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Intended Symposium: Landscape resilience to changing disturbance dynamics: bold approaches and solutions, Organized by Erica A.H. Smithwick

200 word limit

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Modeling carbon tipping points in the Greater Yellowstone Ecosystem: lessons learned

Climate change in the Greater Yellowstone Ecosystem is predicted to increase fire frequency dramatically, from 100-300 years to <30 years. More frequent fires will alter carbon (C) stocks by reducing the amount of C stored in biomass and soil and, potentially, by shifting vegetation distribution. However, the thresholds of fire frequency that could shift heterogeneous landscapes from C sinks to C sources are not known. Using downscaled climate projections and a dynamic ecosystem process model, we simulated that fire intervals <90 years will cause forests to shift from a net C sink to C source because the time between fires would be less than the time required to recover the C lost to fire. The capacity for post-fire regeneration of lodgepole pine and the projected increase in lodgepole pine productivity under warmer climate would not counter the consequences of reduced fire-return intervals. The magnitude of this shift depends on the future distribution of forest and non-forest ecosystems, fuels, ignition factors, and the accuracy of fire-climate relationships as future climate diverges increasingly from the past. Science-management partnerships should be encouraged to foster understanding of vegetation recovery capacity, patterns, and variability; early warning signals and indicators; and no-regrets strategies.