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CALIBRATING THE TRUAX ROUGH RIDER SEED DRILL FOR RESTORATION PLANTINGS

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Introduction

The purpose of this technical note is to provide a step-by- step approach to calibrating the Truax Rough Rider range drill, a relatively new, state-of-the-art rangeland drill. To achieve the desired outcome of a seeding project, an important step following proper weed control and seedbed preparation is the calibration of the seeding equipment to ensure the recommended amount of seed is uniformly planted.

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The Rough Rider drill is a very heavy-duty planter designed to plant multiple species on sites that are typically too rough for conventional seeding equipment. It is designed to plant seed on rugged sites with minimal soil disturbance. Ground penetration is achieved by 4 tons of weight riding on the planting disks. The Rough Rider drill has a 10 foot planting width and is configured to plant 10 rows on 12 inch centers. The planting units are arranged in two ranks with a front to back separation of 48 inches for maximum trash clearance. Each planting unit on the drill has 20 inches of vertical travel between the low and high points with 20 inch diameter planting disks (figures 1 and 2). An optional broadcasting attachment is available to surface plant species that require surface or very shallow seed placement. The broadcasting attachment has a “brillion” style press wheel to press the seed into the soil surface to help ensure good seed-to-soil contact (figure 3).

Power to drive the seed box shafts and agitators originates from a floating drive wheel that rides on top of the right ground wheel. Floating hydraulics allow the planters to be raised for transport and to transfer weight to the disk openers when planting. The drill has 3 seed boxes. The small seed box with row dividers and fluted feed, uses a standard shifter output control. The fluffy box, with row dividers, agitator and picker wheel has a derailleur for output control. The cool season box also has an agitator and has standard grain drill cups with fluted feed and a shifter output control.

Seeding rate recommendations are often given in pounds of Pure Live Seed (PLS) per acre. PLS seeding rates **must** be converted to bulk pounds per acre in order to calibrate planting equipment.

Seed mixtures commonly have both large and small seeded species. NRCS seeding rate recommendations are based on the following basic rules:

Large seed < 500,000 seeds/lb – $20\text{-}30 \text{ seeds/ft}^2 = 24 \text{ seeds/ft}$ at 12” row spacing

Small seed > 500,000 seeds/lb – $40\text{-}50 \text{ seeds/ft}^2 = 48 \text{ seeds/ft}$ at 12” row spacing

Critical area plantings and broadcast seeding – use 1.5 to 2 times the drill seeding rates shown above.

Drill Calibration Methods

Method #1: Determine the seeds per foot of row.

Method #2: Run the drill a given distance, weigh the seed dropped, then convert to pounds per acre.

Method #3: Measure the floating drive wheel circumference or determine the number of revolutions required to travel a given distance, turn the wheel the prescribed number of times, weigh the seed dropped, then convert to pounds per acre.

Method #4: Fill the drill with a weighed amount of seed, seed a measured area, reweigh what is left in the drill, then calculate the pounds per acre.

Method #5: Calculate a rice hull to seed ratio, then set the drill for seeding barley.

Method #6: Consult the seed chart on the inside of the drill cover.

Most people use Method #6 because some drills have a handy chart glued to the inside of the cover and it often lists a few species, along with seeding rates and drill settings. The charts work well for crops such as barley, wheat, oats and sorghum. Unfortunately, the charts **do not** work well for restoration seeding projects. Most restoration seeding projects are mixtures of species that have different sized seeds. Some species flow better than others and often rice hulls or cracked grain needs to be added to the seed mixture in order for the drill to operate efficiently and for the seed to be planted uniformly.

This technical note provides information on the steps involved for **Method # 3** which is the most preferred and efficient calibration method for the Rough Rider drill. It also provides an example to assist the planner and drill operator with drill calibration to insure successful seedings that help solve resource problems. For details on the other methods of drill calibration, refer to Idaho NRCS Plant Materials Technical Note No. 19, Calibrating a Seed Drill for Conservation Plantings.

You will need the following items to calibrate the drill:

- Metric ruler
- Gram scale
- 2 seed collection containers (2 pound coffee cans work well)

Steps in Calibration Method 3 – Wheel Circumference

Step 1 - become familiar with the drill being used. Perform necessary maintenance and check to ensure the drill is in proper operating condition. You can expect to find rusty

openers that inhibit seed flow; overzealous greasing and oiling that will interfere with seed flow; and tubes clogged with nesting materials from field mice, birds and insects.

Check drill gates to ensure they are in the proper position for the size and kind of seed being planted and start calibration from a wide-open position and close down to the desired position. If the seed mix includes rice hulls, a setting for barley will be a good starting point as mixtures with rice hulls generally flow at about the same rate as barley. This information will provide a good starting point to begin calibration.

Step 2 - determine the bulk seeding rate per acre for each species in the planting mix based on the PLS seeding recommendation. PLS information (purity and germination or viability) will be on the seed tag or seed analysis report. If a carrier such as rice hulls is being used, the amount of rice hulls in the seed mix also needs to be known.

Refer to Idaho NRCS Plant Materials Technical Notes: No. 4, Reading Seed Packaging Labels and Calculating Seed Mixtures; No. 7, Mixing Seed with Rice Hulls; and No. 24, Grass, Grass-Like, Forb, Legume and Woody Species for the Intermountain West for details in determining seeding rates. The NRCS Idaho Plant Materials website also features a spreadsheet that can be used to calculate seed and rice hull mixtures as well as calculate mixture weights for drill calibration at the following link:

ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/ricehull_calculator1105.xls

To calculate bulk seeding rate use the following formula:

$$\text{PLS pounds per acre} \div \text{percent PLS} = \text{Bulk seeding rate per acre}$$

Species	Prescribed rate pounds PLS/ac.	Percent Purity	Percent Germination	Percent PLS	Actual Bulk pounds/ac.
Indian ricegrass	1.80	99.12	97	96.15	1.87
Bottlebrush squirreltail	1.75	99.09	93	92.15	1.90
Bluebunch wheatgrass	1.75	97.83	87	85.11	2.06
Fourwing saltbush	2.00	93.21	47	43.81	4.57
Blue flax	0.20	93.33	80	74.67	0.27
Munro globemallow	0.10	95.98	85	81.55	0.12
Rice hulls (carrier)					4.71
Total mix					15.49

The prescribed rate for Indian ricegrass is 1.8 pounds PLS/ac. In order to determine the bulk seeding rate, percent PLS must first be determined.

$$\frac{99.12 \% \text{ purity} \times 97 \% \text{ germination}}{100} = 96.15 \% \text{ PLS}$$

$$1.8 \text{ pounds PLS/ac} \div 96.15\% \text{ PLS} = 1.87 \text{ bulk pounds per acre}$$

In this example 1.87 bulk pounds/ac of Indian ricegrass will be planted to meet the prescribed rate of 1.8 pounds PLS/ac. This calculation needs to be repeated for each species in the mix.

Step 3 – Count the number of revolutions of the floating drive wheel turns to cover a pre-determined length of run (usually 100 feet). This method only works on drills where the drive wheel can be turned by hand without pulling the drill. **On the Rough Rider drill, the floating wheel rotates 22.5 times for the drill to travel 100 feet.** It is extremely important that the recommended air pressure for the tires on the drill be maintained at the same pressure during both calibration and seeding operations. Low or excessive air pressure in the tires will cause inaccurate calibration and seeding rates. To facilitate calibration, the Aberdeen Plant Materials Center installed a handle to the floating drive wheel on the Roughrider drill (figure 4).

Then, determine the area covered in 100 feet using the following equation:

$$\frac{\text{Drill width (feet)} \times 100 \text{ foot test run}}{43,560 \text{ ft}^2 / \text{acre}} = \text{area (acres) of test run}$$

$$\frac{10 \text{ ft} \times 100 \text{ feet}}{43,560 \text{ ft}^2 / \text{ac}} = 0.0229 \text{ acres}$$

Next, remove a spout from one of the disk openers on the left side and one from the right side of the drill and place a couple of pounds of the seed mixture in the box directly above the removed openers. Disengage the floating wheel from the ground wheel. Turn the floating wheel counter clockwise until the spouts are dropping seed uniformly. You will want to collect this seed in empty cans so you don't have a mess to clean up afterward. Once the seed begins to flow, stop turning the wheel and place clean, empty cans under each of the removed spouts.

Rotate the floating wheel 22.5 rotations counter clockwise, catch the seed in the cans and weigh the collected seed.

Calculate the amount of seed mixture required for test run:

Indian ricegrass	1.87 bulk pounds per acre
Bottlebrush squirreltail	1.90
Bluebunch wheatgrass	2.06
Fourwing saltbush	4.57
Blue flax	0.27
Munro globemallow	0.12
<u>Rice hulls*</u>	<u>4.71</u>
Total	15.49 bulk pounds per acre

* See Idaho NRCS Plant Materials Technical Note No. 7, Mixing Seed with Rice Hulls for details on using and calculating mixtures.

15.49 pounds x 0.0229 acres (area of test run) = 0.355 pounds of seed mix for test run

Determine the amount of seed that should be delivered through each drill spout during the test run.

$\frac{\text{Pounds of mix for test run}}{\text{Number of spouts on drill}} = \text{pounds of mix per spout}$

$\frac{0.355 \text{ pounds of seed mix for test run}}{10 \text{ spouts on drill}} = 0.0355 \text{ pounds mix per spout}$
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Since a small amount of seed is being weighed, it is desirable to convert the amount to grams (0.0355 pounds x 454 grams/pound = 16.11 grams per spout for test run).

Make adjustments to the gates on the drill openers and repeat the above procedure until seed weight is within 10 percent of the desired rate. The use of a millimeter ruler is helpful to measure and adjust the gap on the opener (figure 5). Check results with one more trial at the same setting. Be sure to record the drill settings for future reference.

If the Rough Rider drill is set up to plant an alternate row seeding with both drilled and broadcast species, each seed mix (drilled and broadcast) must be mixed separately and the amount of carrier (rice hulls) would need to be calculated and mixed with each seed mix. The same procedure for calibration as outlined above would be followed however, only 5 spouts would be planting the drilled mix and 5 spouts would be planting the broadcast mix.

The same process would be followed to calibrate the small seed box and the fluffy seed box. Figure 6 shows the inside of the fluffy box. However, adjustment of the fluffy box involves adjusting the derailleur controls (figure 7). The derailleur has (2) five-step sprockets with a spring tension idler between the two stepped sprockets and provides 5 settings for seed output. To adjust calibration, lift the idler and move the chain from one set of sprockets to another. The lowest seed output is when the chain is on the furthest right combination of sprockets (when looking back from the tongue). To increase seed output, move the chain left.

When using the fluffy box, it is even more important to test the seed mix to make sure the mix will flow as desired. It is recommended that a small amount of seed mix (amount for 1 acre including carrier) be run through the drill to make sure the target seeding rate can be applied. If calibration rates cannot be achieved, the amount of carrier will need to be adjusted. Start out by mixing a small amount of carrier with a small amount of the seed mix and increase the amount of carrier gradually until the drill is calibrated to apply the proper amount of seed.

References

Revegetating Deteriorated Rangeland. USDA NRCS Range Technical Note No. 30, Boise, ID March, 1985.

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Calibrating a Drill. USDA NRCS Plant Materials Technical Note No. 30, Bozeman, MT May 1985.

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ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/mixseed_ricehulls.pdf

Reading Seed Packaging Labels and Calculating Seed Mixtures. USDA NRCS Plant Materials Technical Note No. 4, Boise, ID October 2002.

ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/seed_label.pdf

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<ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/calibration07.pdf>

Truax Company, Inc. Truax Rangeland Drills.

<http://www.truaxcomp.com/rangeland.html>

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Figure 1. Close-up view of drill seeding unit.



Figure 2. Truax Roughrider seed drill showing location of seed boxes and floating drive wheel with handle for calibration,



Figure 3. Drill with broadcast planter attachments on alternating rows with drill units.



Figure 4. Floating drive wheel with drive handle for calibration, and number of and direction of rotation for drill calibration.



Figure 5. Using a millimeter ruler to adjust openers during drill calibration.



Figure 6. View of inside of fluffy box showing agitator and picker wheel.

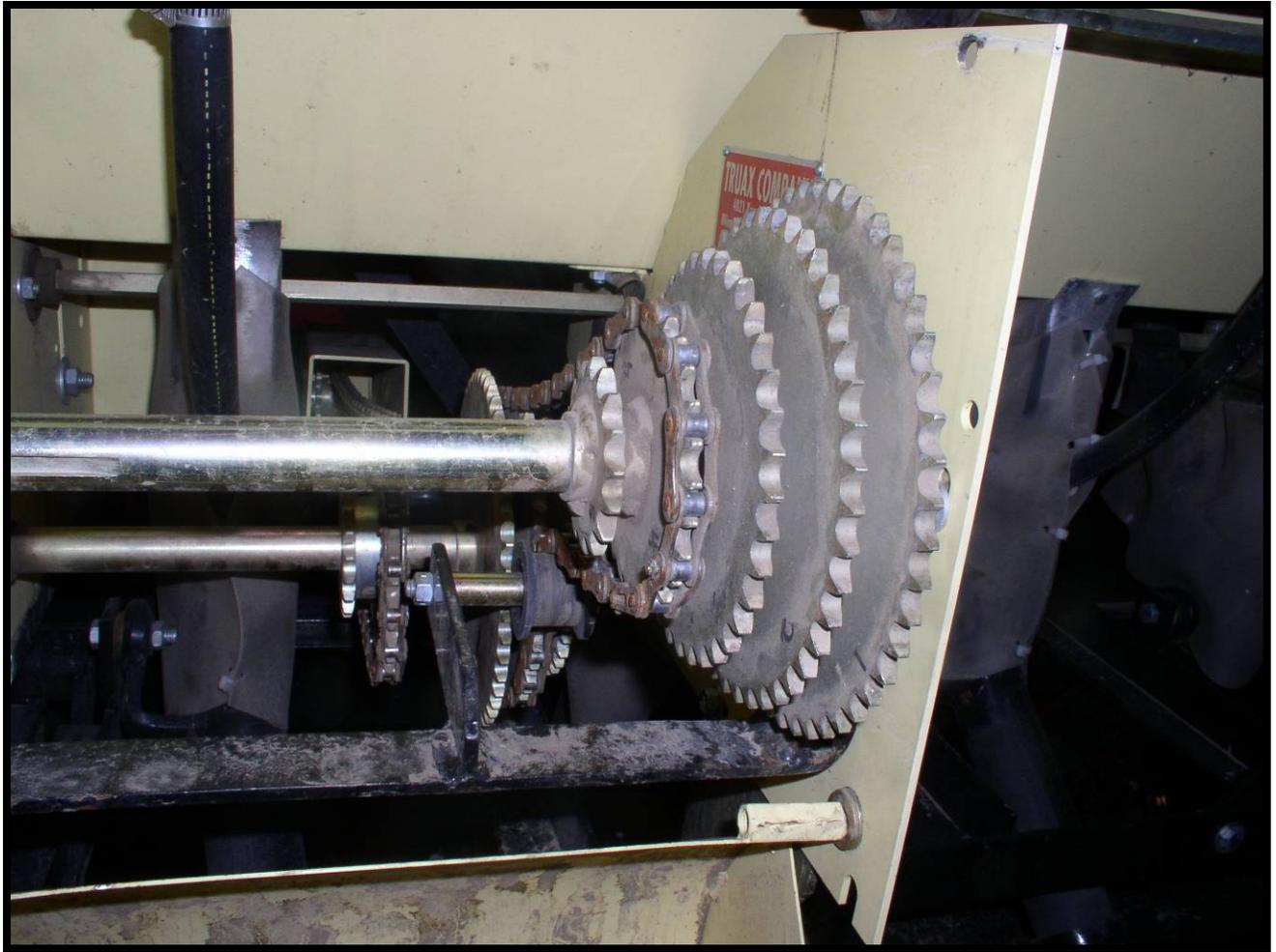


Figure 7. Derailleur controls for fluffy seed box. Moving the chain to the left increases seed output and moving the chain to the right decreases seed output.