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REPORT

2020 Quantitative Vegetation and Erosion Monitoring

Little Rock Mine, United States Natural Resources (USNR) Test Plots

Submitted to:

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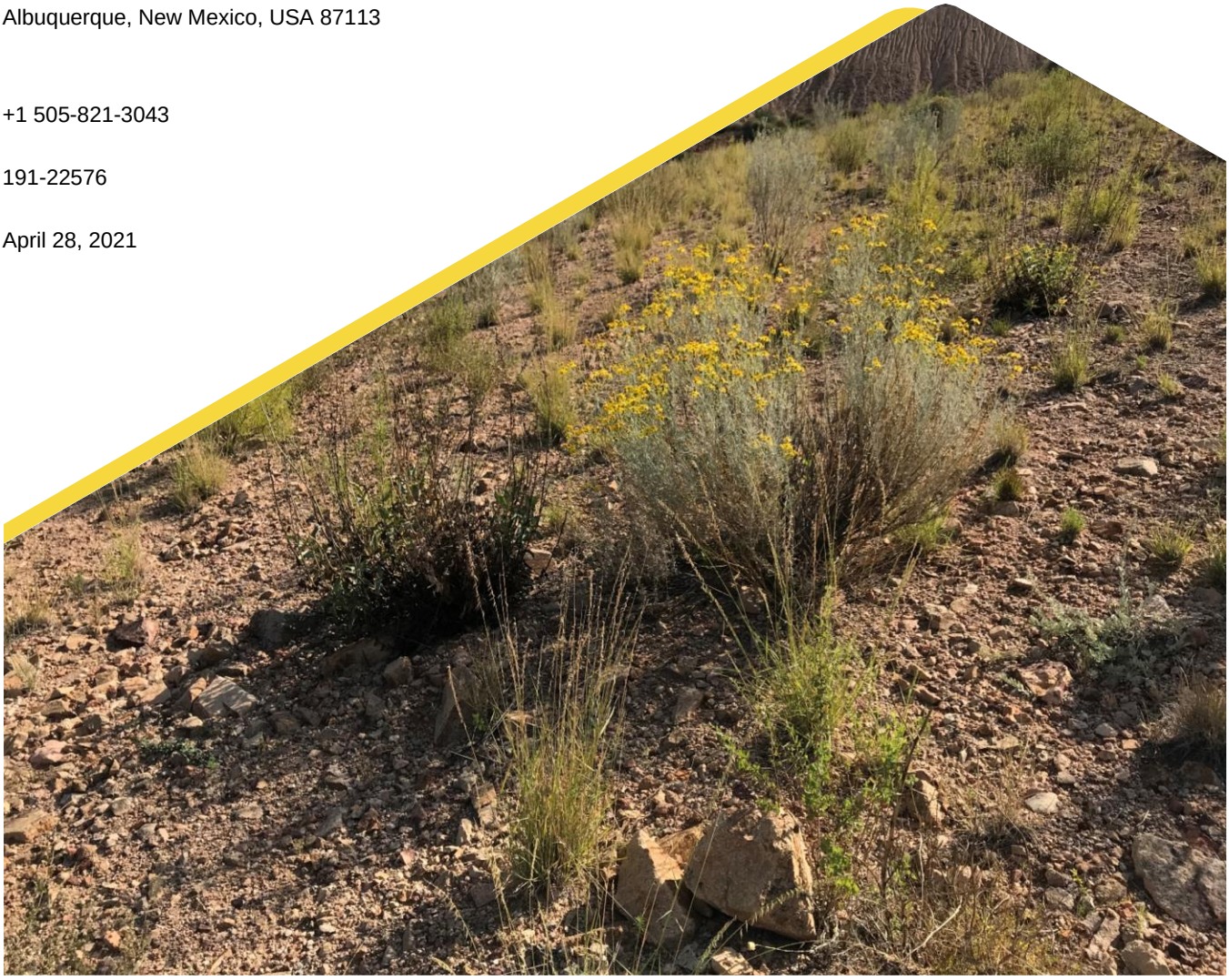

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1.0 INTRODUCTION

The Little Rock Mine is permitted as an existing mine under Mining Act Permit No. GR007RE and Discharge Permit 1236 (DP-1236). The best available materials for reclamation at the Little Rock mine is overburden composed of Precambrian Granite. In early 2014, Freeport-McMoRan Tyrone Inc. (Tyrone) proposed to build test plots on a portion of the United States National Resource (USNR) reclamation area to evaluate the use of Precambrian Granite from the Little Rock pit. The test plot was tentatively approved by the New Mexico Mining and Minerals Division (MMD) and the New Mexico Environment Department (NMED) prior to construction with the understanding that formal approval was pending further consideration.

In November 2014, Tyrone prepared a work plan for the USNR test plots to facilitate technical discussions with the MMD and NMED (FMI 2014). The Agencies requested that Tyrone modify the work plan to include enhanced erosion and vegetation monitoring and consider the application of amendments. The USNR test plot work plan was conditionally approved in conjunction with Modification 17-1 to Permit GR007RE, Condition 8.P.1 (a & b). The work plan also addressed the requirements of Condition 33 of Discharge Permit 1236 (DP-1236). The test plots construction started in late 2014 and were seeded in the spring of 2015. Golder Associates Inc. (Golder) has prepared this report on behalf of Tyrone to document the results of the erosion and vegetation monitoring following the 2020 growing season.

1.1 Background and Objectives

The Little Rock Test Plots were originally constructed on the 7A Stockpile at the Tyrone Mine using Tertiary Quartz Monzonite overburden from the Copper Mountain Pit. When the Little Rock Test Plot work plan was originally developed (2001 with major revisions in 2004) it was impractical to access the overburden from the Little Rock pit because mining had not started and the haul road to Tyrone was not constructed. Copper Mountain materials were used because at the time they were considered similar to the overburden from the Little Rock pit and the availability of materials and a test location (i.e., the 7A stockpile). Once mining at Little Rock commenced, it was possible to construct test plots using overburden from the Little Rock pit. The USNR reclamation area provided an opportunity to test the Precambrian Granite overburden from the Little Rock pit and further refine and demonstrate material handling techniques and reclamation specifications.

The primary goal for the USNR test plot program is to evaluate vegetation success and erosion for the Little Rock Precambrian granite. Tyrone hypothesized that multiple year delays in seeding the Tertiary Quartz Monzonite on the 7A test plots lead to a very rocky seedbed with limited fines, combined with drought conditions, contributed to low vegetation establishment (Golder 2014). Thus, the major performance criterion to be assessed at the USNR test plots is vegetation performance on Precambrian Granite cover materials. The test plots will further inform Tyrone about the implications of surface armoring on seedling establishment over time. The second objective of the test plots is to quantify erosion during the early plant establishment phase on the Precambrian Granite cover materials.

Condition 8.P.1 (a) of Revision 17-1 to Permit GR007RE requires quantitative vegetation monitoring during Year 3 (2018) and Year 5 (2020) after seeding to determine if the trajectory of the vegetation is expected to meet reclamation revegetation standards. Vegetation attributes on the USNR test plots were evaluated quantitatively in September 2018 and found that vegetation had successfully established on all treatments (Golder 2019). Specifically, total canopy cover, plant density, and species diversity in Year 3 across all treatments were in line with expectations for the early stage of reclamation for the region. Average total canopy cover levels ranged by treatment from 11.6% to 16.5% and the seed mix and mulching treatments did not result in statistically different

canopy cover levels. Average perennial plant density exceeded one plant per square foot, indicating successful establishment based on Golder's experience with reclamation in the southwestern U.S. Each plant community was dominated by perennials and no noxious weeds were present.

For the Year 5 monitoring, vegetation performance on the USNR test plots was compared to the Tyrone Reference Area (Figure 1). Further, the trajectory of the vegetation and presence of seeded and volunteer species are key indicators assessing the suitability of the Little Rock Precambrian granite.

The Little Rock Mine revegetation success standards are typically used to assess total canopy cover, shrub density, and plant diversity in a reclamation for at least two of the last four years, starting after the eight year of the 12-year monitoring period. The revegetation success standards are presented here for reference. A proportional success standard is used for total canopy cover and shrub density to compare the reclamation to a native reference area. At Little Rock, revegetation efforts are considered successful when the canopy cover on the reclaimed facility is at least 70% of the reference area canopy cover. Shrub density is considered adequate if it is at least 60% of the reference area. Diversity is also evaluated using a numerical guideline for different structural components of the vegetation and by evidence of colonization of the reclaimed site by native species. The diversity guideline for reclamation at the Little Rock Mine would be met if the reclaimed area contains at least three warm season grasses and two shrubs, with individual cover levels of at least 1%. In addition, two non-weedy forb species should occur at a minimum cover level of at least 0.1% to meet the proposed diversity guideline. The forb guideline is unqualified with respect to seasonality and could include a perennial, biannual, or annual species.

Success standards in Year 5 were not stated explicitly in the USNR test plot work plan (FMI 2014), but the primary metric of vegetation progress in the early stages of reclamation is typically total canopy cover. For the Year 5 evaluation of the USNR test plots, canopy cover levels of the test plots were compared to 40% of the reference area canopy cover. Shrub density and plant diversity are also evaluated to further demonstrate the revegetation efforts were successful and the Precambrian Granite are suitable as a reclamation cover material.

This report provides a short review of the USNR test plot design and revegetation (Section 2.0), an analysis of erosion rates on the test plots (Section 3.0), and a thorough evaluation of the quantitative vegetation monitoring conducted in 2020 (Section 4.0).

2.0 USNR TEST PLOT DESIGN AND REVEGETATION

Reclamation of the USNR Leach Stockpile area involved removal of the residual leached ore materials primarily from drainage areas, minor regrading of the site to tie into bedrock drainages, and installation of a nominal 3-foot thick cover of Precambrian Granite from the Little Rock pit. The construction and material handling methods were described in the as-built report (Golder 2017). The layout and design of the test plot treatments are discussed in Section 2.1 and revegetation techniques are summarized in Section 2.2.

2.1 Test Plot Layout and Design

The two-acre USNR test plot includes four treatments, one control and three treatments, each approximately a half-acre in size (Figure 2). The major treatments involve experimental seed mix and the timing of mulching. The treatments are described below:

- control (conventional seed mix and mulching [CSMA])
- mulch prior to seeding with conventional seed mix (CSMB)

- conventional mulch with experimental seed mix (ESMA)
- mulch prior to seeding with experimental seed mix (ESMB)

Figure 2 illustrates the layout and configuration of the USNR test plots. The finished slope gradients on the test plot ranged from about 3:1 to 4:1 with slope lengths ranging from about 150 to 180 feet. The cover thickness exceeded 3 feet on the test plot (Golder 2017).

2.2 Revegetation

The plots were revegetated in a manner consistent with requirements of Appendix C of Permit GR007RE, with some minor variations related to the seed mix and the timing of the mulching, which are described below. The revegetation operations were performed by the Freeport McMoRan seeding crew on June 4 and 5, 2015. Operationally, the revegetation procedures included: 1) scarification and seedbed preparation, 2) seeding, and 3) mulching and crimping.

Scarification was performed on the contour at a depth of 8-12 inches. The seed was drilled and broadcast simultaneously using a modified rangeland drill with depth control bands, packer wheels, agitators and augers, and picker wheels. The light and fluffy seeds were allowed to fall freely behind the drill and were covered using chain drags pulled behind the drill. Denser seeds were drilled to promote proper seed placement.

Two seed mixes were applied on USNR test plots. The conventional seed mix was modified slightly from the primary seed mix in Appendix C of the MMD permit modification 06-3 to accommodate the availability of seed and included four warm-season grass, five cool-season grass, three forb, and four shrub species (Table 1). An alternative seed mix deviated from the typical seed mix in Appendix C of Permit GR007RE to include a number of experimental species native to the region. The alternative seed mix was comprised of ten warm season grass, six cool-season grass, ten forb, and six shrub species (Table 2). For reference the number of seeds per square foot were similar for both seed mixes but the experimental mix contained some species with larger seeds.

Conventionally, Tyrone has applied mulch after seed placement. At the USNR test plots, the timing of seeding and mulching varied among the treatments. Mulch was applied prior to seeding on half of the area and after seeding on the other half. Mulch was applied at a rate of approximately two tons per acre. The mulch was then crimped 3 to 4 inches into the cover using a disc harrow with straight coulter discs spaced approximately 6 to 8 inches apart. The crimping operation was performed on the contour.

2.3 Prevailing Climate Conditions

The amount and distribution of precipitation are important determinants for the progression of vegetation affecting cover levels on a year-to-year basis, with grasses and forbs showing the most immediate effects. Table 3 provides monthly, annual, and growing season precipitation from 2015 through 2020 from the Little Rock meteorological station. The daily distribution of precipitation is shown in Figure 3. Daily totals in 2020 exceeded 1.0 inches once during peak precipitation months (i.e., July through September) with most daily totals ranging from 0.1 to 0.3 inches. Since 2015, the site has seen a number of daily storms events with precipitation greater than 1.0 inches, but no significant high-magnitude rainfall events (i.e., greater than 2 inches) that characterize the region’s monsoonal precipitation patterns have been measured.

While total annual precipitation at the Little Rock meteorological station was above the regional average of 15.8 inches at Ft. Bayard (WRCC 2019) in 2016 and 2019, it was below the regional average in 2015, 2017, and 2018 (Table 3). In 2020, total annual precipitation at the Little Rock meteorological station was 8.89 inches and well

below regional average (57% of normal). From a growing season perspective (May through September), precipitation was slightly to well below average for five of the last six years with 2016 being the only year above normal (Figure 3). Growing season precipitation in 2020 was 4.59 inches, about 46% of normal. In 2020, June and July had the highest monthly totals, but the later part of the growing season months was dry.

From a regional perspective, the USNR test plots have experienced persistent drought conditions during the growing season since seeding, with 2020 conditions considered exceptionally dry. In contrast, precipitation since 2015 during late fall and winter (November through February) has been above normal monthly levels for the region (Table 3). Months when monthly total precipitation was 50% greater than regional averages include November 2015, December 2016, January and February 2017, February and December 2018, and November and December 2019.

3.0 EROSION MONITORING

Erosion is the detachment and movement of soil by wind or water. Soil erosion rates vary temporally in response to several controlling factors. The major factors affecting erosion include the amount, duration, and intensity of rainfall; soil physical characteristics, nature of the soil surface, vegetation, litter, and rock cover, and the gradient, shape, and length of slope. Soil erosion at mine sites is typically predicted using models that incorporate these factors (Toy and Foster 1998). Because erosion is episodic, short-term measurements are typically poorly correlated to the long-term prediction provided by models (Weltz et al. 1998). For instance, erosion rates are expected to be highest during the vegetation establishment period and may not reflect long-term rates. Similarly, variations in weather events can strongly affect the erosion process. Because of the large size of the plots, sediment traps were considered impractical as a means to measure erosion. Soil erosion was measured using a portable erosion meter (McCool et al. 1981, Kincaid and Williams 1966). The erosion measurements were made using the portable erosion meter described in Golder (2009).

The erosion transects were installed and baseline monitoring was conducted in June 2016 approximately one year following seeding. Subsequent monitoring episodes were conducted in the late fall or early winter since December 2016 to assess changes in surface topography. Figure 2 shows the location of the erosion monitoring stations. Photographs of the monitoring locations compared to the baseline conditions are included in Appendix A. Cross-section plots of the relative changes in the ground surface from the baseline measurements in 2016 are also included in Appendix A (Figures A-1 to A-2).

Changes in soil surface elevations were evaluated assuming each erosion station represents a separate sample. For each station, the average change in surface elevation from the initial baseline measurement was calculated using points that intersected soil, rock fragments, and litter. Negative changes in surface elevation indicate degradation and positive changes indicate aggradation. The four individual stations on each transect were averaged to determine the change in elevation for each transect. The two transects were averaged to estimate the change in surface elevation for the test plot as a whole considering that the vegetation is not substantively different among the mulching treatments.

3.1 Changes in Surface Elevation and Erosion

The relative changes in ground surface elevation were minimal considering that the test plots are still in the vegetation establishment phase. In 2020, the relative change in the ground surface from baseline was 2.4 mm on the north transect and 1.0 mm on the south transect (Table 4). Thus, the average change in elevation for the test plot transects in 2020 was 1.7 mm. Since 2016, the average surface elevation has increased about 1.9 mm

(Table 5). The total estimated accumulation on the test plots is about 62 tons per acre for the past three years, averaging 12 tons per acre per year (Table 6).

Examination of the station cross-sections suggests that very minor rill erosion has occurred, primarily in mid-slope positions (Figures A-1 and A-2). These data also suggest that some of the rills that formed in 2016 in the mid slope position during the first and second growing season have filled in and healed (e.g., USNR-N-2 and -3 and USNR-S-3). Soil loss is evident at the foot of the slope, particularly at station USNR-N-4, but upgradient accretions are greater than this erosion leading to average soil accumulation for the entire slope profile.

The erosion transects were constructed and baseline conditions were measured about one year after seeding and mulching. The amount of surface aggradation or degradation that occurred during the period between mulching and the baseline measurement (i.e., summer of 2015) is impossible to quantify. Thus, the erosion estimates provided in this section do not represent the entire period of reclamation.

4.0 VEGETATION MONITORING

Qualitative vegetation inspections were performed in 2016, 2017 and 2019 and found all the treatments had high levels of seed germination and seedling establishment with average plant density exceeding one plant per square foot and increases in canopy cover levels year over year (Golder 2017, 2018, and 2020). Treatment effects (seed mixes and seeding before or after mulching) were not observed during the initial inspections and composition (the proportion of woody and herbaceous plants) was generally similar for the experimental and conventional seed mix treatments. Condition 8.P.1 (a) of Revision 17-1 to Permit GR007RE requires quantitative vegetation monitoring of the USNR test plots in both Year 3 (2018) and Year 5 (2020) after seeding to determine if vegetation status is on a trajectory expected to meet reclamation vegetation standards. Results for the Year 3 monitoring indicate the USNR test plots are establishing a self-sustaining vegetation community and the cover materials are stable (Golder 2019).

For the 2020 quantitative monitoring, vegetation attributes were also evaluated in the Tyrone Reference Area to compare to the USNR treatments. The quantitative vegetation monitoring methods used in 2020 are described in Section 4.1. The results of the 2020 vegetation monitoring for the USNR Test Plots and Tyrone Reference Area are presented in Section 4.2.

4.1 Vegetation Monitoring Methods

Vegetation attributes were quantified using the same methods on the USNR test plots and the Tyrone Reference Area. The quantitative vegetation monitoring of both areas took place between August 27-29, 2020.

A systematic random sampling procedure employing a transect/quadrat system was used to select sample sites within the test plots. A five-meter square (m^2) grid was imposed over each treatment to delineate vegetation sample plots, and random coordinates were used to select plots for vegetation sampling. Transects originated from the southeastern corner of the selected vegetation plot. Each transect was 10 m long in a dog leg pattern (Figure 5). Four 0.5 m^2 quadrats were located at predetermined intervals along the transect for quantitative vegetation measurements. The locations of randomly selected vegetation plots are shown on Figure 6 for the USNR test plots and the Tyrone Reference Area. The quadrat data are included in Appendix B and photographs of the quadrats are in Appendix C.

For each quadrat, ocular estimates were made of total canopy, species canopy cover, basal cover, surface litter, surface rock fragments, and bare soil. Not all plant species are expected to occur in the sampling quadrats. Prior

to and during formal sampling, each site was traversed on foot to inventory plants growing within the plots and across the reclaimed area.

4.1.1 Vegetation and Ground Cover

Relative and total canopy cover, basal cover, surface litter, rock fragments, and bare soil were visually estimated for each quadrat. Canopy cover estimates include the foliage and foliage interspaces of all individual plants rooted in the quadrat. For the monitoring effort, canopy cover is defined as the percentage of quadrat area included in the vertical projection of the canopy (Daubenmire 1968). The canopy cover estimates made on a species basis may exceed 100% in individual quadrats where the vegetation has multi-layered canopies. In contrast, the sum of the total canopy cover, surface litter, rock fragments, and bare soil does not exceed 100%.

Basal cover is defined as the proportion of the ground occupied by the crowns of grasses and rooting stems of forbs and shrubs. Basal cover estimates were also made for surface litter, rock fragments, and bare soil. Like the total cover estimates, the basal cover estimates do not exceed 100%. All cover estimates were made in 0.1% increments. Percent area cards were used to increase the accuracy and consistency of the cover estimates. Plant frequency also determined on a species-basis by counting the number of individual plants rooted in each quadrat.

4.1.2 Shrub Density

Shrub density, or the number of woody plants per square meter, was determined using the frequency count data from the quadrats and the belt transect method (Bonham 1989). Shrub density was calculated from the quadrat frequency data by dividing the total number of individual plants counted by the number of quadrats measured.

Shrub density was also determined using a belt transect method (Bonham 1989). Shrub density was determined from a 2-meter wide, 10-meter long belt transect situated along the perimeter of the dog-legged transect (Figure 5). Shrubs rooted in the belt transect were counted on a species basis.

4.1.3 Sample Adequacy

The number of samples required to characterize a particular vegetation attribute depends on the uniformity of the vegetation and the desired degree of certainty required for the analysis. Rigorous statistical guidelines are typically applied to bond release analyses. In contrast, interim monitoring activities do not need to have this level of statistical rigor. Often it is impractical to achieve sample adequacy in vegetation monitoring studies and a minimum sample number approach is taken. MMD recognizes this limitation and has provided minimum sample sizes for various quantitative methods (MMD 1996). With normally distributed data where sample adequacy cannot be met because of operational constraints or for other reasons, 40 samples are often considered adequate. The minimum of 40 samples is based on an estimate of the minimum number of samples needed for a t-test under a normal distribution (Sokal and Rohlf 1981). Schulz et al. (1961) have also demonstrated that this number remains robust for most cover and density measures with increased numbers of samples only slightly improving precision.

The number of samples necessary to meet sample adequacy was calculated for canopy cover, basal cover, and shrub density assuming the data were normally distributed using Snedecor and Cochran (1967).

$$N_{min} = \frac{t^2 s^2}{(\overline{x}D)^2}$$

Where N_{min} equals minimum number of samples required, t is the two-tailed t-distribution value based on a 90% level of confidence with n-1 degrees of freedom, s is the standard deviation of the sample data, $\bar{x}$ is the mean, and D is the desired level of accuracy, which is 10% of the mean. By rule the t-value for shrub density is based on an 80% level of confidence (α = 0.2) with n-1 degrees of freedom.

Although statistical adequacy is not required for interim vegetation monitoring at the USNR test plots, the number of samples necessary to meet sample adequacy are reported. Additionally, the 90% confidence interval (CI) of the sample mean and the level of confidence that the sample mean is within 10% of the true mean are reported. The probability statistic is provided as a convenience to better understand the confidence level for the sample mean when sample adequacy is not achieved.

4.2 Quantitative Vegetation Monitoring Results

As stated in Section 1.1, the Year 5 monitoring of vegetation performance on the USNR test plots was compared to the Tyrone Reference Area. Results from the Year 5 quantitative monitoring are presented in Section 4.2.1 for the Conventional Seed Mix plots, Section 4.2.2 for the Experimental Seed Mix plots, and Section 4.2.3 for the Tyrone Reference Area.

4.2.1 Conventional Seed Mix Plots

Mean total canopy cover levels in 2020 ranged from 15.5% to 20.0% for the Conventional Seed Mix treatments (Table 7) with individual quadrat values ranging from 0.0% to 65.0% (Tables B-1 and B-4). Mean basal cover in 2020 was 1.1% for both Conventional Seed Mix treatments with individual quadrat values ranging from 0.0% to 4.3% (Tables B-2 and B-5). Mulching before or after seeding did not result in statistically different canopy cover levels (based on a 90% CI overlap, Figure 7). Shrub density ranged from 0.7 to 0.8 stems per square meter (stems/m^2), based on the belt transect method (Table 7).

Over 35 plant species were identified on the Conventional Seed Mix treatments, and the plant communities are dominated by perennials with no noxious weeds present (Table 8). Fourteen of the plant species on the Conventional Seed Mix plots were from the seed mix with the remaining species recruited from the surrounding vegetation communities. Two seeded species were not observed or recorded on the Conventional Seed Mix treatments: prairie junegrass (*Koeleria macrantha*) and winterfat (*Krascheninikovia lanata*) which are both cool season plants.

These vegetation attributes indicate that the Conventional Seed Mix under both mulching treatments are progressing well and are consistent with the levels expected for the early establishment phase of reclamation in this region. Figure 8 provides a comparison of vegetation progression for the CSMA and CSMB plots in 2017, 2018, and 2020. Monitoring results for the two mulching treatments are discussed in the subsections below.

4.2.1.1 Conventional Mulching (CSMA)

Mean total canopy cover (± 90% CI) in 2020 for the CSMA plot was 20.0% ± 4.8% and the mean basal cover was estimated at 1.1% ± 0.3% (Table 7). Canopy cover in the individual quadrats ranged from 0.0% to 65.0% and basal cover ranged from 0.0% to 4.3% (Tables B-1 and B-2). The calculated N_{min} was 191 samples for canopy cover (Table 7). The canopy cover components for vegetation, litter, rock, and bare soil on the CSMA plot is illustrated in Figure 9.

The proportional or relative canopy cover for the plant classes (grasses, forbs, and shrubs) is also illustrated in Figure 7 for the CSMA treatment. Grasses represented 72% of the total relative canopy, with sideoats grama

(*Bouteloua curtipendula*) providing the most cover (Table 9). Relative herbaceous forb cover was 1%, with three forbs providing less than 0.1% canopy cover on an individual basis. Relative shrub cover was 27% with California brickellbush (*Brickellia californica)* and rubber rabbitbrush (*Ericameria nauseosa*) contributing the most canopy cover.

As of the fall of 2020, 36 species (12 from the seed mix) had been identified in the reclaimed plant community on the CSMA treatment (Table 8). Thus, plant diversity is increasing with the recruitment of 24 native species from the surrounding ecosystem. In 2020, ten species were captured in the 32 quadrats on the CSMA treatment.

Mean shrub density on the CSMA treatment was 0.8 stems/m^2 using the belt transect method (Table 7). Four shrub species were encountered in the belt transects with California brickellbush (*Brickellia californica*) being the most frequently measured species (Table B-16). Based on the quadrat count (frequency) data, the mean total shrub density was 3.7 stems/m^2. Only two of the six shrub species identified on the CSMA treatment were captured in the quadrat data (Tables 8, 9).

4.2.1.2 Mulch Prior to Seeding (CSMB)

Mean total canopy cover for the CSMB plot in 2020 was 15.5% ± 3.9% (Table 7). Canopy cover in the individual quadrats ranged from 0.5 to 62.5% (Table B-4). Canopy cover components for vegetation, litter, rock, and bare soil on the CSMB plot is illustrated in Figure 7. The calculated minimum sample size for total canopy cover was 214 samples (Table 7). Mean basal cover was estimated at 1.1% ± 0.2% and ranged from zero to 2.1% (Table B 5).

The proportional or relative canopy cover for the plant classes (grasses, forbs, and shrubs) is illustrated in Figure 7 for the CSMB plot. Grasses represented 66% of the total relative canopy, with sideoats grama, being the most prevalent (Table 10). Relative herbaceous forb cover was 2%, with yellow sweetclover (*Meliotus officinalis*) and false yarrow (*Chaenactis stevioides*) being the most prevalent. Relative shrub cover was 32% and included five shrub species, with California brickellbush contributing the most canopy cover.

As of the fall of 2020, 41 species (12 from the seed mix) have been identified in the reclaimed plant community on the CSMB plot (Table 8). Thus, plant diversity is increasing with the recruitment of an additional 29 native species from the surrounding ecosystem. In 2020, 14 species were captured in the 32 quadrats on the CSMB plot.

Mean shrub density on the CSMB plot in 2020 was 0.7 stems/m^2 using the belt transect method (Table 7). Four shrub species were encountered in the belt transects with California brickellbush being the most frequently measured species (Table B-16). Based on the quadrat count (frequency) data, the mean total shrub density was 5.9 stems/m^2 (Table 7). Three of the five shrub species identified on the CSMB plot were captured in the quadrat data (Table 9).

4.2.2 Experimental Seed Mix Plots

In 2020, mean total canopy cover levels for the Experimental Seed Mix Plots were from 10.7% to 16.5% (Table 7) with individual quadrat values ranging from 0.7% to 88.0% (Tables B-7 and B-10). Mulching before or after seeding did not result in statistically different (based on a 90% CI overlap) canopy cover levels (Figure 7). The mean basal cover ranged from 0.9% to 1.4% for the Experimental Seed Mix plots with individual quadrat values ranging from 0.3% to 3.6% (Tables B-8 and B-11).

Over 38 plant species were identified on the Experimental Seed Mix plots, and the plant community was dominated by perennials with no noxious weeds present. Up to 18 plant species were from the seed mix with

20 volunteer native species from the surrounding vegetation community. Shrub density ranged from 2.0 to 2.8 stems/m^2, based on the belt transect method.

These vegetation attributes indicate that the Experimental Seed Mix under both mulching treatments are progressing well and are consistent with the levels expected for the early establishment phase of reclamation in this region. Figure 10 provides a comparison of vegetation progression for the ESMA and ESMB plots in 2017, 2018 and 2020. Monitoring results for the two mulching treatments are discussed in the following subsections.

4.2.2.1 Conventional Mulching (ESMA)

For 2020, mean total canopy cover for the ESMA plot was 16.5% ± 4.8% and N_{min} for canopy cover was 287 samples (Table 7). Canopy cover in the individual quadrats ranged from 6.2% to 55.0% (Table B-5). Canopy cover components for vegetation, litter, rock, and bare soil on the ESMA plot is illustrated in Figure 11. Mean basal cover was estimated at 1.4% ± 0.3% and ranged from 0.0% to 3.6% (Table B 8).

The proportional or relative canopy cover for the plant classes (grasses, forbs, and shrubs) is illustrated in Figure 11 for the ESMA plot. Grasses represented 67% of the total relative canopy, with sideoats grama, little bluestem (*Schizachyrium scoparium*), intermediate wheatgrass (*Thinopyrum intermedium*), and blue wildrye (*Elymus glacus*) being the most prevalent (Table 11). Relative herbaceous forb cover was 5%, with Palmer's penstemon (*Penstemon palmeri*), narrowleaf goosefoot (*Chenopodium leptophyllum*) and false yarrow being the most prevalent. Relative shrub cover was 28% and included eight shrub species, with white sagebrush (*Artemisia ludoviciana)*, whitethorn acacia (*Vachellia constricta*), and desert willow (*Chilopsis linearis*) contributing the most canopy cover.

As of the fall of 2020, 38 species (16 from the seed mix) have been identified in the reclaimed plant community on the ESMA plot (Table 8). Thus, plant diversity is increasing with the recruitment of an additional 22 native species from the surrounding ecosystems. In 2020, 19 species were captured in the 32 quadrats on the ESMA plot.

Mean shrub density on the ESMA plot was 2.8 stems/m^2 using the belt transect method (Table 7). Six shrub species were encountered in the belt transects with white sagebrush and desert willow being the most frequently measured species (Table B-16). Based on the quadrat count (frequency) data, the mean total shrub density was 7.1 stems/m^2 (Table 7). Five of the nine shrub species identified on the ESMA plot were captured in the quadrat data (Table 11).

4.2.2.2 Mulch Prior to Seeding (ESMB)

Mean total canopy cover for the ESMB plot in 2020 was 10.7% ± 2.2% and the calculated N_{min} for canopy cover was 140 samples (Table 7). Canopy cover in the individual quadrats ranged from 0.7% to 26.0% (Table B-7). Canopy cover components for vegetation, litter, rock, and bare soil on the ESMB plot is illustrated in Figure 11. Mean basal cover was estimated at 0.9% ± 0.2% and ranged from 0.1$ to 2.9% (Table B 11).

The proportional or relative canopy cover for the plant classes (grasses, forbs, and shrubs) is illustrated in Figure 11 for the ESMB plot. Grasses represented 77% of the total relative canopy, with sideoats grama, little bluestem, and bottlebrush squirreltail (*Elymus elymoides*) being the most prevalent (Table 12). Relative herbaceous forb cover was 12%, with Palmer's penstemon and false yarrow being the most prevalent. Relative shrub cover was 11% and included ten shrub species, with white sagebrush contributing the most canopy cover.

As of the fall of 2020, 43 species (18 from the seed mix) have been identified in the reclaimed plant community on the ESMB plot (Table 12). Thus, plant diversity is increasing with the recruitment of an additional 25 native

species from the surrounding plant community. In 2020, 19 species were captured in the 32 quadrats on the ESMB plot.

Mean shrub density on the ESMB plot was 2.0 stems/m^2 using the belt transect method (Table 7). Eight shrub species were encountered in the belt transects with white sagebrush and desert willow being the most frequently measured species (Appendix B-16). Based on the quadrat count (frequency) data, the mean total shrub density was 4.5 stems/m^2. Four of the ten shrub species identified on the ESMB plot were captured in the quadrat data (Table 12).

4.2.3 Tyrone Reference Area

For 2020, mean total canopy cover for the Tyrone Reference Area was 51.4% ± 6.5% and the N_{min} for canopy cover was 67 samples (Table 7). Canopy cover in the individual quadrats ranged from 16.2% to 100% (Table B-12). Canopy cover components for vegetation, litter, rock, and bare soil on the Reference Area is illustrated in Figure 12. Mean basal cover was estimated at 4.9% ± 1.8% and ranged from 0.4% to 32.1% (Table B 14).

The proportional or relative canopy cover for the plant classes (grasses, forbs, and shrubs) is illustrated in Figure 12 for the ESMA plot. Grasses represented 45% of the total relative canopy, with blue grama (*Bouteloua gracilis*), sideoats grama, and spidergrass (*Aristida ternipes*) being the most prevalent (Table 12). Relative herbaceous forb cover was 18%, with purple aster (Machaeranthera canescens), mountain pepperweed (*Lepidium montanum*), and bastardsage (*Eriogonum wrightii*) being the most prevalent. Relative shrub cover was 37% and included eight shrub species with honey mesquite (*Prosopis glandulosa*), broom snakeweed (*Gutierrezia sarothrae*) and beargrass (*Nolina macrocarpa*) contributing the most canopy cover. In 2020, 43 species were captured in the Reference Area sampling quadrats.

Mean shrub density in the Reference Area was 1.4 stems/m^2 using the belt transect method (Table 7). Fourteen shrub species were encountered in the belt transects with prairie acacia (*Acaciella angustissima*) and broom snakeweed being the most frequently measured species (Table B-17). Based on the quadrat count (frequency) data, the mean shrub density was 3.1 stems/m^2 (Table 7) with 8 shrub species captured in the quadrats (Table 13).

5.0 SUMMARY

The primary goal for the USNR test plot program is to evaluate vegetation success and erosion for the Little Rock Precambrian Granite and demonstrate its suitability as a reclamation cover material. Vegetation attributes on the USNR test plots were evaluated quantitatively in August 2020, fulfilling the Year 5 monitoring requirement.

Precipitation in 2020 at the Little Rock meteorological station was well below normal from a regional perspective. Annual and growing season precipitation has been slightly to well below average for five of the last six years with only 2016 being above average. Late fall and winter precipitation, particularly in 2016-2017 and in 2019-2020, has been well above regional normal. The site has seen a number of daily storms events with precipitation greater than 1 inch, but no significant high-magnitude rainfall events (i.e., greater than 2 inches) that characterize the region’s monsoonal precipitation patterns have been measured.

Cumulatively, erosion at the site since seeding has resulted in soil accumulation rather than degradation with average accumulation estimated at 12 tons per acre per year. While localized sheet and small-scale rill erosion was evident in mid-slope positions soon after seeding, rill healing over the past three years has led to aggradation for the entire slope profile. The soil accumulation trend in the first five years may be in part due to the lack of

high-magnitude precipitation events at the site in combination with the armoring of the soil surface. Initial results for the USNR test plots indicate the erosional stability of the Precambrian granite is adequate, though long-term evaluations will offer greater insight into the cover materials' ability to resist erosion.

Vegetation efforts on the USNR test plots are considered successful with average perennial plant density exceeding one plant per square foot that generally indicates good seed establishment for southwestern U.S. reclamation activities. Average total canopy cover levels on the USNR test plots ranged from 10.7% for the ESMB treatment to 20.0% for the CSMA control treatment (Figure 7). The proportional reference area standard for total canopy cover in Year 5 is 20.5% (40% of 51.4% canopy cover). Based on analysis of the 90% CI around the treatment means, only the ESMB treatment is considered to be performing poorly compared to the other treatments and the reference area standard. Photographic comparisons of the treatments also indicate positive vegetation progression between 2017 and 2020 (Figures 8 and 10). With respect to mulching effects, mulching prior to seeding, regardless of the seed mix, appears to negatively impact early canopy development (Figure 7). In light of the severe drought conditions that have prevailed at the site, the total canopy cover results are encouraging and suggest that the Precambrian Granite is fully capable in supporting a self-sustaining ecosystem.

Shrub density measured in belt transects ranged from 0.7 stems/m^2 for the CSMB treatment to 2.8 stems/m^2 for the ESMA treatment. These densities represent 50% to 200% of the 1.4 stems/m^2 shrub density measured in the reference area. In addition to rubber rabbitbrush, several experimental shrubs have become established including desert willow, whitethorn acacia, and white sagebrush and all the test plots have recruited California brickellbush. The higher shrub density associated with the experimental seed mix is expected over time to provide more canopy cover as the shrubs mature.

Grass species are providing the most canopy cover in both experimental and conventional seed mix treatments. Sideoats grama is the dominate grass across all the test plots, with good establishment of blue grama as well as little bluestem and threeawns from the experimental seed mix. Initial responses of cool-season grasses are positive including intermediate wheatgrass, blue wildrye and bottlebrush squirretail that likely are responding to the increase in winter precipitation over the past several years. Seeded perennial forbs including Palmer's penstemon, upright prairie coneflower, and white prairie clover were encountered during the monitoring, but at low canopy cover levels most likely due to the drought conditions. Diversity is increasing in all test plots with 20 or more volunteer native plant species observed. In particular, numerous native forbs have been recruited from adjacent undisturbed areas including false yarrow, shrubby deervetch and manyflowered ipomopsis. Each test plot plant community was dominated by perennials and no noxious weeds were present.

Based on the shrub density and plant diversity observed in experimental seed mix plots since 2018, several species should be considered for the Little Rock and Tyrone primary seed mix in future seeding efforts. These plant species include shrubs desert willow, whitethorn and catclaw acacias, and white sagebrush; grasses little bluestem, cane bluestem, and threeawns; and forbs Palmer's penstemon and common yarrow.

The 2020 monitoring indicates the USNR test plots are establishing self-sustaining vegetation communities and soil surfaces are stable. Vegetation performance in three of the four seeding/mulching treatments are on par with the reference area performance standard in Year 5 and are demonstrating resiliency even under the severe drought conditions that have prevailed for five of the last six years. The Year 5 results for the USNR test plots indicate the Little Rock Precambrian Granite is a suitable cover material with the ability to resist erosion and support vegetation using standard reclamation methods even under the adverse climatic conditions that are characteristic of the region.

6.0 REFERENCES

Bonham, C D 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons. New York, NY.

Daubenmire, R 1968. Plant communities: A textbook of plant synecology. Harper & Row, Publishers, New York.

Freeport-McMoRan (FMI). 2014. United States Natural Resources (USNR) Test Plot Work Plan: Condition 8.G of Permit Revision 97-1 of GR007RE and Condition 33 of Discharge Permit-1236 (DP-1236). Freeport-McMoRan Tyrone. November 26, 2014.

Golder Associates Inc. (Golder) 2009. No. 1 Stockpile Test Plots Annual Report- Report No. 3. Prepared for Freeport-McMoRan Tyrone Inc. February 27, 2009.

Golder. 2014. Little Rock Mine and Tyrone Mine Leach Cap Test Plots – Status Report 2013 Reseeding. Technical Memorandum. October 2014.

Golder. 2017. United States Natural Resources (USNR) Test Plot – Annual Report No. 1. Little Rock and Tyrone Mines. Prepared for Freeport-McMoRan Tyrone, LLC. March 8, 2017.

Golder. 2018. United States Natural Resources (USNR) Test Plot – Annual Report No. 2. Little Rock and Tyrone Mines. Prepared for Freeport-McMoRan Tyrone, LLC. April 26, 2018.

Golder. 2019. 2018 Quantitative Vegetation and Erosion Monitoring. Little Rock Mine, United States Natural Resources (USNR) Test Plots. Prepared for Freeport-McMoRan Tyrone, LLC. April 25, 2019.

Golder. 2020. United States Natural Resources (USNR) Test Plot, 2019 Annual Report. Little Rock Mine. Prepared for Freeport-McMoRan Tyrone, LLC. April 24, 2020.

Kincaid, D R, and G Williams. 1966. Rainfall Effect on Soil Surface Characteristics Following Range Improvement Treatments. J. Range Manage. 19: 346-351.

McCool, D K , M G Dossett, and S J Yecha. 1981. A Portable Rill Meter for Field Measurement of Soil Loss. Erosion and Sediment Transport Measurement, Proc of the Florence Symp. IAHS Publ. no. 133 pp. 479-484.

Mining and Minerals Division (MMD). 1996. Coal Mine Reclamation Program Vegetation Standards. Santa Fe, NM. April 30.

Schulz, A M, R P Gibbens, and L F DeBano. 1961. Artificial populations for teaching and testing range techniques. J. Range Management. 14:236-242.

Snedecor, G W, and W G Cochran. 1967. Statistical Methods. Iowa State University Press. 593 pp.

Sokal, R R, and F J Rohlf. 1981. Biometry (2nd edit.). W. H. Freeman and Co., San Francisco.

Toy, T J, and G R Foster. 1998. Guidelines for the use of the Revised Universal Soil Loss Equation (RUSLE v. 1.06) on mined lands, construction sites, and reclaimed lands. J.R. Galetovic (ed.) Office of Surface Mining, Denver, CO.

Weltz, M A , M R Kidwell, and H D Fox. 1998. Influence of Abiotic and Biotic Factors in Measuring and Modeling Soil Erosion on Rangelands: State of knowledge. J. Range Manage. 51:482-495.

Western Regional Climate Center (WRCC). 2019. Fort Bayard Station (293265), New Mexico Climate Data. Downloaded April 2019.

https://golderassociates.sharepoint.com/sites/117323/project files/6 deliverables/002 - usnr tp 2020/rev0/19122576-002-r-rev0-usnr_annrpt_2020_04282021.docx

Tables

Table 1: Conventional Seed Mix used at the USNR Test Plots

Scientific Name	Common Name	lbs/ac
Warm-season Grasses		
Bothriochloa barbinodis	Cane bluestem	0.3
Bouteloua curtipendula	Sideoats gramma	1.25
Bouteloua gracilis	Blue grama	0.25
Leptochloa dubia	Green sprangletop	0.4
Cool-season Grasses		
Achnatherum hymenoides	Indian ricegrass	1.5
Agropyron dasystachyum	Streambank wheatgrass	1
Elymus elymoides	Bottlebrush squirreltail	1.25
Koeleria macrantha	Prairie Junegrass	0.1
Sporobolus cryptandrus	Sand dropseed	0.05
Shrubs		
Atriplex canescens	Fourwing saltbush	0.75
Chilopsis linearis	Desert willow	0.75
Ericameria nauseosa	Rubber rabbitbrush	0.3
Krascheninikovia lanata	Winterfat	0.5
Forbs		
Dalea candida	White prairie clover	0.4
Linum lewisii	Blue flax	0.12
Ratibida columnaris	Prairie coneflower	0.2
	PLS (lbs/acre)	**9.12**

Notes:
lbs/ac = pounds per acre, PLS = pure live seed

Table 2: Experimental Seed Mix used at the USNR Test Plots

Scientific Name	Common Name	lbs/ac
Warm-season Grasses		
Aristida purpurea var. longiseta	Fendler threeawn	0.25
Bothriochloa barbinodis	Cane bluestem	0.1
Bouteloua curtipendula	Sideoats grama	1
Bouteloua rothrockii	Rothrock's grama	0.05
Eragrostis intermedia	Plains lovegrass	0.05
Heteropogon contortus	Tanglehead	0.25
Muhlenbergia montana	Mountain muhly	0.03
Schizachyrium scoparium	Little bluestem	0.9
Sporobolus airoides	Alkali sacaton	0.05
Sporobolus giganteus	Giant dropseed	0.05
Cool-season Grasses		
Elymus elymoides	Bottlebrush squirreltail	1
Elymus glaucus	Blue wildrye	0.4
Hesperostipa neomexicana	New Mexico feathergrass	3
Poa secunda	Sandberg bluegrass	0.05
Sporobolus cryptandrus	Sand dropseed	0.02
Thinopyrum intermedium	Intermediate wheatgrass	1
Shrubs		
Acacia constricta	Whitethorn acacia	1
Acacia greggii	Catclaw acacia	2
Atriplex canescens	Fourwing saltbush	1.5
Encelia virginensis	Virgin River brittlebush	0.25
Ericameria nauseosa	Rubber rabbitbrush	0.2
Robinia neomexicana	New Mexico locust	2.5
Forbs		
Achillea millefolium var. occidentalis	Western yarrow	0.01
Artemisia ludoviciana	White sagebrush*	0.05
Baileya multiradiata	Desert marigold	0.05
Erigeron speciosus	Aspen fleabane	0.05
Isocoma tenuisecta	Burroweed*	0.05
Lotus rigidus	Deervetch	0.1
Oenothera pallida	Pale evening primrose	0.1
Penstemon palmeri	Palmer's penstemon	0.2
Senna covesii	Coues' cassia	0.25
Sphaeralcea coccinea	Scarlet globemallow	0.1
	PLS (lbs/acre)	**16.61**

Notes:

lbs/ac = pounds per acre, PLS = pure live seed

Table 3: Monthly and Annual Precipitation (inches) at the Little Rock Met Station

	2015	2016	2017	2018	2019	2020	Ft Bayard[(a)]
January	2.22	1.03	3.22	0.00	0.73	0.58	0.88
February	0.44	0.31	1.54	2.14	1.42	1.20	0.85
March	0.82	0.00	0.17	0.16	0.82	1.65	0.68
April	0.31	0.54	0.03	0.01	0.77	0.02	0.38
May	0.52	0.15	0.07	0.00	0.32	0.05	0.47
June	1.14	0.61	0.98	0.18	0.36	1.39	0.82
July	2.40	2.43	3.29	1.25	0.80	2.07	3.32
August	2.57	5.53	1.85	3.95	3.43	0.67	3.30
September	1.14	3.34	0.16	1.89	3.06	0.41	2.06
October	0.25	0.27	0.26	2.10	0.09	0.54	1.24
November	1.15	0.26	0.07	0.28	4.53	0.31	0.75
December	1.44	2.54	0.30	1.99	2.05	0.00	1.05
Annual	**14.40**	**17.01**	**11.94**	**13.95**	**18.38**	**8.89**	**15.80**
Seasonal[(b)]	*7.77*	*12.06*	*6.35*	*7.27*	*7.97*	*4.59*	*9.97*

Notes:

a) Long-term averages are for the Ft Bayard Station (293265) and are from Western Regional Climate Center (2019).

b) Seasonal precipitation is assessed for the growing season months of May through September.

Table 4: Average Change in Ground Surface Elevation of the USNR Erosion Transects

Year	Individual Transects		Test Plot
	North (mm)	South (mm)	(mm)
2016	0.9	1.7	1.3
2017	2.9	1.9	2.4
2018	1	3.8	2.4
2019	2.1	1.4	1.7
2020	2.4	1.0	1.7

Notes:
Negative values indicate an average loss of materials (degradation).
Positive values indicate average accumulation of materials (aggradation).

Table 5: Cumulative and Annual Average Change in Ground Surface Elevation

MARGINAL CHANGE IN ANNUAL AVERAGE GROUND SURFACE ELEVATION							
Transect	2016	2017	2018	2019	2020	Cumulative	Five-Year Average
	(mm)						(mm/yr)
USNR North and South Two-Station Average	1.3	2.4	2.4	1.7	1.7	9.5	1.9

Notes:
Negative values indicate surface degradation; Positive values indicate surface aggradation

Table 6: Cumulative and Annual Average Soil Loss or Accumulation

ANNUAL AVERAGE SOIL LOSS OR ACCUMULATION							
Transect	2016	2017	2018	2019	2020	Cumulative	Five-Year Average
	(tons/acre)						(t/ac/yr)
USNR North and South Two-Station Average	-9	-16	-16	-11	-11	-62	-12

Notes:
Positive values indicate erosion; Negative values indicate accumulation.
Erosion values assume a 1 mm change in elevation = 6.5 tons/acre

Table 7: Summary Statistics for the USNR Test Plots and the Tyrone Reference Area

		CSMB	ESMA	ESMB	Reference Area
Total Canopy (%)					
Mean	20.0	15.5	16.5	10.7	51.4
Standard Deviation	16.3	13.4	16.4	7.4	25.0
90% Confidence Interval	4.8	3.9	4.8	2.2	6.5
Nmin[(1)]	191	214	287	140	67
Confidence level of sample mean[(2)]	0.68	0.69	0.71	0.65	0.62
Basal Cover (%)					
Mean	1.1	1.1	1.4	0.9	4.9
Standard Deviation	0.9	0.8	0.9	0.7	6.7
90% Confidence Interval	0.3	0.2	0.3	0.2	1.7
Nmin[(1)]	212	139	133	145	524
Confidence level of sample mean[(2)]	0.68	0.65	0.65	0.65	0.80
Shrub Density (stems/m^2) from Quadrats					
Mean	3.7	5.9	7.1	4.5	3.1
Standard Deviation	8.3	8.7	10.0	6.8	5.9
90% Confidence Interval	2.4	2.5	2.9	2.0	1.5
Nmin[(3)]	865	376	333	383	718
Confidence level of sample mean[(2)]	0.89	0.80	0.78	0.80	0.88
Shrub Density (stems/m^2) from Belt Transect					
Mean	0.8	0.7	2.8	2.0	1.4
Standard Deviation	0.3	0.3	1.9	0.5	1.4
90% Confidence Interval	0.2	0.2	1.1	0.3	0.7
Nmin[(3)]	41	27	92	14	214
Confidence level of sample mean[(2)]	0.55	0.54	0.57	0.53	0.62

Notes:

1) Minimum number of samples required at 90 percent level of confidence that the sample mean is within 10 percent of the population mean

2) Estimated confidence level that the true mean is within 10 percent of the sample mean based on a one-sided student's t distribution

3) Minimum number of samples required at 80 percent level of confidence that the sample mean is within 10 percent of the population mean

CSMA = Conventional seed mix, mulch applied after seeding

CSMB = Conventional seed mix, mulch applied before seeding

ESMA = Experimental seed mix, mulch applied after seeding

ESMB = Experimental seed mix, mulch applied before seeding

Table 8: Comprehensive Plant List for the USNR Test Plots, 2015 to 2020

Scientific Name	Common Name	Code	Treatment			
			CSMA	CSMB	ESMA	ESMB
Warm-season Grasses						
Aristida purpurea	Purple threeawn	ARPU	X	X	X	X
Aristida purpurea var. longiseta	Fendler threeawn	ARPUL	--	--	--	X
Bothriochloa barbinodis	Cane bluestem	BOBA3	X	X	X	X
Bouteloua curtipendula	Sideoats grama	BOCU	X	X	X	X
Bouteloua gracilis	Blue grama	BOGR2	X	X	X	X
Dasyochloa pulchella	Low woollygrass	DAPU7	X	--	X	--
Leptochloa dubia	Green sprangletop	LEDU	--	X	--	--
Panicum capillare	Witchgrass	PACA6	--	--	X	X
Schizachyrium scoparium	Little bluestem	SCSC	--	X	X	X
Sorghastrum nutans	Indiangrass	SONU2	--	X	--	--
Sporobolus airoides	Alkali sacaton	SPAI	--	--	--	X
	Subtotal, Warm-season Grasses		*5*	*7*	*7*	*8*
Intermediate-season Grasses						
Sporobolus cryptandrus	Sand dropseed	SPCR	--	X	--	--
	Subtotal, Intermediate-season Grasses		*0*	*1*	*0*	*0*
Cool-season Grasses						
Achnatherum hymenoides	**Indian ricegrass**	**ACHY**	X	X	--	--
Agropyron dasystachyum	Streambank wheatgrass	AGDA	X	X	--	--
Bromus marginatus	Mountain brome	BRMA4	--	X	--	--
Elymus elymoides	Bottlebrush squirreltail	ELEL	X	X	X	X
Elymus glaucus	Blue wildrye	ELGL	X	X	X	X
Poa secunda	Sandberg bluegrass	POSE	--	--	X	X
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	X	X	X	X
	Subtotal, Cool-season Grasses		*5*	*6*	*4*	*4*
Forbs						
Achillea millefolium	Common yarrow	ACMI2	X	X	X	X
Baileya multiradiata	Desert marigold	BAMU	X	X	X	X
Chaenactis fremontii	Pincushion flower	CHFR	--	X	--	X
Chaenactis stevioides	False yarrow	CHST	X	X	X	X
Chenopodium leptophyllum	Narrowleaf goosefoot	CHLE4	--	--	X	X
Cirsium species	Unknown thistle species	CIRSI	--	X	--	--
Dalea candida	White prairie clover	DACA	X	X	X	X
Erigeron speciosus	Aspen fleabane	ERSP4	--	X	--	--
Eriogonum pharnaceoides	Wirestem buckwheat	ERPH2	X	X	X	X
Eriogonum polycladon	Annual pink buckwheat	ERPO	X	X	X	X
Eriogonum wrightii	Bastardsage	ERWR	X	--	--	X
Heliomeris longifolia	Longleaf false goldeneye	HELO6	X	--	X	X
Heliomeris multiflora	Showy goldeneye	HEMU3	X	--	--	--
Heterotheca subaxillaris	Telegraph plant	HESU3	X	--	X	--
Ipomopsis multiflora	Manyflowered ipomopsis	IPMU	--	X	--	--
Lotus rigidus	Shrubby deervetch	LORI3	--	--	X	X
Linum lewisii	Lewis flax	LILE	X	X	--	X
Machaeranthera canescens	Purple aster	MACA	X	--	--	X
Machaeranthera gracilis	Slender goldenweed	MAGR	X	X	X	X
Medicago sativa	Alfalfa	MESA	--	X	--	--
Melilotus officinalis	Yellow sweetclover	MEOF	--	X	X	--

Table 8: Comprehensive Plant List for the USNR Test Plots, 2015 to 2020

Scientific Name	Common Name	Code	Treatment			
			CSMA	CSMB	ESMA	ESMB
Forbs (continued)						
Penstemon palmeri	Palmer's penstemon	PEPA8	X	X	X	X
Pseudognaphalium canescens	Gray everlasting	PSCA	X	X	X	X
Psoralidium lanceolatum	Lemon scurfpea	PSLA3	X	--	X	X
Ratibida columnifera	Upright prairie coneflower	RACO3	X	X	--	X
Rhynchosia senna	Rosary bean	RHSE	--	X	X	X
Salsola tragus	Russian thistle	SATR	X	X	X	X
Sanvitalia abertii	Abert's creeping zinnia	SAAB	X	--	--	--
Sphaeralcea coccinea	Scarlet globemallow	SPCO	--	X	--	--
Stephanomeria pauciflora	Skeleton weed	STPA4	--	X	X	X
Tragopogon dubius	Yellow salsify	TRDU	--	X	--	--
Unknown Forb	Unknown Forb	UNKF	X	--	--	--
		Subtotal, Forbs	*20*	*22*	*18*	*21*
Shrubs						
Artemisia ludoviciana	White sagebrush	ARLU	--	--	X	X
Atriplex canescens	Four-wing saltbush	ATCA	X	X	X	X
Brickellia californica	California brickellbush	BRCA	X	X	X	X
Chilopsis linearis	Desert willow	CHLI2	X	X	X	X
Ericameria nauseosa	Rubber rabbitbrush	ERNA	X	X	X	X
Fallugia paradoxa	Apache plume	FAPA	--	--	X	X
Pinus edulis	Piñon pine	PIED	X	--	--	X
Pinus ponderosa	Ponderosa pine	PIPO	X	--	--	--
Senecio flaccidus	Threadleaf groundsel	SEFL3	--	X	X	X
Senegalia greggii	Catclaw acacia	SEGR4	--	--	X	X
Vachellia constricta	Whitethorn acacia	VACO9	--	--	X	X
		Subtotal, Shrubs	*6*	*5*	*9*	*10*
		Total Observed Species	***36***	***41***	***38***	***43***

Notes:
-- not observed or recorded on plot

Table 9: Vegetation Cover and Density Results for the CSMA Treatment, 2020

Scientific Name	Common Name	Code	Mean Cover (%)		Mean Density (stems/m²)	Source
			Basal	Canopy		
Warm-season Grasses						
Aristida purpurea	Purple threeawn	ARPU	<0.1	0.1	0.4	V
Bothriochloa barbinodis	Cane bluestem	BOBA3	--	--	--	S
Bouteloua curtipendula	Sideoats grama	BOCU	0.9	14.4	7.5	S
Bouteloua gracilis	Blue grama	BOGR2	<0.1	0.3	0.8	S
Dasyochloa pulchella	Low woollygrass	DAPU7	--	--	--	V
Cool-Season Grasses						
Achnatherum hymenoides	Indian ricegrass	ACHY	<0.1	<0.1	0.1	S
Agropyron dasystachyum	Streambank wheatgrass	AGDA	--	--	--	S
Elymus elymoides	Bottlebrush squirreltail	ELEL	<0.1	0.1	0.2	S
Elymus glaucus	Blue wildrye	ELGL	--	--	--	V
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	--	--	--	V
Forbs						
Achillea millefolium	Common yarrow	ACMI2	--	--	--	V
Baileya multiradiata	Desert marigold	BAMU	--	--	--	V
Chaenactis stevioides	False yarrow	CHST	<0.1	<0.1	<0.1	V
Dalea candida	White prairie clover	DACA	--	--	--	S
Eriogonum pharnaceoides	Wirestem buckwheat	ERPH2	--	--	--	V
Eriogonum polycladon	Annual pink buckwheat	ERPO	--	--	--	V
Eriogonum wrightii	Bastardsage	ERWR	--	--	--	V
Heliomeris longifolia	Longleaf false goldeneye	HELO6	--	--	--	V
Heliomeris multiflora	Showy goldeneye	HEMU3	--	--	--	V
Heterotheca subaxillaris	Telegraph plant	HESU3	--	--	--	V
Linum lewisii	Lewis flax	LILE	--	--	--	S
Machaeranthera canescens	Purple aster	MACA	--	--	--	V
Machaeranthera gracilis	Slender goldenweed	MAGR	<0.1	<0.1	<0.1	V
Penstemon palmeri	Palmer's penstemon	PEPA8	--	--	--	V
Pseudognaphalium canescens	Gray everlasting	PSCA	--	--	--	V
Psoralidium lanceolatum	Lemon scurfpea	PSLA3	--	--	--	V
Ratibida columnifera	Upright prairie coneflower	RACO3	<0.1	<0.1	<0.1	S
Salsola tragus	Russian thistle	SATR	--	--	--	V
Sanvitalia abertii	Abert's creeping zinnia	SAAB	--	--	--	V
Unknown forb species		UNKF	--	--	--	V
Shrubs						
Atriplex canescens	Four-wing saltbush	ATCA	--	--	--	S
Brickellia californica	California brickellbush	BRCA	<0.1	5.5	1.8	V
Chilopsis linearis	Desert willow	CHLI2	<0.1	<0.1	<0.1	S
Ericameria nauseosa	Rubber rabbitbrush	ERNA	--	--	--	S
Pinus edulis	Piñon pine	PIED	--	--	--	V
Picea pungens	Blue spruce	PIPU	--	--	--	V

Notes:
S=seeded; V=volunteer
-- = oberved on plot

Table 10: Vegetation Cover and Density Results for the CSMB Treatment, 2020

Scientific Name	Common Name	Code	Mean Cover (%)		Mean Density (stems/m²)	Source
			Basal	Canopy		
Warm-season Grasses						
Aristida purpurea	Purple threeawn	ARPU	<0.1	<0.1	0.3	V
Bothriochloa barbinodis	Cane bluestem	BOBA3	--	--	--	S
Bouteloua curtipendula	Sideoats grama	BOCU	1.0	10.2	8.3	S
Bouteloua gracilis	Blue grama	BOGR2	<0.1	0.1	0.8	S
Leptochloa dubia	Green sprangletop	LEDU	--	--	--	S
Schizachyrium scoparium	Little bluestem	SCSC	<0.1	<0.1	<0.1	V
Sorghastrum nutans	Indiangrass	SONU2	--	--	--	V
Intermediate-Season Grasses						
Sporobolus cryptandrus	Sand dropseed	SPCR	<0.1	<0.1	<0.1	S
Cool-Season Grasses						
Achnatherum hymenoides	Indian ricegrass	ACHY	--	--	--	S
Agropyron dasystachyum	Streambank wheatgrass	AGDA	--	--	--	S
Bromus marginatus	Mountain brome	BRMA4	--	--	--	V
Elymus elymoides	Bottlebrush squirreltail	ELEL	<0.1	<0.1	0.2	S
Elymus glaucus	Blue wildrye	ELGL	--	--	--	V
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	--	--	--	V
Forbs						
Achillea millefolium	Common yarrow	ACMI2	--	--	--	V
Baileya multiradiata	Desert marigold	BAMU	--	--	--	V
Chaenactis fremontii	Pincushion flower	CHFR	--	--	--	V
Chaenactis stevioides	False yarrow	CHST	<0.1	<0.1	0.7	V
Cirsium species	Unknown thistle species	CIRSI	--	--	--	V
Dalea candida	White prairie clover	DACA	<0.1	<0.1	0.2	S
Erigeron speciosus	Aspen fleabane	ERSP4	--	--	--	V
Eriogonum pharnaceoides	Wirestem buckwheat	ERPH2	--	--	--	V
Eriogonum polycladon	Annual pink buckwheat	ERPO	--	--	--	V
Ipomopsis multiflora	Manyflowered ipomopsis	IPMU	<0.1	<0.1	<0.1	V
Linum lewisii	Lewis flax	LILE	--	--	--	S
Machaeranthera gracilis	Slender goldenweed	MAGR	--	--	--	V
Medicago sativa	Alfalfa	MESA	<0.1	<0.1	<0.1	V
Melilotus officinalis	Yellow sweetclover	MEOF	<0.1	0.2	<0.1	V
Penstemon palmeri	Palmer's penstemon	PEPA8	--	--	--	V
Pseudognaphalium canescens	Gray everlasting	PSCA	--	--	--	V
Ratibida columnifera	Upright prairie coneflower	RACO3	--	--	--	S
Rhynchosia senna	Rosary bean	RHSE	--	--	--	V
Salsola tragus	Russian thistle	SATR	--	--	--	V
Sphaeralcea coccinea	Scarlet globemallow	SPCO	--	--	--	V
Stephanomeria pauciflora	Skeleton weed	STPA4	--	--	--	V
Tragopogon dubius	Yellow salsify	TRDU	--	--	--	V
Shrubs						
Atriplex canescens	Four-wing saltbush	ATCA	--	--	--	S
Brickellia californica	California brickellbush	BRCA	<0.1	4.4	2.8	V
Chilopsis linearis	Desert willow	CHLI2	<0.1	<0.1	<0.1	S
Ericameria nauseosa	Rubber rabbitbrush	ERNA	<0.1	0.6	<0.1	S
Senecio flaccidus	Threadleaf groundsel	SEFL3	--	--	--	V

Notes:
S=seeded; V=volunteer
-- = oberved on plot

Table 11: Vegetation Cover and Density Results for the ESMA Treatment, 2020

Scientific Name	Common Name	Code	Mean Cover (%)		Mean Density (stems/m²)	Source
			Basal	Canopy		
Warm-season Grasses						
Aristida purpurea	Purple threeawn	ARPU	--	--	--	V
Bothriochloa barbinodis	Cane bluestem	BOBA3	--	--	--	S
Bouteloua curtipendula	Sideoats grama	BOCU	0.9	9.5	10.6	S
Bouteloua gracilis	Blue grama	BOGR2	<0.1	<0.1	0.2	V
Dasyochloa pulchella	Low woollygrass	DAPU7	--	--	--	V
Panicum capillare	Witchgrass	PACA6	--	--	--	V
Schizachyrium scoparium	Little bluestem	SCSC	0.1	1.0	2.3	S
Cool-Season Grasses						
Elymus elymoides	Bottlebrush squirreltail	ELEL	<0.1	0.2	0.3	S
Elymus glaucus	Blue wildrye	ELGL	<0.1	0.3	0.7	S
Poa secunda	Sandberg bluegrass	POSE	<0.1	<0.1	<0.1	S
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	<0.1	0.3	0.8	S
Forbs						
Achillea millefolium	Common yarrow	ACMI2	<0.1	<0.1	<0.1	S
Baileya multiradiata	Desert marigold	BAMU	--	--	--	S
Chaenactis stevioides	False yarrow	CHST	<0.1	<0.1	0.6	V
Chenopodium leptophyllum	Narrowleaf goosefoot	CHLE4	<0.1	<0.1	0.6	V
Dalea candida	White prairie clover	DACA	<0.1	<0.1	0.2	V
Eriogonum pharnaceoides	Wirestem buckwheat	ERPH2	--	--	--	V
Eriogonum polycladon	Annual pink buckwheat	ERPO	--	--	--	V
Heliomeris longifolia	Longleaf false goldeneye	HELO6	--	--	--	V
Heterotheca subaxillaris	Telegraph plant	HESU3	--	--	--	V
Lotus rigidus	Shrubby deervetch	LORI3	<0.1	<0.1	<0.1	S
Machaeranthera gracilis	Slender goldenweed	MAGR	--	--	--	V
Melilotus officinalis	Yellow sweetclover	MEOF	<0.1	<0.1	<0.1	V
Penstemon palmeri	Palmer's penstemon	PEPA8	<0.1	0.8	0.1	S
Pseudognaphalium canescens	Gray everlasting	PSCA	--	--	--	V
Psoralidium lanceolatum	Lemon scurfpea	PSLA3	--	--	--	V
Rhynchosia senna	Rosary bean	RHSE	--	--	--	V
Salsola tragus	Russian thistle	SATR	--	--	--	V
Stephanomeria pauciflora	Skeleton weed	STPA4	--	--	--	V
Shrubs						
Artemisia ludoviciana	White sagebrush	ARLU	<0.1	1.3	1.9	S
Atriplex canescens	Four-wing saltbush	ATCA	--	--	--	S
Brickellia californica	California brickellbush	BRCA	<0.1	0.5	1.2	V
Chilopsis linearis	Desert willow	CHLI2	<0.1	0.7	0.4	V
Ericameria nauseosa	Rubber rabbitbrush	ERNA	--	--	--	S
Fallugia paradoxa	Apache plume	FAPA	--	--	--	V
Senegalia greggii	Catclaw acacia	SEGR4	<0.1	<0.1	<0.1	S
Vachellia constricta	Whitethorn acacia	VACO9	<0.1	2.3	<0.1	S

Notes:
S=seeded; V=volunteer
-- = oberved on plot

Table 12: Vegetation Cover and Density Results for the ESMB Treatment, 2020

Scientific Name	Common Name	Code	Mean Cover (%)		Mean Density (stems/m²)	Source
			Basal	Canopy		
Warm-season Grasses						
Aristida purpurea	Purple threeawn	ARPU	--	--	--	V
Aristida purpurea var. longiseta	Fendler threeawn	ARPUL	<0.1	<0.1	0.1	S
Bothriochloa barbinodis	Cane bluestem	BOBA3	<0.1	<0.1	<0.1	S
Bouteloua curtipendula	Sideoats grama	BOCU	0.6	6.8	13.1	S
Bouteloua gracilis	Blue grama	BOGR2	<0.1	<0.1	0.2	V
Panicum capillare	Witchgrass	PACA6	--	--	--	V
Schizachyrium scoparium	Little bluestem	SCSC	<0.1	0.6	1.9	S
Sporobolus airoides	Alkali sacaton	SPAI	<0.1	<0.1	<0.1	S
Cool-Season Grasses						
Elymus elymoides	Bottlebrush squirreltail	ELEL	<0.1	0.2	1.0	S
Elymus glaucus	Blue wildrye	ELGL	<0.1	0.5	0.9	S
Poa secunda	Sandberg bluegrass	POSE	<0.1	<0.1	<0.1	S
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	<0.1	0.1	0.5	S
Forbs						
Achillea millefolium	Common yarrow	ACMI2	--	--	--	S
Baileya multiradiata	Desert marigold	BAMU	--	--	--	S
Chaenactis fremontii	Pincushion flower	CHFR	<0.1	<0.1	<0.1	V
Chaenactis stevioides	False yarrow	CHST	<0.1	<0.1	0.2	V
Chenopodium leptophyllum	Narrowleaf goosefoot	CHLE4	<0.1	<0.1	<0.1	V
Dalea candida	White prairie clover	DACA	--	--	--	V
Eriogonum pharnaceoides	Wirestem buckwheat	ERPH2	--	--	--	V
Eriogonum polycladon	Annual pink buckwheat	ERPO	--	--	--	V
Eriogonum wrightii	Bastardsage	ERWR	--	--	--	V
Heliomeris longifolia	Longleaf false goldeneye	HELO6	--	--	--	V
Lotus rigidus	Shrubby deervetch	LORI3	<0.1	<0.1	0.1	S
Linum lewisii	Lewis flax	LILE	--	--	--	V
Machaeranthera canescens	Purple aster	MACA	--	--	--	V
Machaeranthera gracilis	Slender goldenweed	MAGR	--	--	--	V
Penstemon palmeri	Palmer's penstemon	PEPA8	0.1	1.3	0.3	S
Pseudognaphalium canescens	Gray everlasting	PSCA	--	--	--	V
Psoralidium lanceolatum	Lemon scurfpea	PSLA3	--	--	--	V
Ratibida columnifera	Upright prairie coneflower	RACO3	--	--	--	V
Rhynchosia senna	Rosary bean	RHSE	--	--	--	V
Salsola tragus	Russian thistle	SATR	--	--	--	V
Stephanomeria pauciflora	Skeleton weed	STPA4	--	--	--	V
Shrubs						
Artemisia ludoviciana	White sagebrush	ARLU	<0.1	0.7	1.6	S
Atriplex canescens	Four-wing saltbush	ATCA	--	--	--	S
Brickellia californica	California brickellbush	BRCA	<0.1	<0.1	0.2	V
Chilopsis linearis	Desert willow	CHLI2	<0.1	0.3	0.4	V
Ericameria nauseosa	Rubber rabbitbrush	ERNA	<0.1	<0.1	<0.1	S
Fallugia paradoxa	Apache plume	FAPA	--	--	--	V
Picea pungens	Blue spruce	PIPU	--	--	--	V
Senecio flaccidus	Threadleaf groundsel	SEFL3	--	--	--	V
Senegalia greggii	Catclaw acacia	SEGR4	--	--	--	S
Vachellia constricta	Whitethorn acacia	VACO9	--	--	--	S

Notes:
S=seeded; V=volunteer
-- = oberved on plot

Table 13: Vegetation Cover and Density Results for the Tyrone Reference Area, 2020

Scientific Name	Common Name	Code	Mean Cover (%)		Mean Density (stems/m²)
			Basal	Canopy	
Warm-season Grasses					
Aristida harvardii	Harvard's threeawn	ARHA3	0.2	1.4	1.0
Aristida purpurea	Purple threeawn	ARPU	<0.1	1.2	0.8
Aristida purpurea var. longiseta	Fendler threeawn	ARPUL	<0.1	0.5	0.2
Aristida ternipes	Spidergrass	ARTE3	0.2	2.9	0.4
Bouteloua curtipendula	Sideoats grama	BOCU	0.4	6.3	2.9
Bouteloua eriopoda	Black grama	BOER4	<0.1	0.8	0.6
Bouteloua gracilis	Blue grama	BOGR2	1.4	8.1	6.1
Bouteloua hirusta	Hairy grama	BOHI2	<0.1	1.2	0.8
Digitaria californica	Arizona cottontop	DICA8	<0.1	0.1	<0.1
Hilaria belangeri	Curly mesquite	HIBE	0.2	1.0	2.3
Lycurus phleoides	Common wolfstail	LYPH	<0.1	<0.1	0.2
Muhlenbergia asperifolia	Scratchgrass	MUAS	<0.1	0.5	0.1
Muhlenbergia emersleyi	Bullgrass	MUEM	<0.1	1.5	0.6
Cool-Season Grasses					
Poa secunda	Sandberg bluegrass	POSE	<0.1	0.4	0.3
Forbs					
Bahia dissecta	Bahia	BADI	<0.1	<0.1	<0.1
Chenopodium album	Lambsquarters	CHAL7	<0.1	<0.1	<0.1
Chaetopappa ericoides	Rose heath	CHER	<0.1	0.1	<0.1
Erigeron flagellaris	Trailing fleabane	ERFL	<0.1	<0.1	0.3
Eriogonum wrightii	Bastardsage	ERWR	0.2	0.8	0.2
Evolvulus sericeus	Silver dwarf morning-glory	EVSE	<0.1	0.2	0.5
Hoffmannseggia glauca	Hog potato	HOGL2	<0.1	0.4	0.4
Lappula occidentalis	Flatspine stickseed	LAOC3	<0.1	0.4	0.2
Lepidium alyssoides	Mesa pepperwort	LEAL4	<0.1	<0.1	<0.1
Lepidium montanum	Mountain pepperweed	LEMO2	<0.1	1.8	0.7
Linum lewisii	Lewis flax	LILE	<0.1	<0.1	<0.1
Machaeranthera canescens	Purple aster	MACA	0.1	5.4	8.7
Machaeranthera gracilis	Slender goldenweed	MAGR	<0.1	<0.1	<0.1
Penstemon barbatus	Beardlip penstemon	PEBA2	<0.1	<0.1	<0.1
Phemeranthus aurantiacus	Orange fameflower	PHAU13	<0.1	0.7	4.9
Plantago patagonica	Woolly plantain	PLPA2	<0.1	<0.1	<0.1
Sanvitalia abertii	Abert's creeping zinnia	SAAB	<0.1	0.2	0.2
Sisymbrium altissimum	Tall tumblemustard	SIAL2	<0.1	<0.1	<0.1
Solanum elaeagnifolium	Silverleaf nightshade	SOEL	<0.1	<0.1	0.2
Sphaeralcea coccinea	Scarlet globemallow	SPCO	<0.1	<0.1	<0.1
Unknown Brassicaceae	Unknown mustard family species	UNKBR	<0.1	<0.1	0.1
Shrubs					
Acaciella angustissima	Prairie acacia	ACAN11	<0.1	1.6	0.6
Baccharis pteronioides	Yerba de pasmo	BAPT	<0.1	0.6	<0.1
Dasylirion wheeleri	Common sotol	DAWH2	0.8	2.3	<0.1
Gutierrezia sarothrae	Broom snakeweed	GUSA	0.1	3.2	0.6
Nolina microcarpa	Beargrass	NOMI	0.3	2.8	<0.1
Prosopis glandulosa	Honey mesquite	PRGL	0.4	8.3	0.2
Quercus emoryi	Emory oak	QUEM	<0.1	0.5	<0.1
Quercus grisea	Gray oak	QUGR3	0.2	2.1	<0.1

Notes:
Table 13 provides a comprehensive plant species list for the Tyrone Reference Area

Figures

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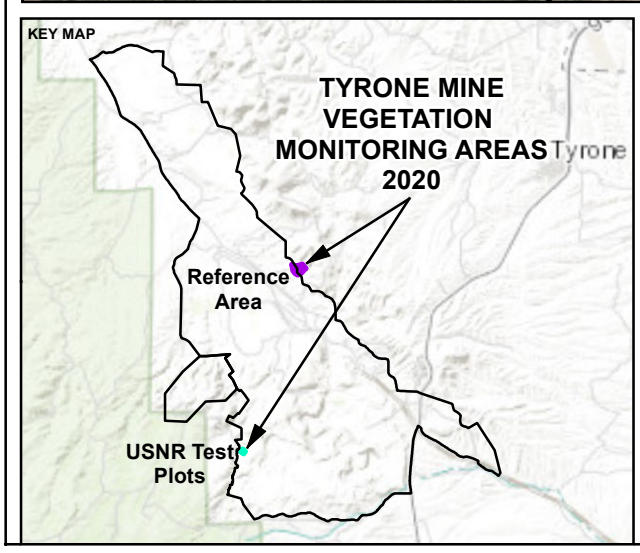
KEY MAP



LEGEND

- USNR Test Plots
- Reference Area

0 1,500 3,000

1 " = 1,500 ' Feet

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1983

CLIENT
FREEPORT-MCMORAN TYRONE AND LITTLE ROCK MINES
GRANT COUNTY, NEW MEXICO

PROJECT
2020 QUANTITATIVE VEGETATION AND EROSION MONITORING FOR USNR TEST PLOTS

TITLE
TYRONE MINE VEGETATION MONITORING AREAS, 2020

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2020-08-07
DESIGNED	DW
PREPARED	GFD
REVIEWED	DW
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
19122576	A001	0	1

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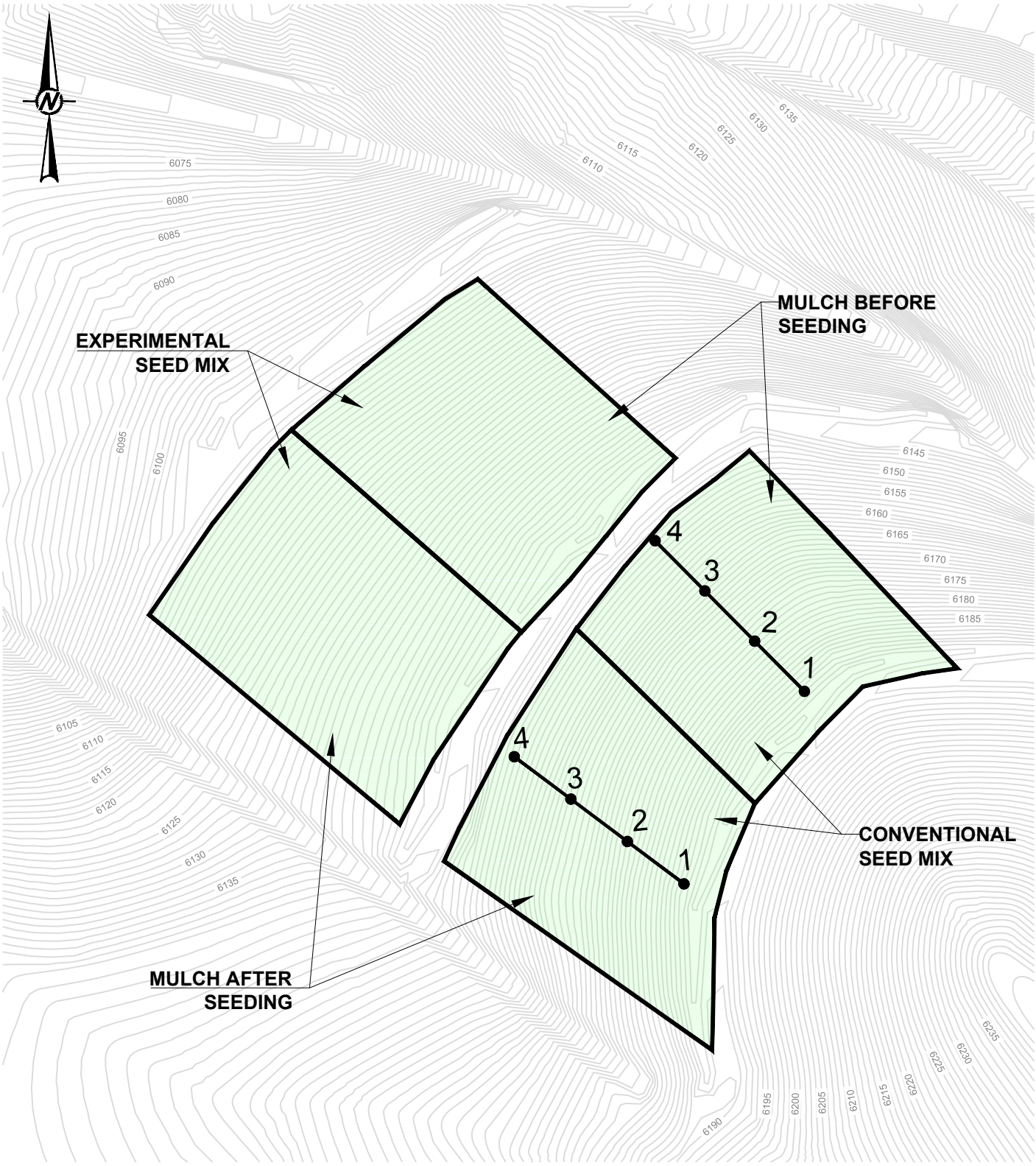

LEGEND

4 3 2 1

TEST PLOT BOUNDARY

TRANSECT LOCATION WITH STATIONS AT 40 FEET APART, STATION 1 AT 10 FEET FROM CREST OF SLOPE.

REFERENCE(S)

TOPOGRAPHY PROVIDED BY FREEPORT McMoRAN TYRONE INC.

0 40 80
1" = 80' FEET

CLIENT
FREEPORT-MCMORAN, TYRONE AND LITTLE ROCK MINES
GRANT COUNTY, NEW MEXICO

PROJECT
2019 USNR TEST PLOT
VEGETATION AND EROSION MONITORING

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2017-02-22
DESIGNED	LM
PREPARED	CM
REVIEWED	DR
APPROVED	DR

TITLE
CONFIGURATION OF THE USNR TEST PLOTS AND EROSION TRANSECT LOCATIONS

PROJECT NO.	PHASE	REV.	FIGURE
191-22576	--	--	2

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
0 1 in

Figure 3: Daily Precipitation at the Little Rock Meteorological Station, 2015-2020

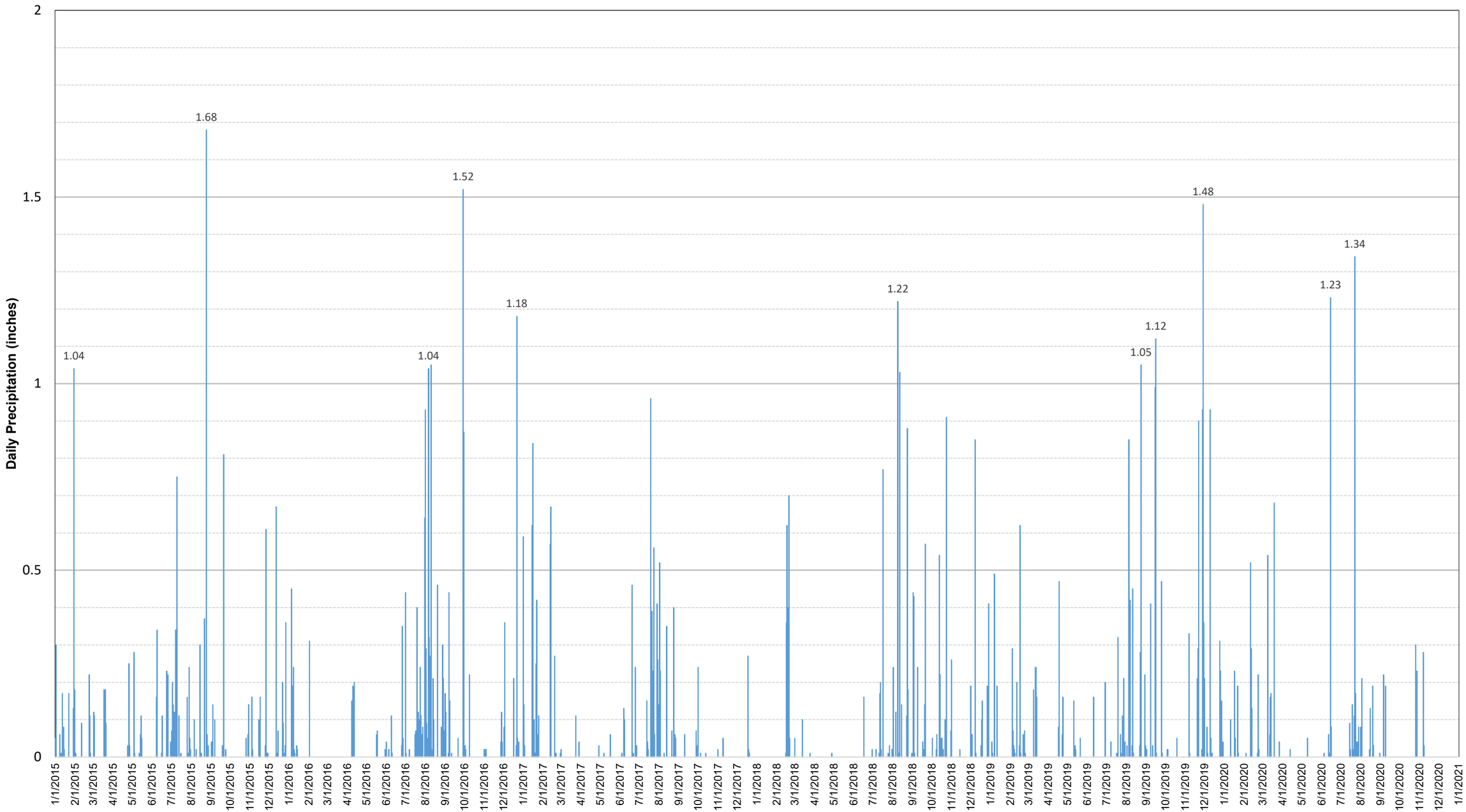
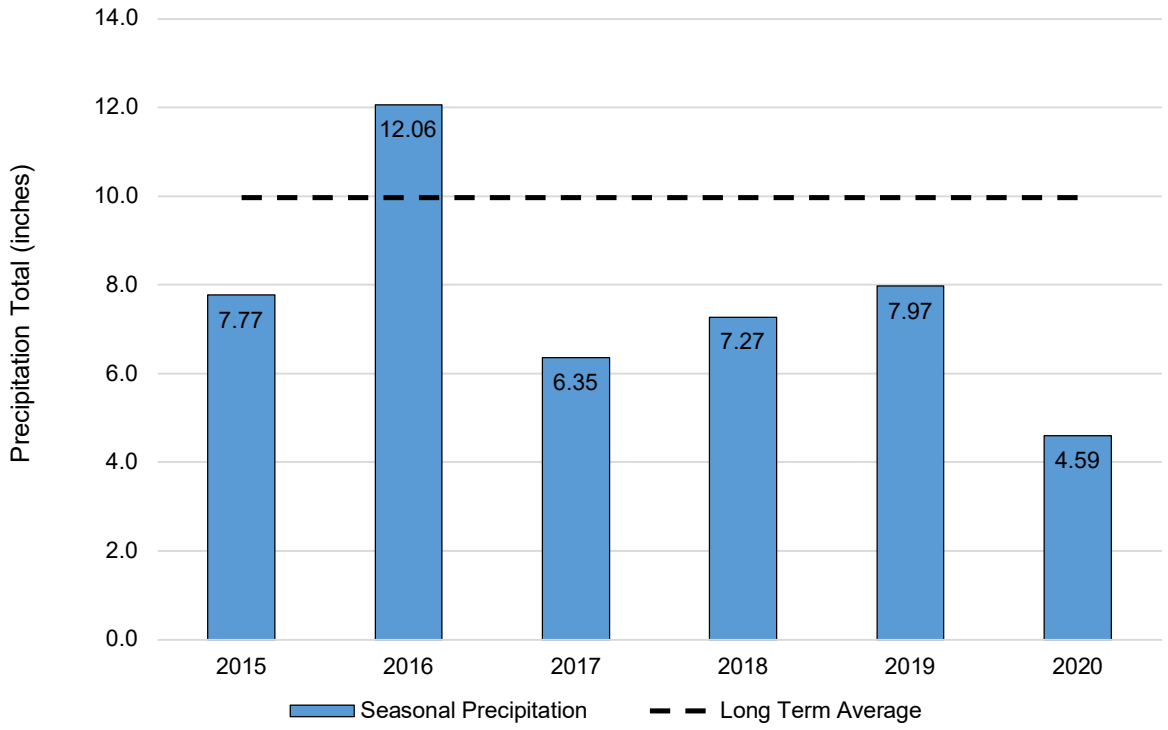


Figure 4: Growing Season Precipitation at the Little Rock Meteorological Station, 2015-2020

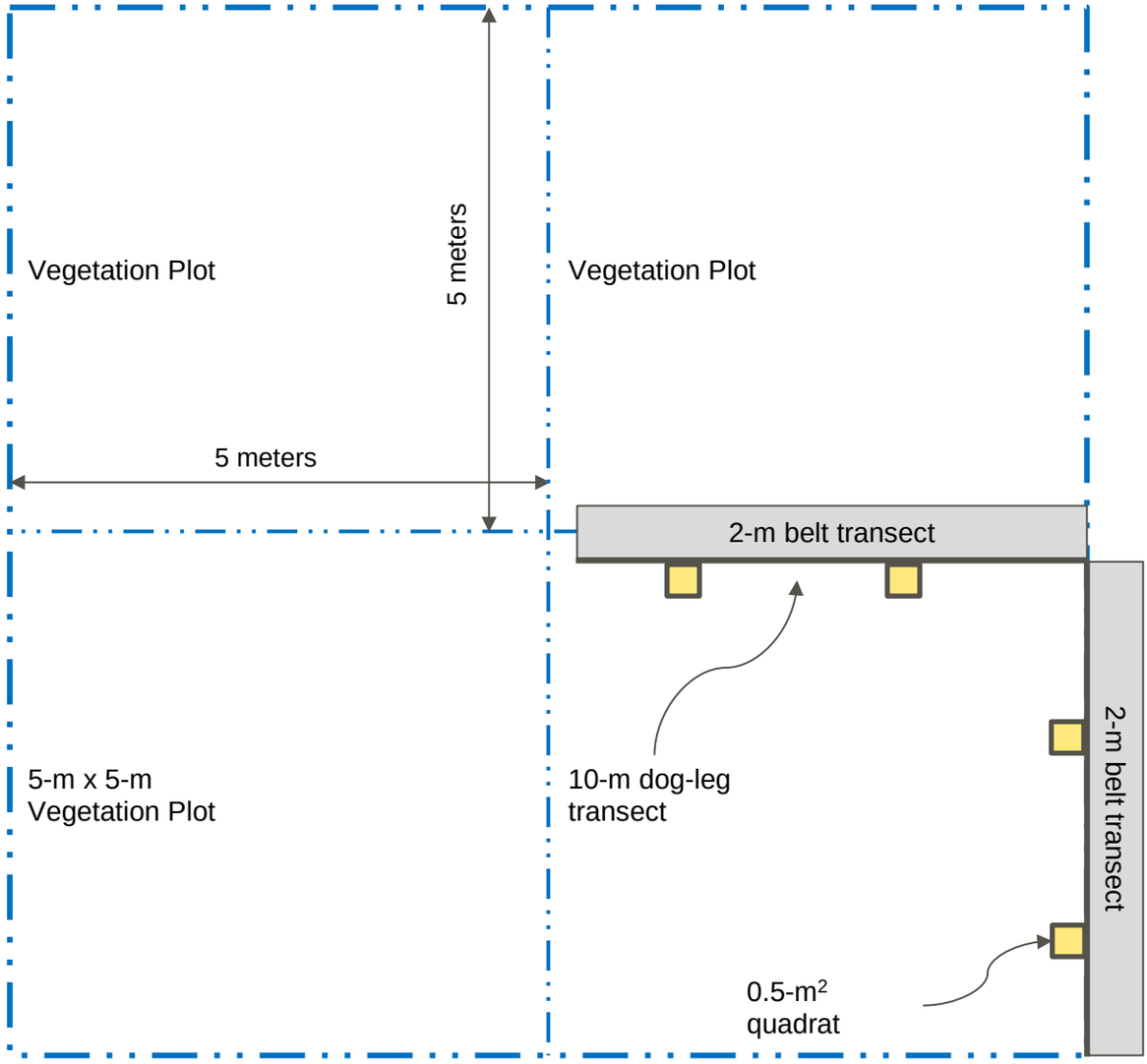


Notes:

[a] The long-term average (1897-2011) for Ft Bayard Station (293265) (WRCC 2019).

[b] Growing season precipitation totals are for May through September.

Figure 5: Vegetation Plot, Transect, and Quadrat Layout



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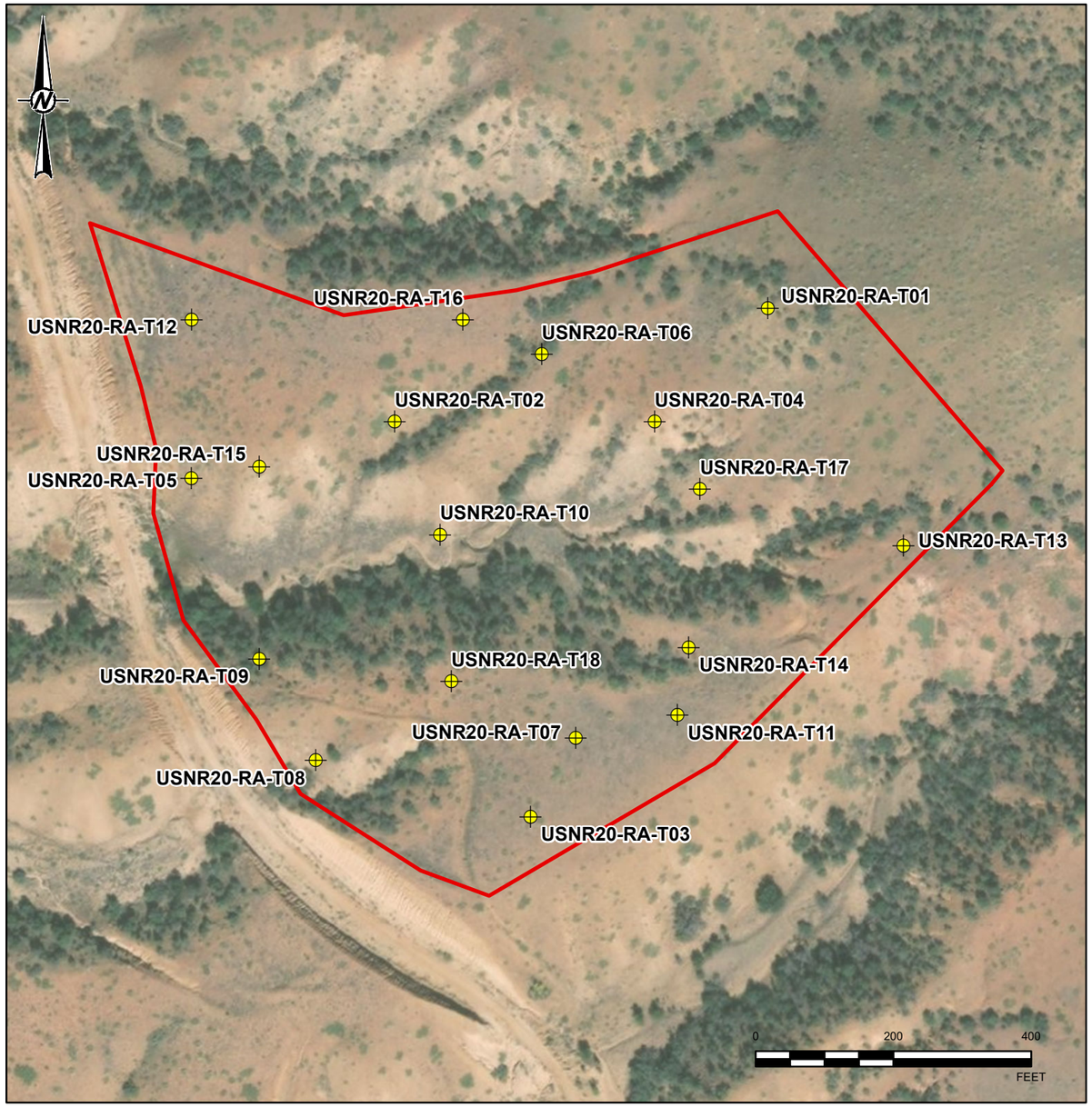
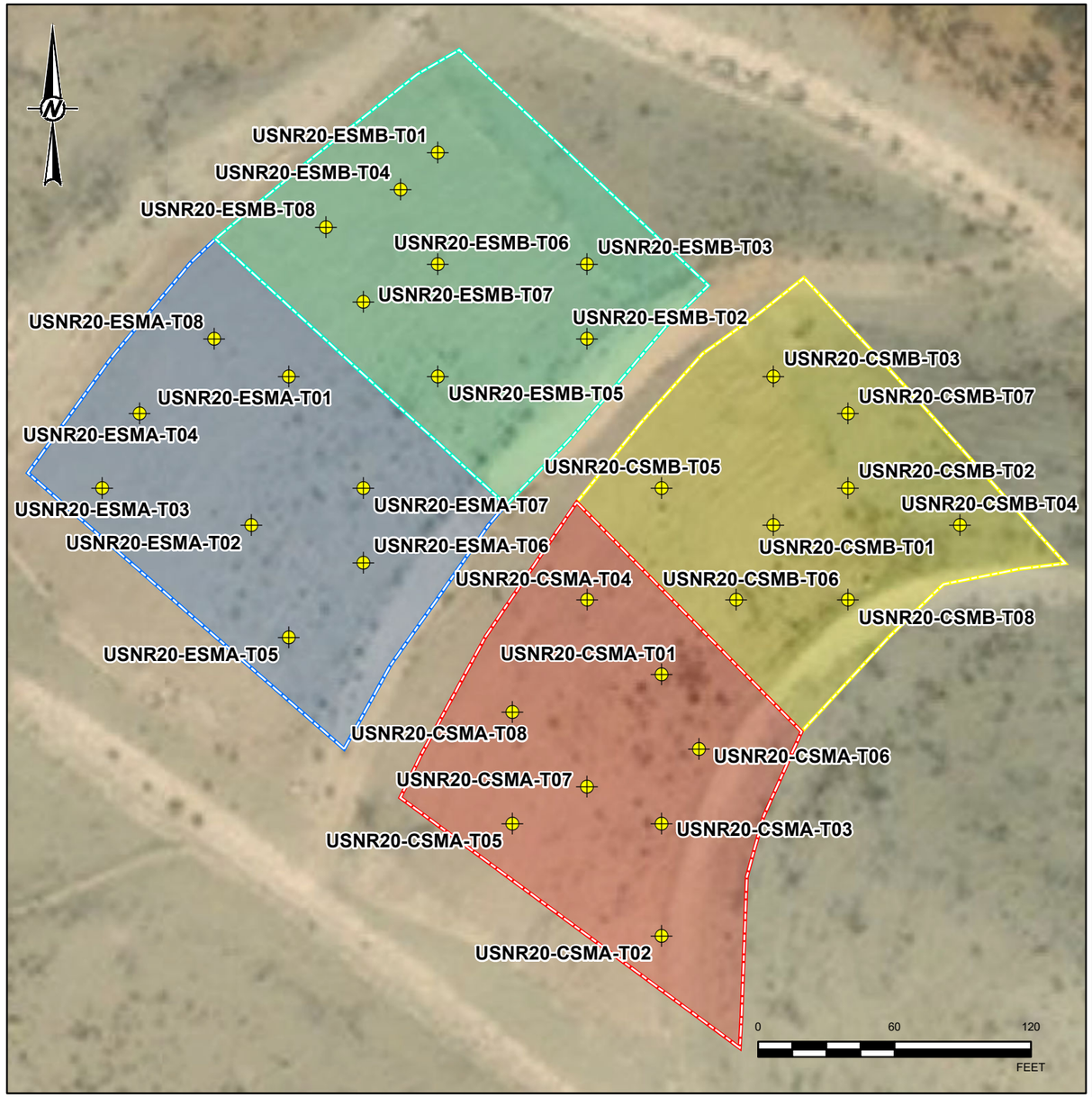
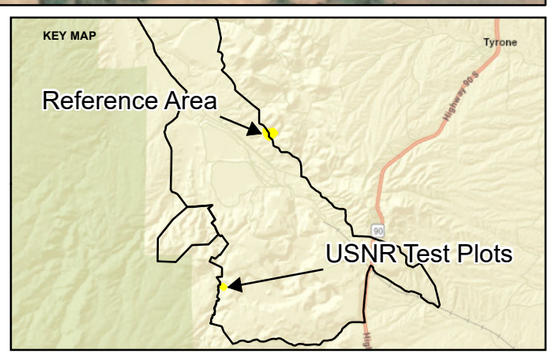




LEGEND

- Vegetation Monitoring Transects
- Conventional Seed Mix, Mulch After Seeding
- Conventional Seed Mix, Mulch Before Seeding
- Experimental Seed Mix, Mulch After Seeding
- Experimental Seed Mix, Mulch Before Seeding
- Reference Area



NOTE(S)

1. CS = CONVENTIONAL SEED MIX
2. ES = EXPERIMENTAL SEED MIX
3. MB = MULCH BEFORE SEEDING
4. MA = MULCH AFTER SEEDING
5. KEY MAP IS NOT TO SCALE

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1983
UNITS: FOOT US

CLIENT
FREEPORT MCMORAN TYRONE AND LITTLE ROCK MINES
GRANT COUNTY, NEW MEXICO

PROJECT
2020 QUANTITATIVE VEGETATION AND EROSION MONITORING FOR USNR TEST PLOTS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2020-08-14
DESIGNED	GFD
PREPARED	GFD
REVIEWED	DR
APPROVED	TS

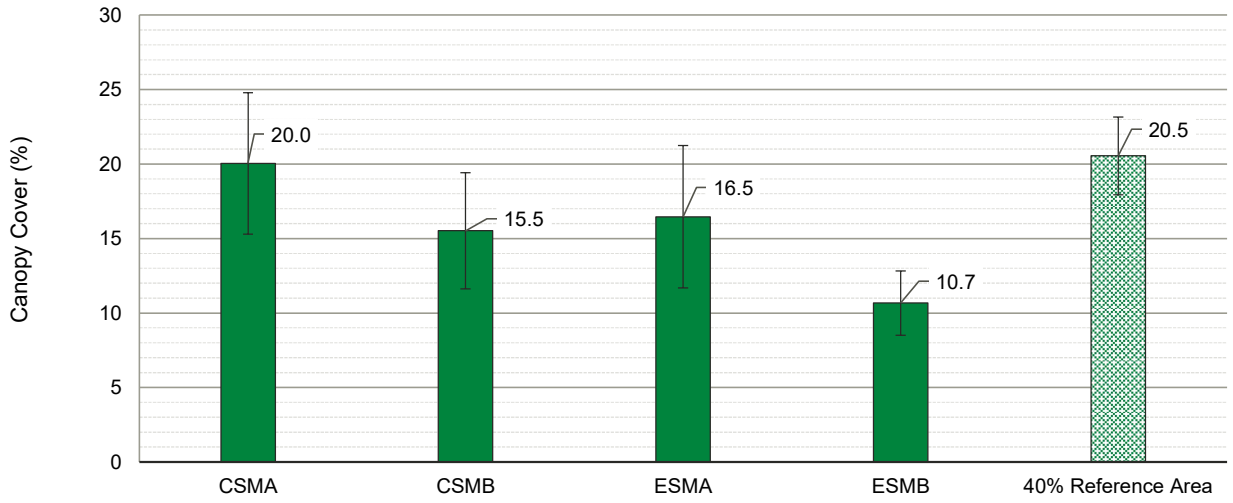
TITLE
REFERENCE AREA AND USNR TEST PLOT VEGETATION TRANSECT LOCATIONS, 2020

PROJECT NO.	CONTROL	REV.	FIGURE
19122576	A002	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

PATH: G:\Projects\Freeport_McMoran\Tyrone_NM\99_PROJECTS\19122576_Tyrone_USNR_Borrow\TestPlots\A_USNR_TestPlot_Monitoring\02_PRODUCTION\MXD\19122576_A002_Tyrone_2020_VegTransectLocations.mxd PRINTED ON: 2020-08-14 AT: 9:13:54 AM

Figure 7: Canopy Cover for USNR Test Plots Treatments and the Tyrone Reference Area Standard (40%)



Notes:

Error bars are the 90% confidence interval about the mean

CSMA = Conventional seed mix, mulch applied after seeding

CSMB = Conventional seed mix, mulch applied before seeding

ESMA = Experimental seed mix, mulch applied after seeding

ESMB = Experimental seed mix, mulch applied before seeding

Figure 8: Conventional Seed Mix Plots, Photograph Comparisons

Mulch Before (CSMB)

Mulch After (CSMA)

Figure 8a: August 2020

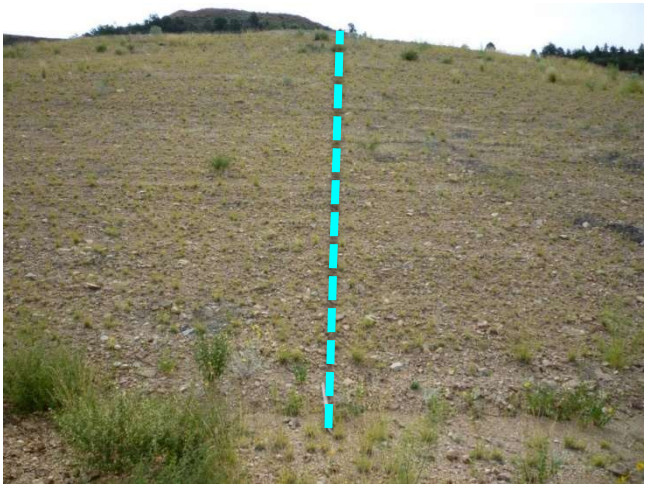


Figure 8b: September 2018

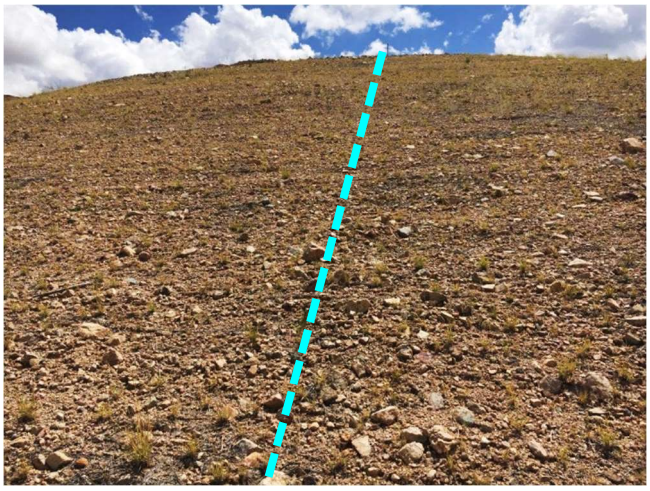
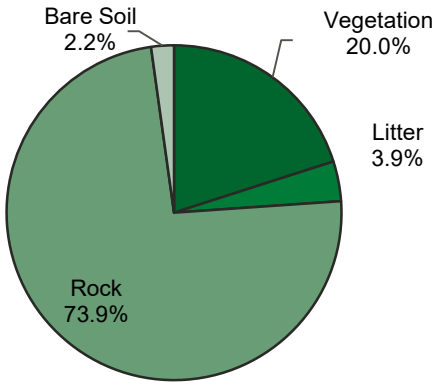


Figure 8c: September 2017

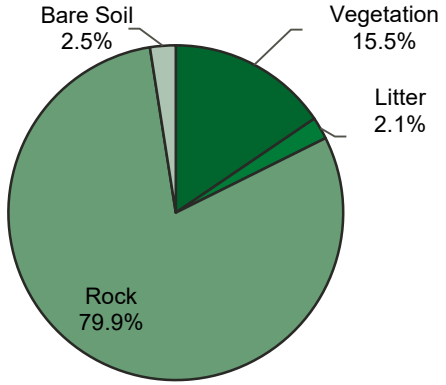
Figure 9: Ground Cover Components and Proportional Canopy Cover by Plant Class for Conventional Seed Mix Plots, 2020

Canopy Cover Components

CSMA

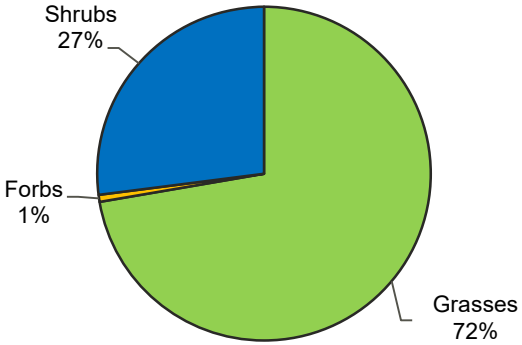


CSMB



Proportional Canopy Cover by Plant Class

CSMA



CSMB

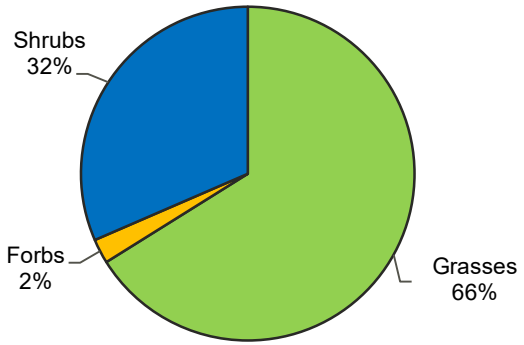


Figure 10: Experimental Seed Mix Plots, Photograph Comparisons

Mulch Before (ESMB)

Mulch After (ESMA)

Figure 10a: August 2020

Figure 10b: September 2018

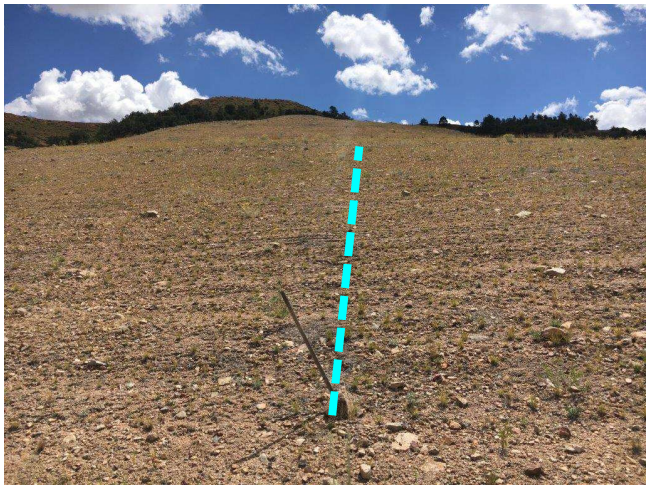
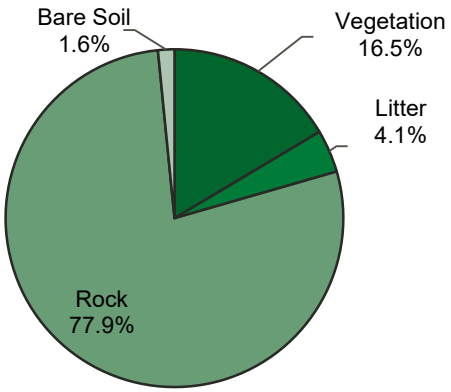


Figure 10c: September 2017

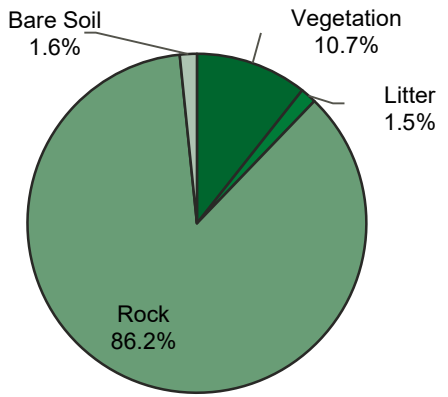
Figure 11: Ground Cover Components and Proportional Canopy Cover by Plant Class for Experimental Seed Mix Plots, 2020

Canopy Cover Components

ESMA

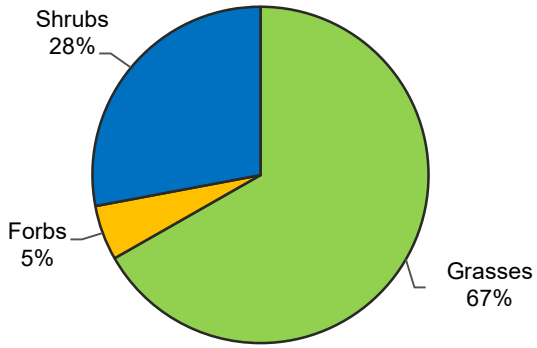


ESMB



Proportional Canopy Cover by Plant Class

ESMA



ESMB

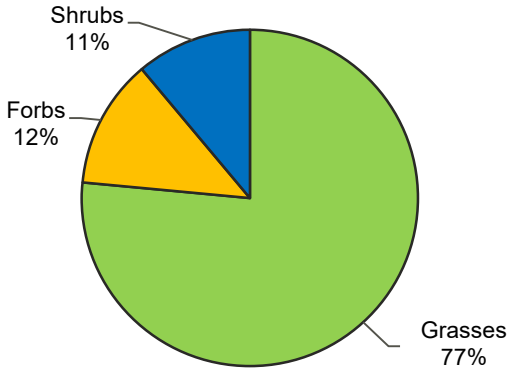
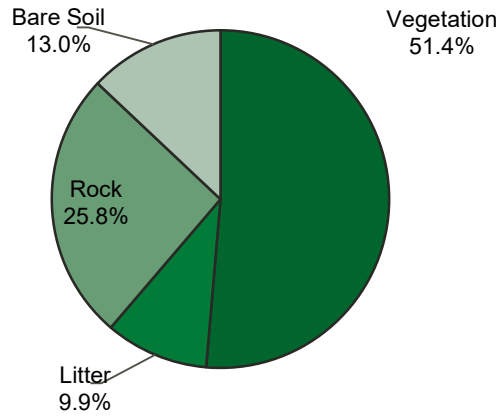


Figure 12: Ground Cover Components and Proportional Canopy Cover by Plant Class for the Reference Area, 2020

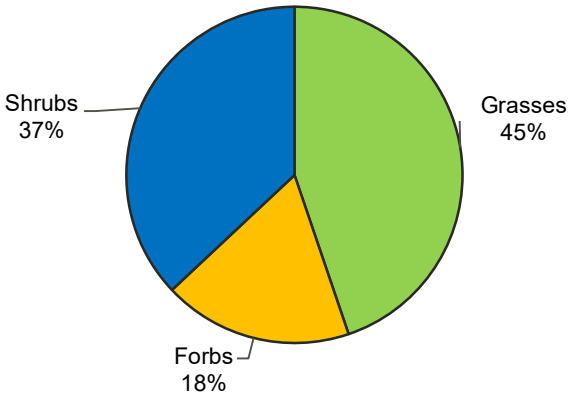
Canopy Cover Components

Reference Area



Proportional Canopy Cover by Plant Class

Reference Area



APPENDIX A

Erosion Transect Graphs and Photographs

Transect Location: USNR-N-1	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020
Transect Location: USNR-N-2	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020
Transect Location: USNR-N-3	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020

Transect Location: USNR-N-4	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020
Transect Location: USNR-S-1	

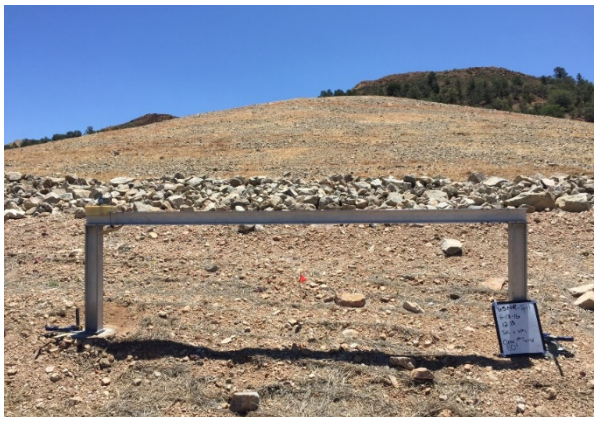



Photo Date: 6/13/2016	Photo Date: 12/07/2020
Transect Location: USNR-S-2	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020

Transect Location: USNR-S-3	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020
Transect Location: USNR-S-4	
	
Photo Date: 6/13/2016	Photo Date: 12/07/2020

FIGURE - A-1
TRANSECTS
USNR-N1, N2, N3, N4

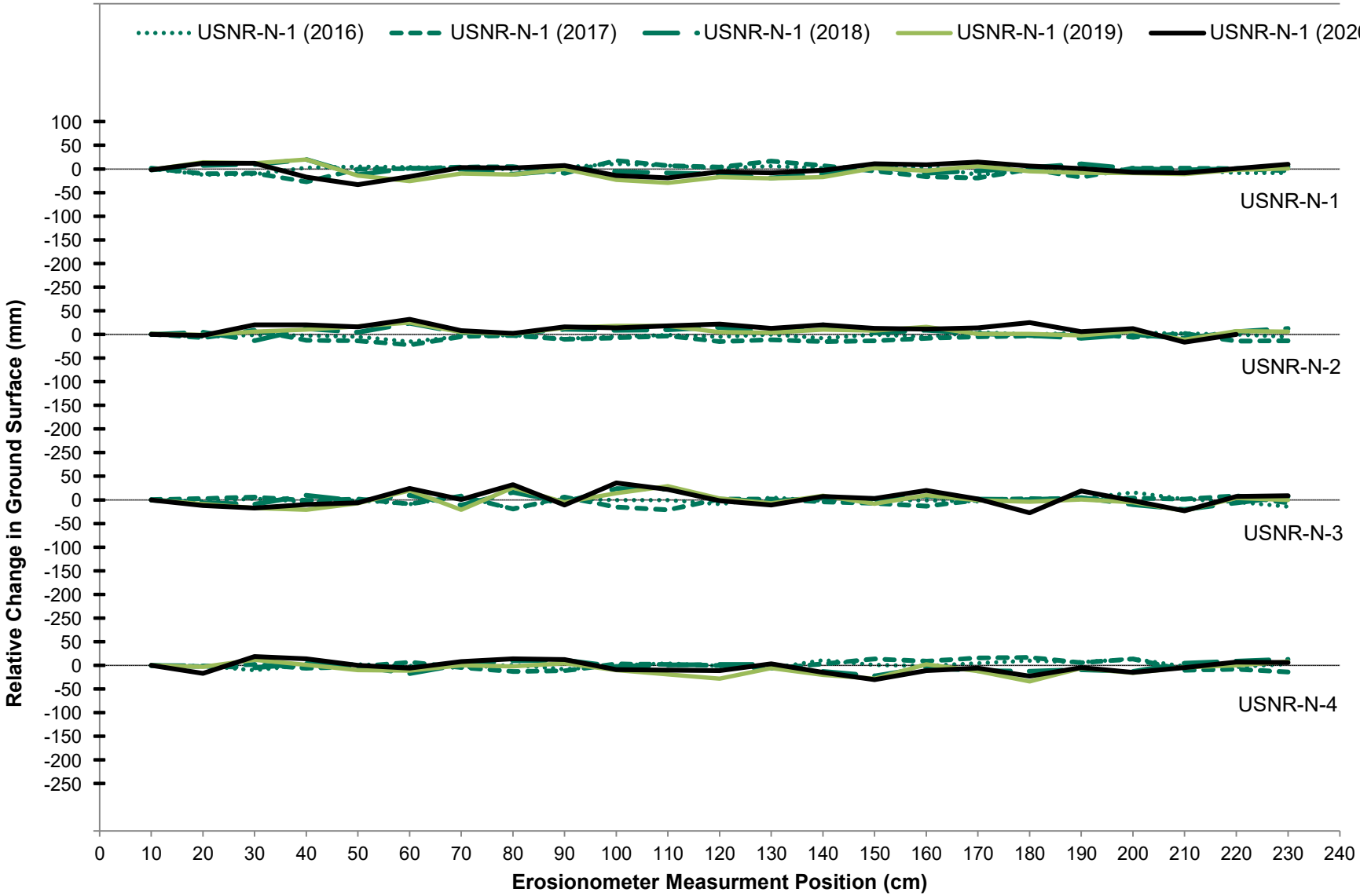
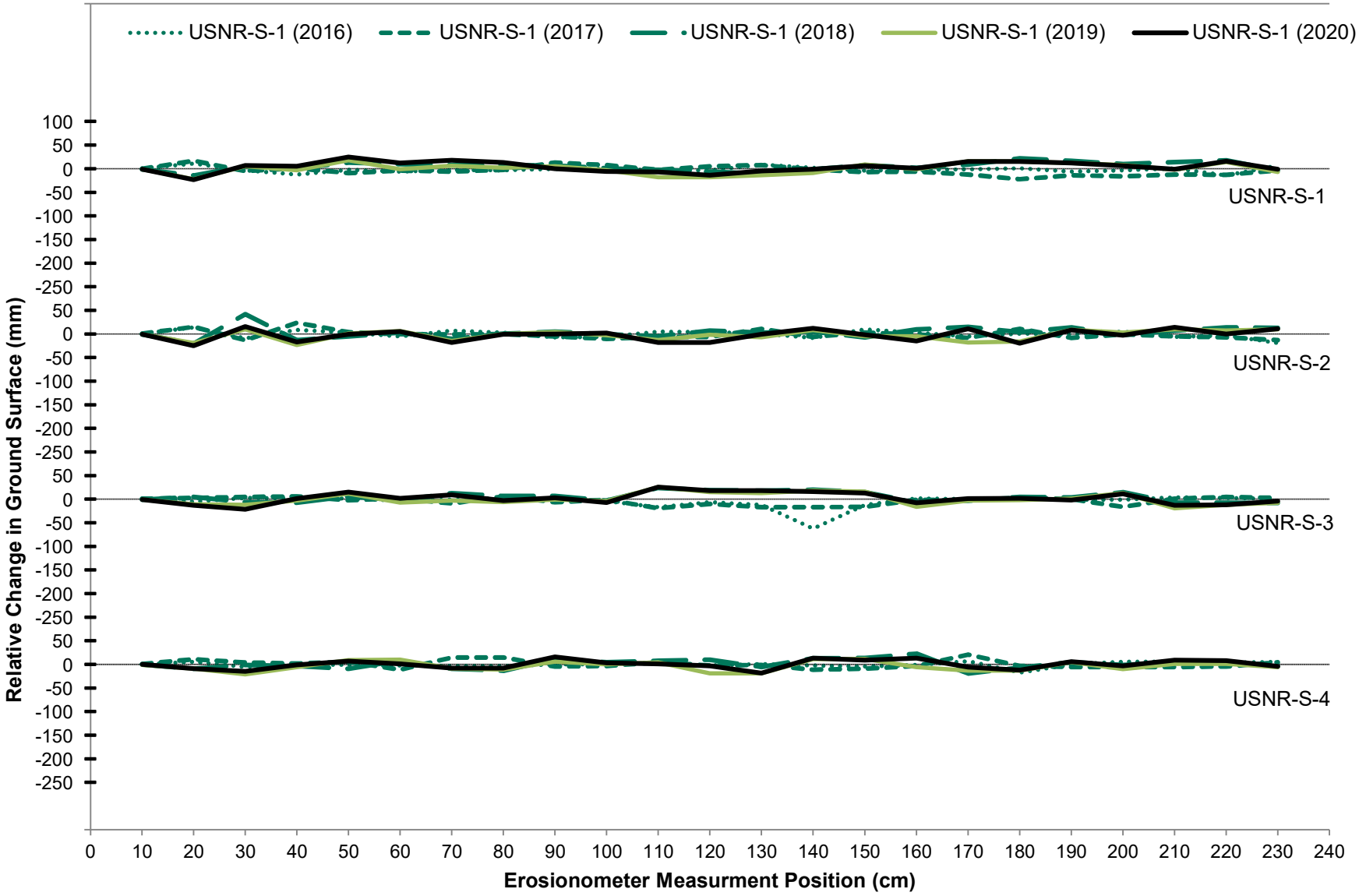


FIGURE - A-2
TRANSECTS
USNR-S1, S2, S3, S4



APPENDIX B

Vegetation Transect Data

Table B-1: CSMA Treatment, Canopy Cover (%) - 2020

Transect	USNR20-CSMA-T01				USNR20-CSMA-T02				USNR20-CSMA-T03				USNR20-CSMA-T04				USNR20-CSMA-T05				USNR20-CSMA-T06				USNR20-CSMA-T07				USNR20-CSMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ACHY	--	--	--	--	0.20	--	--	--	--	0.85	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARPU	--	--	--	--	--	--	--	--	0.55	--	--	0.25	0.05	--	--	--	--	--	--	1.00	--	--	--	--	0.30	0.10	1.00	--	--	--	--	--
BOCU	27.50	55.00	12.00	20.00	8.75	23.00	--	9.00	0.45	22.75	25.00	6.00	36.50	17.75	6.00	18.00	21.00	12.50	6.00	8.00	0.25	0.30	10.00	5.00	12.00	25.00	25.00	9.75	--	14.60	8.00	15.00
BOGR2	1.10	--	0.50	--	--	--	--	0.10	--	--	--	--	--	0.60	0.50	1.50	0.25	0.50	0.10	--	--	--	--	--	--	--	--	0.25	--	--	3.00	--
ELEL	--	--	--	--	--	0.25	--	--	2.70	--	--	--	--	0.20	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.30	--	--
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.00	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--
Shrubs																																
BRCA	--	0.10	--	--	0.30	--	--	0.03	1.00	--	--	--	1.75	0.25	57.00	--	--	--	--	0.03	1.75	32.50	65.00	--	--	14.00	--	--	2.75	--	--	--
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.50	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	28.6	55.1	12.5	20.0	9.3	23.3	0.0	9.0	4.7	23.6	25.0	6.3	38.3	18.8	59.0	19.5	21.2	13.1	6.0	9.0	2.0	32.8	65.0	9.5	12.3	38.0	26.0	10.0	2.8	15.9	10.0	15.0
Litter	1.4	1.3	0.5	0.5	1.0	4.5	25.0	1.0	5.0	3.2	1.0	0.8	15.3	6.5	0.0	0.5	3.0	1.2	5.0	5.0	0.5	8.5	0.0	0.0	2.3	4.0	0.0	0.5	19.3	6.1	0.5	0.5
Rock	68.0	41.8	86.0	79.0	88.0	70.8	75.0	90.0	88.8	71.5	72.0	91.0	45.2	73.7	41.0	74.0	74.0	84.0	82.0	76.0	96.0	58.0	35.0	90.5	82.5	56.0	67.0	89.5	77.0	76.3	86.5	78.5
Bare Soil	2.0	1.9	1.0	0.5	1.8	1.5	0.0	0.0	1.5	1.7	2.0	2.0	1.3	1.0	0.0	6.0	1.8	1.8	7.0	10.0	1.5	0.7	0.0	0.0	3.0	2.0	7.0	0.0	1.0	1.8	3.0	6.0

Notes:
Species codes defined in Table 8

Table B-2: CSMA Treatment, Basal Cover (%) - 2020

Transect	USNR20-CSMA-T01				USNR20-CSMA-T02				USNR20-CSMA-T03				USNR20-CSMA-T04				USNR20-CSMA-T05				USNR20-CSMA-T06				USNR20-CSMA-T07				USNR20-CSMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ACHY	--	--	--	--	0.03	--	--	--	--	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARPU	--	--	--	--	--	--	--	--	0.10	--	--	0.03	0.03	--	--	--	--	--	--	0.10	--	--	--	--	0.05	0.03	0.10	--	--	--	--	--
BOCU	1.75	4.25	0.50	0.25	0.80	2.00	--	0.50	0.05	1.75	0.50	0.25	1.40	2.25	0.50	0.50	1.80	1.10	0.25	0.50	0.10	0.05	0.25	0.25	1.75	1.60	1.00	0.25	--	1.40	0.50	1.00
BOGR2	0.25	--	0.10	--	--	--	--	0.03	--	--	--	--	--	0.10	0.10	0.10	0.10	0.15	0.03	--	--	--	--	--	--	--	--	0.10	--	--	0.10	--
ELEL	--	--	--	--	--	0.05	--	--	0.30	--	--	--	--	0.03	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--	--
Shrubs																																
BRCA	--	0.03	--	--	0.03	--	--	0.03	0.05	--	--	--	0.05	0.03	1.00	--	--	--	--	0.03	0.05	0.25	0.25	--	--	0.05	--	--	0.05	--	--	--
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.50	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	2.0	4.3	0.6	0.3	0.9	2.1	0.0	0.6	0.5	2.0	0.5	0.3	1.5	2.4	1.6	0.6	1.9	1.3	0.3	0.6	0.2	0.3	0.5	0.6	1.8	1.7	1.1	0.4	0.1	1.6	0.6	1.0
Litter	8.5	13.0	0.5	1.5	2.3	8.1	25.0	1.0	5.5	5.3	1.0	1.0	21.0	9.3	10.0	1.4	5.0	3.5	5.0	6.0	0.5	9.5	3.0	1.4	5.5	4.5	5.9	1.7	20.5	8.0	1.4	1.0
Rock	86.5	80.5	97.9	97.5	95.0	88.3	75.0	98.4	92.3	91.0	96.5	96.5	76.0	87.3	88.4	92.0	91.0	93.3	87.7	83.0	97.8	89.0	96.5	98.0	89.5	90.5	86.0	98.0	78.4	88.6	95.0	92.0
Bare Soil	3.0	2.2	1.0	0.8	1.9	1.6	0.0	0.0	1.7	1.8	2.0	2.2	1.5	1.1	0.0	6.0	2.1	2.0	7.0	10.4	1.6	1.2	0.0	0.0	3.2	3.3	7.0	0.0	1.1	1.9	3.0	6.0

Notes
Species codes defined in Table 8

Table B-3: CSMA Treatment, Frequency - 2020

Transect	USNR20-CSMA-T01				USNR20-CSMA-T02				USNR20-CSMA-T03				USNR20-CSMA-T04				USNR20-CSMA-T05				USNR20-CSMA-T06				USNR20-CSMA-T07				USNR20-CSMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ACHY	--	--	--	--	1	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARPU	--	--	--	--	--	--	--	--	1	--	--	2	1	--	--	--	--	--	--	1	--	--	--	--	3	5	1	--	--	--	--	--
BOCU	6	12	9	1	5	6	--	2	4	9	2	1	7	12	10	14	17	14	4	2	1	2	4	13	18	15	10	10	--	6	18	5
BOGR2	2	--	2	--	--	--	--	1	--	--	--	--	--	1	1	3	3	4	1	--	--	--	--	--	--	--	--	2	--	--	5	--
ELEL	--	--	--	--	--	1	--	--	4	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
Shrubs																																
BRCA	--	9	--	--	3	--	--	1	1	--	--	--	4	2	1	--	--	--	--	1	2	11	20	--	--	1	--	--	2	--	--	--
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--

Notes:
Species codes defined in Table 8

Table B-4: CSMB Treatment, Canopy Cover (%) - 2020

Transect	USNR20-CSMB-T01				USNR20-CSMB-T02				USNR20-CSMB-T03				USNR20-CSMB-T04				USNR20-CSMB-T05				USNR20-CSMB-T06				USNR20-CSMB-T07				USNR20-CSMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPU	--	0.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	0.10	--	--	--	--	--	--	--	--	--	--
BOCU	16.00	25.00	25.00	--	2.75	9.00	2.50	6.00	15.00	11.00	1.50	1.75	8.50	0.85	5.00	--	13.50	11.50	8.75	6.00	17.50	6.75	27.00	--	20.00	28.00	5.00	4.00	22.00	9.00	6.00	12.00
BOGR2	0.10	--	0.25	0.50	--	0.75	--	--	0.20	0.80	--	--	--	--	--	--	0.10	0.35	--	0.25	--	--	0.25	0.50	--	0.30	0.25	--	0.03	--	--	--
ELEL	--	--	--	--	--	0.50	--	--	0.30	0.25	--	--	--	--	--	--	--	--	--	--	--	0.15	--	--	--	0.40	--	--	--	--	--	--
SCSC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--
SPCR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.80	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	1.30	0.75	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	0.10	0.05	--	--
DACA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--
IPMU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	0.25
MESA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.75	--	--	--	--	--	--
Shrubs																																
BRCA	--	1.00	0.10	0.03	0.50	--	20.00	0.25	5.50	--	0.03	0.10	22.50	1.75	13.00	1.00	--	--	9.00	--	0.05	--	--	2.00	--	4.50	--	--	1.00	58.00	1.25	0.03
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERNA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.00	--	--	--
Cover Components																																
Vegetation	16.1	26.3	25.3	0.5	3.3	10.3	22.0	6.3	21.0	12.1	1.5	1.9	32.0	3.9	19.0	8.0	13.6	11.9	18.0	6.3	17.8	7.1	25.0	2.5	20.0	32.3	6.3	4.0	41.1	62.5	7.3	12.0
Litter	0.5	1.0	0.3	6.0	3.0	2.0	5.0	0.3	7.0	2.5	4.5	1.0	4.0	6.2	0.5	1.5	3.3	4.5	0.3	0.3	5.0	0.5	0.5	0.5	1.0	2.0	0.5	0.5	0.6	1.3	2.0	0.3
Rock	82.0	71.0	74.0	88.0	92.0	86.5	71.0	93.0	70.0	84.0	93.0	96.4	62.0	88.5	75.0	78.5	82.0	82.2	79.8	90.8	75.0	91.0	62.5	92.0	76.5	64.3	90.3	95.0	58.0	35.0	89.0	87.8
Bare Soil	1.4	1.7	0.5	5.5	1.8	1.3	2.0	0.5	2.0	1.5	1.0	0.8	2.0	1.5	5.5	12.0	1.2	1.5	2.0	2.8	2.2	1.5	12.0	5.0	2.5	1.5	3.0	0.5	0.4	1.3	1.8	0.0

Notes:
Species codes defined in Table 8

Table B-5: CSMB Treatment, Basal Cover (%) - 2020

Transect	USNR20-CSMB-T01				USNR20-CSMB-T02				USNR20-CSMB-T03				USNR20-CSMB-T04				USNR20-CSMB-T05				USNR20-CSMB-T06				USNR20-CSMB-T07				USNR20-CSMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPU	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	0.03	--	--	--	--	--	--	--	--	--	--
BOCU	1.50	1.75	1.00	--	0.80	2.25	0.25	0.50	0.85	1.75	0.50	0.25	0.75	0.15	0.50	--	2.00	1.25	0.50	0.75	2.75	0.60	0.50	--	2.50	3.00	0.50	0.50	1.75	0.85	0.50	0.50
BOGR2	0.03	--	0.03	0.25	--	0.20	--	--	0.03	0.10	--	--	--	--	--	--	0.05	0.15	--	0.10	--	--	0.10	0.10	--	0.05	0.10	--	0.03	--	--	--
ELEL	--	--	--	--	--	0.03	--	--	0.03	0.03	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	0.03	--	--	--	--	--	--
SCSC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--
SPCR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.15	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	0.05	0.05	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	0.03	0.03	--	--
DACA	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--
IPMU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	0.03
MESA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--
Shrubs																																
BRCA	--	0.05	0.03	0.03	0.03	--	0.25	0.03	0.10	--	0.03	0.03	0.25	0.05	0.25	0.25	--	--	0.25	--	0.03	--	--	0.25	--	0.10	--	--	0.05	0.20	0.03	0.03
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERNA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--
Cover Components																																
Vegetation	1.5	1.8	1.1	0.3	0.8	2.5	0.5	0.5	1.0	1.9	0.5	0.3	1.1	0.3	0.9	0.8	2.1	1.4	0.8	0.9	2.8	0.7	0.6	0.4	2.5	3.2	0.9	0.5	2.0	1.2	0.6	0.6
Litter	1.5	1.8	2.0	6.0	4.1	7.0	5.0	1.0	11.3	11.5	5.0	1.0	8.3	7.5	2.5	8.0	11.0	9.0	1.5	1.0	9.0	2.0	5.0	1.0	17.0	9.0	1.0	1.0	5.3	5.5	3.0	1.5
Rock	95.3	94.5	95.9	88.0	93.2	89.3	92.0	97.9	86.5	85.0	93.5	97.9	89.5	90.5	91.0	79.0	85.5	88.0	9.7	95.2	85.5	95.5	82.0	93.2	78.0	86.0	95.0	98.0	92.3	91.5	94.5	97.9
Bare Soil	1.7	1.9	1.0	5.7	1.9	1.3	2.5	0.6	1.2	1.6	1.0	0.8	1.2	1.7	5.6	12.3	1.5	1.6	88.0	3.0	2.7	1.8	12.4	5.5	2.5	1.8	3.2	0.5	0.5	1.8	1.9	0.0

Notes:
Species codes defined in Table 8

Table B-6: CSMB Treatment, Frequency - 2020

Transect	USNR20-CSMB-T01				USNR20-CSMB-T02				USNR20-CSMB-T03				USNR20-CSMB-T04				USNR20-CSMB-T05				USNR20-CSMB-T06				USNR20-CSMB-T07				USNR20-CSMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPU	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	4	--	--	--	--	--	--	--	--	--	--
BOCU	19	9	7	--	6	20	2	1	8	18	3	14	3	4	2	--	25	24	10	7	14	3	10	--	7	19	8	6	3	4	1	7
BOGR2	2	--	2	2	--	6	--	--	2	2	--	--	--	--	--	--	1	2	--	1	--	--	1	1	--	1	1	--	2	--	--	--
ELEL	--	--	--	--	--	1	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	--	--	--
SCSC	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--
SPCR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--
Forbs																																
CHST	--	--	--	--	--	--	--	--	--	--	--	--	6	10	--	--	--	--	--	--	--	1	--	--	--	--	--	--	3	3	--	--
DACA	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
IPMU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1
MESA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--
Shrubs																																
BRCA	--	4	1	1	2	--	3	1	2	--	1	3	6	8	1	2	--	--	1	--	5	--	--	1	--	4	--	--	20	10	5	10
CHLI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERNA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--

Notes:
Species codes defined in Table 8

Table B-7: ESMA Treatment, Canopy Cover (%) - 2020

Transect	USNR20-ESMA-T01				USNR20-ESMA-T02				USNR20-ESMA-T03				USNR20-ESMA-T04				USNR20-ESMA-T05				USNR20-ESMA-T06				USNR20-ESMA-T07				USNR20-ESMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
BOCU	1.20	3.90	2.40	4.80	2.50	4.20	6.60	3.60	7.75	10.50	5.00	4.50	16.00	9.75	12.00	11.00	15.00	6.75	25.00	5.00	9.50	19.50	12.00	--	0.15	18.50	27.00	25.00	9.50	8.00	6.00	12.00
BOGR2	--	--	--	--	--	0.20	--	0.20	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELEL	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--	0.75	0.80	--	--	--	0.80	--	--	--	1.20	--	--
ELGL	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	1.00	0.50	--	--	--	1.00	--	--	2.00	--	--	--	--	2.00	1.20	--	1.50	0.10
HENE5	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POSE	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCSC	--	0.50	1.40	0.10	0.10	--	0.35	1.20	0.90	7.50	0.50	4.00	--	0.65	--	--	--	0.50	--	--	2.25	0.20	0.50	--	0.25	--	1.50	0.50	--	6.50	0.50	1.00
THIN6	--	--	--	--	--	--	1.10	0.20	1.20	0.65	--	--	1.20	3.00	--	--	--	2.30	--	--	--	--	--	--	0.20	--	--	--	--	1.00	--	--
Forbs																																
ACMI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	0.10	0.20	--	--	--	--	--	--	--	0.10	--	--	0.10	0.65	--	--	--	--	--	--	0.15	--	--	--
DACA	--	--	--	0.05	--	0.05	--	--	--	0.50	--	0.25	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	0.65	--	--	7.50	--	--	--	--	4.00	--	12.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs																																
ARLU	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	17.00	--	3.50	12.00	4.00	--	--	1.00	--	--	--	--	--	0.90	0.10	1.00	--
BRCA	0.50	--	--	--	--	--	--	--	0.05	--	0.25	0.03	--	--	--	--	--	--	--	--	0.15	0.35	--	2.00	0.10	0.10	--	12.00	--	--	--	--
CHLI2	--	0.10	0.40	--	--	1.25	--	--	--	--	5.00	0.03	0.50	0.35	2.00	--	--	--	--	--	--	--	--	--	--	8.50	--	--	--	--	--	3.00
SEGR4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--
VACO9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	72.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	1.7	4.5	4.2	4.9	2.6	8.1	8.7	5.2	10.1	25.0	10.9	8.5	18.1	15.9	19.0	29.5	88.0	14.0	37.0	10.5	12.8	21.5	15.5	2.0	0.7	27.9	28.5	38.0	11.8	16.8	9.0	16.0
Litter	0.5	1.0	0.4	0.2	0.8	0.3	0.5	1.0	1.5	5.0	1.0	0.5	5.0	4.0	0.5	2.0	2.0	12.5	3.0	3.8	5.5	2.0	30.0	0.0	40.0	1.2	0.3	1.0	1.5	1.8	1.0	1.0
Rock	91.8	93.8	93.2	93.7	96.1	90.3	89.9	93.4	86.0	68.0	85.2	90.0	74.3	76.1	78.5	67.5	9.3	72.5	59.0	82.3	80.8	75.5	54.0	98.0	58.3	70.4	70.0	61.0	85.0	78.9	88.0	82.0
Bare Soil	6.0	0.8	2.2	1.2	0.5	1.3	0.9	0.4	2.5	2.0	3.0	1.0	2.7	4.0	2.0	1.0	0.8	1.0	1.0	3.5	1.0	1.0	0.5	0.0	1.0	0.5	1.3	0.0	1.8	2.6	2.0	1.0

Notes:
Species codes defined in Table 8

Table B-8: ESMA Treatment, Basal Cover (%) - 2020

Transect	USNR20-ESMA-T01				USNR20-ESMA-T02				USNR20-ESMA-T03				USNR20-ESMA-T04				USNR20-ESMA-T05				USNR20-ESMA-T06				USNR20-ESMA-T07				USNR20-ESMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
BOCU	0.30	1.10	1.10	1.40	0.80	1.30	1.20	1.10	1.00	2.20	0.10	0.25	2.30	1.50	0.25	0.25	2.10	0.50	0.50	0.50	1.50	1.90	0.25	--	0.03	2.50	0.50	0.25	1.00	0.75	0.10	0.25
BOGR2	--	--	--	--	--	0.00	--	0.15	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELEL	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	0.15	0.20	--	--	--	0.10	--	--	--	0.15	--	--
ELGL	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	0.10	0.10	--	--	--	0.10	--	--	0.10	--	--	--	--	0.10	0.15	--	0.03	0.03
HENE5	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POSE	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCSC	--	0.10	0.30	0.00	0.00	--	0.10	0.60	0.20	0.80	0.10	0.25	--	0.20	--	--	--	0.15	--	--	0.35	0.05	0.10	--	0.10	--	0.25	0.10	--	0.50	0.03	0.10
THIN6	--	--	--	--	--	--	0.10	0.05	0.20	0.10	--	--	0.30	0.25	--	--	--	0.30	--	--	--	--	--	--	0.03	--	--	--	--	0.10	--	--
Forbs																																
ACMI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	0.03	0.03	--	--	--	--	--	--	--	0.03	--	--	0.03	0.05	--	--	--	--	--	--	0.03	--	--	--
DACA	--	--	--	0.00	--	0.00	--	--	--	0.03	--	0.03	0.03	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	0.00	--	--	0.40	--	--	--	--	0.50	--	0.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs																																
ARLU	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	1.00	--	0.65	0.25	0.10	--	--	0.10	--	--	--	--	--	0.05	0.03	0.10	--
BRCA	0.00	--	--	--	--	--	--	--	0.03	--	0.03	0.03	--	--	--	--	--	--	--	--	0.03	0.03	--	0.03	0.03	0.03	--	0.50	--	--	--	--
CHLI2	--	0.00	0.00	--	--	0.00	--	--	--	--	0.10	0.03	0.05	0.03	0.10	--	--	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	0.03
SEGR4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--
VACO9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	0.3	1.2	1.4	1.4	0.8	1.5	1.4	1.9	1.5	3.6	0.4	0.6	2.8	2.5	1.0	1.5	3.3	1.7	0.8	0.7	2.1	2.2	0.6	0.0	0.2	2.8	0.8	1.0	1.2	1.5	0.3	0.4
Litter	0.8	2.1	1.7	1.3	1.5	1.3	2.0	2.5	4.0	12.3	1.0	1.8	12.0	8.0	1.8	3.0	17.0	16.5	12.0	4.8	8.6	3.3	35.0	0.0	40.5	4.5	4.3	5.1	2.3	4.5	2.0	1.5
Rock	92.4	95.7	96.1	96.0	96.8	95.8	95.6	95.1	92.0	82.0	95.6	96.7	82.3	85.0	95.3	94.1	77.5	80.5	86.3	94.0	88.2	93.3	64.4	100.0	58.3	91.9	93.5	94.0	94.3	92.2	95.5	97.0
Bare Soil	6.5	1.0	0.8	1.3	0.9	1.4	1.0	0.5	2.5	2.2	3.0	1.0	3.0	4.5	2.0	1.5	2.2	1.3	1.0	0.5	1.2	1.2	0.0	0.0	1.0	0.8	1.5	0.0	2.3	1.8	2.2	1.1

Notes:
Species codes defined in Table 8

Table B-9: ESMA Treatment, Frequency - 2020

Transect	USNR20-ESMA-T01				USNR20-ESMA-T02				USNR20-ESMA-T03				USNR20-ESMA-T04				USNR20-ESMA-T05				USNR20-ESMA-T06				USNR20-ESMA-T07				USNR20-ESMA-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
BOCU	11	19	16	28	7	7	7	13	18	16	3	13	11	27	6	8	8	8	7	2	12	5	5	--	5	6	3	1	8	23	11	24
BOGR2	--	--	--	--	--	3	--	2	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELEL	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	2	3	--	--	--	2	--	--	--	2	--	--
ELGL	--	--	--	--	--	--	--	--	--	--	1	--	--	--	3	2	--	--	--	4	--	--	2	--	--	--	--	1	3	--	2	3
HENE5	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POSE	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCSC	--	5	6	3	1	--	1	1	5	9	3	7	--	5	--	--	--	2	--	--	2	1	1	--	1	--	1	1	--	7	5	5
THIN6	--	--	--	--	--	--	2	1	3	4	--	--	3	4	--	--	--	3	--	--	--	--	--	--	1	--	--	--	--	5	--	--
Forbs																																
ACMI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	2	5	--	--	--	--	--	--	--	2	--	--	4	6	--	--	--	--	--	--	1	--	--	--
DACA	--	--	--	1	--	1	--	--	--	2	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	1	--	--	1	--	--	--	--	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs																																
ARLU	--	--	--	--	--	6	--	--	--	--	--	--	--	--	--	23	--	7	10	6	--	--	3	--	--	--	--	--	3	1	2	--
BRCA	2	--	--	--	--	--	--	--	2	--	1	1	--	--	--	--	--	--	--	--	8	1	--	1	15	5	--	1	--	--	--	--
CHLI2	--	1	1	--	--	1	--	--	--	--	1	1	1	1	2	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	2
SEGR4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	1	--	--	--	--	--	--	--	--	--
VACO9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Species codes defined in Table 8

Table B-10: ESMB Treatment, Canopy Cover (%) - 2020

Transect	USNR20-ESMB-T01				USNR20-ESMB-T02				USNR20-ESMB-T03				USNR20-ESMB-T04				USNR20-ESMB-T05				USNR20-ESMB-T06				USNR20-ESMB-T07				USNR20-ESMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPUL	0.15	--	--	--	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.60	--	--	--
BOBA3	--	--	--	--	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOCU	13.50	2.75	5.00	5.00	19.00	7.25	1.50	5.00	0.15	6.50	5.00	3.75	4.25	5.00	3.50	2.75	10.25	17.00	3.00	12.00	6.50	10.50	25.00	6.00	7.00	8.50	4.50	2.00	5.25	7.75	1.00	2.00
BOGR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	0.50	--	--	--	0.50	--	--	--	--
ELEL	--	0.35	--	--	--	1.80	--	--	--	0.75	--	--	1.00	0.70	--	--	1.20	--	--	--	--	--	--	--	0.75	1.00	--	--	--	--	--	--
ELGL	2.00	--	2.50	1.00	0.50	--	--	--	--	1.65	--	--	--	1.00	--	1.00	--	1.25	--	0.50	--	0.35	--	--	--	--	3.00	--	--	0.50	--	--
POSE	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.30	--	--	--	--	--	--	--	--	--	--
SCSC	0.20	2.00	--	--	--	--	--	--	--	--	--	--	--	0.30	--	--	--	--	--	--	--	0.20	--	--	0.30	0.25	0.25	4.00	0.80	7.00	3.00	--
SPAI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--
THIN6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.10	2.20	--	--	--	0.20	--	--
Forbs																																
CHFR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.60	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	0.30	--	--
PEPA8	--	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	--	3.50	1.50	--	7.50	--	--	--	0.30	--	5.00	0.50	18.00	3.50	--	--
Shrubs																																
ARLU	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	15.50	2.00	2.00	--	0.65	--	--	--	--	--	1.00	0.10	0.30	2.25	0.03	--
BRCA	--	--	--	1.00	--	--	0.10	--	0.55	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--
CHLI2	0.25	--	--	2.00	0.15	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	6.00	--	0.10	--	--	0.10	1.50
ERNA	--	--	--	--	--	--	--	3.00	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	16.0	5.4	7.5	9.0	19.7	9.8	4.1	8.0	0.7	8.9	5.0	3.8	5.6	7.0	4.5	0.8	26.0	23.3	5.0	12.5	14.7	12.0	25.0	6.5	9.5	16.3	13.5	7.0	25.5	21.5	4.0	3.5
Litter	1.0	0.8	1.0	0.5	0.5	1.3	0.0	1.0	0.5	1.0	0.5	0.3	2.0	2.0	0.5	0.5	7.0	5.5	5.0	0.5	2.3	1.3	0.5	0.0	1.3	2.0	5.0	1.0	1.0	1.5	2.0	0.3
Rock	82.0	92.7	88.0	89.0	78.9	88.2	95.0	89.0	98.0	89.6	91.5	95.0	88.4	89.0	92.0	97.0	65.0	70.4	90.0	87.0	82.8	86.0	72.0	90.5	88.8	80.8	81.5	91.0	70.0	74.5	91.0	93.3
Bare Soil	1.0	1.2	3.5	1.5	1.0	0.8	0.9	2.0	0.8	0.5	3.0	1.0	4.0	2.0	3.0	1.8	2.0	0.9	0.0	0.0	0.4	0.8	2.5	3.0	0.5	1.0	0.0	1.0	3.5	2.5	3.0	3.0

Notes:
Species codes defined in Table 8

Table B-11: ESMB Treatment, Basal Cover (%) - 2020

Transect	USNR20-ESMB-T01				USNR20-ESMB-T02				USNR20-ESMB-T03				USNR20-ESMB-T04				USNR20-ESMB-T05				USNR20-ESMB-T06				USNR20-ESMB-T07				USNR20-ESMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPUL	0.05	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--
BOBA3	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOCU	1.10	0.30	0.25	0.25	2.00	0.40	0.10	0.50	0.03	0.55	0.10	0.25	0.70	0.55	0.50	0.25	1.20	2.10	0.10	0.25	0.85	1.00	0.50	0.25	0.50	0.70	0.25	0.25	0.60	1.00	0.10	0.25
BOGR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	0.10	--	--	--	0.10	--	--	--	--
ELEL	--	0.03	--	--	--	0.15	--	--	--	0.10	--	--	0.10	0.10	--	--	0.20	--	--	--	--	--	--	--	0.05	0.10	--	--	--	--	--	--
ELGL	0.15	--	0.10	0.10	0.05	--	--	--	--	0.30	--	--	--	0.15	--	0.10	--	0.25	--	0.10	--	0.10	--	--	--	--	0.10	--	--	0.03	--	--
POSE	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--
SCSC	0.05	0.25	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	0.05	--	--	0.05	0.03	0.10	0.50	0.15	1.00	0.25	--
SPAI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	--
THIN6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	0.20	--	--	--	0.05	--	--
Forbs																																
CHFR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	0.03	--	--
PEPA8	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	0.35	1.00	--	0.55	--	--	--	0.03	--	0.50	0.03	0.25	0.20	--	--
Shrubs																																
ARLU	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	0.20	0.25	--	0.05	--	--	--	--	--	0.10	0.03	0.03	0.25	0.03	--
BRCA	--	--	--	0.03	--	--	0.03	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--
CHLI2	0.03	--	--	0.10	0.03	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--	0.03	--	--	0.03	0.25
ERNA	--	--	--	--	--	--	--	0.25	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																
Vegetation	1.4	0.6	0.4	0.5	2.1	0.7	0.6	0.8	0.1	1.0	0.1	0.3	0.9	0.9	0.8	0.4	1.4	2.9	1.4	0.4	1.5	1.4	0.5	0.4	0.8	1.2	1.1	0.9	1.1	2.6	0.4	0.5
Litter	2.5	2.0	2.0	1.0	7.0	2.0	0.5	1.3	0.6	4.0	0.5	2.8	4.0	2.5	0.5	1.3	21.0	13.0	7.0	3.0	5.0	3.0	2.0	3.7	3.0	8.0	6.5	1.5	6.5	6.0	3.0	1.5
Rock	95.0	96.1	94.0	97.0	89.7	96.5	97.9	96.0	98.6	94.5	96.4	96.0	91.0	94.5	95.8	96.5	75.4	83.1	91.7	96.7	93.1	94.5	94.8	93.0	95.5	89.5	92.5	96.0	88.4	88.7	93.6	95.0
Bare Soil	1.2	1.3	3.7	1.5	1.2	0.9	1.0	2.0	0.8	0.6	3.0	1.0	4.1	2.1	3.0	1.9	2.2	1.0	0.0	0.0	0.5	1.1	2.7	3.0	0.7	1.3	0.0	1.6	4.0	2.7	3.0	3.0

Notes:
Species codes defined in Table 8

Table B-12: ESMB Treatment, Frequency - 2020

Transect	USNR20-ESMB-T01				USNR20-ESMB-T02				USNR20-ESMB-T03				USNR20-ESMB-T04				USNR20-ESMB-T05				USNR20-ESMB-T06				USNR20-ESMB-T07				USNR20-ESMB-T08			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																
ARPUL	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--
BOBA3	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOCU	25	12	15	7	12	8	6	9	7	11	2	9	17	24	6	13	12	20	8	9	24	16	10	8	27	36	5	6	31	21	1	3
BOGR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1	--	--	--	5	--	--	--	--
ELEL	--	1	--	--	--	8	--	--	--	2	--	--	7	3	--	--	4	--	--	--	--	--	--	--	3	3	--	--	--	--	--	--
ELGL	1	--	1	5	1	--	--	--	--	3	--	--	--	4	--	1	--	3	--	2	--	2	--	--	--	--	5	--	--	2	--	--
POSE	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--
SCSC	2	12	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	2	--	--	2	2	1	5	10	12	10	--
SPAI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--
THIN6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	5	--	--	--	1	--	--
Forbs																																
CHFR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHST	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--
LORI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	3	--	--
PEPA8	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	2	1	--	1	--	--	--	1	--	1	1	2	1	--	--
Shrubs																																
ARLU	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	5	6	16	--	3	--	--	--	--	--	8	3	2	6	1	--
BRCA	--	--	--	1	--	--	1	--	3	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--
CHLI2	1	--	--	1	1	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	6	--	1	--	--	1	1
ERNA	--	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Species codes defined in Table 8

Table B-13: Tyrone Reference Area, Canopy Cover (%) - 2020

Transect	USNR20-RA-T01				USNR20-RA-T02				USNR20-RA-T03				USNR20-RA-T04				USNR20-RA-T05				USNR20-RA-T06				USNR20-RA-T07				USNR20-RA-T08				USNR20-RA-T09				USNR20-RA-T10			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
ARHA3	--	--	--	--	--	--	--	--	9.75	--	--	--	--	--	--	--	--	--	3.00	--	--	--	--	--	9.00	14.00	--	--	--	3.10	--	--	--	--	--	--	6.00	10.50	--	--
ARPU	--	3.00	--	--	--	--	--	--	--	2.80	2.00	1.50	--	--	15.00	--	--	--	--	--	5.50	6.00	2.00	4.50	--	--	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--
ARPUL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARTE3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65.00	50.00
BOCU	--	--	--	--	--	--	--	--	7.50	2.40	--	--	6.00	0.20	--	6.00	--	--	21.00	12.00	10.50	9.00	--	25.00	--	--	--	--	6.00	3.20	--	--	40.00	6.80	12.00	15.00	28.00	40.00	--	--
BOER4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30.00	0.80	2.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	30.00	27.00	7.00	--	--	--	--	21.00	3.40	7.00	8.00	--	--	--	--	--	--	--	--	--	7.00	--	--	31.00	39.50	82.00	9.00	22.50	--	--	--	--	--	--	25.00	--	6.50	--	--
BOHI2	--	--	--	9.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.00	--	14.00	22.00	--	--	--	--	--	--	--
DICA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.50	--	--	--	--	--	--	--	--	--	--	--	--	--
HIBE	--	--	--	--	--	--	--	--	--	--	--	--	27.00	6.80	--	--	--	0.70	6.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.40	--	--
LYPH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.50	--	--	--	--	--
MUAS	--	--	--	18.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MUEM	--	--	--	--	1.40	25.00	8.00	--	--	--	--	--	--	--	--	--	--	3.20	--	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	20.00	--	--	--	--	--
POSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.00	6.20	--	--	--	--	--
Forbs																																								
BADI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.20	--	--	--	--	--
CHAL7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--
CHER	--	--	--	--	--	--	--	--	--	--	5.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERFL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	0.70	1.00	--	--	--	--
ERWR	--	1.20	--	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	12.00	--	--	17.00	--	--	--	--	--	--	--	--	--	--	--	--	--
EVSE	--	1.00	1.50	--	--	--	--	--	4.00	0.50	1.00	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	0.40	--	--	--
HOGL2	--	1.10	--	--	--	--	--	--	2.75	--	10.00	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--	--
LAOC3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12.00	--	--	--	--	4.00	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAL4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.25	--	--	--	--	--	--	--	--	--	--	--	--
LEMO2	--	--	--	--	12.00	--	--	15.00	--	--	--	--	--	--	--	--	--	0.20	8.50	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	12.00	--	--	25.00
LILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA	--	--	--	--	--	4.00	--	--	--	--	--	--	2.50	5.80	12.00	23.00	6.00	--	12.00	27.00	--	--	--	--	--	--	--	--	5.00	11.80	25.00	25.00	--	--	--	--	17.00	17.00	12.00	12.00
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.50	--	--	--	--	--	--	--	--	--	--	--	--
PEBA2	--	--	--	--	--	--	--	--	0.20	--	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHAU13	--	--	--	--	--	5.00	--	--	--	--	--	--	--	--	3.00	1.50	1.00	--	1.30	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	1.00	--	1.00	12.00
PLPA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--
SAAB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.00	3.20	--	--	--	--	--	--	0.90	--	--
SIAL2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--
SOEL	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.50	--	--	--	--	--	--	--	--	--	--	--	--
UNKBR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.20	--	--	--	--	--	--
Shrubs																																								
ACAN11	--	--	1.00	--	--	--	--	--	--	--	--	--	--	4.20	--	4.00	--	21.50	--	28.00	--	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAPT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DAWH2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	90.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA	--	--	--	--	--	--	--	--	--	10.00	--	28.00	--	--	5.00	--	--	--	--	--	38.00	6.00	--	--	--	--	--	42.00	--	--	--	--	--	--	--	--	--	--	--	--
NOMI	40.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	70.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRGL	--	--	--	--	100.00	--	95.00	100.00	--	--	--	--	--	--	37.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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QUGR3	85.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																								
Vegetation	100.0	35.0	25.0	30.0	100.0	34.0	96.0	100.0	44.0	18.3	25.0	33.0	35.0	16.2	55.0	51.5	34.0	97.0	46.0	75.0	54.0	28.0	75.0	37.0	38.5	55.0	82.0	50.0	38.0	21.5	33.0	47.0	52.0	17.2	51.0	40.0	60.0	72.5	78.0	75.0
Litter	0.0	16.0	3.0	5.0	0.0	0.5	3.5	0.0	13.0	25.0	29.0	5.0	3.0	13.0	5.0	6.5	1.5	2.3	1.5	1.0	3.0	3.0	0.0	25.0	20.0	20.0	3.0	5.0	9.5	9.5	12.0	2.0	30.5	23.0	28.0	33.5	10.0	13.0	7.0	5.0
Rock	0.0	21.0	33.0	5.0	0.0	62.5	0.0	0.0	36.0	36.7	38.0	55.0	52.5	60.0	1.0	12.0	39.5	0.5	49.0	22.0	36.0	60.0	20.0	33.0	16.0	10.0	12.0	38.0	25.0	60.0	33.0	25.0	3.0	46.0	21.0	26.0	13.0	11.0	7.0	12.5
Bare Soil	0.0	28.0	39.0	60.0	0.0	3.0	0.5	0.0	7.0	20.0	8.0	7.0	9.5	10.8	39.0	30.0	25.0	0.2	3.5	2.0	7.0	9.0	5.0	5.0	25.5	15.0	3.0	7.0	27.5	9.0	22.0	26.0	14.5	13.8	0.0	0.5	17.0	3.5	8.0	7.5

Notes:
Species codes defined in Table 8

Table B-14: Tyrone Reference Area, Basal Cover (%) - 2020

Transect	USNR20-RA-T01				USNR20-RA-T02				USNR20-RA-T03				USNR20-RA-T04				USNR20-RA-T05				USNR20-RA-T06				USNR20-RA-T07				USNR20-RA-T08				USNR20-RA-T09				USNR20-RA-T10			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
ARHA3	--	--	--	--	--	--	--	--	1.35	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	0.80	2.50	--	--	--	0.60	--	--	--	--	--	--	0.50	0.80	--	--
ARPU	--	0.35	--	--	--	--	--	--	--	0.40	0.03	0.25	--	--	1.00	--	--	--	--	--	0.50	0.50	0.10	0.25	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--
ARPUL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARTE3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.00	1.00
BOCU	--	--	--	--	--	--	--	--	0.75	0.50	--	--	0.25	0.10	--	0.75	--	--	1.75	1.00	1.00	0.75	--	1.00	--	--	--	--	0.35	0.50	--	--	3.20	0.70	0.25	0.50	3.00	1.20	--	--
BOER4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	0.10	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	2.50	0.50	0.25	--	--	--	--	3.50	1.30	0.25	0.30	--	--	--	--	--	--	--	--	--	1.00	--	--	7.00	8.50	27.00	1.75	3.10	--	--	--	--	--	--	0.30	--	0.70	--	--
BOHI2	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	--	0.50	1.00	--	--	--	--	--	--	--
DICA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--
HIBE	--	--	--	--	--	--	--	--	--	--	--	--	3.10	2.50	--	--	--	0.10	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--
LYPH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.70	--	--	--	--	--
MUAS	--	--	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MUEM	--	--	--	--	0.20	2.00	0.50	--	--	--	--	--	--	--	--	--	--	0.30	--	--	0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--
POSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.55	0.40	--	--	--	--	--
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CHAL7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--	--
CHER	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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ERWR	--	0.03	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	1.00	--	--	5.00	--	--	--	--	--	--	--	--	--	--	--	--	--
EVSE	--	0.03	0.10	--	--	--	--	--	0.10	0.03	0.03	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	0.05	--	--	--
HOGL2	--	0.05	--	--	--	--	--	--	0.03	--	0.03	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--
LAOC3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	0.05	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAL4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--
LEMO2	--	--	--	--	0.03	--	--	0.40	--	--	--	--	--	--	--	--	--	0.00	0.03	--	--	--	--	--	--	--	--	--	--	0.00	--	--	--	--	--	--	0.10	--	--	0.10
LILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA	--	--	--	--	--	0.50	--	--	--	--	--	--	0.15	0.15	0.50	0.75	0.03	--	0.05	0.50	--	--	--	--	--	--	--	--	0.10	0.05	1.00	0.25	--	--	--	--	0.10	0.15	0.50	0.25
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--
PEBA2	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHAU13	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	0.03	0.03	0.03	--	0.05	--	--	--	--	--	--	--	--	--	--	0.00	--	--	--	--	--	--	0.03	--	0.03	0.03
PLPA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--
SAAB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	0.05	--	--	--	--	--	--	0.00	--	--
SIAL2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--
SOEL	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--
UNKBR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	--
Shrubs																																								
ACAN11	--	--	0.03	0.03	--	--	--	--	--	--	--	--	--	0.10	--	0.40	--	0.20	--	2.00	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAPT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DAWH2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA	--	--	--	--	--	--	--	--	--	0.30	--	2.00	--	--	1.00	--	--	--	--	--	0.85	0.20	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--	--	--
NOMI	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRGL	--	--	--	--	5.00	--	2.50	3.50	--	--	--	--	--	--	3.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
QUEM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.03	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--
QUGR3	8.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																								
Vegetation	9.0	3.0	0.6	1.3	5.2	2.6	3.0	3.9	6.1	2.5	0.4	2.6	3.5	2.9	5.5	3.9	1.1	30.7	2.8	3.5	2.9	2.5	12.7	2.3	7.9	11.5	32.1	3.1	3.8	1.2	1.5	1.3	4.0	1.8	0.9	0.8	3.8	3.0	5.5	1.4
Litter	90.0	40.0	4.0	27.0	81.3	12.0	86.0	81.5	31.5	42.0	32.0	12.0	3.5	16.5	25.0	15.0	6.0	58.0	4.5	4.0	10.0	7.0	50.0	27.0	40.0	46.0	33.0	18.0	13.0	15.0	15.0	5.0	75.0	37.0	76.1	68.7	26.0	65.0	50.0	38.0
Rock	0.0	23.0	35.0	5.0	11.5	80.4	7.5	12.5	46.5	40.0	59.6	76.9	78.0	68.5	3.8	30.0	66.9	7.0	88.0	88.5	73.0	78.0	33.0	8.0	22.0	21.0	31.9	69.9	39.0	72.0	40.0	66.8	4.5	47.0	23.0	30.0	40.0	23.5	34.5	20.0
Bare Soil	1.0	34.0	60.4	66.7	2.0	5.0	3.5	2.1	15.9	15.5	8.0	8.5	15.0	12.2	65.7	51.1	26.0	4.3	4.7	4.0	14.1	12.5	4.3	62.8	30.2	21.5	3.0	9.0	44.2	11.8	43.5	27.0	16.5	14.2	0.0	0.5	30.2	8.5	10.0	40.6

Notes:
Species codes defined in Table 8

Table B-15: Tyrone Reference Area, Basal Cover (%) - 2020

Transect	USNR20-RA-T01				USNR20-RA-T02				USNR20-RA-T03				USNR20-RA-T04				USNR20-RA-T05				USNR20-RA-T06				USNR20-RA-T07				USNR20-RA-T08				USNR20-RA-T09				USNR20-RA-T10			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
ARHA3	--	--	--	--	--	--	--	--	6	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	3	10	--	--	6	--	--	--	--	--	--	--	7	4	--	--
ARPU	--	4	--	--	--	--	--	--	--	8	4	4	--	--	1	--	--	--	--	--	4	2	1	1	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--
ARPUL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ARTE3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6	8
BOCU	--	--	--	--	--	--	--	--	3	10	--	--	3	1	--	13	--	--	15	4	17	11	--	5	--	--	--	--	5	4	--	--	13	7	1	1	--	4	--	--
BOER4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	26	18	6	--	--	--	--	16	15	7	14	--	--	--	--	--	--	--	--	--	10	--	--	15	22	51	10	19	--	--	--	--	--	--	7	--	7	--	--
BOHI2	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	11	16	--	--	--	--	--	--	--	--
DICA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIBE	--	--	--	--	--	--	--	--	--	--	--	--	48	29	--	--	--	1	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
LYPH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8	--	--	--	--	--	--
MUAS	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MUEM	--	--	--	--	6	3	6	--	--	--	--	--	--	--	--	--	--	2	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--
POSE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	9	--	--	--	--	--	--
Forbs																																								
BADI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--
CHAL7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
CHER	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERFL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8	3	2	--	--	--	--	--
ERWR	--	1	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	2	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
EVSE	--	1	1	--	--	--	--	--	8	3	2	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	1	--	--	--
HOGL2	--	6	--	--	--	--	--	--	3	--	2	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--
LAOC3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	4	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--
LEAL4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
LEMO2	--	--	--	--	6	--	--	5	--	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	7	--	--	6
LILE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA	--	--	--	--	--	2	--	--	--	--	--	--	16	81	18	150	2	--	5	3	--	--	--	--	--	--	--	--	6	10	10	6	--	--	--	--	4	15	14	7
MAGR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
PEBA2	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PHAU13	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1	2	1	--	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	1	--	178	8
PLPA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--
SAAB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	2	--	--	--	--	--	--	--	2	--	--	--
SIAL2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
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UNKBR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	--	--
Shrubs																																								
ACAN11	--	--	2	8	--	--	--	--	--	--	--	--	--	4	--	1	--	6	--	--	1	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAPT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DAWH2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA	--	--	--	--	--	--	--	--	--	1	--	3	--	--	1	--	--	--	--	--	15	1	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
NOMI	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PRGL	--	--	--	--	1	--	2	4	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
QUEM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--
QUGR3	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Species codes defined in Table 8

Table B-16: USNR Test Plot, Belt Transect Data for Shrubs (counts) - 2020

CSMA										
	Species Code	ARLU	ATCA	BRCA	CHLI2	ERNA	FAPA	PIED	SEFL3	SEGR4
Transect (counts)	*USNR20-CSMA-T01*	--	--	5	--	--	--	--	--	--
	USNR20-CSMA-T02	--	--	11	--	--	--	--	--	--
	USNR20-CSMA-T03	--	--	21	1	--	--	--	--	--
	USNR20-CSMA-T04	--	--	23	1	1	--	--	--	--
	USNR20-CSMA-T05	--	--	13	2	--	--	--	--	--
	USNR20-CSMA-T06	--	--	15	1	--	--	--	--	--
	USNR20-CSMA-T07	--	--	3	3	1	--	1	--	--
	USNR20-CSMA-T08	--	--	13	2	3	--	--	--	--
CSMB										
	Species Code	**ARLU**	**ATCA**	**BRCA**	**CHLI2**	**ERNA**	**FAPA**	**PIED**	**SEFL3**	**SEGR4**
Transect (counts)	*USNR20-CSMB-T01*	--	--	12	--	--	--	--	--	--
	USNR20-CSMB-T02	--	--	17	2	1	--	--	--	--
	USNR20-CSMB-T03	--	--	10	3	--	--	--	--	--
	USNR20-CSMB-T04	--	--	13	6	--	--	--	2	--
	USNR20-CSMB-T05	--	--	12	2	--	--	--	--	--
	USNR20-CSMB-T06	--	--	16	--	2	--	--	--	--
	USNR20-CSMB-T07	--	--	3	5	--	--	--	--	--
	USNR20-CSMB-T08	--	--	5	--	2	--	--	--	--
ESMA										
	Species Code	**ARLU**	**ATCA**	**BRCA**	**CHLI2**	**ERNA**	**FAPA**	**PIED**	**SEFL3**	**SEGR4**
Transect (counts)	*USNR20-ESMA-T01*	121	--	2	22	--	--	--	--	1
	USNR20-ESMA-T02	33	--	1	8	--	--	--	--	1
	USNR20-ESMA-T03	39	--	2	18	--	--	--	--	--
	USNR20-ESMA-T04	27	--	--	25	--	--	--	--	2
	USNR20-ESMA-T05	16	--	5	8	2	--	--	--	6
	USNR20-ESMA-T06	18	--	4	12	1	1	--	--	4
	USNR20-ESMA-T07	--	--	17	6	--	--	--	--	1
	USNR20-ESMA-T08	35	--	3	7	--	--	--	--	--
ESMB										
	Species Code	**ARLU**	**ATCA**	**BRCA**	**CHLI2**	**ERNA**	**FAPA**	**PIED**	**SEFL3**	**SEGR4**
Transect (counts)	*USNR20-ESMB-T01*	26	--	--	10	1	--	--	--	--
	USNR20-ESMB-T02	26	--	7	6	--	--	--	--	--
	USNR20-ESMB-T03	13	--	3	10	1	--	--	--	--
	USNR20-ESMB-T04	22	1	3	11	--	--	--	--	3
	USNR20-ESMB-T05	14	--	3	7	--	--	1	1	--
	USNR20-ESMB-T06	35	--	6	7	--	--	--	1	--
	USNR20-ESMB-T07	35	--	2	19	1	--	--	--	--
	USNR20-ESMB-T08	29	--	--	8	--	--	--	--	--

Notes:
The shrub belt transect area is $20m^2$ (2m x 10m); shrubs rooted in the belt transect were counted on an individual basis

Explanation of Species Codes:

Scientific Name	Common Name	Code
Artemisia ludoviciana	White sagebrush	ARLU
Atriplex canescens	Four-wing saltbush	ATCA
Brickellia californica	California brickellbush	BRCA
Chilopsis linearis	Desert willow	CHLI2
Ericameria nauseosa	Rubber rabbitbrush	ERNA
Fallugia paradoxa	Apache plume	FAPA
Pinus edulis	Piñon pine	PIED
Senecio flaccidus	Threadleaf groundsel	SEFL3
Senegalia greggii	Catclaw acacia	SEGR4

Table B-17: Tyrone Reference Area, Belt Transect Data for Shrubs (counts) - 2020

Tyrone - Reference Area															
	Species Code	ACAN11	BAPT	CYIM	DAWH2	GUSA	LYPA	MAHE2	NOMI	OPEN	PIED	PRGL	QUEM	QUGR3	SEFL3
Transect (counts)	*USNR20-RA-T01*	10	--	--	--	16	--	--	1	--	--	--	--	--	--
	USNR20-RA-T02	6	--	--	--	1	--	--	--	--	--	7	--	--	1
	USNR20-RA-T03	--	--	--	--	44	--	--	--	--	--	--	--	--	--
	USNR20-RA-T04	19	--	--	--	2	5	--	--	--	--	4	--	--	--
	USNR20-RA-T05	93	--	--	1	--	--	--	--	--	--	--	--	--	--
	USNR20-RA-T06	12	--	--	--	26	--	--	--	--	--	--	1	1	--
	USNR20-RA-T07	--	--	--	--	6	--	--	--	--	--	--	--	--	--
	USNR20-RA-T08	1	--	--	--	--	--	1	2	--	--	--	--	--	--
	USNR20-RA-T09	--	--	2	--	--	--	--	3	1	1	--	3	2	--
	USNR20-RA-T10	--	1	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
The shrub belt transect area is 20m^2 (2m x 10m); shrubs rooted in the belt transect were counted on an individual basis

Explanation of Species Codes:

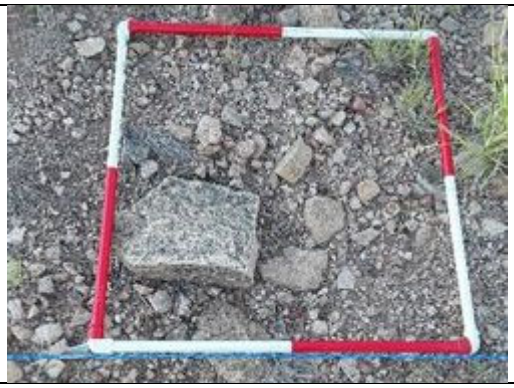
Scientific Name	Common Name	Code
Acaciella angustissima	Prairie acacia	ACAN11
Baccharis pteronioides	Yerba de pasmo	BAPT
Cylindropuntia imbricata	Tree cholla	CYIM
Dasylirion wheeleri	Common sotol	DAWH2
Gutierrezia sarothrae	Broom snakeweed	GUSA
Lycium pallidum	Pale wolfberry	LYPA
Mammillaria heyderi	Little nipple cactus	MAHE2
Nolina microcarpa	Beargrass	NOMI
Opuntia engelmannii	Prickly pear	OPEN
Pinus edulis	Piñon pine	PIED
Prosopis glandulosa	Honey mesquite	PRGL
Quercus emoryi	Emory oak	QUEM
Quercus grisea	Gray oak	QUGR3
Senecio flaccidus	Threadleaf groundsel	SEFL3

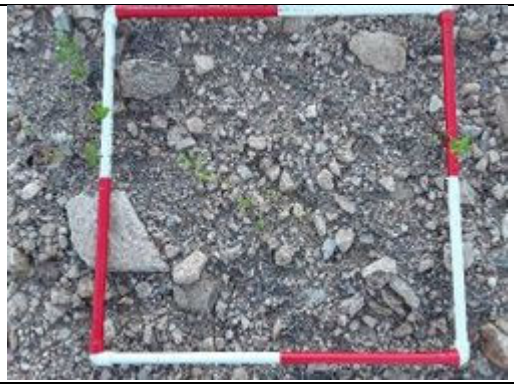
APPENDIX C

Vegetation Quadrat Photographs

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMA-T01 Q-1	USNR20-CSMA-T01 Q-2
	
USNR20-CSMA-T01 Q-3	USNR20-CSMA-T01 Q-4
	
USNR20-CSMA-T02 Q-1	USNR20-CSMA-T02 Q-2
	
USNR20-CSMA-T02 Q-3	USNR20-CSMA-T02 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMA-T03 Q-1	USNR20-CSMA-T03 Q-2
	
USNR20-CSMA-T03 Q-3	USNR20-CSMA-T03 Q-4
	
USNR20-CSMA-T04 Q-1	USNR20-CSMA-T04 Q-2
	
USNR20-CSMA-T04 Q-3	USNR20-CSMA-T04 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMA-T05 Q-1	USNR20-CSMA-T05 Q-2
	
USNR20-CSMA-T05 Q-3	USNR20-CSMA-T05 Q-4
	
USNR20-CSMA-T06 Q-1	USNR20-CSMA-T06 Q-2
	
USNR20-CSMA-T06 Q-3	USNR20-CSMA-T06 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMA-T07 Q-1	USNR20-CSMA-T07 Q-2
	
USNR20-CSMA-T07 Q-3	USNR20-CSMA-T07 Q-4
	
USNR20-CSMA-T08 Q-1	USNR20-CSMA-T08 Q-2
	
USNR20-CSMA-T08 Q-3	USNR20-CSMA-T08 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMB-T01 Q-1	USNR20-CSMB-T01 Q-2
	
USNR20-CSMB-T01 Q-3	USNR20-CSMB-T01 Q-4
	
USNR20-CSMB-T02 Q-1	USNR20-CSMB-T02 Q-2
	
USNR20-CSMB-T02 Q-3	USNR20-CSMB-T02 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
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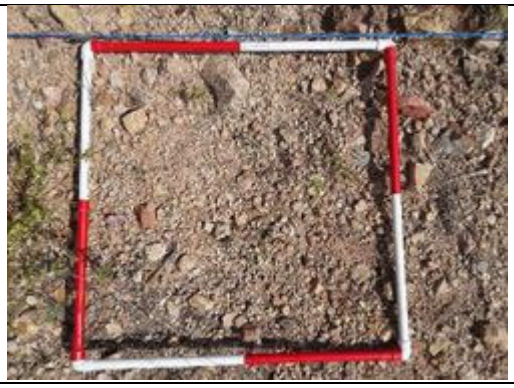
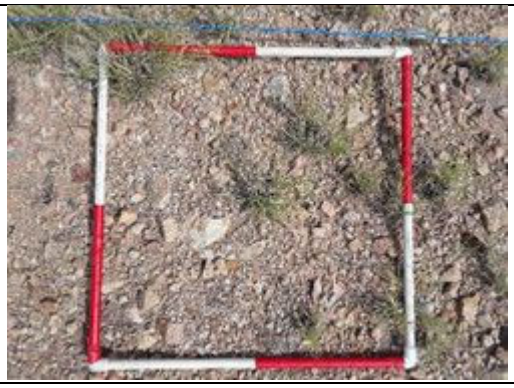
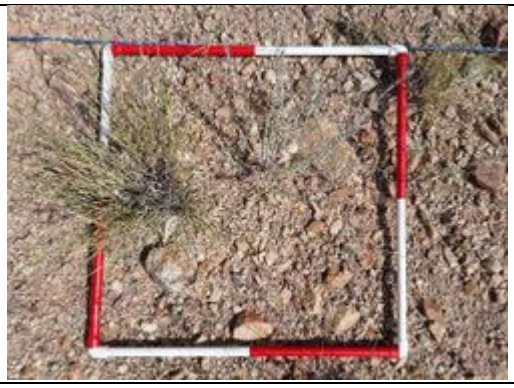
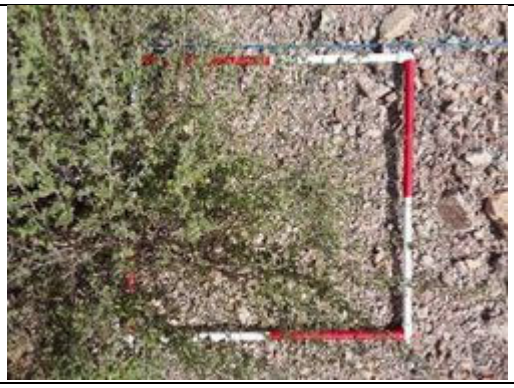
	USNR20-CSMB-T03 Q-2
	
USNR20-CSMB-T03 Q-3	USNR20-CSMB-T03 Q-4
	
USNR20-CSMB-T04 Q-1	USNR20-CSMB-T04 Q-2
	
USNR20-CSMB-T04 Q-3	USNR20-CSMB-T04 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMB-T05 Q-1	USNR20-CSMB-T05 Q-2
	
USNR20-CSMB-T05 Q-3	USNR20-CSMB-T05 Q-4
	
USNR20-CSMB-T06 Q-1	USNR20-CSMB-T06 Q-2
	
USNR20-CSMB-T06 Q-3	USNR20-CSMB-T06 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-CSMB-T07 Q-1	USNR20-CSMB-T07 Q-2
	
USNR20-CSMB-T07 Q-3	USNR20-CSMB-T07 Q-4
	
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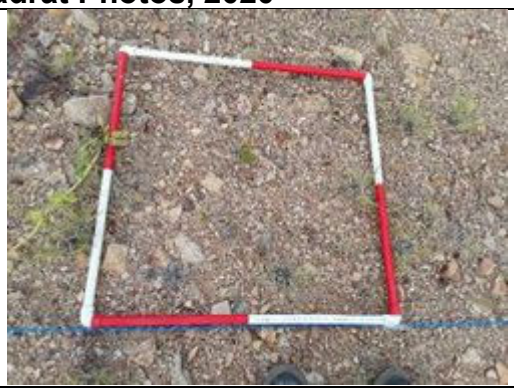
USNR20-CSMB-T08 Q-3	USNR20-CSMB-T08 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
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	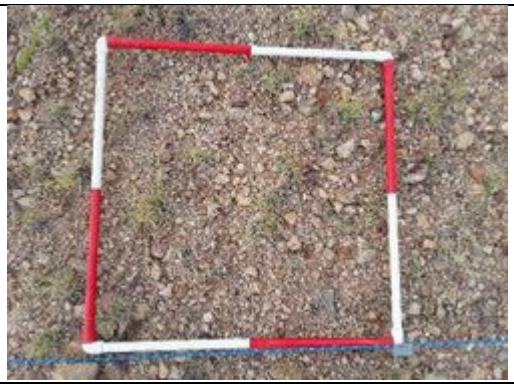
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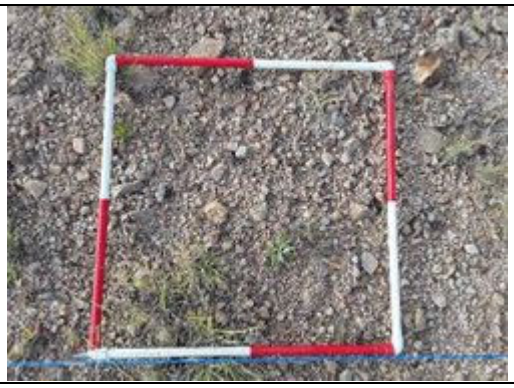
USNR20-ESMA-T02 Q-1	USNR20-ESMA-T02 Q-2
	
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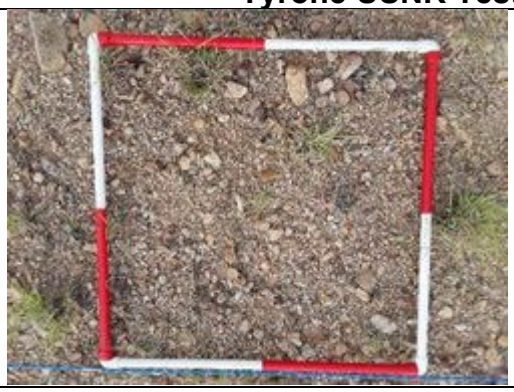
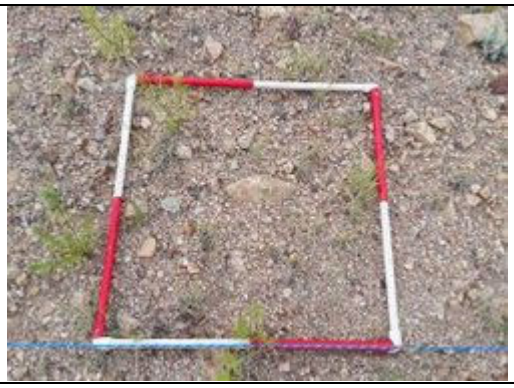
	
USNR20-ESMA-T03 Q-1	USNR20-ESMA-T03 Q-2
	
USNR20-ESMA-T03 Q-3	USNR20-ESMA-T03 Q-4
No Photo	
USNR20-ESMA-T04 Q-1	USNR20-ESMA-T04 Q-2
	
USNR20-ESMA-T04 Q-3	USNR20-ESMA-T04 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-ESMA-T05 Q-1	USNR20-ESMA-T05 Q-2
	
USNR20-ESMA-T05 Q-3	USNR20-ESMA-T05 Q-4
	
USNR20-ESMA-T06 Q-1	USNR20-ESMA-T06 Q-2
	
USNR20-ESMA-T06 Q-3	USNR20-ESMA-T06 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-ESMA-T07 Q-1	USNR20-ESMA-T07 Q-2
	
USNR20-ESMA-T07 Q-3	USNR20-ESMA-T07 Q-4
	
USNR20-ESMA-T08 Q-1	USNR20-ESMA-T08 Q-2
	
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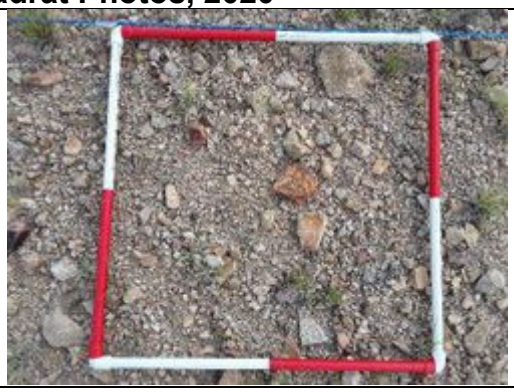
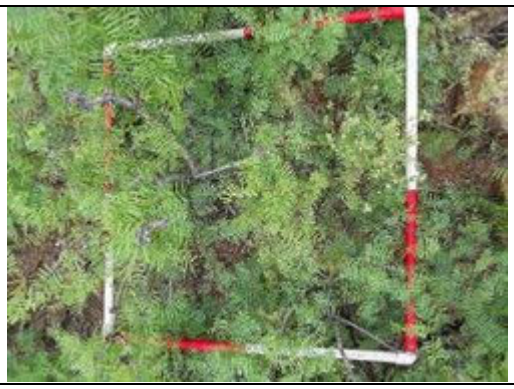
	
USNR20-ESMB-T01 Q-1	USNR20-ESMB-T01 Q-2
	
USNR20-ESMB-T01 Q-3	USNR20-ESMB-T01 Q-4
	
USNR20-ESMB-T02 Q-1	USNR20-ESMB-T02 Q-2
	
USNR20-ESMB-T02 Q-3	USNR20-ESMB-T02 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-ESMB-T03 Q-1	USNR20-ESMB-T03 Q-2
	
USNR20-ESMB-T03 Q-3	USNR20-ESMB-T03 Q-4
	
USNR20-ESMB-T04 Q-1	USNR20-ESMB-T04 Q-2
	
USNR20-ESMB-T04 Q-3	USNR20-ESMB-T04 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-ESMB-T05 Q-1	USNR20-ESMB-T05 Q-2
	
USNR20-ESMB-T05 Q-3	USNR20-ESMB-T05 Q-4
	
USNR20-ESMB-T06 Q-1	USNR20-ESMB-T06 Q-2
	
USNR20-ESMB-T06 Q-3	USNR20-ESMB-T06 Q-4

Tyrone USNR Test Plots Quadrat Photos, 2020	
	
USNR20-ESMB-T07 Q-1	USNR20-ESMB-T07 Q-2
	
USNR20-ESMB-T07 Q-3	USNR20-ESMB-T07 Q-4
	
USNR20-ESMB-T08 Q-1	USNR20-ESMB-T08 Q-2
	
USNR20-ESMB-T08 Q-3	USNR20-ESMB-T08 Q-4

Tyrone Reference Area Quadrat Photos, 2020	
	
USNR20-RA-T01 Q-1	USNR20-RA-T01 Q-2
	
USNR20-RA-T01 Q-3	USNR20-RA-T01 Q-4
	
USNR20-RA-T02 Q-1	USNR20-RA-T02 Q-2
	
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Tyrone Reference Area Quadrat Photos, 2020	
	
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USNR20-RA-T03 Q-3	USNR20-RA-T03 Q-4
	No Photo
USNR20-RA-T04 Q-1	USNR20-RA-T04 Q-2
	
USNR20-RA-T04 Q-3	USNR20-RA-T04 Q-4

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	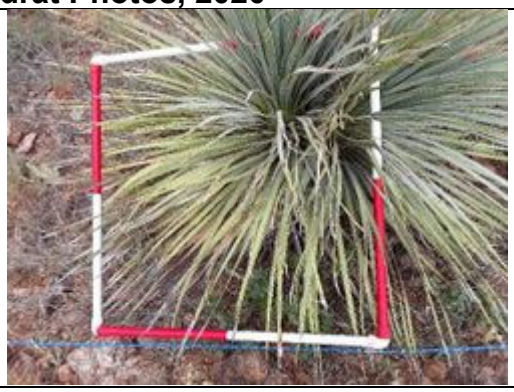
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USNR20-RA-T06 Q-1	USNR20-RA-T06 Q-2
	
USNR20-RA-T06 Q-3	USNR20-RA-T06 Q-4

Tyrone Reference Area Quadrat Photos, 2020	
	
USNR20-RA-T07 Q-1	USNR20-RA-T07 Q-2
	
USNR20-RA-T07 Q-3	USNR20-RA-T07 Q-4
	
USNR20-RA-T08 Q-1	USNR20-RA-T08 Q-2
	
USNR20-RA-T08 Q-3	USNR20-RA-T08 Q-4

Tyrone Reference Area Quadrat Photos, 2020	
	
USNR20-RA-T09 Q-1	USNR20-RA-T09 Q-2
	
USNR20-RA-T09 Q-3	USNR20-RA-T09 Q-4
	
USNR20-RA-T10 Q-1	USNR20-RA-T10P Q-2
	
USNR20-RA-T10 Q-3	USNR20-RA-T10 Q-4

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