

THURSDAY, SEPT. 5, 2019 | 4:10 P.M. | 103 KOTTMAN HALL

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### Executive Director, Au Sable Institute

#### *Effects of surface treatments and tree species on oil pad reforestation*

Anthropogenically induced forest fragmentation and perforation is a problem of increasing global significance. In northern lower Michigan (USA), a forest – dominated landscape, fragmentation and perforation have been exacerbated by habitat modification associated with oil and natural gas development since the 1970s. After oil and natural gas extraction have been completed on a given site, (well pad), vacated pads have not reforested naturally and have become infested by non-native species. To evaluate potential pathways to rehabilitation and reforestation of now vacant well pads, we evaluated survivorship and growth of four native tree species, *Pinus banksiana*, *Pinus resinosa*, *Quercus alba*, and *Quercus rubra*, planted in four different soil surface treatments – control (planting only, no treatment), disking, fertilization, and disking with fertilization - on vacant well pads. We concurrently determined response of herbaceous vegetation to the same treatments and evaluated differences in soil characteristics between well pads and surrounding forests. *Pinus resinosa* displayed highest survivorship regardless of treatment. Survivorship of all species except *Quercus rubra* was highest in disked treatment. Fertilization lowered survivorship in all species except *Quercus rubra*. Well pads had higher levels of Bray P, Ca, and Mg, but lower levels of Fe, organic matter and moisture. Concentrations of eight toxic chemicals and diesel range organics associated with drilling activity either were not different between well pads and forests, undetectable on both well pads and forests, or, if different, remained within levels acceptable for plant growth, indicating that soil toxicity was not a factor in limiting growth and survivorship of trees on pads. Soil treatment did not affect composition of herbaceous plant communities or presence or abundance of non-native species on well pads. In reforestation efforts on well pads, restorationists should plant *P. resinosa* in disked soil to achieve highest tree survivorship and density. Different restoration objectives will require different combinations of species and treatments.



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