Case Study 3: Southeastern Oregon & Central Montana shrublands and grasslands

Trend:

- LANDFIRE FRCC appears to underestimate the effect of widespread invasion of annual grasses into sage shrublands in southeastern Oregon and to overestimate departure in central Montana grasslands.

Theme:

- Current vegetation alteration, such as invasion by exotic plants, is captured in the maps used to produce LANDFIRE FRCC.
- LANDFIRE FRCC may under-represent the influence of current vegetation alteration because current vegetation data are aggregated to the subsection level for FRCC calculations.
- The changes to current fire regime due to phenomena such as invasive annual grasses are not accounted for in LANDFIRE FRCC.
- Some BpS vegetation models are modeled with more SClasses than can be adequately mapped due to limitations of LANDFIRE EVT, canopy cover, and height. Sometimes this is not discovered until it is too late to change the models.
- Sometimes reviewer input cannot be directly applied to correct for inadequacies of mapped canopy cover or height to reduce or increase departure.

Conclusion:

FRCC appeared to underestimate the effect of invasive annual grasses in southeastern Oregon because:

1. Exotics mapped to generally less than 50% of the area in the sagebrush BpS units in most subsections where exotics mapped at all. This resulted in moderate rather than high departure estimates.
2. Areas with higher densities of exotics plots did not necessarily map to high densities of exotics, due to a high density of non-exotic plots in these same areas.

FRCC appeared to overestimate departure in central Montana grasslands because:

1. LANDFIRE canopy cover appeared to underestimate canopy cover.
2. LANDFIRE canopy height appeared to underestimate canopy height.
3. The SClass descriptions for this BpS required greater resolution and accuracy of canopy cover and height than likely could be mapped using LANDFIRE methods.

Discussion:

LANDFIRE FRCC appeared to underestimate the effect of exotic plants in sagebrush communities of southeastern Oregon because they occupied only a percentage of the total area of a sagebrush BpS within a given Ecological subsection (Figure 1 and Figure 5). To show the effect of exotic plants as FRCC III, the exotics would have to map on at least 66% of the area in a given BpS in a given subsection. A BpS with 66% of its area occupied by exotics would produce roughly 66% departure, and thus be assigned to FRCC III. In the subsections where exotic plants mapped strongly, they often occupied less than 50% of the area within a BpS. At times the relative area in exotics is reduced by the multiple polygons associated with a single

subsection; this would occur if exotics dominated strongly in one polygon of the subsection and were absent from the others (Figure 5).

It is important to note two facts about the role of exotic plants in LANDFIRE FRCC mapping. First, if these exotic plants are primarily annual grasses, their potentially large effect on current fire regimes, such as increases in fire frequency and fire spread rates, are not accounted for in LANDFIRE FRCC calculations. Only the amount of area that they occupy within a BpS in a given subsection in the SClass layer is used for calculating the departure effect of exotics. Thus LANDFIRE FRCC may under-represent the degree of total ecological and fire regime departure associated with exotics. Second, due to the complex nature of the classification tree methods used to predict exotics, an area with many exotics plots is not necessarily guaranteed to map strongly to exotics (Figure 5). Exotics may also map strongly in areas that have few exotics plots, generally if non-exotics plots are rare or absent. In some cases, areas with a high density of exotics plots are surrounded by a high density of plots not attributed to exotics, which could occur when one area of a landscape is intensively sampled. These non-exotics plots may be true negatives if exotics are absent or below required thresholds. However such non-exotics plots may be false negatives if they have sufficient dominance of exotics in reality, because this information may not be adequately recorded in the plot data, such as failure to record cover of exotic annual grasses if they have senesced for the season.

LANDFIRE FRCC appeared to overestimate departure in central Montana grasslands due to limitations of the LANDFIRE canopy cover and height layers and the level of resolution of cover and height required to fit the SClass descriptions in the BpS vegetation model for this system. This BpS was modeled with 3 SClasses, distinguished based on canopy cover and height. The dominant reference SClass would have been A, which would have been expected to have moderate canopy cover and be 0.5-1 meters in height. However, the very low mapped canopy cover and height put most pixels clearly in B, which is described as low cover and height due to prairie dog disturbance and intense native herbivore grazing; this SClass would have been expected to be a small proportion of the reference conditions. The guidance given during SClass review was to move pixels with 20-60% cover from B into A and ignore the mapped height, because A is intended to characterize higher canopy cover than B. However, due to the strong dominance of the 10-20% canopy cover class in the map (Figure 4), many pixels remained in B (Figure 3), which resulted in a moderate to high departure measurement for this system. The low variability of mapped canopy cover and height is likely the result of very few training plots for these attributes in grassland systems in this Zone, combined with the inability of Landsat imagery to help distinguish height in grassland systems. Of the few available plots, several recorded low to moderate canopy cover, which may simply reflect the time of the year that they were measured in addition to the drought status of that year.

The mapping of LANDFIRE FRCC in central Montana grasslands highlights a few notable limitations of the LANDFIRE FRCC process. First, models are developed by experts to fit the best available ecological understanding of a system, but descriptions of the SClasses may be somewhat different than the ecological intent of those SClasses because they are described in terms of the classes used in LANDFIRE Cover and Height maps. This makes it difficult to know which SClass is most appropriate when an error is suspected in the cover or height layers. Second, when few training plots are available or poor relationships exist between Landsat

imagery and vegetation cover or height, mapped canopy cover or height may not adequately depict reality. This would lead to potentially incorrect SClasses being mapped, and result in erroneous estimates of FRCC. Third, the distinctions described between SClasses in the BpS vegetation models may be more subtle than can be adequately discriminated in LANDFIRE maps. In this case, there are more unique successional stages in these models than can be adequately discriminated with the data available to LANDFIRE, leading to mismatches between the simulated reference conditions and the current conditions used for FRCC.

Zone	BpS unit (Figure 2)	Dominant FRCC (Figure 1)	Dominant Fire Regime Group	Reference or Current?	Dominant SClass	Dominant Cover Range (Figure 4)	Dominant Height (Figure 4)	SClass instructions from review
9	**10800:** Inter-Mountain Basins Big Sagebrush Shrubland	II	III	**RC**	C	10-20%	Shrub Short (0.5-0.9m)	• Many areas very departed because of exotic grasses • Mostly C & D today • Trees are UN
				CC	D, UE (Figure 3)	10-30%	Shrub dwarf (<0.5 m)	
	11240: Columbia Plateau Low Sagebrush Steppe	I	III,IV	**RC**	C	10-30%	Shrub dwarf (<0.5 m)	• Trees are UN
				CC	C (Figure 3)	10-30%	Shrub dwarf (<0.5 m)	
	11250: Inter-Mountain Basins Big Sagebrush Steppe	I-II	III	**RC**	C	10-20%	Shrub Short (0.5-0.9m)	• Many areas departed because of exotic grasses • Canopy height underestimated, should be short shrubs • Trees are UN
				CC	D (Figure 3)	10-30%	Shrub dwarf (<0.5 m)	
20	**11410:** Northwestern Great Plains Mixedgrass Prairie	III	II	**RC**	A	10-60%	Herb Short (0.5-0.9m)	• Canopy cover appears greatly underestimated, this should have higher cover • Move pixels with 20-60% canopy cover from B to A
				CC	B (Figure 3)	10-20%	Herb short (<0.5 m)	

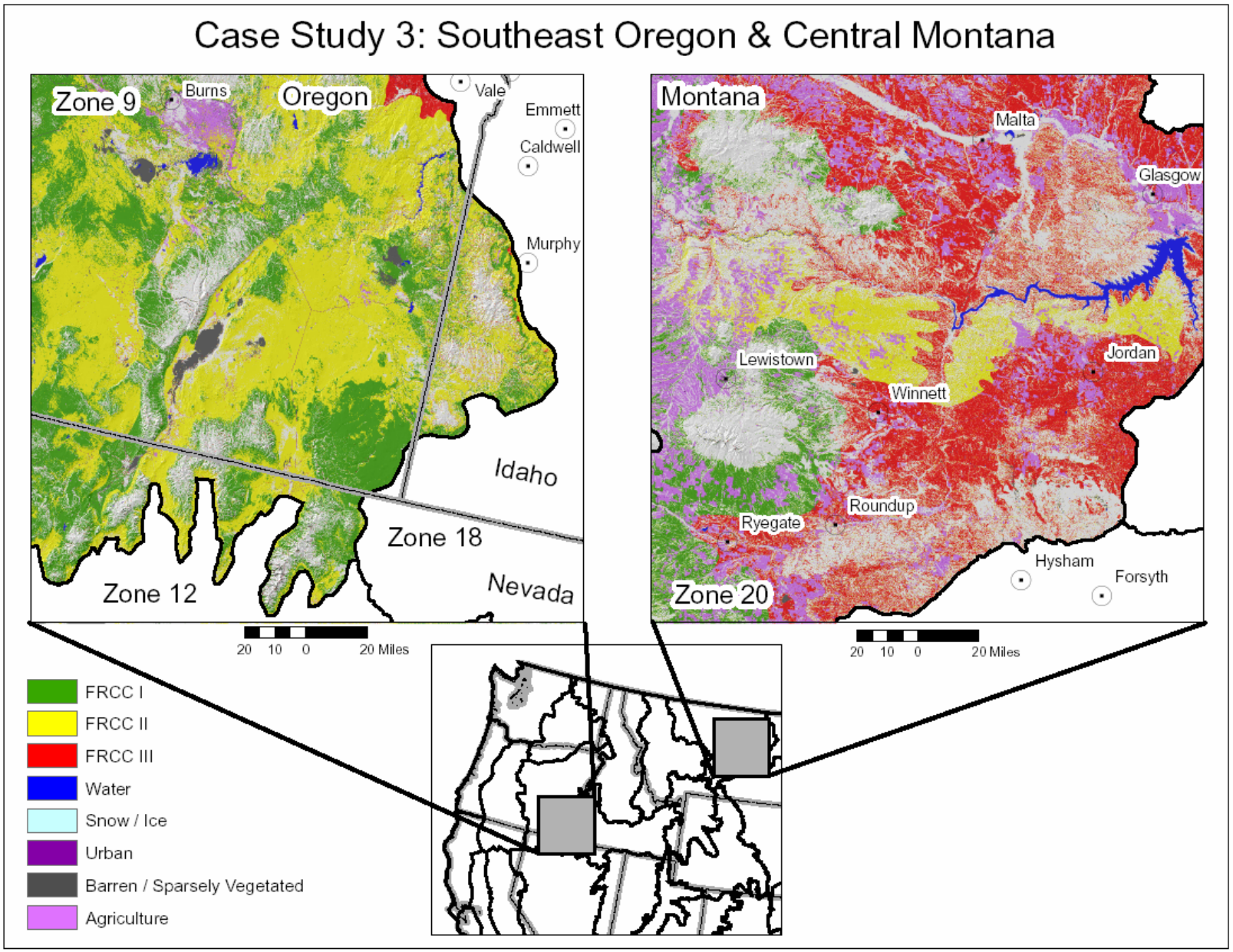

Figure 1: LANDFIRE FRCC for dominant grassland and shrubland systems in Zones 9, 12, 18 in Oregon, Idaho, and Nevada and Zone 20 in Montana (note: Zones 12 and 18 are pending remapping efforts; these data are excluded from this analysis). See Figure 9 for BpS units shown.

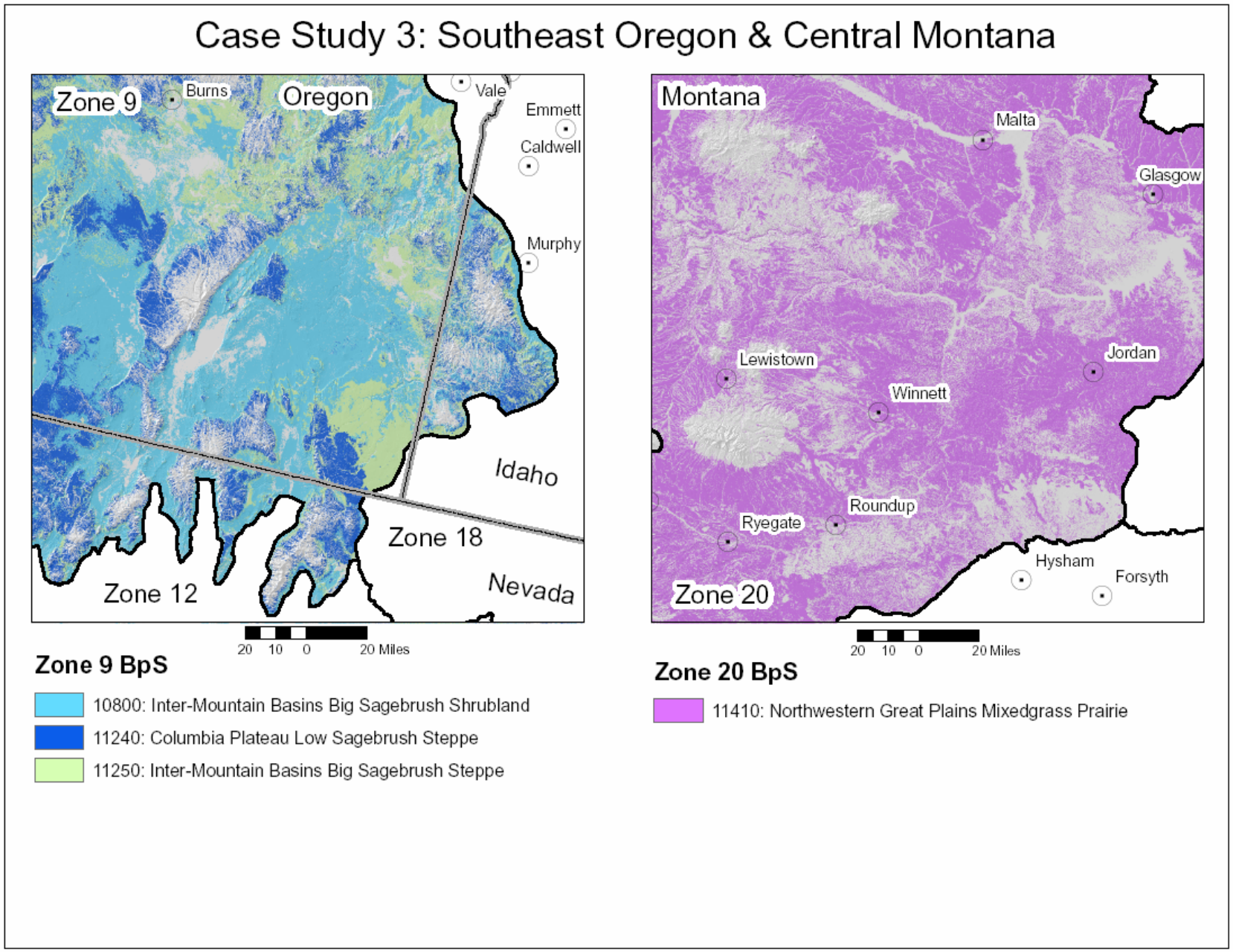

Figure 2: LANDFIRE BpS for dominant shrublands and grasslands in Zones 9 and 20.

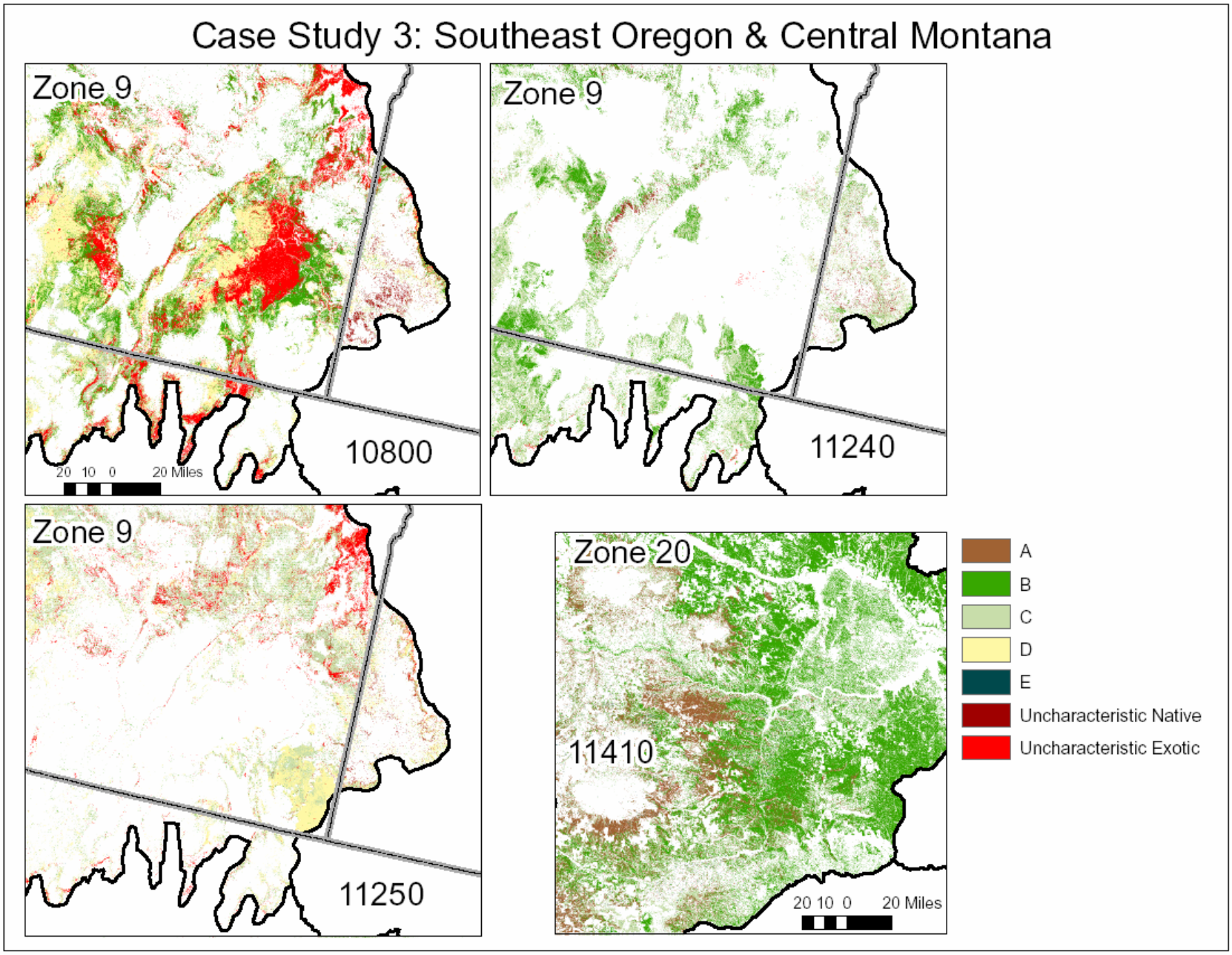

Figure 3: LANDFIRE SClass for dominant shrubland and grassland systems in Zones 9 and 20.

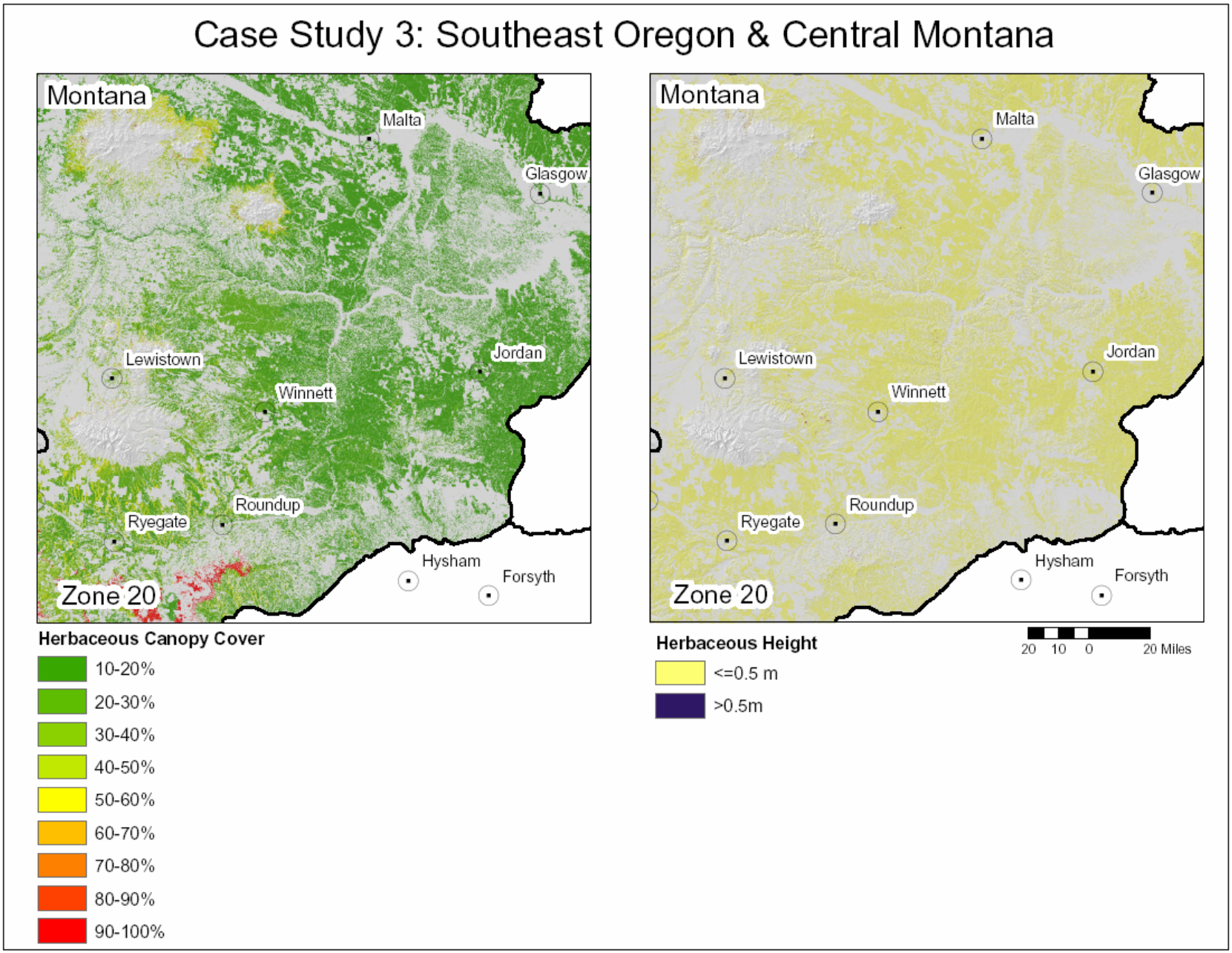

Figure 4: LANDFIRE Canopy Cover and Height for dominant grassland system in Zone 20.

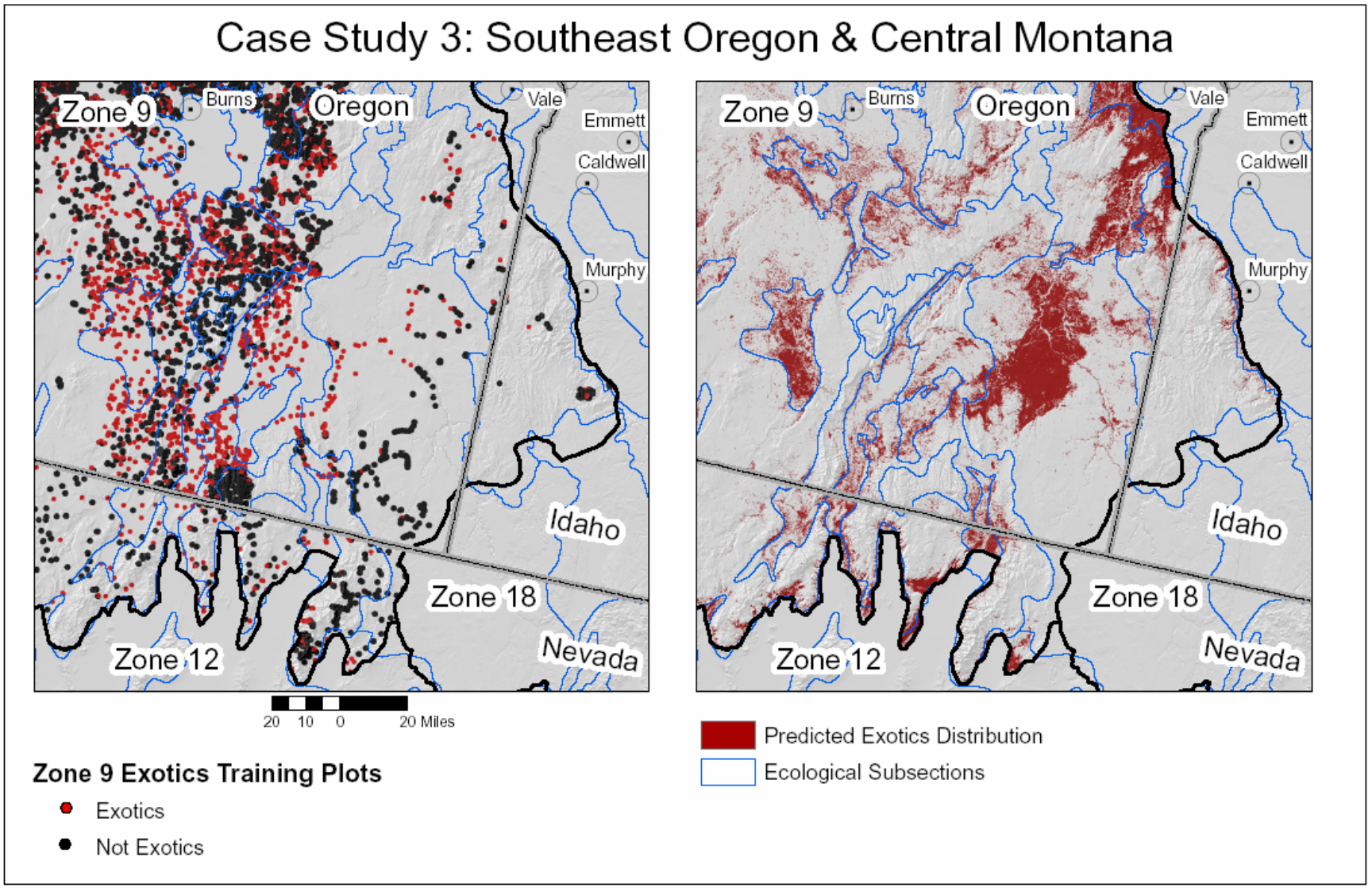

Figure 5: Training plots and predicted exotics distribution used for LANDFIRE SClass mapping in Zone 9.