**Supplementary Table S1.** Examples of herbicides that have been found to be effective at controlling *Salsola*, along with authors, environmental setting, formulation and application rate, and timing.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Authors** | **Environmental Setting** | **Effective Herbicides** | **Formulation and application rate, if available** | **Timing** |
| McGinnies 1968 | Rangeland | 2,4-D | “Amine formulation of 2,4-D (2,4- dichlorophenoxyacetic acid) at a rate of 3 lb acid equivalent in 60 gal water/acre was applied with a hand sprayer.” | When *Salsola* plants were 15.2-30.5 cm tall |
| Antill et al 2012 | Rangeland | Metsulfuron-methyl  | “Applied at 20 g ha-1 in 20 L of water” with backpack sprayer | July |
| Fick et al. 2016 | Rangeland | Plateau © | “(Ammonium salt of imazapic (±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid; BASF, Florham Park, New Jersey), at a rate of 327 liters/ha (35 gal/acre)” | July |
| Young and Whitesides 1987 | Small-grain, summer-fallow rotation | Chlorsulfuron Glyphosate plus chlorsulfuronParaquatBromoxynil plus metribuzin | “Chlorsulfuron {2 -chloro-N-[[(4 -methoxy- 6-methyl - 1, 3 , 5 - triazin-2-yl)amino] carbonyl] benzenesulfonamide}”“Commercialpremix of glyphosate (108 g/L as the isopropylaminesalt)”“Paraquat (1,1'-dimethyl-4,4'-bipyridinium ion)”“bromoxynil(3,5-dibromo-4-hydroxybenzonitrile) plus metribuzin[4-amino-6-(1 , 1 -dimethylethyl)-3 - (methylthio)-1, 2 , 4-triazin- 5 (4H)-one]”“All herbicide treatments were applied as commercially available formulations in water at 95 L/ha and 2 1 0 kPa with a backpack sprayer. A nonionic surfactant at 0.25% v/v was addedto all herbicide treatments except…a commercialpremix of glyphosate (108 g/L as the isopropylaminesalt).” | September 5, *Salsola* plants were 40-55 cm tall and approximately 75% flowered |

**Supplementary Table S2.** List of plant species present in the study. \*species in the native seeded treatment; †species in the forage seeded treatment.

| **Species** | **Native status** |
| --- | --- |
| *Amsinckia sp.* | Native |
| *Avena barbata* | Non-native |
| *Avena fatua* | Non-native |
| *Avena sp.* | Non-native |
| *Brachypodium distachyon* | Non-native |
| *Brasicaceae sp.* | Non-native |
| *Brassica nigra* | Non-native |
| *Bromus carinatus\** | Native |
| *Bromus diandrus* | Non-native |
| *Bromus hordeaceous†* | Non-native |
| *Bromus japonicus* | Non-native |
| *Bromus madritensis* | Non-native |
| *Bromus madritensis rubens* | Non-native |
| *Calandrinia menziesii* | Native |
| *Capsella bursapastoris* | Non-native |
| *Guillenia lasiophylla* | Native |
| *Centaurea melitensis* | Non-native |
| *Chenopodium sp.* | Non-native |
| *Convolvulaceae sp.* | Non-native |
| *Croton setiger* | Native |
| *Elymus glaucus\** | Native |
| *Erodium cicutarium* | Non-native |
| *Erodium moschatum* | Non-native |
| *Erodium sp.* | Non-native |
| *Festuca arundinacea†* | Non-native |
| *Festuca bromoides* | Non-native |
| *Festuca microstachys* | Native |
| *Festuca myuros* | Non-native |
| *Festuca perennis* | Non-native |
| *Festuca sp.* | Non-native |
| *Galium sp.* | Non-native |
| *Hirschfeldia incana* | Non-native |
| *Hordeum brachyantherum* | Native |
| *Hordeum murinum* | Non-native |
| *Hypochaeris glabra* | Non-native |
| *Lactuca serriola* | Non-native |
| *Lamarckia aurea* | Non-native |
| *Malva parviflora* | Non-native |
| *Marrubium vulgare* | Non-native |
| *Medicago polymorpha* | Non-native |
| *Melilotus indicus* | Non-native |
| *Poa secunda\** | Native |
| *Polypogon monspeliensis* | Non-native |
| *Salsola spp.* | Non-native |
| *Schismus arabicus* | Non-native |
| *Silybum marianum* | Non-native |
| *Sisymbrium irio* | Non-native |
| *Sonchus sp.* | Non-native |
| *Trifolium gracilentum* | Native |
| *Trifolium sp.* | Native |

**Supplementary Table S3.** Stocking Rates for both ranches

|  |  |  |
| --- | --- | --- |
| Year | Ranch 1 | Ranch 2 |
| 2015/2016 | 6.9 acres/animal for 6 months (Sept, Oct, Feb, Mar, Apr, May) | 2.7 acres/animal for 5.5 months (mid-Dec through May) |
| 2016/2017 | 5.7 acres/animal for 10 months (Sept through mid-June) | 2.9 acres/animal for 6.5 months (mid-November through May) |
| 2017-2018 | 4.5 acres/animal for 5 months (Sept, Oct, Mar, Apr, May) | 2.7 acres/animal for 7 months (December through June) |
| 2018-2019 | 4.9 acres/animal for 8 months (Sept, Oct, Nov, Dec, Feb, Mar, Apr, May) | 2.7 acres/animal for 7 months (December through June) |
| 2019-2020 | 4.7 acres/animal for 2 months (March, Apr) | 3.2 acres/animal for 7 months (November through May) |

**Supplementary Table S4.** Mean percent cover (± SE) of seeded species. \*species in the native seeded treatment; †species in the forage seeded treatment.

| **Species** | **Year** | **Seeding treatment** |
| --- | --- | --- |
| **Unseeded** | **Forage** | **Native** |
| *Bromus carinatus\** | 2016 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0.67 (±0.19) |
| 2018 | 0 (±0) | 0 (±0) | 0.03 (±0.03) |
| 2019 | 0 (±0) | 0.08 (±) | 0.28 (±0.14) |
| 2020 | 0 (±0) | 0 (±0) | 0.33 (±0.34) |
| *Bromus hordeaceous†* | 2016 | 1.06 (±0.90) | 1.64 (±0.47) | 2.06 (±0.68) |
| 2017 | 6.39 (±1.81) | 5.78 (±2.05) | 6.72 (±2.14) |
| 2018 | 7.89 (±1.96) | 12.83 (±2.51) | 9.81 (±2.35) |
| 2019 | 8.83 (±1.65) | 19.53 (±2.17) | 11.08 (±2.09) |
| 2020 | 6.53 (±1.56) | 16.42 (±2.22) | 7.09 (±1.36) |
| *Elymus glaucus\** | 2016 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0.64 (±0.20) |
| 2018 | 0 (±0) | 0 (±0) | 0.03 (±0.03) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.11 (±0.09) |
| *Festuca arundinacea†* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 1.31 (±0.40) | 0.03 (±0.03) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0.03 (±0.03) | 0 (±0) |
| *Poa secunda\** | 2016 | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0.61 (±0.13) |
| 2018 | 0 (±0) | 0 (±0) | 0.03 (±0.03) |
| 2019 | 0 (±0) | 0 (±0) | 0.36 (±0.12) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) |

**Supplementary Table S5.** Mean percent cover (± SE) of non-native species. †species in the forage seeded treatment.

| **Species** | **Year** | **Treatment combination** |
| --- | --- | --- |
| Ungrazed, no herbicide | Ungrazed, herbicide | Grazed,no herbicide | Grazed, herbicide |
| *Avena barbata* | 2016 | 0.78 (±0.43) | 1.41 (±0.81) | 0.07 (±0.07) | 0.07 (±0.07) |
| 2017 | 0.04 (±0.04) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2019 | 0.07 (±0.07) | 0.93 (±0.93) | 0 (±0) | 0 (±0) |
| 2020 | 0.07 (±0.07) | 0 (±0) | 0.74 (±0.70) | 0 (±0) |
| *Avena fatua* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0.52 (±0.23) | 0.04 (±0.04) | 0.04 (±0.04) |
| 2018 | 0.04 (±0.04) | 0.22 (±0.11) | 0 (±0) | 0 (±0) |
| 2019 | 0.22 (±0.22) | 1.70 (±0.80) | 0.19 (±0.15) | 0.44 (±0.22) |
| 2020 | 1.70 (±1.11) | 5.96 (±2.59) | 0.30 (±0.23) | 1.96 (±0.85) |
| *Avena sp.* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.04 (±0.04) | 0.04 (±0.04) | 0 (±0) | 0.07 (±0.07) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Brachypodium distachyon* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.70 (±0.46) | 0 (±0) | 0.30 (±0.14) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Brasicaceae sp.* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.11 (±0.06) | 0.04 (±0.04) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Brassica nigra* | 2016 | 0.04 (±0.04) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2017 | 2.93 (±0.88) | 4.56 (±1.67) | 3.70 (±1.46) | 2.19 (±0.72) |
| 2018 | 10.85 (±2.53) | 6.85 (±2.12) | 5.30 (±1.32) | 3.78 (±1.03) |
| 2019 | 6.81 (±1.38) | 4.26 (±0.77) | 6.59 (±1.69) | 4.52 (±1.82) |
| 2020 | 34.67 (±5.84) | 31.81 (±7.29) | 8.96 (±2.36) | 11.63 (±3.43) |
| *Bromus diandrus* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Bromus hordeaceous†* | 2016 | 0.85 (±0.44) | 2.00 (±0.77) | 2.56 (±0.92) | 1.78 (±0.53) |
| 2017 | 1.70 (±0.59) | 6.11 (±2.06) | 9.59 (±2.91) | 7.78 (±2.69) |
| 2018 | 8.11 (±2.25) | 11.07 (±2.77) | 10.96 (±2.93) | 10.56 (±2.68) |
| 2019 | 14.37 (±2.86) | 11.56 (±2.07) | 11.63 (±2.14) | 15.04 (±2.63) |
| 2020 | 11.30 (±2.62) | 7.96 (±1.56) | 8.52 (±1.95) | 12.11 (±2.27) |
| *Bromus japonicus* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0.15 (±0) | 0 (±0) | 0 (±0) | 0.56 (±0.52) |
| 2020 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0.22 (±0.13) |
| *Bromus madritensis* | 2016 | 0.59 (±0.56) | 1.96 (±1.31) | 1.22 (±0.48) | 0.48 (±0.21) |
| 2017 | 7.56 (±3.07) | 3.63 (±1.49) | 3.85 (±2.13) | 0.81 (±0.29) |
| 2018 | 14.15 (±4.18) | 13.93 (±3.64) | 6.74 (±2.52) | 2.59 (±0.75) |
| 2019 | 27.15 (±7.20) | 29.78 (±7.27) | 13.44 (±4.35) | 4.89 (±1.36) |
| 2020 | 3.52 (±1.75) | 2.74 (±1.33) | 0.41 (±0.15) | 0.26 (±0.10) |
| *Bromus madritensis rubens* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 22.41 (±5.43) | 26.93 (±6.45) | 6.70 (±2.46) | 5.48 (±1.76) |
| *Capsella bursapastoris* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.11 (±0.06) | 0 (±0) | 0.07 (±0.05) | 0 (±0) |
| 2018 | 0.22 (±0.13) | 0 (±0) | 0.07 (±0.05) | 0.15 (±0.09) |
| 2019 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0.04 (±0.04) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0.19 (±0.12) |
| *Centaurea melitensis* | 2016 | 0 (±0) | 0 (±0) | 0.07 (±0.05) | 0 (±0) |
| 2017 | 0.07 (±0.05) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2018 | 0.15 (±0.07) | 0.11 (±0.06) | 0.07 (±0.05) | 0.04 (±0.04) |
| 2019 | 0.04 (±0.04) | 0 (±0) | 0.19 (±0.08) | 0.19 (±0.11) |
| 2020 | 0.15 (±0.09) | 0 (±0) | 0.30 (±0.14) | 0.22 (±0.13) |
| *Chenopodium sp.* | 2016 | 0.15 (±0.15) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Convolvulaceae sp.* | 2016 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Erodium cicutarium* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 15.15 (±3.22) | 0.33 (±0.09) | 9.48 (±2.18) | 0.15 (±0.07) |
| 2018 | 9.30 (±2.20) | 0.96 (±0.28) | 7.93 (±1.61) | 1.11 (±0.47) |
| 2019 | 10.30 (±3.01) | 0.30 (±0.09) | 17.52 (±3.35) | 1.63 (±0.47) |
| 2020 | 3.33 (±1.16) | 0.63 (±0.25) | 13.00 (±3.13) | 2.00 (±0.51) |
| *Erodium moschatum* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0.11 (±0.11) | 0.04 (±0.04) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.26 (±0.20) | 0.11 (±0.08) |
| *Erodium sp.* | 2016 | 6.19 (±1.60) | 1.59 (±0.63) | 4.30 (±1.45) | 0.19 (±0.12) |
| 2017 | 0.26 (±0.26) | 0 (±0) | 0.52 (±0.36) | 0.04 (±0.04) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Festuca arundinacea†* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.78 (±0.50) | 0.44 (±0.21) | 0.26 (±0.14) | 0.30 (±0.13) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| *Festuca bromoides* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 1.85 (±1.85) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Festuca myuros* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 2.59 (±1.45) | 6.67 (±1.81) | 5.70 (±1.80) | 6.81 (±2.06) |
| 2018 | 4.41 (±1.47) | 20.74 (±4.44) | 6.37 (±2.09) | 6.93 (±2.11) |
| 2019 | 18.30 (±4.72) | 57.15 (±5.02) | 14.15 (±4.21) | 12.15 (±3.25) |
| 2020 | 4.78 (±1.77) | 8.37 (±3.00) | 10.11 (±1.95) | 10.00 (±1.97) |
| *Festuca perennis* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0.11 (±0.08) | 0.04 (±0.04) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0.04 (±0.04) |
| 2020 | 0.04 (±0.04) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| *Festuca sp.* | 2016 | 0 (±0) | 0.52 (±0.28) | 1.30 (±0.47) | 0.44 (±0.37) |
| 2017 | 0.15 (±0.15) | 0.15 (±0.12) | 0.07 (±0.05) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0.30 (±0.20) | 0.04 (±0.04) |
| 2020 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Galium sp.* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Hirschfeldia incana* | 2016 | 5.30 (±1.89) | 0 (±0) | 2.56 (±0.90) | 0 (±0) |
| 2017 | 9.22 (±3.32) | 0.70 (±0.28) | 3.15 (±1.25) | 0.11 (±0.11) |
| 2018 | 7.15 (±2.49) | 13.70 (±3.90) | 3.89 (±1.33) | 4.26 (±1.80) |
| 2019 | 1.59 (±0.67) | 2.96 (±2.10) | 2.04 (±0.66) | 9.96 (±3.47) |
| 2020 | 1.96 (±0.83) | 0.81 (±0.55) | 1.37 (±0.69) | 1.41 (±0.69) |
| *Hordeum murinum* | 2016 | 8.74 (±3.38) | 5.56 (±1.51) | 10.93 (±2.74) | 9.96 (±2.56) |
| 2017 | 34.11 (±6.62) | 16.85 (±4.40) | 42.41 (±6.84) | 17.59 (±3.94) |
| 2018 | 22.30 (±3.75) | 23.37 (±3.29) | 30.22 (±4.47) | 24.33 (±4.82) |
| 2019 | 48.07 (±5.88) | 55.00 (±6.69) | 59.15 (±5.39) | 61.96 (±6.21) |
| 2020 | 45.37 (±5.61) | 62.26 (±6.29) | 51.74 (±3.28) | 71.78 (±4.04) |
| *Hypochaeris glabra* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Lactuca serriola* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0.15 (±0.12) | 0 (±0) |
| 2019 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 2.67 (±1.24) | 0.33 (±0.19) | 0.19 (±0.09) | 0.33 (±0.18) |
| *Lamarckia aurea* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Malva parviflora* | 2016 | 2.67 (±0.94) | 1.15 (±0.40) | 1.41 (±0.67) | 0.33 (±0.18) |
| 2017 | 3.33 (±1.23) | 0.04 (±0.04) | 2.78 (±1.11) | 0 (±0) |
| 2018 | 6.11 (±2.51) | 0.26 (±0.09) | 4.85 (±1.62) | 0.22 (±0.08) |
| 2019 | 0 (±0) | 0 (±0) | 0.37 (±0.17) | 0.22 (±0.08) |
| 2020 | 0.22 (±0.13) | 0 (±0) | 0.26 (±0.13) | 0.22 (±0.08) |
| *Marrubium vulgare* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0.04 (±0.04) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Medicago polymorpha* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.59 (±0.24) | 0 (±0) | 2.63 (±1.07) | 0.04 (±0.04) |
| 2018 | 0.93 (±0.29) | 0.07 (±0.05) | 0.74 (±0.22) | 0.07 (±0.05) |
| 2019 | 4.22 (±1.04) | 0.78 (±0.19) | 7.26 (±1.27) | 1.59 (±0.39) |
| 2020 | 0.41 (±0.27) | 0.11 (±0.06) | 5.59 (±1.67) | 0.93 (±0.26) |
| *Melilotus indicus* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.26 (±0.26) | 0 (±0) | 0.04 (±0.04) | 0 (±0) |
| 2018 | 0.07 (±0.05) | 0 (±0) | 0.15 (±0.07) | 0 (±0) |
| 2019 | 0.07 (±0.07) | 0 (±0) | 0.74 (±0.33) | 0 (±0) |
| 2020 | 0.15 (±0.12) | 0 (±0) | 1.81 (±0.79) | 0.11 (±0.11) |
| *Polypogon monspeliensis* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.04 (±0.04) | 0.63 (±0.56) | 0 (±0) | 0.19 (±0.19) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Salsola spp.* | 2016 | 25.96 (±5.44) | 10.59 (±3.23) | 17.41 (±2.86) | 3.93 (±1.74) |
| 2017 | 3.00 (±1.44) | 0.11 (±0.08) | 0.04 (±0.04) | 0 (±0) |
| 2018 | 1.07 (±0.43) | 0.04 (±0.04) | 0.04 (±0.04) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.74 (±0.70) | 0 (±0) |
| *Schismus arabicus* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.04 (±0.04) | 0.59 (±0.37) |
| *Silybum marianum* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0.07 (±0.07) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| *Sisymbrium irio* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0.07 (±0.05) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0.93 (±0.93) | 0.04 (±0.04) | 0.07 (±0.05) |
| *Sonchus sp.* | 2016 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2017 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2018 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2019 | 0 (±0) | 0 (±0) | 0 (±0) | 0 (±0) |
| 2020 | 0 (±0) | 0 (±0) | 0.07 (±0.05) | 0 (±0) |

**Supplementary Figure S1.** Rainfall at Pinnacles National Park, near the study site. This graph shows the hydrologic year (October 1 – September 30) from 2001-2020. Average annual rainfall for that time period (28.4 cm) is depicted by the horizontal line (RAWS 2021).

**Supplementary Figure S2.** Monthly rainfall at Pinnacles National Park from the study period, October 2016 – September 2020 (RAWS 2021).

