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Flagstaff Arizona, October 21st, 2016

Dear Dr. Saah and Spatial Informatics Group team members,

Thank you for your detailed comments on our Southwestern Forest Restoration: Reduced Emissions from Decreased Wildfire Severity and Forest Conservation methodology. Below you will find responses to your comments, along with notes illustrating changes to the methodology based on your contribution. We hope that you find these items satisfactory and welcome further discussion.

1. **Fire Return Interval**

We carefully reviewed Mann et al. 2016 and agree with the conclusions that humans have a distinct impact on the future trajectory of wildfire. That said we failed to see clear overlap in methods that would allow us to include a 'binning' as you mentioned in your comment. Currently, we allow two sources for WRI: published literature and the Western Wildfire Risk Explorer. We are unaware of wild divergence within the literature of these datasets for the Southwestern U.S.

2. **Constant vs. Weibull based fire rotation**

We chose the Weibull distribution as it allows us to scale wildfire emissions and its downstream effects based on the *cumulative probability* that wildfire has occurred. This avoids assumptions of wildfire occurring early within the project. Further, this cumulative probability approach, as opposed to a constant probability approach, does not assume that any of the project burns in any given year, it rather addresses the cumulative probability that an event has occurred. We consider this to be a more a conservative approach than assuming fire every year.

We have revised the language within the methodology to set guidelines for the scale and shape parameters. Thank you for this suggestion, we believe it will be helpful to project developers.

3. **Wildfire Shadow Emissions**

We first wish to state that we expect fuels treatments to decrease the severity of wildfire, but not necessarily the size (acres) of the wildfire itself. To reiterate, the goal of this type of restoration is to reintroduce high-frequency, low-severity fire to the landscape. This effect, which is supported within Southwestern ponderosa pine literature[12] stems from a decrease in fire severity and increase in standing live trees adjacent to treatments due to changes in wildfire behavior (decreased severity). We agree that this item is a challenge to model and has uncertainty. For this reason we left this category as optional for those

[1] Finney, Mark A., Charles W. McHugh, and Isaac C. Grenfell. "Stand-and landscape-level effects of prescribed burning on two Arizona wildfires."*Canadian Journal of Forest Research* 35.7 (2005): 1714-1722.

[2] Kent, Larissa L. Yocom, et al. "Interactions of fuel treatments, wildfire severity, and carbon dynamics in dry conifer forests." *Forest Ecology and Management* 349 (2015): 66-72.

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developers who wanted to avoid additional uncertainty, and the deductions which stem from it.

We disagree that this element provides the bulk of carbon emission reduction credits. Our pilot project demonstrated a moderate contribution of emission reduction credits stemming from adjacent changes in wildfire behavior, but it by no means held the lion's share. We are interested in your comments on this item as this element of the methodology was one suggested by your colleagues at SIG in previous iterations of this methodology when our teams worked in conjunction. We welcome specific guidance on the minimum standard requirements you mention.

**4. Avoided redirection/vegetation type conversion**

We would like to begin by correcting the statement made by Katharyn Duffy (formerly Woods) in the webinar. This is not the source of an 'outstanding' source of credits, but a 'significant' one. The aim of this project is to protect live forest cover through restoration/fuels treatments. Mass mortality of forests is expected across the Southwestern US due to climate related stress. In addition the extent and frequency of high severity fire is increasing. This one-two punch is already creating de-forested landscapes, and is expected to increase in the future. Our methodology can almost be seen as a hybrid REDD+IFM methodology as it aims to preserve live forest cover. This was the intent of the comment that Katharyn made within the webinar.

The literature on Southwestern ponderosa pine regeneration following wildfire extends far beyond two citations and is very cohesive[3,4,5,6,7]. The change in carbon storage and sequestration is largely determined through growth and yield models such as ClimateFVS. We have added additional criteria and guidance to the methodology to address vagueness in this component and in the case of multiple citations available at project development and validation.

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[3] Savage, Melissa, Joy Nystrom Mast, and Johannes J. Feddema. "Double whammy: high-severity fire and drought in ponderosa pine forests of the Southwest." *Canadian Journal of Forest Research* 43.6 (2013): 570-583.

[4] Ouzts, Jessi, et al. "Post-fire ponderosa pine regeneration with and without planting in Arizona and New Mexico." *Forest Ecology and Management* 354 (2015): 281-290.

[5] Roccaforte, John P., et al. "Woody debris and tree regeneration dynamics following severe wildfires in Arizona ponderosa pine forests." *Canadian Journal of Forest Research* 42.3 (2012): 593-604.

[6] Savage, Melissa, and Joy Nystrom Mast. "How resilient are southwestern ponderosa pine forests after crown fires?." *Canadian Journal of Forest Research* 35.4 (2005): 967-977.

[7] Haire, Sandra L., and Kevin McGarigal. "Effects of landscape patterns of fire severity on regenerating ponderosa pine forests (Pinus ponderosa) in New Mexico and Arizona, USA." *Landscape Ecology* 25.7 (2010): 1055-1069.

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**5. Uncertainty estimates**

An additional sensitivity analysis approach has been added to highlight areas which add to uncertainty in the analysis and aid in their estimation.

**6. Aggregated emissions accounting**

We have bolstered the language in the Weibull probability section to clarify this issue. With permission and guidance from the American Carbon Registry we are willing to provide a template for emissions accounting aggregation and are happy to keep you apprised of this decision and progress. All further comments in this section are addressed in the Public Comments Response Document which will be available through the American Carbon Registry.

Thank you for your time and effort in reviewing this work. We look forward to future collaboration.

Best regards,

Katharyn Duffy
Methodology author

Spencer Plumb
Methodology author