viii. Decisions could then be made about whether, how, and where to spend resources based on the current risk of a wildfire in the Santa Fe Fireshed combined with the costs of wildfire risk reduction treatments, and their expected reduction in wildfire risk.

ix. Unfortunately, The Nature Conservancy's Wildfire Risk Assessment for the Greater Santa Fe Fireshed (TNC Risk Assessment) cannot be used to support decisions concerning wildfire risk reduction treatments because:

   a. The TNC Risk Assessment did not estimate the current risk of a wildfire occurring in the Santa Fe Fireshed. Specifically, TNC did not estimate the chance of a wildfire occurring within the greater Santa Fe Fireshed and only calculated the consequences of a wildfire (actually the consequences of 640,000 wildfires). The public is left not knowing the current risk of a wildfire and whether that risk is acceptable or not. Without knowing the current risk of a wildfire, the value of reducing the wildfire risk is not only unknown but unknowable.

   b. The costs of the consequences (homes burned, infrastructure destroyed, etc.) of a wildfire are not provided.

   c. The costs and benefits (effectiveness) of wildfire risk reduction treatments (thinning, burning, etc.) are not presented.

[2] Wildfire Risk Assessment, Version 1.0 - March 22, 2018. Prepared for The Greater Santa Fe Fireshed Coalition by Steven Bassett, The Nature Conservancy.

INTRODUCTION AND BACKGROUND

i. The Nature Conservancy (TNC) prepared a Wildfire Risk Assessment of the Santa Fe Fireshed for the Greater Santa Fe Fireshed Coalition and in doing so stated:

"This assessment can be a useful tool for planning wildfire risk reduction treatments."

ii. This paper evaluates the TNC Risk Assessment and the potential use of this risk assessment in planning risk reduction treatments.

iii. This paper does not address other critical aspects of the TNC Risk Assessment, including TNC's presentation of the history and effects of wildfires, TNC's decision to ignore the risk of uncontrolled "controlled" burns and backfires, the choice of "Valued Assets," and the use and assumptions associated with the fire behavior model. These aspects of the TNC Risk Assessment deserve scrutiny but are not reviewed in this paper.

WILDFIRE RISK-BASED DECISION ANALYSIS FOR FOREST MANAGEMENT

iv. Bruce Hill, a spokesman for the Santa Fe National Forest, stated that the value of saving a community from a catastrophic wildfire is "priceless."[3]

v. Mr. Hill's statement reveals an emotional reaction to wildfire as well as the U.S. Forest Service's traditional approach to wildfire management.

vi. The taxpayers are expected to pay any amount of money to "fight" wildfires when they occur and to reduce the risk of wildfires through wildfire risk reduction treatments (i.e., forest thinning, controlled burns, etc.) — all without regard to the current risks posed by wildfire, the cost of wildfire risk reduction treatments, or the effectiveness of wildfire risk reduction treatments.

vii. A rational approach would be to:

   a. Assess the current risk of a wildfire, including the value of the assets that are likely to be damaged by a potential wildfire (i.e., cost of homes burned, etc.).
   b. Decide if the current risk is acceptable or not. If the current risk is acceptable, then no further action is warranted.
   c. If the risk is unacceptable, do the following:
      1) List the available wildfire risk reduction treatments.
      2) For each wildfire risk reduction treatment, determine:
         - The cost of the treatment
         - The potential reduction in wildfire risk resulting from the treatment
         - The potential harm to the forest associated with the wildfire risk reduction treatment

[3] The Santa Fe New Mexican: http://www.santafenewmexican.com/news/local_news/the-price-of-combating-fires/article_23c43da8-0359-5948-8e59-6d7f553b1a9d.html

d. Combine the attributes of each potential wildfire risk reduction treatment to allow a comparison between the costs and benefits of:
    1) Doing nothing if the costs are too high and the benefits too low for all of the potential wildfire risk reduction treatments, or
    2) Employing the wildfire risk reduction treatment that has the least cost associated with the highest benefit.

TNC RISK ASSESSMENT: A SUMMARY

viii. Recently, the Greater Santa Fe Fireshed Coalition, which includes the U.S. Forest Service, took the first step in the direction of rational forest management by funding The Nature Conservancy to produce a Wildfire Risk Assessment for the Santa Fe Fireshed[4].

ix. TNC claims that their Wildfire Risk Assessment "can be a useful tool for planning wildfire risk reduction treatments."

x. The TNC risk assessment:
    a. Simulated 640,000 wildfires (10,000 fires for each of 64 weather conditions) as occurring randomly across the Santa Fe Fireshed.
    b. Used the Forest Service fire simulation model FConstMTT to estimate the spread and intensity of each of the 640,000 fires, assuming each fire burns for 72 hours (no fire fighting is assumed).
    c. Calculated the relative chance each pixel (small square area within the fireshed) would be burned at a given intensity by one or more of the 640,000 simulated fires.
    d. Identified Valued Resources and Assets (VRAs) that could be damaged by these spreading wildfires. Valued Resources and Assets included tangible assets like private land, structures, roads, trails, etc., and more abstract concepts like flooding potential, which was calculated by combining landscape features with assets that could be damaged. For example, a VRA could be a stand of trees that if burned would contribute to a flood that could damage downstream structures.
    e. Assigned each VRA a subjective index ranging from zero to one, where zero was no value and a value of one represented the highest value.
    f. Subjectively defined "response functions" that prescribe how the value of a given VRA decreases[5] for each fire intensity. For example, a private home could be assigned an initial value of 1.0, with an intense wildfire burning the home down, resulting in a new value of zero.
    g. Produced maps of net value change resulting from hypothetical fires.

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[4] Wildfire Risk Assessment, Version 1.0 - March 22, 2018, Prepared for The Greater Santa Fe Fireshed Coalition, by Steven Bassett, The Nature Conservancy.

[5] There are a few cases where low-intensity fires increase the value of a VRA.

h. Produced "risk" maps that assign a net value change multiplied by the "burn probability," where probability is the relative probability that a given pixel will burn based on 640,000 simulated fires that start at random locations across the fireshed.

THE USE OF THE TNC RISK ASSESSMENT IN RISK-BASED DECISION ANALYSIS

xi. The third section of this paper outlined how wildfire risk can be a "useful tool for planning wildfire risk reduction treatments."

xii. The question now is: does the TNC Wildfire Risk Assessment provide the information needed to support risk-based decision analysis?

xiii. The short answer is no. Why not?

xiv. First, we need to know today's risk of a wildfire occurring in the Santa Fe Fireshed before making any decisions regarding wildfire reduction treatments. The TNC Risk Assessment failed to provide the current risk of a wildfire. The TNC Risk Assessment estimated the consequences of 640,000 wildfires but never addressed the likelihood (probability) that a wildfire would occur in the Santa Fe Fireshed. Therefore a key component of risk (probability times consequence) is missing.

xv. The probability of wildfire could have been calculated for a given stand in a given time frame from historic records of wildfires along with consideration of the potential impacts of climate change. This information can be found, for example, in Parks et al. 2015 and Baker 2015.

xvi. The TNC Risk Assessment cannot be used for any purpose in the absence of the probability of a wildfire occurring in the Santa Fe Fireshed.

xvii. The TNC Risk Assessment does address the potential consequences of a wildfire but fails to address: 1) the likelihood that such consequences will be realized, and 2) the costs associated with these consequences.

xviii. The TNC Risk Assessment treats consequences as damage to Valued Resources and Assets (VRAs).

xix. As stated above, VRAs include directly affected tangible assets like private homes. The TNC Risk Assessment assumes that any home within the path of one of their simulated fires will be destroyed.

xx. VRAs also include indirectly affected tangible assets. For example, a home destroyed by a flood that was caused by a wildfire followed by significant precipitation would be an indirectly affected tangible asset. In calculating the damage to indirectly affected tangible assets, the TNC Risk Assessment assumes that, depending on topography and elevation and without regard to actual or predicted precipitation events, floods will follow wildfires and will destroy structures in their path. However, not every wildfire destroys homes and not every wildfire is followed by flooding that destroys homes. The recent 416 wildfire near Durango burned over 50,000 acres and did not destroy a single

home in its path. Flooding did follow the fire but resulted in minimal property damage. So the reality is that some fires burn homes and some don't; sometimes flooding does follow wildfires and sometimes it does not. Therefore a defensible approach would have been for the TNC Risk Assessment to quantify the likelihood of damage to the VRAs.

xxi. The TNC Risk Assessment cannot be used as a "tool for planning wildfire risk reduction treatments" without estimating how likely it is that VRAs will be damaged in the event of a wildfire.

xxii. The TNC Risk Assessment failed to estimate the cost of the damage to its Valued Resources and Assets (VRAs). The TNC Risk Assessment provides a long list of VRAs that could be damaged as a result of a wildfire. But instead of providing costs associated with the VRAs and costs of damages to VRAs, the TNC Risk Assessment employs a subjective index of 0-1 for each VRA with 1 being the highest value and 0 the lowest.

xxiii. However, real dollars will be spent on wildfire risk reduction treatments. Taxpayers will not spend subjective indices from 0-1. A simple example: say a wildfire is likely to burn down a home costing $200,000. And assume that there is some risk reduction treatment that completely eliminates the chance of a wildfire. Obviously, the cost of the risk reduction treatment must be less than $200,000 to be worthwhile. But the TNC Risk Assessment does not provide us with the cost of the homes potentially burned by a wildfire or the cost of any VRA, instead providing only a subjective index of 0-1. Therefore no comparison of costs and benefits is possible.

xxiv. The TNC Risk Assessment cannot be used as a "tool for planning wildfire risk reduction treatments" without providing the costs of the potential damage to VRAs resulting from a wildfire.

xxv. The benefit of wildfire reduction treatments should be the elimination of wildfire risk or at least the reduction of wildfire risk.

xxvi. The TNC Risk Assessment fails to provide a list of possible wildfire risk reduction treatments and the reduction of wildfire risk resulting from the implementation of each treatment.

xxvii. The TNC Risk Assessment cannot be used as a "tool for planning wildfire risk reduction treatments" without providing a list of possible wildfire risk reduction treatments and the reduction of wildfire risk resulting from the implementation of each treatment.

SUMMARY

xxviii. The TNC Wildfire Risk Assessment provides a useful first step toward rational planning of wildfire risk reduction treatments. However, the TNC Wildfire Risk Assessment is not a "tool for planning wildfire risk reduction treatments" without knowing:

a. The current risk of a wildfire,
b. the probabilities that each VRA will be damaged,
c. the costs of damage to each VRA, and
d. the reduction in risk resulting from wildfire risk reduction treatments.

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