Supplementary Table S1. List of species occurring at site 1 and site 2 with their growth habit and nativity status1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Scientific Name**  | **Common Name** | **Site 1** | **Site 2** | **Growth Habit** | **Native Status** | **Desirability**  |
| *Alyssum simplex* | Rudolphi alyssum | X | X | Forb | Nonnative | Desirable |
| *Ambrosia psilostachya*  | Western ragweed | X | X | Forb | Native | Desirable |
| *Andropogon geradii* | Big bluestem | X |   | Grass | Native | Desirable  |
| Antennaria gaertn. | Pussytoes | X | X | Forb | Native | Desirable  |
| *Artemisia dracunculus*  | Tarragon | X | X | Sub-shrub | Native | Desirable  |
| *Artemisia frigida* | Fringed sagebrush | X | X | Sub-shrub | Native | Desirable  |
| *Artemisisa ludoviciana*  | White sagebrush | X | X | Sub-shrub | Native | Desirable  |
| *Astragalus agrestris* | Purple milkvetch | X | X | Forb | Native | Desirable  |
| *Astragalus flexuosus* | Flexile milkvetch | X | X | Forb | Native | Desirable  |
| *Astragalus laxmanii* | Laxmann's milkvetch |   | X | Forb | Native | Desirable  |
| *Astragalus spp.* | Milkvetch |   | X | Forb | Native | Desirable  |
| *Boechera stricta* | Canada rockcress | X | X | Forb | Native | Desirable  |
| *Bouteloua dactyolides* | Buffalograss | X | X | Grass | Native | Desirable  |
| *Bouteloua gracilis* | Blue grama | X |   | Grass | Native | Desirable  |
| *Bromus tectorum*  | Downy brome | X | X | Grass | Nonnative | Undesirable |
| *Comandra umbellata*  | Bastard toadflax |   | X | Forb | Native | Desirable  |
| *Cryptantha virgata* | Miner's candle |   | X | Forb | Native | Desirable  |
| *Elymus elymoides* | Bottlebrush squirreltail |   | X | Grass | Native | Desirable  |
| *Ericameria nauseosa*  | Rubber rabbitbrush | X | X | Shrub | Native | Desirable  |
| *Erigeron divergens* | Spreading fleabane | X |   | Forb | Native | Desirable  |
| *Erigeron flagellaris*  | Trailing fleabane | X | X | Forb | Native | Desirable  |
| *Eriogonum umbellatum* | Sulfur-flower buckwheat | X | X | Forb | Native | Desirable  |
| *Eriogonum jamesii* | James' buckwheat |   | X | Forb | Native | Desirable  |
| *Erodium cicutarium* | Redstem filaree | X |   | Forb | Nonnative | Undesirable  |
| *Erysimum capitatum* | Western wallflower |   | X | Forb | Native | Desirable  |
| *Euphorbia brachycera* | Horned spurge |   | X | Forb | Native | Desirable  |
| *Gaillardia aristata* | Blanketflower | X | X | Forb | Native | Desirable  |
| *Geranium caespitosum*  | Parry’s Geranium |   | X | Sub-shrub | Native | Desirable  |
| *Grindelia squarrosa* | Curlycup gumweed | X | X | Forb | Native | Desirable  |
| *Helianthus pumilus* | Little sunflower | X | X | Forb | Native | Desirable  |
| *Hesperostipa comata* | Needle-and-thread | X | X | Grass | Native | Desirable  |
| *Heterotheca villosa* | Hairy false goldenaster | X | X | Sub-shrub | Native | Desirable  |
| *Hypericum perforatum*  | Common St. Johnswort | X | X | Forb | Nonnative | Undesirable |
| *Gutierrezia sarothrae* | Broom snakeweed  |   | X | Shrub | Native | Desirable  |
| *Koeleria macrantha* | Prairie Junegrass | X | X | Grass | Native | Desirable  |
| *Linarius dalmatica* | Dalmatian toadflax | X | X | Forb | Nonnative | Undesirable |
| *Liatris punctata* | Dotted blazing star | X | X | Forb | Native | Desirable  |
| *Lupinus argenteus*  | Silvery lupine | X |   | Forb | Native | Desirable  |
| *Mirabilis hirsuta* | Hairy four o'clock |   | X | Forb | Native | Desirable  |
| *Opuntia polyacantha* | Plains pricklypear | X | X | Shrub | Native | Desirable  |
| *Pascopyrum smithii* | Western wheatgrass | X | X | Grass | Native | Desirable  |
| *Plantago patagonica* | Woolly plantain | X |   | Forb | Native | Desirable  |
| *Poa compressa* | Canada bluegrass | X | X | Grass | Nonnative | Desirable  |
| *Poa pratensis* | Kentucky bluegrass | X | X | Grass | Nonnative | Desirable  |
| *Potentilla hippiana* | Woolly cinquefoil |   | X | Forb | Native | Desirable  |
| *Psoralidium tenuiflorum* | Slimflower scurfpea | X | X | Forb | Native | Desirable  |
| *Ratibida columnifera* | Upright prairie coneflower | X | X | Forb | Native | Desirable  |
| *Rosa woodsii* | Woods' rose |   | X | Forb | Native | Desirable  |
| *Tragopogon dubius*  | Yellow salsify  | X | X | Forb | Nonnative | Undesirable |
| *Rhus trilobata* | Skunkbush sumac | X |   | Shrub | Native | Desirable  |
| *Senecio spartisoides*  | Broom-like ragwort |   | X | Sub-shrub | Nonnative | Desirable  |
| *Silene drumondii* | Drummond's campion |   | X | Forb | Native | Desirable  |
| *Solidago altissima* | Tall goldenrod | X |   | Forb | Native | Desirable  |
| *Sphaeralcea coccinea* | Scarlet globemallow | X |   | Forb | Native | Desirable  |
| *Symphyotrichum falcatum* | White prairie aster | X | X | Forb | Native | Desirable  |
| *Thlaspi arvense* | Field pennycress | X |   | Forb | Nonnative  | Undesirable |
| *Verbascum blattaria* | Moth mullein | X | X | Forb | Nonnative | Undesirable |
| *Yucca glauca* | Soapweed | X | X | Shrub | Native | Desirable  |

1 Taxonomic information for species were collected from the USDA-NRCS Plants Database.

Supplementary Table S2. Results of linear mixed model ANOVA tests for the effects of treatment, burn type, and year on *Bromus tectorum* cover. Sites were combined for analysis of variance.

|  |  |
| --- | --- |
|   | *B. tectorum* |
| Source | df | *F*a | *P*b |
| Year | 1 | 2.452 | 0.118 |
| Treatment  | 10 | 42.854 | **<0.0001** |
| Burn Type | 1 | 49.157 | **<0.0001** |
| Year x Treatment | 10 | 0.918 | 0.516 |
| Year x Burn Type | 1 | 0.488 | 0.485 |
| Treatment x Burn Type  | 10 | 3.652 | **<0.01** |
| Year x Treatment x Burn Type | 10 | 0.609 | 0.806 |

a*F* = F-statistic from Analysis of Variance summary table; df = degrees of freedom

b*P* = P-value from Analysis of Variance summary table, α = 0.05; values in bold indicate significance at P < 0.05

Supplementary Table S3. Results of linear mixed model ANOVA tests for the effects of treatment and burn type on perennial grass, perennial forbs, and shrub/sub-shrub cover.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   | Perennial Grass | Perennial Forbs | Shrubs/sub-shrubs |
| Source | df | *F*a | *P*b | *F*a | *P*b | *F*a | *P*b |
| Site 1  |   |   |   |   |   |   |   |
| Year | 1 | 14.164 | **<0.001** | 36.535 | **<0.001** | 0.188 | 0.665 |
| Treatment | 10 | 2.919 | **0.002** | 1.241 | 0.271 | 1.253 | 0.264 |
| Burn Type  | 1 | 1.365 | 0.291 | 1.871 | 0.172 | 0.598 | 0.471 |
| Year x Treatment | 10 | 0.214 | 0.995 | 1.095 | 0.371 | 0.076 | 0.999 |
| Year x Burn Type | 1 | 0.109 | 0.742 | 15.68 | **<0.01** | 0.001 | 0.979 |
| Treatment x Burn Type | 10 | 0.623 | 0.792 | 2.225 | **0.02** | 2.972 | **0.002** |
| Year x Treatment x Burn Type | 10 | 0.154 | 0.998 | 0.678 | 0.742 | 0.363 | 0.96 |
|   |  |  |  |  |  |  |   |
| Site 2 |  |  |   |   |   |   |   |
| Year | 1 | 6.687 | **0.011** | 19.054 | **<0.001** | 14.658 | **<0.001** |
| Treatment | 10 | 1.444 | 0.168 | 2.285 | 0.017 | 2.107 | **0.028** |
| Burn Type  | 1 | 0.758 | 0.399 | 2.637 | 0.203 | 1.023 | 0.322 |
| Year x Treatment | 10 | 0.684 | 0.738 | 0.418 | 0.934 | 0.179 | 0.997 |
| Year x Burn Type | 1 | 0.073 | 0.788 | 0.118 | 0.732 | 0.048 | 0.826 |
| Treatment x Burn Type | 10 | 0.83 | 0.6 | 1.649 | 0.1 | 0.217 | 0.994 |
| Year x Treatment x Burn Type | 10 | 0.962 | 0.479 | 0.699 | 0.723 | 0.421 | 0.934 |

a*F* = F-statistic from Analysis of Variance summary table; df = degrees of freedom

b*P* = P-value from Analysis of Variance summary table, α = 0.05; values in bold indicate significance at P < 0.05.

Supplementary Table S4. Results of linear mixed model ANOVA tests for the effects of treatment, burn type, and year on species richness, Shannon’s diversity index, and Simpson’s diversity index.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   | Species Richness | Shannon's Diversity Index | Simpson's Diversity Index |
| Source | df | *F*a | *P*b | *F*a | *P*b | *F*a | *P*b |
| Site 1 |  |  |  |  |  |  |  |
| Year | 1 | 0.009 | 0.951 | 0.705 | 0.403 | 0.012 | 0.912 |
| Treatment | 10 | 1.183 | 0.902 | 1.593 | 0.116 | 1.359 | 0.207 |
| Burn Type | 1 | 0.0 | 0.996 | 0.027 | 0.879 | 0.002 | 0.965 |
| Year x Treatment | 10 | 0.814 | 0.974 | 0.787 | 0.641 | 0.603 | 0.809 |
| Year x Burn Type | 1 | 0.039 | 0.918 | 0.161 | 0.689 | 0.843 | 0.36 |
| Treatment x Burn Type | 10 | 0.847 | 0.963 | 0.789 | 0.629 | 1.058 | 0.399 |
| Year x Treatment x Burn Type | 10 | 0.598 | 0.987 | 0.391 | 0.949 | 0.683 | 0.739 |
|  |  |  |  |  |  |  |  |
| Site 2 |  |  |  |  |  |  |  |
| Year | 1 | 0.348 | 0.154 | 0.713 | **0.001** | 0.714 | **0.012** |
| Treatment | 10 | 0.294 | 0.793 | 1.113 | 0.244 | 1.267 | 0.093 |
| Burn Type | 1 | 0.178 | **<0.0001** | 0.372 | **0.023** | 0.683 | **0.025** |
| Year x Treatment | 10 | 0.02 | 0.997 | 2.634 | 0.819 | 4.967 | 0.497 |
| Year x Burn Type | 1 | 0.517 | 0.701 | 0.655 | 0.077 | 0.988 | **0.03** |
| Treatment x Burn Type | 10 | 70.354 | 0.739 | 70.107 | **<0.001** | 40.898 | **<0.001** |
| Year x Treatment x Burn Type | 10 | 3.739 | 0.998 | 13.163 | 0.68 | 8.776 | 0.539 |

a*F* = F-statistic from Analysis of Variance summary table; df = degrees of freedom

b*P* = P-value from Analysis of Variance summary table, α = 0.05; values in bold indicate significance at P < 0.05.

Supplementary Figure S1. Diagram of experimental design. With the exception of block 1, herbicide treatments were randomized within each block. Each row represents a block. The study includes 11 treatments, applied in four replications/blocks within the two burn types, and two sites, resulting in 176 experimental units.