plot of each treatment on each slope. Four replicate plots of the tilled treatments were placed on a southeastern slope and four on a northwestern slope in 2001/2002; four tilled replicates were placed on a northwestern slope in 2002/2003. Similar treatments were established in the fall of 2003.

Data from the winters of 2001/2002 and 2002/2003 have been analyzed. In 2001/2002, a year with drifting snow, aspect of the stubble treatments had more effect than the treatment itself. North slopes had more snow and greater runoff, 10mm vs. 2mm, although there was large variation in the data. On the tilled plots, the northwest aspect plots had 23mm runoff and the southeast aspect only 8mm runoff. In 2002/2003, the stubble treatments were again placed on the north and south sides of two east-west ridges. There was less snow and aspect was not important in the results, with 0mm runoff from the north plots and 1mm runoff from the south plots. None of the stubble treatments had over 6mm runoff. The mean runoff from the four tilled plots was 28mm.

Runoff was greater from conventionally seeded treatments than from continuous direct stubble seeded treatments during the winter seasons of 2001/2002 and 2002/2003. In neither season was infiltration and runoff dominated by a deep freeze and rapid melt event.

*DRYLAND CROPPING SYSTEMS RESEARCH AT LIND

Bill Schillinger, Harry Schafer, Bruce Sauer, and Steve Schofstoll
Dept. of Crop and Soil Sciences, WSU

Cropping systems research that compares intensive cropping using no-till vs. the traditional winter wheat – summer fallow rotation with tillage has been ongoing at the WSU Lind Dryland Research Station since 1998. Annual spring cropping was not economically competitive with winter wheat - summer fallow from 1998 to 2003. On average, soft white spring wheat grain yield was less than half of grain yield for soft white winter wheat after summer fallow (i.e., one crop every two years). Recrop winter wheat after two years of spring wheat has yielded significantly more grain than continuous annual spring wheat in 3 of 4 years. In addition, Russian thistle infestation in recrop winter wheat is minimal whereas Russian thistle infestation is generally severe in spring wheat. In 2003, winter wheat after summer fallow produced 32 bu/ac compared to 24 bu/ac for winter wheat after chemical fallow, 16 bu/ac for recrop winter wheat, and 8 bu/ac for continuous spring wheat.

ROTARY SUBSOILING TO REDUCE EROSION AND IMPROVE INFILTRATION IN NEWLY-PLANTED WINTER WHEAT AFTER SUMMER FALLOW

John D. Williams, Stewart B. Wuest, William F. Schillinger, and Hero T. Gollany
USDA-ARS, Pendleton, Oregon, and Dept. of Crop and Soil Sciences, WSU

Water erosion and runoff can be severe due to poor infiltration through frozen soil in the dryland wheat (Triticum aestivum L.) production region of the inland Pacific Northwest (PNW), USA. For more than 70 years, farmers and researchers have used various methods of subsoiling to reduce runoff and erosion and to improve infiltration and soil water storage. The practice and equipment have evolved from chiseling continuous open channels across hillslopes to the rotary subsoiler that pits the soil. Farmers often subsoil wheat stubble after harvest, but do not employ

this practice on newly-planted winter wheat fields. These fields are especially vulnerable to erosion because of meager residue cover after a year of fallow. A 6-year field study was conducted in eastern Washington to determine the effect of rotary subsoiling in newly-planted winter wheat on over-winter water storage, erosion, infiltration, and grain yield. There were two treatments, rotary subsoiling and control. The rotary subsoiler created one 16-inch-deep pit with 0.98-gallon capacity every 7.5 ft2. Natural precipitation did not cause rill erosion in either treatment because of mild winters during the study period. Net change in water storage was significantly ($P < 0.05$) improved with rotary subsoiling compared to the control in 2 of 6 years. Grain yield was not affected by treatments in any year or when averaged over years. In 2003, we simulated rainfall for approximately 3 hr at a rate of 0.72 inch/hr on both subsoiled and control plots to determine runoff and erosion responses on frozen soils. Rotary subsoiling reduced runoff ($P < 0.01$) by 38 percent. Rotary subsoiling also significantly reduced erosion ($P < 0.01$) during the 20- to 45-min period after runoff had begun. The total quantity of eroded soils were 0.58 and 1.52 ton/acre for the subsoiled and control treatments, respectively, with inter-rill the dominant erosion process. The average infiltration rate for the control treatment (0.13 inches/hr) was half of the rate for the subsoiled treatment (0.26 inches/hr), at the end of the 3-hr simulation. Rotary subsoiling of newly-planted winter wheat can increase soil water stored over-winter and reduce runoff and soil loss on frozen soils, but the benefit of this practice for increasing grain yield has not been proven.

SOIL WATER IS STRANDED IN RHIZOCTONIA PATCHES

Bill Schillinger, Harry Schafer, Steve Schofstoll, and Tim Paulitz
WSU and USDA-ARS

Continuous annual no-till soft white spring wheat at the long-term cropping systems study at the Ron Jirava farm near Ritzville is considered an economic (but risky) success, even though an average of 8% of land area was in bare patches caused by Rhizoctonia root rot during the last five crop years (1999-2003). How are the relatively high spring wheat grain yields achieved with such a high level of bare patch disease? Are healthy wheat plants extracting soil water from within the bare patches, thus possibly minimizing or negating the patching effect on wheat grain yield? To find out, we installed neutron probe access tubes in several locations inside and outside of Rhizoctonia patches in all four replications of the continuous annual soft white spring wheat treatment and measured soil water throughout the spring and summer in 2003. Six access tubes were placed in each plot: 10 ft inside a patch (i.e., no healthy wheat within a 10-ft

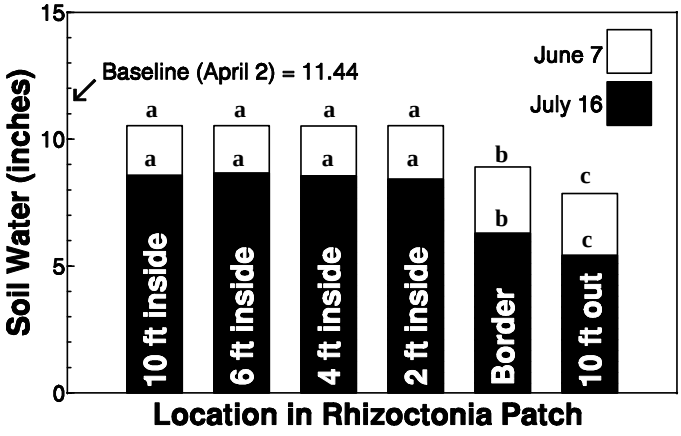

Figure 1. Soil water content in the 6-ft soil profile in June and July of 2003 as affected by the location inside, at the border, and outside of Rhizoctonia bare patches.