



July 15, 2025

Ms. Hunter Ridley
Environmental Protection Specialist
Colorado Division of Reclamation, Mining & Safety
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, CO 80203

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
MR-265 Interim Revegetation Monitoring

Dear Ms. Ridley,

Tri-State Generation and Transmission Association Inc. (Tri-State) is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P. (Colowyo). Therefore, Tri-State on behalf of Colowyo is submitting minor revision 265 (MR-265) to Permit No. C-1981-019. MR-265 proposes to revise the interim revegetation monitoring timeframes described in Volume 1, Section 4.15.1(4).

Included in this minor revision is a change of index sheet to ease incorporation of this minor revision into the permit document. If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 at your convenience.

Sincerely,

DocuSigned by:
A blue ink signature of Chris Gilbreath.
D250C711D0BF450...

Chris Gilbreath
Senior Manager,
Remediation and Reclamation

CG:TT

Enclosure

cc: Tom Cummins (BLM-WRFO)
Tony Tennyson (via email)
File: C. F. 1.1.1.24

CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Date: **July 15, 2025**

Permit Number: **C-1981-019**

Revision Description: **MR-265 Interim Revegetation Monitoring**

Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
1	Table of Contents Page iv (1 page)	Table of Contents Page iv (1 page)	Table of Contents has been updated.
1	Pages 4-39 through 4-48 (10 pages)	Pages 4-39 through 4-48 (10 pages)	Section 4.15.1(4) has been updated which caused a pagination shift.
2A			No Change
2B			No Change
2C			No Change
2D			No Change
2E			No Change
3			No Change
4			No Change
5A			No Change
5B			No Change
6			No Change
7			No Change
8			No Change
9			No Change
10			No Change
12			No Change
13			No Change
14			No Change
15			No Change
16			No Change
15			No Change
17			No Change
18A			No Change
18B			No Change

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Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
18C			No Change
18D			No Change
19			No Change
20			No Change
20			No Change
21			No Change
22			No Change

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4.15.1(4) Vegetation Monitoring

The monitoring plan will evaluate the success of shrub and herbaceous vegetation establishment, and track progress toward achieving reclamation goals in the following manner:

1. Sampling of herbaceous vegetation will take place during the peak of the growing season when the vegetation reaches the mature stages and is most easily identified. This period of time is generally from late June to late August.
2. Unlike sampling for bond release purposes, sampling is for informational purposes and will not be required to meet statistical adequacy.
3. Interim monitoring will occur once for each individual reclamation unit in any year before the fifth growing season.
4. The data and an assessment of the monitoring results for that year will be submitted in the Annual Reclamation Report.

4.15.2 Use of Introduced Species

For pre-2008 revegetation (especially pre-2002 revegetation), the rangeland seed mixture used at that time included some introduced species, including Intermediate Wheatgrass (*Agropyron intermedium*), Siberian Wheatgrass (*Agropyron sibericum*), Pubescent Wheatgrass (*Agropyron trichophorum*), Smooth Brome (*Bromus inermis*), Orchard Grass (*Dactylus glomerata*), Vinall Russian Wildrye (*Elymus junceus*), Durar Hard Fescue (*Festuca ovina duriscula*), Timothy (*Phleum pratense*), Kentucky Bluegrass (*Poa pratensis*), Lutana Cicer Milkvetch (*Astragalus cicer*) and Alfalfa (*Medicago sativa*).

Of the thirty-one species in the pre-2008 seed mixtures, twenty-one species were native, which on a seed-weight basis accounts for 65% of the planted seeds. Studies and experience have demonstrates some beneficial uses for introduced species considering erosion control and forage for livestock and wildlife, but are no longer a component of the desired post-mining vegetation communities.

For post-2008 revegetation, the seed mixes (please see Tables 2.05.4-7 through 2.05.4-9) are comprised entirely of native species, except with the inclusion of modest quantities of small burnett or nitrogen fixing legumes such as cicer milkvetch or alfalfa as supplemental forage for wildlife.

4.15.3 Seeding and Planting

Please refer to the reclamation plan found in Section 2.05.4

4.15.4 Mulching and Other Soil Stabilizing Practices

As addressed in Section 2.05.4, Colowyo currently does not mulch, chisel plow, or terrace, because experience demonstrates sufficient surface roughness survives the topsoil laydown process to

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maintain favorable seed-bed conditions. If conditions warrant additional topsoil manipulation, Colowyo will utilize an appropriate practice specific to the circumstance. Best management practices, such as minimizing topsoil handling and manipulation, ripping along the contour, disking, or cross ripping will be implemented and are further discussed in Section 2.05.4.

4.15.5 Grazing

All the lands reclaimed by Colowyo will not be grazed by livestock for a period of at least three years after seeding or planting and will be managed to promote the postmining land use.

Grazing by livestock will not commence until Colowyo has demonstrated to the satisfaction of the Division that the vegetation on the reclaimed surface is adequately established and can be expected to withstand grazing pressures. Any grazing studies undertaken by Colowyo will not preclude or interfere with postmining vegetation sampling as required in section 4.15.8.

4.15.6 Field Trials

As a result of previous consultations with CPW and DRMS, Colowyo implemented three field trials. The field trials were meant to provide information to the appropriate expectations for success/failure of establishing these habitat types at Colowyo in the context of a ten-year bond clock, to provide some baseline information that can be used to modify practices, and the plant materials used to meet the current expectations.

The study was comprised of three test scenarios designed to explore different species and habitat requisites necessary for tall shrub survival. The first treatment was to establish an overstory of quaking aspen (*Populus tremuloides*) trees that are planted into deep topsoil (48 inches). The second treatment was serviceberry (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*) shrubs planted into deep topsoil (48 inches). The third and final treatment was serviceberry and mountain mahogany (*Cercocarpus montanus*) shrubs planted into shallow topsoil (4 inches). The aspen trees and/or tall shrubs were planted in ten-220-foot long rows per treatment, for a total of 550 plants per treatment. The initial planting consisted of 550 quaking aspen tubelings in the first treatment, 276 serviceberry and 274 chokecherry tubelings in the second treatment, and 276 serviceberry and 274 mountain mahogany tubelings in the third treatment.

The status of each tree or shrub was evaluated in 2012 through 2016. Trees and shrubs that “were observed to be dead” during the evaluation effort in August 2012 needed to be replaced (one-time replacement). Replacement of dead plants occurred in November 2012. During the final evaluation in 2016, no quaking aspen trees in Treatment 1 were observed to be alive. In Treatment 2, no serviceberry and 42 individuals of the chokecherry (15%) were observed to be alive in 2016. In Treatment 3, 143 individuals of the serviceberry (52%) and 147 individuals of the mountain mahogany (54%) were observed to be alive in 2016. The unfavorable results of the aspen and tall shrub trials (documented in annual reporting to the Division) have prompted Colowyo to undertake additional efforts as outlined below.

As a result of these unsuccessful test plots, Colowyo intends to design and implement new field trials which draw upon success at Trapper and Seneca IIW. Cedar Creek Associates, Inc. (Cedar

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Creek) has conducted a literature review to support Colowyo in achieving revegetation success criteria pertaining to tall shrub establishment. This literature review aimed to optimize success at Colowyo by synthesizing the successes and challenges of other efforts both at Colowyo and in the region.

Based on these findings, Colowyo identified areas of snow accumulation during the winter (November 2019 – February 2020). These seventeen test areas are scattered throughout recently reclaimed areas in East and West Pit and will be implemented in a manner to optimize successful tall shrub establishment. Please see Figure 4.15-1 for approximate tall shrub test plot locations. For the most part, these are small (~0.1 acres) areas which accumulate snow in the winter months and as a result improve seasonal plant available water through snow-capture. Final siting of the tall shrub test plots will be based on additional snow drift data yet to be acquired.

The first step will be to create some topsoil mounding for additional structure for precipitation retention. The test areas will then be planted with containerized Planting / tubelings as establishing tall shrubs from seed was not successful at either Colowyo or Trapper. Since the test sites are located in upland areas the following species will be considered for planting:

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)
- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos* sp.)

The planting of tubelings will not occur in the middle of winter or summer and will not exceed one tubeling per ten square feet. Fencing will be used to decrease herbivory, which will likely be crucial, at least during the first few years while tall shrubs are establishing. The fencing employed will be at least six feet in height, and will be of a type to ensure large mammals such as deer and elk cannot enter the trial area. Fencing will be removed once the tall shrubs are mature enough to handle browsing, or fencing may be retained at the discretion of the landowner. At a minimum, it will be removed prior to Phase III release of a particular reclamation area.

Native soil, collected from the locally source ecosystems on or directly adjacent to Colowyo Mine exhibiting similar tall shrubs species as being implemented in the trial, will be used to inoculate the test sites with beneficial mycorrhizae. Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis. Once the mounding is completed and prior to installation of weed guard fabric, locally sourced soils (containing local mycorrhizae) will be scattered at random on the mounded surface. Care will be taken to ensure these soils are placed around where the tubling will be planted and under the weed guard fabric.

Weed guard fabric will also be placed around the tubelings, with limited opening size in the weed guard fabric to plant the tubeling. This should help assist in limiting competition from moisture from other plants. The final step will be to broadcast seed the entire trial area with the seed mixture

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presented on Table 2.05-8. No other manipulation of the trial area will occur post construction to limit annuals, but if necessary noxious weeds will be controlled during the entire trial period.

Colowyo will monitor the survival of planted tall shrubs annually for three years following planting. The primary purpose of this approach to test plots is to identify areas that already exhibit favorable conditions to establish tall shrubs, rather than try to replicate those conditions.

4.15.7 Determining Revegetation Success: General Requirements and Standards

Three reference areas have been selected to represent the three major vegetative communities to be disturbed, sagebrush, mountain shrub, and aspen. The locations of these reference areas are shown on Map 4. Detailed vegetative sampling was performed on these reference areas as described in Section 2.04.10.

The reference areas were sampled for herbaceous cover, herbaceous production and woody plant density. Species diversity was determined utilizing herbaceous cover data from the premining inventory of the sagebrush, mountain shrub, and aspen communities. The reference areas are each approximately seven acres in size.

Statistical tests were performed on the vegetative data from the reference areas to prove that they were comparable to the premined area. The parameters compared were herbaceous cover and herbaceous production. Revegetation success will be determined by comparisons of weighted averages between reference areas and revegetated areas in accordance with Rule 4.15.7(4) (b).

For demonstration of revegetation success, vegetation cover, herbaceous production, and in certain circumstances woody plant density will be sampled to statistical adequacy (where necessary), and compared to the revegetation metrics described in Section 4.15.8 below. Sampling methodologies and statistical testing utilized for bond release evaluations are described in Section 4.15.11.

To summarize, there are three reference areas, the Mountain Shrub reference area, Sagebrush reference area, and Collom Aspen reference area that are utilized to evaluate revegetation success at Colowyo. The comparison between the reclamation area and the reference area will occur as follows:

- West and East Pit Reclamation Areas
 - Reclaimed areas shall be compared to weighted parameters from the Mountain Shrub reference area (55% weight) and the Sagebrush reference area (45% weight) in accordance with Rule 4.15.7(4)(b).
- South Taylor Pit Reclamation Areas
 - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (52% weight), the Sagebrush reference area (25% weight), and the Collom Aspen reference area (23% weight) in accordance with Rule 4.15.7(4)(b).
- Collom Reclamation Areas
 - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (39% weight), the Sagebrush reference area

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(47% weight), and the Grassland reference area (14% weight) in accordance with Rule 4.15.7(4)(b).

4.15.8 Revegetation Success Criteria

Colowyo will meet the requirements to ensure that the post-mining vegetation will be adequate for final bond release. As described in Section 4.15.7, Colowyo will utilize the reference areas for comparisons between reclaimed areas and appropriate native reference areas for the variables of ground cover and production. For the variables of woody plant density and species diversity, Colowyo shall compare revegetated areas against defined standards (detailed later in this section). Data to be used in these comparisons must be from statistically adequate sampling (where necessary) as indicated in Rule 4.15.11.

Herbaceous Cover

For revegetation targeting (and achieving) the rangeland land use subcomponents of grazingland and wildlife habitat, herbaceous cover of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous cover as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (3) (a).

Herbaceous Production

For revegetation targeting the rangeland land use subcomponents of grazingland and wildlife habitat, herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous production, as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (4).

Woody Plant Density

Where shrubs establish to form wildlife habitat, they will be segregated into low and high-density areas, each with a separate woody plant density success criterion. On high-density areas (areas of shrub concentration), the standard shall be 375 live woody plants per acre. At least one-half of these totals shall be sagebrush species. In low-density areas, the standard shall be 200 plants per acre. Furthermore, Colowyo will establish wildlife habitat areas, comprised of both low and high-density areas, on approximately 20% of the acres in each bond release evaluation, with at least 50% of those acres representing high-density areas. The grazingland acres will not be subject to woody plant density standards.

Tall Shrubs and Aspens

For the South Taylor reclamation areas, as part of the revegetation success criteria for those areas, Colowyo will establish 18.5 acres of aspens and 12.0 acres of tall shrubs. This will be accomplished through large singular plots or various small plots that add up the acres noted previously. Tall shrubs plots will consist of, but may not contain all, of the following species to be considered successful.

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)

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- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos sp.*)

For the Collom reclamation areas, at the request of CPW, Colowyo will incorporate approximately 750 small size exclosures into Collom reclamation areas on 150 acres at a density of approximately five exclosures per acre to meet their expectations for establishing tall shrub species.

Diversity

The revegetation objective for diversity will be to establish at least four native* perennial species, each more than 3% composition, minimum of two of which are grasses and a minimum of one which is a forb, with the following caveat;

If no single forb species exceeds 3% composition, the forb requirement can be met if:

- a) at least two native* perennial forbs combined comprise at least 2% composition, or;
- b) at least four native* perennial forbs combined comprise at least 1% composition.

The dominant species will contribute to the appropriate structure and stability of the post-mining vegetative community to insure that the post-mining land use as addressed in Section 2.05.5.

4.15.9 Revegetation Success Criteria: Cropland

Colowyo does not impact any cropland areas; therefore, the requirements of this rule are not applicable to Colowyo.

4.15.10 Revegetation Success Criteria: Previously Mined Areas: Areas to be Developed for Industrial or Residential Use

Colowyo does not plan to develop any areas to industrial or residential use; therefore, the requirements of this rule are not applicable to Colowyo.

4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation

During monitoring of revegetated units, developing shrub patches will be identified and as necessary delineated to facilitate mapping that in turn will represent the juxtaposition (stratification) of developing communities. As indicated previously, delineated shrub patches will be classified as either low or high density areas depending on apparent density of developing shrub populations.

Sample Layout

The sample layout protocol for revegetation monitoring and bond release evaluations shall be a systematic procedure designed to better account for the heterogeneous expression of seedlings within reclaimed areas while precluding bias in the sample site selection process. By design, the procedure is initiated randomly, and thereafter, samples are located in a systematic manner, along grid coordinates spaced at fixed distances (e.g. 200 ft). In this manner, representation from across

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the target reclamation unit is forced rather than risking the chance that significant pockets are entirely missed, or overemphasized as often occurs with simple random sampling.

Older reclaimed units (e.g., 7+ years) shall receive a minimum of 20 ground cover transects and co-located shrub density belts. Production for monitoring purposes shall be collected from a representative five of these 20 sample points. For bond release efforts, production will be collected from a statistically adequate sample as defined below. Monitoring efforts for younger reclaimed units (e.g., 2 to 4 years) shall receive 15 transects and co-located woody density belts (as necessary) but no production sampling. First year units will receive one cluster of five emergent density quadrats spread in a representative manner for approximately every two acres of reclamation. For units 50 acres or larger, a five-quadrat cluster should be collected from every 4 acres of reclamation. With regard to any two-year old or older reclamation unit that is smaller than about 3 acres, the number of samples (for monitoring) shall be limited to five.

The systematic procedure for sample location in revegetated units shall occur in the following stepwise manner. First, a fixed point of reference (e.g., fence corner) will be selected for the target unit to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions will be selected to provide a reasonable number of coordinate intersections (e.g., 5, 15, 20, etc.) that would then be used for the set of sample sites. Third, a scaled representation of the grid will be overlain on a computer-generated map of the target unit extending along north/south and east/west lines. Fourth, the initial placement of this grid will be implemented by selection of two random numbers (an X and Y distance) to be used for locating a systematic coordinate from the fixed point of reference, thereby making the effort unbiased. Fifth, where an excess number of potential sample points (grid intersections) is indicated by overlain maps, the excess may be randomly chosen for elimination. (If later determined that additional samples are needed, the eliminated potential sample sites would be added back in reverse order until enough samples can be collected.) Sixth, using a handheld compass and pacing techniques, or a hand-held GPS, sample points will be located in the field.

Once a selected grid (sample) point is located in the field, sampling metrics will be utilized in a consistent and uniform manner. In this regard, ground cover sampling transects will always be oriented in the direction of the next site to be physically sampled to further limit any potential bias while facilitating sampling efficiency. Depending on logistics, timing, and access points to a target sampling area, the field crew may occasionally layout a set of points along coordinates in one direction and then sample them in reverse order. However, orientation protocol will always be maintained (i.e. in the direction of the next point to be physically sampled). If the boundary of an area is encountered before reaching the full length of a transect, the transect orientation will be turned 90° in the appropriate direction so the transect will be completed within the target unit. In this manner, edge transects will be retained entirely within the target unit by “bouncing” off the boundaries. Production quadrats will always be oriented 90° to the right (clockwise) of the ground cover transect and placed one meter from the starting point so as to avoid any trampled vegetation. Woody plant density belts (for monitoring efforts) will be extended parallel to the ground cover transects for a distance of 50 meters and width of 2 meters. (If the grid distance is less than 50 meters, density belts will be reconfigured to be 4 m X 25 m or similar configuration, but always totaling 100 m².)

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Determination of Ground Cover

Ground cover at each sampling site will be determined utilizing the point-intercept methodology. This methodology will be applied as follows: First, a transect 10 meters in length will be extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a “laser point bar”, “optical point bar” or 10-point frame will be situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits will be determined at each meter interval as follows:

1. When a laser point bar is used, a battery of 10 specialized lasers situated along the bar at 10-centimeter intervals will be activated and the variable intercepted by each of the narrow (0.02”) focused beams will be recorded;
2. If an optical point bar is used, intercepts will be recorded based on the item intercepted by fine crosshairs situated within each of 10 optical scopes located at 10-centimeter intervals.
3. If a 10-point frame is used, sharpened pins will be used to determine intercepts at 10-centimeter intervals. Care will be taken to NOT record “side touches” on the pins as this will result in a significant overestimation error.

The following sampling rules should apply during data collection. Intercepts will be recorded for the first (typically highest) current annual (alive during the current growing season) plant part intercepted without regard to underlying intercepts or attachment to a living base except when multiple strata are present. In this circumstance, multiple live hits may be recorded, but only one hit per stratum with the second live hit being recorded separately and not used to calculate total ground cover. Otherwise, the intercept will be litter, rock or bare soil. Rock intercepts are based on a particle size of 2 mm or larger (NRCS definition), otherwise it would be classified as bare soil. To distinguish between current year senescent plant material and litter (including standing dead), the following rule should apply: 1) if the material is gray or faded tan it should be considered litter; and 2) if the material is bright yellow or beige it should be considered current annual (alive) and recorded by species. On occasion, experience with non-conforming taxa may override this rule.

When using laser or optic instruments during windy field conditions, the observer should consistently utilize one of the following techniques for determining a hit: 1) record the first item focused upon that is intercepted by the narrow laser beam or cross-hair; 2) wait a few moments and record the item intercepted for the longest time, or 3) block the wind and record the intercept. When using a pin frame, the observer must wait for the wind to subside.

With regard to gaps in the overstory, the point-intercept procedure naturally corrects for overestimations created by 2-dimensional areal (quadrat) or 1-dimensional linear (line-intercept) techniques. In this regard, the 0-dimensional point is extended along a line-of-sight until it intercepts something that is then recorded. Frequently points simply pass through overstory gaps until a lower plant part, litter, rock or bare soil is encountered.

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Regardless of instrument, a total of 100 intercepts per transect will be recorded resulting in 1 percent cover per intercept. This methodology and instrumentation (excepting the 10-point frame) facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible. Identification and nomenclature of plant species should follow Weber and Wittman (1996) Colorado Flora: Western Slope or newer text.

Determination of Production

Where production samples are to be collected (7+ year-old units or bond release units) current annual herbaceous production will be collected from a $\frac{1}{2}$ m² quadrat frame placed one meter and 90° to the right (clockwise) of the ground cover transect to facilitate avoidance of vegetation trampled by investigators during sample site location. If more production samples are necessary than cover samples (typical case for bond release efforts), orientation protocol will be maintained except that no ground cover data will be collected. From within each quadrat, all above ground current annual herbaceous vegetation within the vertical boundaries of the frame will be clipped and bagged separately by life form as follows:

Perennial Grass
Annual Grass
Subshrub

Perennial Forb
Annual Forb
Noxious Weeds (if found)

All production samples will be returned to the lab for drying and weighing. Drying will occur at 105° C until a stable weight is achieved (24 hours). Samples will then be re-weighed to the nearest 0.1 gram.

Determination of Woody Plant Density

Two sampling methods may be employed for monitoring woody plant density within Colowyo's revegetated units. The first method, belt transects, may be employed when the size of the monitoring unit exceeds one to two acres. At each sample site in such areas, a 2-meter wide by 50-meter long belt transect (or alternately 4 x 25 meter transect) should be established parallel to the ground cover transect and in the direction of the next sampling point. All woody plants (shrubs and trees) within each belt will be enumerated by species. Determination of whether or not a plant may be counted is dependent upon the location of its main stem or root collar where it exits the ground surface with regard to belt limits. A total of 5 or 15 belt transects may be sampled for each monitoring unit.

For bond release sampling with belts, sufficient samples must be collected to insure adequacy of the effort (to facilitate valid testing) in accordance with one of the three methods under either Rule 4.15.11 (2), or Rule 4.15.11 (3). Depending on the selected protocol, care must be taken to collect at least the minimum number of samples indicated.

The second method, total enumeration, may be employed for monitoring when the size of a unit is less than approximately one to two acres in size. Total enumeration shall be the typical method utilized for bond release purposes unless shrub patches are too large (e.g., greater than 10 to 15 acres) to practically utilize this technique (in which case belts will be utilized). This method involves total counts of woody plant populations as opposed to estimates of mean densities through statistical sampling. Implementation of the total count technique would involve circumscribing

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the boundaries of a target polygon with hip chain thread or similar visible designation. Once a unit is circumscribed in this manner, a team of two or more biologists walking shoulder-to-shoulder traverse the plot enumerating each plant by species. The person farthest inside the line of observers trails hip chain thread, or other means, to mark their path to prevent missing or double counting specimens on subsequent passes. The distance between observers should be 15 to 20 feet or less depending on the height of grasses and the presence of low growing taxa such as rose or snowberry. Each internal observer should also “zigzag” as the team progresses, occasionally turning to view the area just passed to ensure visual coverage of the entire survey path. Constant communication among crew members precludes double counting or missing of plants located along the margins of observed paths. Results from total enumeration efforts can be compared directly with success criteria without statistical testing.

Sample Adequacy Determination

Sampling within each unit under consideration for bond release shall start with a minimum of 15 (reference area) or 20 samples (revegetated area) and continue until a statistically adequate sample has been obtained in accordance with Rule 4.15.11 (2). Woody plant density success comparisons can be obtained utilizing Rule 4.15.11(2) or Rule 4.15.11 (3). For woody plant density adequacy determinations utilizing Rule 4.15.11 (2)(a), the estimate is to within 15% of the true mean. Where sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

Success Evaluation

To summarize, success evaluations involve either a direct or a statistical *t*-test comparison of appropriate parameters for each variable of interest (cover, production, diversity, or woody plant density). Ground cover and production comparisons shall be made against reference area data of the same year. Diversity and woody plant density variables shall be compared against the standards defined above.

For bond release efforts, direct comparisons are made when the revegetated area mean value for a given variable is greater than either 90% of the standard or the reference area mean assuming that a statistically adequate sample has been collected in accordance with Rule 4.15.11(2)(a). If a statistically adequate sample cannot be obtained, a “reverse-null” hypothesis test may be employed as detailed in Rule 4.15.11(2)(c). If an adequate sample is obtained for a particular variable, but the mean is less than 90% of the reference area mean or success criteria outline in Section 4.15.8, a standard-null hypothesis *t*-test may be used in accordance with Rule 4.15.11(2)(b).

If adequacy for woody plant density cannot be achieved utilizing the formulation in Rule 4.15.11 (2)(a), additional sample adequacy and success evaluation options are described under Rule 4.15.11(3).