

# South Spring and Hamblin Valley Watersheds Draft Proposed Restoration Treatments for the Implementation Strategy Document

## *Introduction*

The Ely District manages approximately 660,000 acres of the combined South Spring and Hamblin Valley watersheds, located within Northeastern Great Basin and Mojave/Southern Great Basin Resource Advisory Council jurisdictions. The Implementation Strategy for Cave Valley and Lake Valley watersheds is the last phase of a four-part watershed analysis.

Fire Regime Condition Class (FRCC) methodology was used to assess the watersheds' ecological condition. Although called "fire regime" condition, FRCC is an integrated, landscape-level estimate of the ecological condition of terrestrial and riparian ecological systems. FRCC incorporates species composition, vegetation structure, and disturbance regimes to estimate an ecological system's departure from a Desired Range of Conditions (DRC). Ecological departure is measured using the Fire Regime Condition (FRC) metric, a scale of 0 to 100 where higher numbers indicate higher departure from DRC. Since the cost and management urgency to address different uncharacteristic vegetation classes varies greatly, a separate designation and calculation of "high-risk" vegetation classes (e.g. cheatgrass invaded) was also applied.

Management strategies were explored to achieve the objectives for six focal ecological systems in the watershed. Predictive state-and-transition computer models were used to simulate conditions under alternative future management scenarios. Using computer-based models, the likely future condition of six focal ecological systems was assessed after 20 years under four scenarios:

- (1) Minimum management – e.g., no treatment of invasive species, no thinning;
- (2) Current management – continuation of current treatments, as relevant;
- (3) Maximum management – management treatments to restore ecological condition to the greatest possible degree, regardless of budget; and
- (4) Streamlined management – management strategies to improve ecological condition at reduced cost or relatively low investment.

Return on investment (ROI) was calculated to compare ecological benefits to costs, both *within* and *across* ecological systems. Land managers may select final strategies based upon a variety of additional factors, such as availability of financial resources, policy constraints, and non-ecological objectives.

## Key Findings

- **The majority of the watersheds' ecological systems are highly or moderately departed from their DRC.** Of the area's 14 ecological systems, 10 were either highly or moderately departed, including the three largest systems which collectively comprise almost 75% of the area.
- **Six focal systems require special attention, including four sagebrush systems, aspen and montane riparian (Figure 1).** These six include three highly departed systems and three moderately departed (Figure 2). Three of the six focal systems also have very high percentages of high-risk vegetation classes.

Black sagebrush	213,640 acres	62% departure (FRCC 2)
Wyoming big sagebrush	164,291 acres	54% departure (FRCC 2)
Mountain big sagebrush	14,472 acres	75% departure (FRCC 3)
Low sagebrush steppe	3,831 acres	81% departure (FRCC 3)
Aspen-mixed conifer	11,963 acres	84% departure (FRCC 3)
Montane riparian	1,400 acres	66% departure (FRCC 2)

- **Sagebrush systems** have experienced pinyon-juniper encroachment, diminished herbaceous cover, and increasing cover of cheatgrass within shrublands. Both Black sagebrush and Wyoming big sagebrush have cheatgrass present in over 30% of their area.
- **Aspen-mixed conifer woodland** has 85% in the late succession class (versus a DRC of 1%), and is thereby facing a potential dramatic loss of aspen clones.
- **Riparian** systems have experienced entrenched streams on over 60% of their acreage.
- **Over the next 20 years, five of the six focal systems are predicted to become increasingly departed from DRC and/or have increases in high-risk vegetation, without thoughtful active management.**
- **Various management strategies were explored for each targeted ecosystem, using computer simulations to test their effectiveness and adjust the scale of application. Multiple strategies are required for most ecosystems:**
  - **Sagebrush** strategies tested include: restoring sagebrush with both annual and perennial grasses through mowing and herbicide application; restoring tree-encroached sagebrush through thinning, herbicide and seeding; restoring depleted sagebrush with mowing and seeding of native herbaceous species; annual grass control followed by seeding with native and introduced plant species; chainsaw lopping and canopy thinning of encroaching conifer trees; chaining; and prescribed fire.

- *Aspen* strategies tested include prescribed fire. Mechanical operations were not possible due to slopes exceeding 15% in many wilderness areas.
- *Riparian* strategies tested include weed inventory, spot application of herbicides, and restoration of entrenched stream banks.
- **The “streamlined” management scenarios improved FRC results as compared to both minimum and current management for all ecological systems, reducing ecological departure from high (FRCC 3) to low (FRCC 1) for one system and achieving moderate departure (FRCC 2) for five other systems.** Using computer models, varied management strategies were tested to improve ecological condition at reduced cost or relatively low investment. Streamlined management also reduced high-risk vegetation as compared to minimum management for all systems. However, current management scenarios produced slightly better results in reducing high-risk classes for three sagebrush systems. There is no current management for the low sagebrush steppe or montane riparian systems.
- **The “maximum” management scenarios largely eliminated or substantially reduced high-risk vegetation classes for all six ecological systems, except aspen-mixed conifer, and moved four systems to low departure (FRCC 1); however, this scenario achieved these results at a very high dollar cost.** For example, the total 20-year cost for maximum management on the four sagebrush systems was \$45 million, over four times higher than the combined streamlined management cost of approximately \$10 million for these systems.
- **Across the six focal systems, the streamlined management scenarios produced the highest area-weighted return on investment for the black sagebrush, montane sagebrush and Wyoming Big Sagebrush systems, even though the black and Wyoming systems had very high absolute costs (see table of Summary of ecological change, total cost, and Return-on-Investment).** The low sagebrush, aspen-mixed conifer and montane riparian systems showed lower ROI, as management costs were relatively high to achieve ecological improvements on their smaller acreage.

### ***Recommended Strategies, Annual Application Rates and Costs***

The following strategies are recommended for the six focal systems (see three tables below). The average annual cost for managing all six systems (~410,000 acres) with the recommended strategies is approximately \$560,000 per year, over 20 years. Some strategies have higher application rates during the first five years, so the average annual cost in these earlier years is higher. Tables showing the application rates and costs for all scenarios are provided in the main body of the report. Prescribed fire polygons applied to reference classes (i.e., classes of succession retaining native herbaceous and shrub cover) are shown in Figure 3. Polygons were situated on slopes >15%, including >30% slope, due to very limited acres on slopes <15%. Prescribed fire on steeper slopes would likely require helicopter burning. Chaining polygons of reference classes on slopes less than

15% are presented in Figure 4. Treatments included substantial areas of different uncharacteristic vegetation classes (i.e., no understory herbaceous cover detected, tree-encroached shrublands, shrubs with cheatgrass in the understory, annual grasslands, entrenched or degraded creeks) that were not mapped by LANDFIRE, and therefore not mappable here except as uncharacteristic by biophysical setting (Figure 5). Because South Spring and Hamblin valleys contains mostly uncharacteristic vegetation, BLM restoration effort would require field scouting of these classes or new remote sensing that separates all vegetation classes.

<b><i>Black Sagebrush</i></b>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Restoration of shrubs with annual grasses by mowing, herbicide application and seeding	50	50	\$ 220
Restoration of shrubs with annual & perennial grasses by herbicide application	1800	1800	\$ 40
Restoration of tree-encroached shrubland (two-way chaining and seeding with native and introduced plant species after the first chaining).	675	675	\$ 280
Restoration of depleted sagebrush by mechanical thinning and seeding	660	660	\$ 180
<b>Average Annual Cost</b>	<b>\$ 390,500</b>	<b>\$ 390,500</b>	

<b><i>Wyoming Big Sagebrush</i></b>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Restoration of tree-encroached shrubland (two-way chaining and seeding with native and introduced plant species after the first chaining).	-	85	\$ 280
Restoration of shrubs with annual & perennial grasses by herbicide application	515	515	\$ 40
Restoration of shrubs with annual grasses by mowing, herbicide application and seeding	150	150	\$ 220
Chaining of late succession classes to restore early succession classes	115	115	\$ 90
<b>Average Annual Cost</b>	<b>\$ 63,100</b>	<b>\$ 85,780</b>	

<b><i>Mountain Big Sagebrush</i></b>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Prescribed fire in late success class to restore early succession classes	525	-	\$ 50
Chaining of late success class to restore early succession classes	800	-	\$ 90
<b>Average Annual Cost</b>	<b>\$ 98,170</b>	<b>\$ 0</b>	

<i>Low Sagebrush Steppe</i>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Chainsaw felling and limbing tree-encroached classes	415	-	\$ 170
<b>Average Annual Cost</b>	<b>\$ 70,600</b>	<b>\$ 0</b>	

<i>Aspen-Mixed Conifer Woodland</i>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Prescribed fire applied to late succession classes	700	75	\$ 150
<b>Average Annual Cost</b>	<b>\$ 104,300</b>	<b>\$ 11,075</b>	

<i>Montane Riparian</i>	Average acres/yr <b>Years 1-5</b>	Average acres/yr <b>Years 15-20</b>	Cost/acre (\$)
Exotic weed inventory	10	10	\$ 50
Exotic weed control (herbicide application)	6	6	\$ 260
Floodplain restoration to entrenched stream banks	5	5	\$ 2000
<b>Average Annual Cost</b>	<b>\$ 11,300</b>	<b>\$ 11,300</b>	

**Summary of Condition: Desired Range of Condition, Current Condition, and Forecasted Condition in 20 Years with Recommended Management**

The following table summarizes the 20-year outcomes from the recommended strategies, showing results relative to DRC for each vegetation class for each system. The two columns on the right show the outcomes for FRC and high-risk vegetation.

Sagebrush Systems	Early	Mid Open	Mid Closed	Wooded Phase		Un	FRC	High-Risk %	
				Late Open	Late Closed				
<b>Black Sagebrush</b>									
DRC	10	45		25	15	5			
Current Condition	0	14		9	15	62	62	46	
w/Minimum Mgmt	5	8		9	11	67	67	46	
w/ Recommended Mgmt	9	11		20	11	49	<b>46</b>	<b>35</b>	
<b>Wyoming Sagebrush</b>									
DRC	15	35	30	10	5	5			
Current Condition	0	7	40	4	11	39	54	10	
w/Minimum Mgmt	13	4	24	6	7	47	48	28	
w/ Recommended Mgmt	14	5	27	6	7	41	<b>43</b>	<b>25</b>	
<b>Mountain Sagebrush</b>									
DRC	20	50	15	5	5	5			
Current Condition	0	0	20	10	63	8	75	8	
w/Minimum Mgmt	10	14	12	4	47	16	56	13	
w/ Recommended Mgmt	12	43	9	2	21	14	<b>29</b>	<b>10</b>	
<b>Low Sagebrush</b>									
DRC	24	57		19					
Current Condition	0	0		20		80	81	80	
w/Minimum Mgmt	11	1		15		73	73	73	
w/ Recommended Mgmt	16	34		14		35	<b>36</b>	<b>35</b>	
<b>Aspen-Mixed Conifer</b>									
	Early		Mid1 Closed	Mid2 Closed	Late Open	Late Closed	Un	FRC	High-Risk
DRC	15		35	40	9	1			
Current Condition	9		2	3	1	85		84	0
w/Minimum Mgmt	20		16	2	9	46	6	57	6
w/ Recommended Mgmt	27		40	2	7	21	4	<b>41</b>	<b>4</b>
<b>Montane Riparian</b>									
	Early		Mid Closed			Late Closed	Un	FRC	High-Risk
DRC	16		29			55			
Current Condition	10		4			20	66	66	66
w/Minimum Mgmt	3		12			13	72	72	71
w/ Recommended Mgmt	5		16			14	65	<b>65</b>	<b>65</b>

### Summary of ecological change, total cost, and Return-on-Investment (ROI).

This table summarized much of the previous information. The ROI values are new and reflect ecological change relative to the minimum management multiplied by the total area of the biophysical setting and divided by the cumulative 20-year cost. Black, Wyoming big, and montane big sagebrush have the highest and comparable ROI values. The montane-subalpine riparian achieved the lowest ROI. Results suggest that managers might want to focus on the three largest sagebrush systems based purely on ecological change and costs.

Ecological System	Ecological Departure					High Risk Classes					Acres	20 Year Cost Streamlined Mgmt	Stream-lined Mgmt ROI (area-weighted)	
	Current Condition	Minimum Mgmt - 20 yrs	Maximum Mgmt	Current Mgmt	Stream-lined Mgmt	Current Condition	Minimum Mgmt - 20 yrs	Maximum Mgmt	Current Mgmt	Stream-lined Mgmt				
Black Sagebrush	62	67	36	54	46	46	46	11	31	35	213,640	\$ 7,809,600	8.8	
Wyoming Big Sagebrush	54	48	32	44	43	10	28	11	22	25	164,291	\$ 1,600,800	8.2	
Montane Sagebrush Steppe	75	55	27	30	29	8	13	8	3	10	14,472	\$ 490,500	8.6	
Low Sagebrush	81	73	35	-	36	80	73	35	-	35	3,831	\$ 352,800	0.8	
Aspen Mixed-Conifer	84	57	46	46	40	0	6	7	6	4	11,963	\$ 693,800	0.3	
Montane-Subalpine Riparian	66	72	65	-	65	66	72	64	-	65	1,400	\$ 231,000	0.1	
<b>Total</b>											409,597	\$ 11,179,000		
<i>Average Cost per Year (over 20 years)</i>													\$ 559,000	

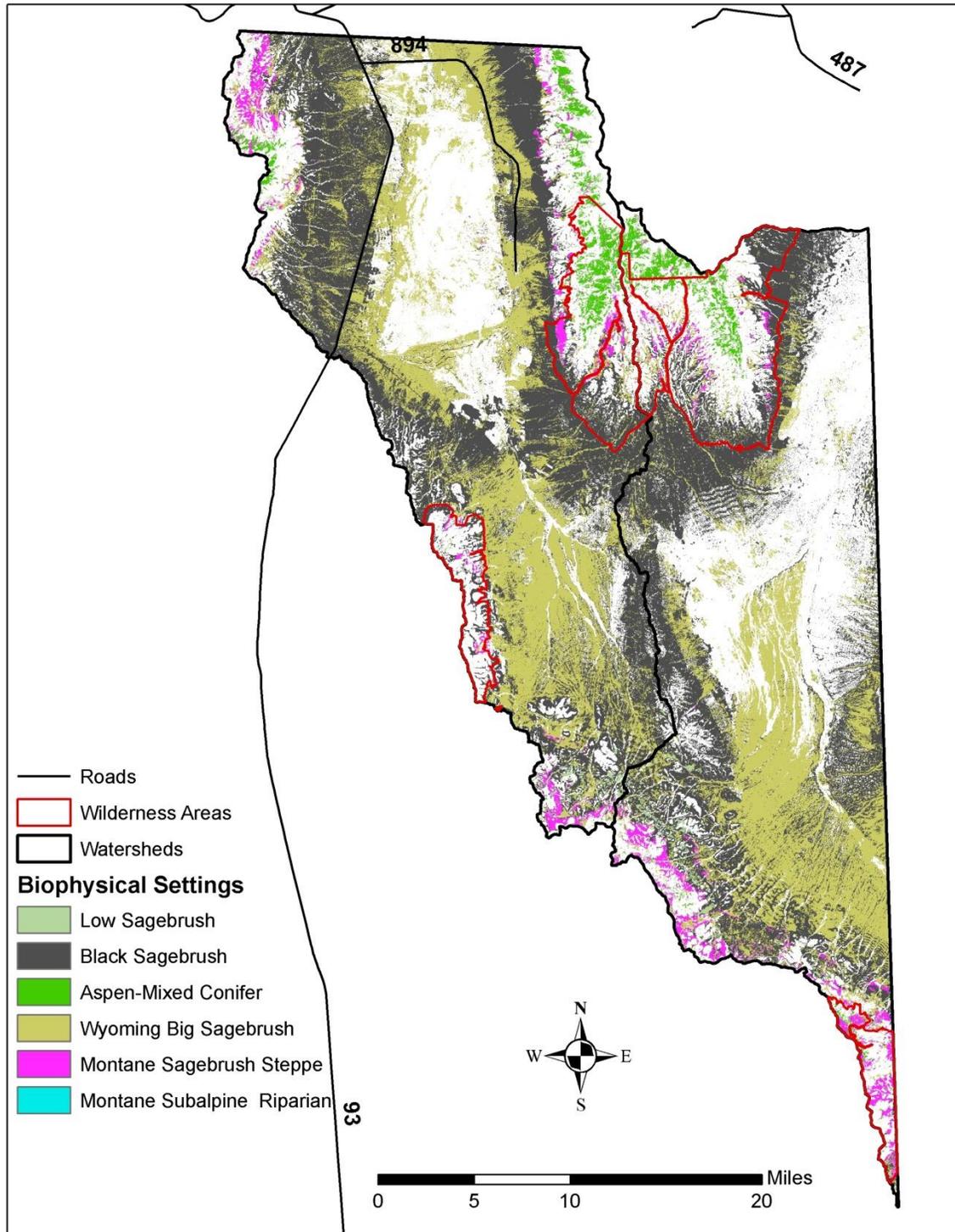


Figure 1. The six targeted biophysical settings of South Spring and Hamblin valleys.

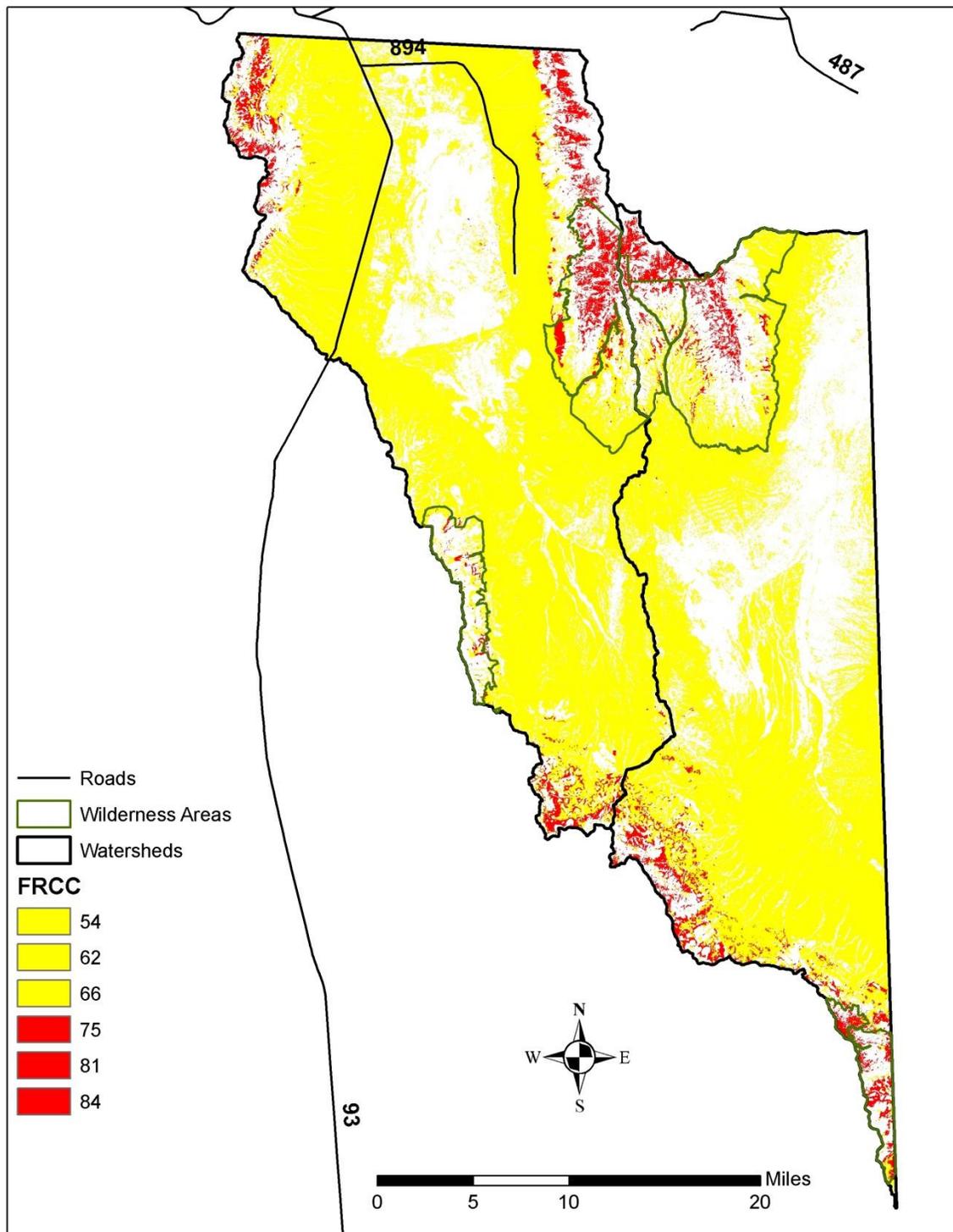


Figure 2. Fire Regime Condition Class (FRCC) of the six targeted biophysical settings of South Spring and Hamblin Valleys. Yellow and red, respectively, represent FRRC 2 and 3. The value shown in the legend is Ecological Departure percentage (aka, Fire regime Condition).

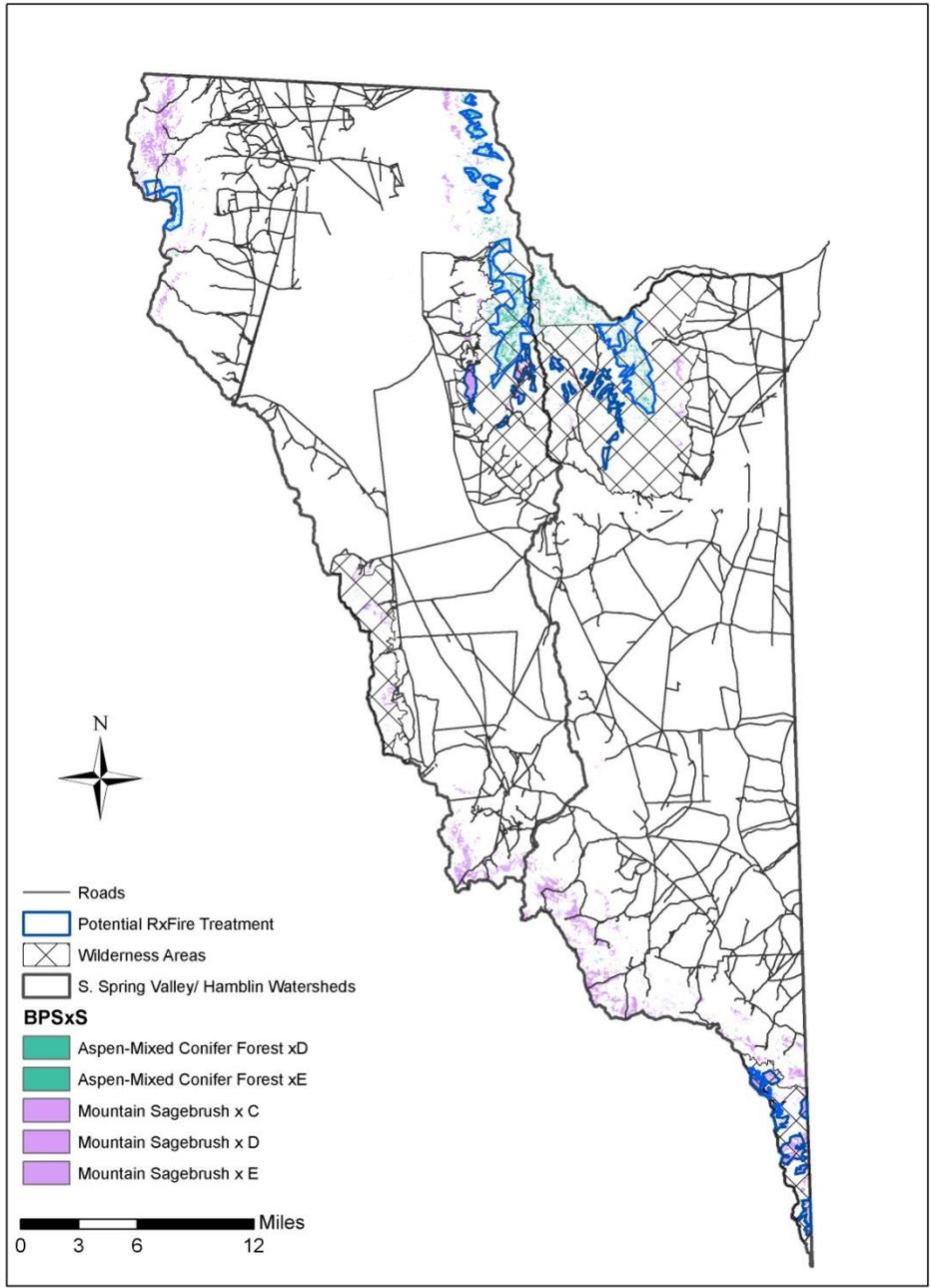


Figure 3. Prescribed fire polygons in reference classes of aspen-mixed conifer and mountain sagebrush. Most polygons are situated on steep slopes perhaps requiring helicopter burns.

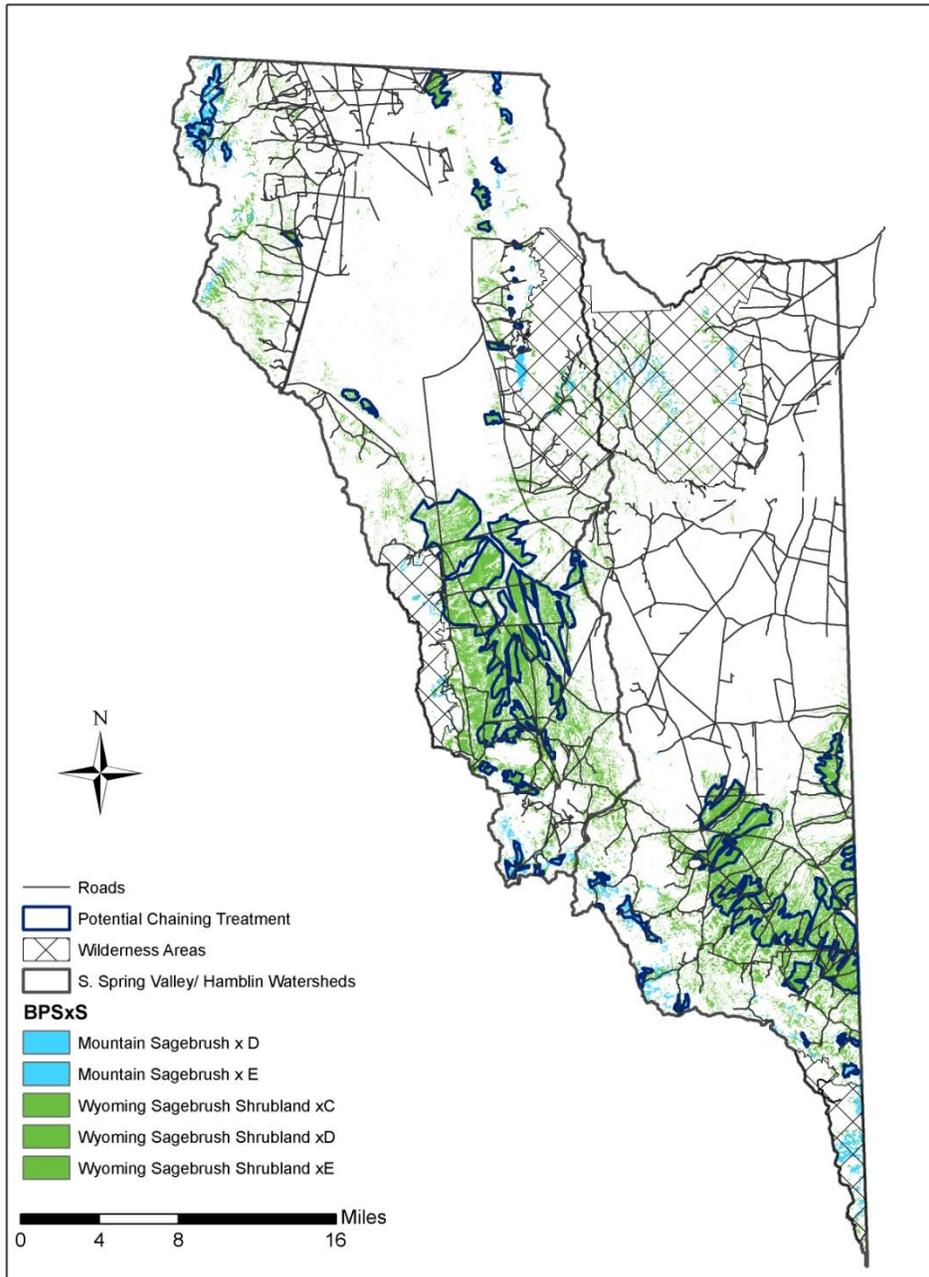


Figure 4. Chaining polygons in reference classes of mountain sagebrush and Wyoming big sagebrush. Polygons are situated on slopes perhaps <15%.

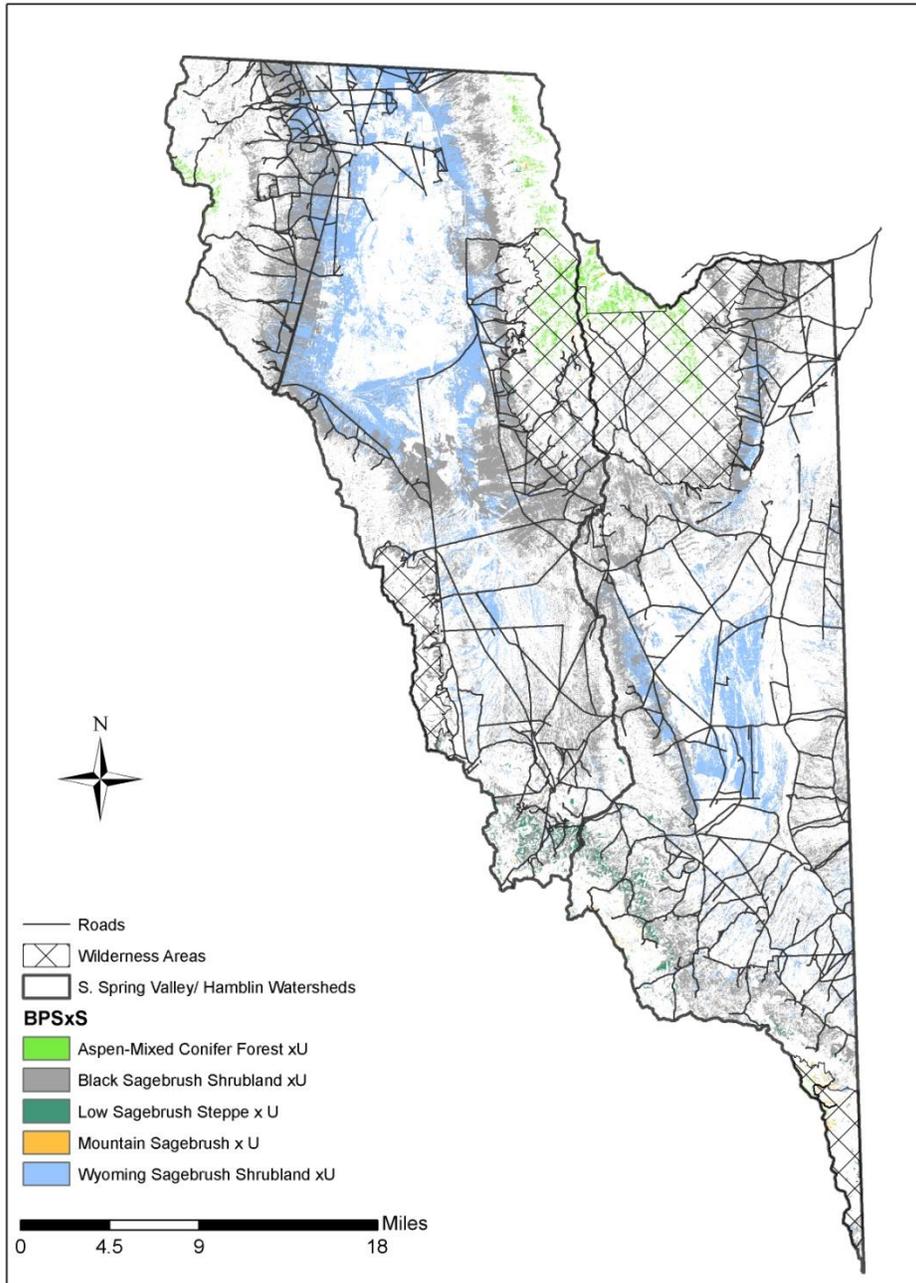


Figure 5. Uncharacteristic vegetation class by biophysical setting requiring substantial restoration areas. Different uncharacteristic classes are not mappable as a limitation of LANDFIRE.