Project Title: Evaluating Landscape Pattern Change and Prioritizing Forest Management Activities in a Changing Environment.

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Description: In this project, we evaluated departure in spatial patterns of vegetation conditions of two subwatersheds (hereafter, the eastern and western) in an eastern Washington forest, from the patterns of two sets of reference conditions; one representing the broad variability of premanagement era (~1900) conditions, and another representing the broad variability associated with a warming and drying climate-change scenario. We used a diagnostic set of class and landscape metrics to compare current spatial patterns of test subwatersheds against the two sets of conditions.

In a companion decision-support model, built with the Ecosystem Management Decision Support modeling system, we considered the degree of vegetation departure in the subwatersheds relative to the two sets of reference conditions (recent historical and future warm-dry climate) along with two additional criteria (vulnerability to severe wildfire and timber harvest opportunity) to determine the relative priority of landscape restoration treatments and the potential for timber harvest to underwrite them. In EMDS, the current spatial pattern conditions of physiognomic types (forest, grassland, shrubland, woodland), land cover types (such as ponderosa pine, Douglas-fir), forest structural classes (such as stand initiation, young multistory forest), and those of late-successional and old forest patches of the two subwatersheds were compared against the two sets of reference conditions.

The degree of departure in spatial patterns of physiognomies was moderate in both subwatersheds in both comparisons. The situation was similar for the cover-type departure analysis, but spatial patterns of cover types increased in similarity to the reference conditions in the western subwatershed under the climate-change scenario. Patterns of structural conditions showed a high degree of departure in both subwatersheds when compared to either set of conditions, but similarity improved in the eastern subwatershed under the climate-change scenario. Spatial patterns of late-successional + old forest structure were strongly similar to the broad envelope of conditions represented by the pre-management era reference in the western subwatershed and moderately similar in the eastern subwatershed, but declined in both subwatersheds when compared with the climate-change reference conditions.

When the degree of departure in spatial patterns of all patch types was considered along with vulnerability to severe wildfire and timber harvest opportunity, the eastern subwatershed rated higher priority for landscape improvement using either set of reference conditions. We considered uncertainties inherent in the analysis approach, types of sensitivity analysis needed to investigate model performance, and broad implications for forest managers.

Deliverables:

Gärtner, S.; Reynolds, K.M.; Hessburg, P.F.; Hummel, S.S.; Twery, M. 2008. Decision support for evaluating landscape departure and prioritizing forest management activities in a changing environment. Forest Ecology and Management. 256: 1666-1676.

Intended Outcomes: In this project, we were intent on four outcomes: (1) Show that it is possible to quantitatively evaluate a host of landscape conditions against historical reference and any future climatic change conditions. (2) Show that historical vegetation pattern conditions along complex temperature and precipitation gradients are a good proxy for future vegetation conditions under varying climatic

scenarios. (3) Show that such analyses are readily coded into decision-support applications, which enables transparent visualization of any and all ecological evaluation outcomes and decisions based on them. (4) Show that landscapes can be evaluated side by side, and restoration priorities may be made based on landscape evaluation outcomes, which are set in the context of other relevant social and economic values.