Our research results provide insights into (1) the degree of tillage necessary to control persistent cover crops and weeds, (2) the impact of tillage on availability of soil nutrients following long-term pastures, (3) yield estimations to be expected from these low input systems, and (4) costs and profit associated with livestock infrastructure and production costs when rotating soil building grazed pastures with annual production of grains, such as wheat.

Pastures were stocked at 2.76 AU/ac for 40 days in May and June (AU=5 sheep). Total herd weight gain was 134 lbs/ac for a gross value of US $276/ac. Non-grazed alfalfa pasture productivity (hay) was 1.1 ton/ac for a gross value of US $218/ac. Pasture soil carbon dynamics will be analyzed in 2010. In grain following mechanically terminated alfalfa, N response to degree of disturbance is being analyzed. Organic, unfertilized grain yield was positively correlated to degree of disturbance, ranging from 3.23 to 66.8 bu/ac, with a maximum gross value of $1,068/ac. Yield was negatively correlated with alfalfa re-growth. Profitability of grain following alfalfa was compared to alfalfa left standing and hayed. Biomass over three cuttings totaled 9.7 ton/ac for a gross value of $1,947/ac. Use of livestock to facilitate organic grain production may be a profitable form of low external input, highly productive agriculture.

Pacific Northwest Undercutter Project

HARRY SCHAFER[1], WILLIAM SCHILLINGER[2], BRETT RUDE[3], AND DONALD WYSOCKI[4]
1. WASHINGTON ASSOCIATION OF WHEAT GROWERS
2. DEPARTMENT OF CROP AND SOIL SCIENCES, WSU
3. WASHINGTON DEPARTMENT OF ECOLOGY
4. OREGON STATE UNIVERSITY

The goal of this $905,000 USDA-NRCS Conservation Innovative Grant is to demonstrate and advance the undercutter method for winter wheat–summer fallow farming in the Inland Pacific Northwest. The project, administered by the Washington Association of Wheat Growers, cost shares 50% of the purchase price of an undercutter up to 34 feet in width and equipped to apply fertilizer at the time of primary spring tillage. Farmers accepted into the project are located in wind erosion problem areas in the 12-inch and under rainfall region that encompasses nine counties of east-central Washington and five counties of north-central Oregon. Participating farmers agree to follow a prescribed minimum-tillage program using the undercutter to retain surface residue and increased surface roughness during the fallow period (Fig. 1).

Fig. 1. The Great Plains (left) Duratech Haybuster (right) undercutters shown here slice below the soil surface with minimum surface soil lifting to completely sever capillary pores to halt liquid water movement towards the soil surface as required to retain seed-zone moisture in summer fallow in the low-precipitation region. All undercutters sold to farmers through the PNW Undercutter Project are rigged to deliver either aqua or anhydrous nitrogen during primary spring tillage.

Of the 47 farmers accepted into the project, 30 are from Washington and 17 from Oregon. Location of farmers by county in Washington are: Adams 14, Benton 9, Douglas 2, Franklin 3, Walla Walla 1, and Yakima 1. The Oregon locations by county are: Gilliam 5, Morrow 5, Umatilla 6, and Wasco 1. Specific criteria were established for undercutters used in the project. The undercutters satisfying the criteria are: the DuraTech 'Haybuster', the Great Plains 'Plains Plow', and the Orthman 'Lazer Plow'. To date, a total of 29 Great Plains Plows, 15 Haybusters, and 2 Orthman Lazer Plows have been purchased.

No-Till and Conventional Tillage Fallow Winter Wheat Production Comparison in the Dryland Cropping Region of Eastern Washington

AARON ESSER[1] AND RICK JONES[2]
1. WSU EXTENSION, LINCOLN-ADAMS COUNTY
2. LINCOLN COUNTY WHEAT PRODUCER

Winter wheat (WW) (*Triticum aestivum* L.) production on tillage based summer fallow systems has been a standard practice for producers in the dryland cropping region of eastern Washington for generations. This practice has been profitable but it comes at a cost that includes soil loss through wind and water erosion. Producers have examined alternative methods including no-till farming systems for maintaining or increasing profitability and reducing soil erosion. A series of on-farm tests were completed over a 5 year period examining WW established under three treatments; 'conventional' tillage fallow system, 'No-till early', or seeded at the same time as the conventional treatment, and 'no-till late' or planting was delayed 1 month. Conventional methods include a chisel sweep and multiple cultiweeding for fertilization and weed control and seeding with a deep furrow hoe drills. No-till include multiple chemical applications for weed control and seeding and fertilization with a no-till hoe drill with Anderson® paired row openers. Similar to previous research, conventional increased seed zone moisture (0-8") but no differences were detected between treatments in total moisture to a depth of 3 feet. Soil compaction was monitored to a depth of 18 inches in one-inch increments. Less soil compaction was detected in no-till at a depth of 10-16 inches. No difference in grain yield was detected between conventional and no-till early averaging 71-bu/acre. No-till late produced 20% less yield. Economic return above variable costs was similar to yield with no differences between conventional and no-till early and lower when seeding was delayed.

Dust Mitigation and Monitoring Research for Williston Reservoir Beaches in British Columbia, Canada

WILLIAM SCHILLINGER[1], WILLIAM NICKLING[2], AND DONALD FRYREAR[3]
1. DEPARTMENT OF CROP AND SOIL SCIENCES, WSU
2. DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF GUELPH, GUELPH, ONTARIO
3. CUSTOM PRODUCTS, BIG SPRING, TX

Williston Reservoir in northern British Columbia was created when BC Hydro constructed Bennett Dam on the Peace River in 1968 to generate hydroelectric power. Williston Reservoir is the largest body of freshwater in British Columbia with a surface area of 685 square miles and a shoreline of 680 miles. The First Nation Tsay Keh band was forced to relocate to the north end of the reservoir as a result of the water impoundment. When reservoir levels are at low pool in the spring, 25,000 acres of beach is exposed (Fig. 1). Winds of more than 15 miles per hour create dust storms from exposed beaches that impacts visibility and air quality in Tsay Key village. With funding and coordination by BC Hydro, we initiated a 3-year field research project in 2008 to: (i) evaluate the effectiveness of two tillage practices to mitigate dust from beaches, and (ii) conduct regional dust monitoring at seven sites surrounding Williston Reservoir. The tactic for the

Fig. 1. Wind erosion scientists, Tsay Keh community members, and BC Hydro administrators at a Williston Reservoir beach during a dust storm.