**Ecologically, socially, and economically responsible wood bioenergy**

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The Forest Stewards Guild (also known as "The Guild") is glad to see Dr. Law (Law 2017) expand the conversation about who should benefit from the growing wood bioenergy economy. As Dr. Law highlights, the debate about wood bioenergy's impact on carbon, and hence the climate, is not settled. Even as researchers work to add clarity and certainty to the discussion of wood bioenergy's potential contributions to a low-carbon future, use of wood for energy in the U.S. and Europe continues to grow. Hence, the questions Dr. Law raises about its ecological sustainability and social equity are important to address before the investment sets the course for this expanding market.

The Guild has been engaged in these questions of the ecological, economic, and social impact of wood bioenergy for over a decade. Much of our work has focused on how to minimize the potential negative ecological impacts of wood bioenergy harvests (Forest Guild 2010, 2012, 2013, Evans 2016). We have also tried to highlight how bioenergy markets can be used as a tool to support good silviculture, restore fire-adapted forests, and support local communities (Perschel 2008, Evans and Finkral 2009). In fact, the Guild was founded with the idea that ecological forestry can support vibrant rural communities. We are committed to promoting forest management that is ecologically, socially, and economically responsible from the villages of northern New Mexico to those northern Vermont (and everywhere in between). In the long run, all three of these elements are required for sustainability, whether the products being removed are the highest-quality sugar maple or the lowest-value wood for bioenergy.

Because wood used for bioenergy usually has the lowest value of any forest product, its potential social or economic impact can be undervalued. However, wood bioenergy can have positive ripple effects throughout rural economies. Without markets such as a bioenergy market for low-value material, landowners may not be able to be able to afford silvicultural improvement thinnings (e.g., Munsell and Germain 2007). In the fire-adapted forests of the western U.S. that have become overly dense due to a century of fire suppression, markets for low value wood can help offset the cost of reducing the risk of large, high severity wildfires (e.g., Nielsen-Pincus et al. 2013). Wood bioenergy markets can also provide the social benefits of reduced heating costs and stable rural employment (e.g., Kukrety et al. 2015).

Based on projects the Guild has been involved with and the experiences of many of our members across the country, the sort of locally- or publically-controlled projects that Dr. Law highlights often have more ecological sustainable outcomes in the woods and more equitable outcomes in the community. Of course, project scale and ownership structure are not the only determinants of wood bioenergy project impacts. Many large corporations adhere to the highest social and ecological standards and, unfortunately, many locally-controlled projects have left degraded forests in their wake. Scale or ownership structure may provide a proxy for sustainability of wood bioenergy, but certification can provide a more direct assessment of forest management (though Dr. Law points to the link between ownership structure and certification). While certification systems such as the Forest Stewardship Council (FSC) do not focus specifically on wood bioenergy harvests, they are flexible enough to cover forest management regardless of the destination of the products. For example, FSC certification requires that "management maintains, enhances, or restores habitat components and associated stand structures, in abundance and distribution that could be expected from naturally occurring processes," (FSC 2010 p. 34) which would help ensure wood bioenergy harvests do not impact

wildlife habitat or regenerative capacity. FSC certification also measures the social impacts of forest management, such as requiring operations to strengthen and diversify the local economy (FSC 2010). Certification is already pervasive enough in some regions such as the Northeast that most bioenergy projects could draw some material from certified lands. Currently, it would be difficult to use only certified wood in a medium to large bioenergy project in the Northeast, but this may be more feasible in the future, particularly as certification pathways for non-industrial private landowners are simplified.

The Guild heartily encourages a boarder conversation about the costs, benefits, and impacts of wood bioenergy, to which Dr. Law has eloquently contributed. Just as the climate impact of wood bioenergy hinges on details such as the alterative fate of wood used for bioenergy, residual stand condition, regrowth, discount rates, landscape change, and substitution effects, social impact and benefit of wood bioenergy is determined by issues such as project scale and ownership structure. As a forestry community, we should work towards wood bioenergy projects that have a clear climate benefit, support good silviculture, contribute to the restoration of fire-adapted forests, enhance wildlife habitat, provide stable employment, and support vibrant rural communities.

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