Sensitivity to Scale and Fire Regime Inputs in Deriving Fire Regime Condition Class

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Abstract

The **Fire Regime Condition Class (FRCC)** is a composite departure measure that compares current vegetation structure and fire regime to historic reference conditions. FRCC is computed as the average of: 1) **Vegetation departure and condition class** (VDEP and VCC); and 2) **Regime (frequency and severity) departure and condition class** (RDEP and RCC). FRCC assessments are applied as ecological condition measures across the U.S. for land and fire management plans, National Environmental Policy Act documents, project plans, burn plans, and agency reporting. Input data to FRCC computation include amounts of different successional stages within biophysical settings, estimates of current fire frequency and severity, historical reference conditions for successional stages, frequency, and severity, and the analysis area extent. The analysis extent area is commonly represented by hydrologic units (HUCs) for regional and local assessments and LANDFIRE Map Zone for national assessments.

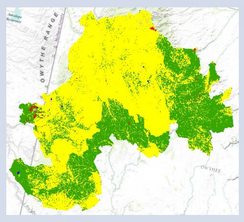
Mapping methods and quality have substantially improved with the development of a Guidebook and the FRCC Mapping Tool with associated User Guide and Tutorial. Our tests of mapping FRCC indicate that resulting FRCC metrics are highly sensitive to analysis scales of landscape extents, assumptions of current and historical fire regimes, and resolution of input maps. Examples of these effects and management implications are presented along with recommendations. We conclude that when appropriately mapped the Strata FRCC is a very useful measure of ecological condition, while the Stand FRCC is a very useful measure for prioritizing local vegetation and fuel treatments. The Regime Conditions of Frequency and Severity are highly useful for prioritizing wildland and prescribed fire options, as well as designing vegetation and fuel treatments.

Study Area

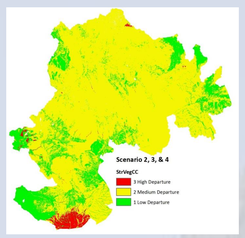
The study area is 275,000 hectares of Juniper Mountain located in Owyhee County of southwestern Idaho. The area is dominated by mountain big sagebrush steppe (*Artemiaia tridentata* ssp. *vaseyana*) and low sagebrush (*Artemisia arbuscula*) biophysical settings. Western juniper (*Juniperus occidentalis* ssp. *occidentalis*) has been expanding into areas that were previously sagebrush steppe. The area is rich in wildlife and is grazed by livestock in the summer.

The elevation in the area ranges from 1480 m to 2074 m. Precipitation ranges from 300 to 600 mm, increasing with elevation. The majority of the winter precipitation is snow while the majority of the spring precipitation is rain, with a dry summer and fall. The annual average temperature varies from a low of -6.6 ° C in December to 26.7° C in July.

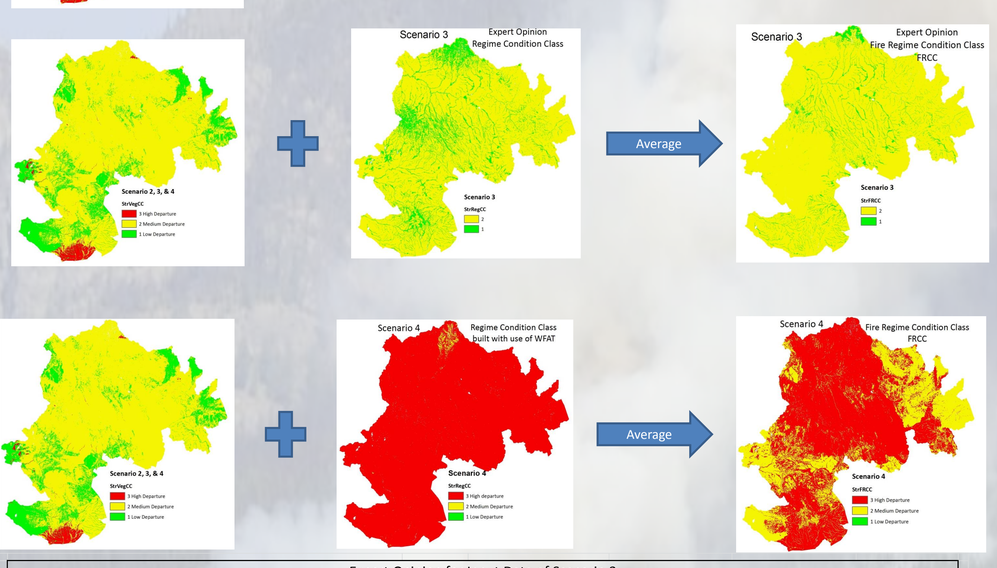
Output Strata Maps



Scenario 1: Landfire download of VCC



Scenario 2: $FRCC_{MT}$ using LANDFIRE BpS Group-SCLASS



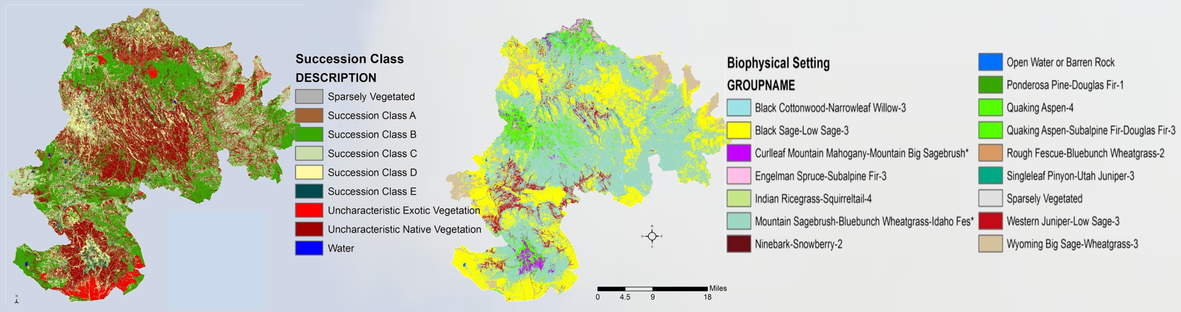
Scenario 3

Scenario 4

Expert Opinion for Input Data of Scenario 3					
BpS GROUPNAME	Area (ha)	Reference FRQ years	Reference SEV %	Current FRQ years	Current SEV %
Mountain Sagebrush-Bluebunch Wheatgrass-Idaho Fescue	128090	50	100	120	80
Black Sage-Low Sage	79670	85	37	250	50
Black Cottonwood-Narrowleaf Willow	17760	61	22	120	22
Quaking Aspen	17360	100	100	150	80
Wyoming Big Sage-Wheatgrass	15810	59	62	25	90
Western Juniper-Low Sage	10740	98	26	250	50
Curlleaf Mountain Mahogany-Mountain Big Sagebrush	3750	64	26	150	50
Quaking Aspen-Subalpine Fir-Douglas Fir	2280	54	46	120	65

Input Data

We obtained biophysical setting and succession class input layers from LANDFIRE Refresh 2008. We used biophysical setting group model for the comparisons.



Hydrologic unit code layers at the 8th, 10th and 12th level were obtained from Idaho Water Resources.

Scenarios

FRCC is an ecological measure of departure from reference historical or "natural" conditions. FRCC is calculated as the average of the vegetation departure (VDEP) and fire regime departure. VDEP reflects departure of successional vegetation class composition from reference, while regime departure (RDEP) represents departure of frequency and severity. We compare four approaches to calculating FRCC ecological departure metrics.

1. Download VDEP/VCC from LANDFIRE Refresh2008 – no run in the $FRCC_{MT}$.
2. VDEP/VCC from $FRCC_{MT}$ using LANDFIRE BpS Group-SCLASS inputs.
3. FRCC from $FRCC_{MT}$ using LANDFIRE BpS Group-SCLASS and Fire Frequency and Severity based on Expert Opinion (see table near references).
4. FRCC from $FRCC_{MT}$ using LANDFIRE BpS Group-SCLASS and Fire Frequency and Severity from LANDFIRE disturbance layers and WFAT.

Scenario	Source	INPUTS				OUTPUTS			
		BPS	S-Class	HUC	Source of Current FRQ and SEV	Vegetation	Regime	Stand FRCC	Strata FRCC
1	Download from LANDFIRE	BPS Group	S-Class	LANDFIRE 8, 10,12	NA	VCC/VDEP	NA	NA	NA
2	Run FRCCmt	BPS Group	S-Class	Other source 8, 10, 12	NA	VCC/VDEP	NA	Stand FRCC	NA
3	Run FRCCmt	BPS Group	S-Class	Other source 8, 10, 12	Expert opinion	VCC/VDEP	RCC/RDEP	Stand FRCC	Strata FRCC
4	Run FRCCmt	BPS Group	S-Class	Other source 8, 10, 12	LANDFIRE Disturbance Layer	VCC/VDEP	RCC/RDEP	Stand FRCC	Strata FRCC

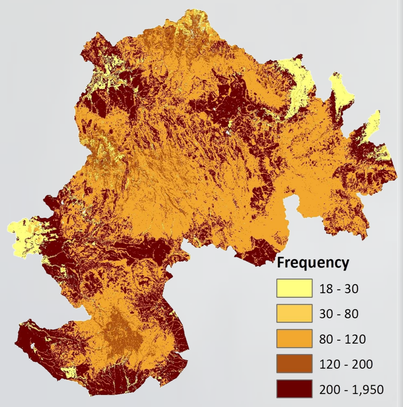
Implications & Recommendations

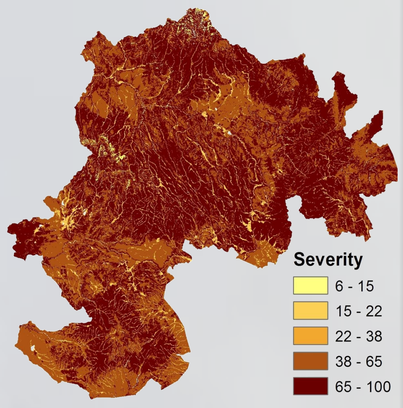
Metric	Recommended Use
Strata Fire Regime Condition Class (Strata FRCC)	Ecological departure at a regional level
Stand Fire Regime Condition Class (Stand FRCC)	Identifying treatment areas at a local level
Vegetation Condition Class (VCC)	Forest and rangeland health measure
Regime Condition Class (RCC)	Management treatment design

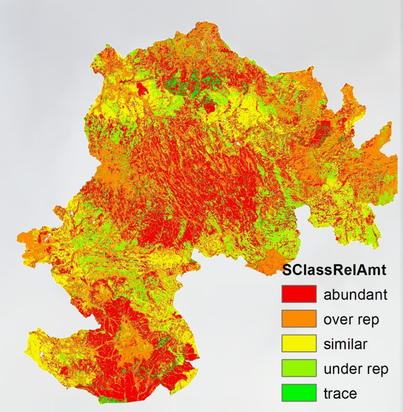
Conclusions

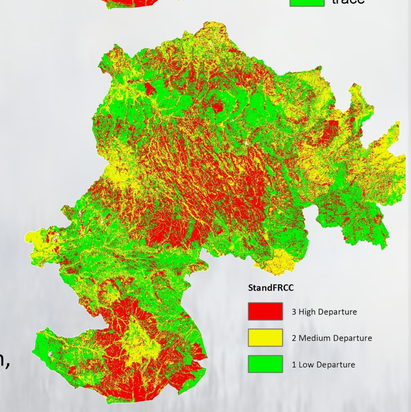
- VCC is highly sensitive to the analysis extent. We recommend a standardized hydrologic unit layer available for download in conjunction with the LANDFIRE inputs of BpS and S-class.
- RCC and Fire Frequency are highly sensitive to temporal scale but less sensitive to spatial scale. We recommend careful considerations when selecting the current inputs for frequency and severity.
- The latest version of LANDFIRE no longer includes any of the FRCC metrics (these cannot be downloaded from LANDFIRE). The FRCC Mapping Tool derives these metrics essential for local analyses along with Stand FRCC, Relative Amount, Frequency Departure, and Severity Departure.
- The FRCC methodology needs to have additional metrics that indicate how much Frequency and Severity are above or below reference conditions.

Output FRCC Mapping Tool









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Software

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Background photo courtesy of the USDA Forest Service

Integrating science, technology and fire management.
Wildland Fire Management RD&A

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