

Truax Rough Rider Rangeland Drill - Modifications
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The cooperators of the IFAFS Project chose to use the Truax Rough Rider Rangeland drill to seed Experiment 1 (common garden studies) and Experiment 3 (restoration treatments) because the drill was considered the best available technology for rangeland seedings in the western United States.

Personnel from the USDA-NRCS Plant Materials Center (PMC) were responsible for completing modifications to ensure both small (10 x 20 foot) plots in Experiment 1 and large (acreage size) plots in Experiment 3 would be planted accurately.

The Truax drill was delivered to the PMC in July, 2003 so that modifications to the drill could be completed. Due to safety issues identified by the drill manufacturer, the drill was recalled to the factory in mid-August. The drill was returned to the PMC in late September, 2003. The following modifications were made prior to the first seeding project:

- Replace accordion style drop tubes with smooth, clear tubes to facilitate seed flow from the seed box
- Fabrication of V-shaped trough over individual seed cups to facilitate changing seed for each plot and cleanout between plots
- Mounted generator, vacuum cleaner and bag holder for changing seed between plots
- Mounted a handle on drive wheel for calibration and drill priming
- Modifications to facilitate calibration
- Removed agitator in cool season box to facilitate cleaning between plots
- Installed seats on drill platform
- Adjustment of press wheels to ensure accurate tracking behind openers

On October 19, 2003 PMC personnel transported the drill to the Canyon Creek Site to begin seeding the common garden study (Experiment 1). Due to the time constraints imposed by the recall of the drill in August, PMC personnel had not had a chance to actually test the drill under field conditions to determine how well the drill placed seed into the soil. It was assumed that the manufacturer had tested seed placement under rangeland conditions. Seeding began after delays in procuring the proper hitch and hydraulic connections between the drill and the tractor which was supplied by ARS.

Once seeding commenced, PMC personnel found seed bridging in the seed drop boot, drastically impeding seed flow to the soil. It was determined that the disk openers were not cutting a slot wide enough for seed to contact soil. The location where the seed left the boot was altered to direct more seed into the slot formed by the disk. Modifications to the drill while in the field were extremely limited due to lack of appropriate tools and materials. The Idaho sites (Canyon Creek and Cinder Cone Butte) were seeded under less than ideal conditions and a good portion of the seed was not adequately covered with soil by the drill.

The following week the Oregon sites were seeded. PMC personnel were able to make additional modifications prior to seeding. Seed tubes were extended past the boot re-directing where the seed dropped, which greatly improved seed placement. Drag chains were also installed behind the press wheels to improve seed coverage. The Nevada and Utah sites were seeded following completion of the Oregon sites.

Prior to the seeding occurring in the fall of 2004, the following additional modifications were completed:

- Wedges (from the manufacturer) were installed to adjust toe-in (7°) on disk openers (this widened the slot that the seed falls into)
- Added flute adjustment crank wheel to improve adjustment of calibration
- Constructed side load trailer ramps on 35 foot trailer in order to haul both the drill and tractor with one truck
- Constructed hitch pin sleeve to use with clevis-type tractor drawbar to reduce the amount of play in pintle eye on drill
- Fabricated pintle hitch for tractor loader in order to side load drill with tractor

The second year seeding of Experiment 1 plots were completed in late October and early November, 2004. The ability to transport both the tractor and drill from site to site with one truck improved the efficiency of the project. A cover crop (triticale) was seeded on the Experiment 3 site in early November. The additional modifications significantly improved the seed placement and soil cover of the seed. The drill performed very well in maintaining seeding depth which was set at $\frac{1}{2}$ to $\frac{3}{4}$ inch depth for the small grain cover crop.

In 2005, a new drill was used to seed Experiment 3. Many of the modifications that were made to the drill used the prior 2 years were installed on the drill. Additional modifications included:

- Windshields added around seed cup drops to reduce seed loss during windy conditions
- Broadcast seeders added to alternate rows to facilitate planting shallow seeded species as well as deeper seeded species in a single operation
- Repositioned mounting brackets for broadcast seeders

This drill was used for the Crested Wheatgrass Diversification Project (Great Basin Native Plant Selection and Increase Project) and Experiment 3.

Mr. Jim Truax visited the seeding sites for the Crested Wheatgrass Diversification Projects in Utah and Oregon and was able to see how well the drill performed with the modifications that had been made. After the first seeding project was completed in Utah, Mr. Truax manufactured new seed drop boots that were steeper, to improve seed drop. The new boots were installed on the drill and were used in Oregon (Crested Wheatgrass Diversification Project) and the seeding of Experiment 3.

Since completion of the seedings in 2005, Mr. Truax has manufactured a new seed drop boot that should further improve seed placement. The new boot will be installed and used in upcoming seeding projects. All of the modifications that have been made have incrementally improved the performance of the Truax rangeland drill. The Truax rangeland drill is a vast improvement over the older rangeland drills which had very poor control of seeding depth.

The cooperators of the IFAFS project thank Mr. Jim Truax for providing the drill for the project and his willingness to work with the project to make improvements to the drill. The excellent cooperation will undoubtedly pay great dividends in future rangeland seeding projects throughout the western United States.