**Supplemental Online Material**

Supplemental Table 1. Parameters used to initialize the ponderosa pine and dry mixed conifer forest types in the Forest Vegetation Simulator. kph = kilometers per hour

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Ponderosa pine forest type** | **Dry mixed conifer forest type** |
| *Fire and Fuels Extension* |  |  |
| Year of fire | 2020 | 2020 |
| Wind speed | 32 kph | 32 kph |
| Moisture Level | Very dry | Very dry |
| Temperature | 31˚ C | 29˚ C |
| Percent stand burned | 100% | 100% |
| Season | After greenup, before fall | After greenup, before fall |
| Fuel moisture (%) |  |  |
| 1-hr | 1.24 | 1.37 |
| 10-hr | 1.77 | 1.97 |
| 100-hr | 3.19 | 3.79 |
| 1000-hr | 7.02 | 7.02 |
| Duff | 12 | 12 |
| Live woody fuels | 60 | 60 |
| Live herbaceous fuels | 22 | 23.57 |
| Fuel model | 164 (TU4); weight 0.5 | 164 (TU4); weight 0.5 |
|  | 165 (TU5); weight 0.5 | 165 (TU5); weight 0.5 |
| *Maximum stand density index* | 450 | 450 (based on ponderosa pine) |

Supplemental Table 2. Species, regeneration values, and sources used in post-fire scenario 1, where conifers regenerate following a wildfire. Regeneration numbers from stand data refer to the mean number of stems less than 25.5mm diameter per stand.

|  |  |  |  |
| --- | --- | --- | --- |
| **Forest type** | **Species** | **Stems ha-1** | **Source** |
| **Dry mixed conifer** | Ponderosa pine | 116.3 | Stoddard et al. (2015) |
| Douglas-fir | 30.1 | Stoddard et al. (2015) |
| White fir | 76.3 | Stoddard et al. (2015) |
| Aspen | 975 | Stoddard et al. (2015) |
| Gambel oak | 7,571 | Stoddard et al. (2015) |
| Piñon pine | 9.8 | Stand data |
| **Ponderosa pine** | Ponderosa pine | 10.7 | Outz et al. (2015) |
| Douglas-fir | 2.5 | Stand data |
| White fir | 7.4 | Stand data |
| Aspen | 32.1 | Stand data |
| Gambel oak | 1,741.3 | Waltz et al. (2003) |
| Piñon pine | 1.3 | Waltz et al. (2003) |
| Rocky Mountain juniper | 2.47 | Stand data |

Supplemental Table 3. Species and regeneration values by forest type used in the no-disturbance FVS run to simulate baseline forest type changes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Forest Type** | **Species** | **Seedlings/acre** | **Survival percent** | **Shade Code** |
| Ponderosa pine | *Pinus ponderosa* | 9 | 100 | Sparse plots |
| Dry mixed conifer | *Pinus ponderosa* | 5 | 100 | Sparse plots |
|  | *Abies concolor* | 30 | 80 | Sparse plots |
|  | *Abies lasiocarpa var. arizonica* | 5 | 80 | Uniform |
|  | *Picea pungens* | 5 | 80 | Uniform |
|  | *Populus tremuloides* | 5 | 30 | Sparse plots |
|  | *Pseudotsuga menziesii* | 10 | 80 | Sparse plots |

*Supplementary indicator information*

**Diameter distribution skew (Fire)**

Increasingly positive skew in diameter distributions indicates a higher proportion of small trees in the stand, which act as ladder fuels and increase the possibility of crowning (Pollet and Omi 2002). We used the skew of historical diameter distributions for southwestern ponderosa pine (1909-1913; Moore et al. 2004) and dry mixed conifer (1870; Fulé et al. 2009) forests, including all species in both forest types for comparison to current conditions. Diameter distributions were calculated for each stand in the study area and compared to the 75th percentile of skew for reference conditions in the same forest type (Table 2).

**Fire simulations (Fire)**

To assess potential resilience, a fire was simulated and forest types (using basal area of ponderosa pine) were reevaluated 35 years post-fire, a time period chosen to account for the majority of post-fire mortality and allow regeneration and establishment to take place.Weather parameters for fire simulations were derived from 97th percentile fire season (April 1 to July 31) conditions at Remote Automated Weather Stations (RAWS) located near the project area. Separate stations were used to represent the climate space of each forest type: Jarita Mesa (elev: 2,683m; N 36.556, W 106.103) for dry mixed conifer and Deadman Peak (elev: 2,575m; N 36.423, W 106.772) for ponderosa pine (Western Regional Climate Center 2016). Fuel moistures and weather percentile values were generated with FireFamilyPlus v4.1 (Bradshaw and McCormick 2000). Wind speed values were increased above the 97th percentile value to 32km/hr in both forest types to account for the importance of gusting in fire behavior (J. Arciniega, personal correspondence). Fuel models TU4 and TU5 (Scott and Burgan 2005) were applied with equal weights in both forest types (J. Arciniega, personal correspondence). We modeled three possible regeneration scenarios in 2021 (1 year post-fire) contingent on post-fire overstory conifer survival by stand. If live overstory conifers were present following the simulated fire, conifer seedlings were naturally regenerated in the model at rates consistent with findings of previous work in the Southwest (Table 7). If no conifers were present following the fire, only sprouting species (aspen and Gambel oak) were regenerated at rates consistent with their pre-fire stem density. If the pre-fire species composition did not include sprouting species and no live overstory conifers were present following the fire, no post-fire regeneration was modeled.

**Canopy bulk density (Fire)**

Canopy bulk density was estimated using the FVS-FFE. In a comparison of fire effects in treated vs. untreated stands in Arizona and New Mexico, Cram et al. (2006) found that stands with pre-fire CBD of 0.075kg/m3 or greater had close to 100% crowning rates, indicating that flames moved into the forest canopy, causing high mortality. We considered stands in the project area with CBD less than 0.075kg/m3 to be resistant to crown fire and therefore more likely to be resilient to a wildfire of any type (Table 2).

**Canopy strata (Western spruce budworm)**

The FVS structural statistics output was used to predict the number of canopy layers in each stand.

**Stand Aspect (Western spruce budworm)**

Stands with south-facing aspects are more susceptible to high severity WSBW outbreaks (Brookes et al. 1985). To identify stands with south-facing aspects (135°-225°) we used the Environmental Systems Research Institute’s (ESRI) Spatial Analyst extension to ArcGIS (Environmental Systems Research Institute, 2011) to calculate mean aspect for each stand polygon using a LANDFIRE 30-meter resolution digital elevation model (DEM; LANDFIRE 2015).