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

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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

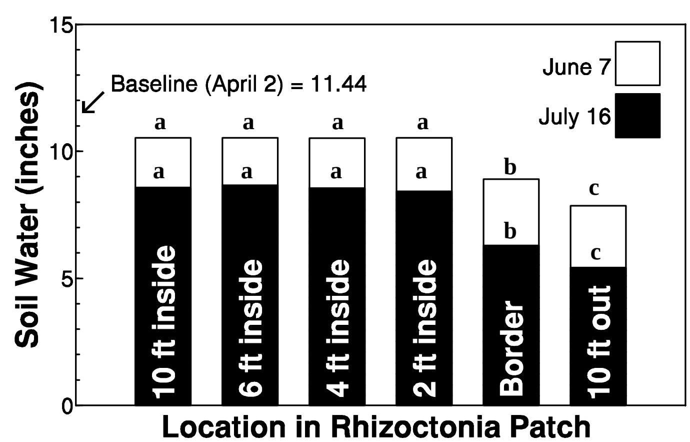

Figure 1. Soil water content in the 6-ft soil profile in June and July of 2003 as affected by the location inside, at the border, and outside of Rhizoctonia bare patches.

radius), 6 ft within a patch, 4 ft within a patch, 2 ft within a patch, at the border of the patch and healthy wheat, and 10 ft into healthy wheat (i.e., no bare patch within a 10-ft radius.

Results strongly suggest that wheat roots do not extract soil water from within Rhizoctonia bare patches (Fig. 1). Healthy spring wheat growing 10 ft from the nearest bare patch had used significantly more soil water than wheat on the border of a patch on both June 7 and July 16 measurement dates. Similarly, soil water content at the border of patches was significantly lower than from within the patch. Water content within patches was the same regardless of location of the access tube within the patch. Note that wheat did not extract soil water even from just 2 ft inside the border (Fig. 1). This experiment is being repeated in 2004.

*MAPPING RHIZOCTONIA BARE PATCH DISEASE IN DIRECT-SEEDED CROPPING SYSTEMS

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The soil-borne fungus *Rhizoctonia solani* AG-8 is a major concern for farmers who practice direct seeding (i.e., no-till) in the inland Pacific Northwest. Bare patches caused by Rhizoctonia first appeared in 1999 during year 3 of a long-term direct-seed cropping systems experiment on the Ron Jirava farm near Ritzville, Washington (11.5 inch annual precipitation). The extent and pattern of patches were mapped each year from 1999-2003 at the 20-acre study site with a backpack-mounted global positioning system equipped with mapping software. The average percentage area of bare patches ranged from 7.5% in 1999 to 11.7% in 2002. Comparison of patterns over years show that some patches increased in size, new patches formed, and some patches disappeared. Bare patches appeared each year in winter and spring wheat, spring barley, yellow mustard, and safflower. Crop rotation had no effect on the occurrence of bare patches caused by Rhizoctonia during the first five years of the experiment, but continuous annual spring wheat had significantly greater area with bare patches compared to spring wheat following spring barley in a 2-yr rotation in 2002 and 2003. Research is underway or planned to determine why some bare patches disappear with time and on management practices to help alleviate the severity of the disease.

*HOW CAN I MISS YOU WHEN YOU WON'T GO AWAY? POST-HARVEST MANAGEMENT OF RUSSIAN THISTLE IN SPRING WHEAT

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We have completed four years of research at the WSU Dryland Research Station at Lind on post-harvest management of Russian thistle in continuous annual spring wheat. Our study compares three post-harvest Russian thistle control treatments. These treatments are: 1) Surefire herbicide (paraquat + diuron) at 24 to 32 ounces/acre applied 7-10 days after wheat harvest; 2) tillage with overlapping adjustable-pitch 32-inch-wide V-blade undercutter sweeps on 28-inch centers conducted 7-10 days after wheat harvest, and; 3) check (do nothing, let the Russian thistles grow). Measurements are: Soil water to a depth of six feet at wheat harvest, after killing frost in the fall, and again in early spring; above-ground Russian thistle dry matter, seed production, and