Proposal for 2004 - 2005
Northwest Columbia Plateau Wind Erosion / Air Quality Project

Objective 5: Wind Erosion and PM10 Emission Control Methods

Title: The Potential of Mustard Green Manures to Control Wind Erosion in the Columbia Basin

Personnel: Principal Investigator: Andy McGuire, WSU Extension;
Collaborating Researchers: Jim Dobrowolski, WSU Natural Resource Sciences; Bill Pan, WSU Crop and Soil Sciences;
Cooperators: Wes Boorman, farmer; Dale Gies, farmer.

Objectives
1. To determine the effects of mustard green manures on the threshold wind erosion velocities (threshold friction velocity of soil particle entrainment) of Columbia Basin soils.
2. To investigate the soil crusts that form on some Columbia Basin soils under rotations containing mustard green manures.
3. To determine if the threshold wind erosion velocities are correlated with the results of an active carbon soil test.

Recent Accomplishments
We made our first attempts to measure the effects of mustard green manures on threshold wind erosion velocities (threshold friction velocities of soil particle entrainment) in the spring of 2003. Two sites were prepared the preceding spring with five randomized pairs of 30 x 30 plots, with and without mustard green manures. One site was on a sandy soil (Boorman) after just one mustard green manure and the other site was on a sandy loam (Gies) on a field that had received mustard green manures every other year for at least the previous four years.

At each site a portable wind tunnel, designed and built by Dr. Dobrowolski, was used to measure the threshold velocities. Measurements at the second site were not completed due to rain.

Results: Threshold wind velocity for plots treated with mustard showed significant differences among treatments at the Boorman farm (Fig. 1). The GLM ANOVA model had an F-Ration of 3.71 and a probability level of 0.54 at α=0.09.

With limited sampling, threshold wind velocity for plots treated with mustard showed no significant differences among treatments at the Gies farm. However all treatment plots were sampled after a transient surface crust had formed following raindrop (irrigation) impact. Note the difference in wind velocities before and after the surface crust was physically removed.
Fig. 1—Threshold wind velocities required to entrain surface soil particles on plots with and without mustard, Boorman and Gies Farms.

**Planned Research**

1. To determine the effects of mustard green manures on the threshold wind erosion velocities (threshold friction velocity of soil particle entrainment) of Columbia Basin soils.
   
   This fall (2004) we will set up the plots at four sites. Each site will have five randomized paired plots (30’ x 30’) of with and without mustard treatments. Next spring (2005) we will use the portable wind tunnel to measure the threshold wind velocities on these sites.

2. To investigate the soil crusts that form on some Columbia Basin soils under rotations containing mustard green manures. We will measure threshold wind velocities, with and without soil crusts, at the site where we observed these crusts last year. We will make similar measurements if we find the crusts at other sites.

   We will consider the value in measuring various other soil characteristics, including crust strength (modulus of rupture), water stable aggregate stability, and surface roughness. Other possible work on these crusts, depending on the results of other measurements, include chemical analyses (cementing agents), and rainfall simulation to produce the crust.

3. To determine if the threshold wind erosion velocities are correlated with the results of an active carbon soil test.

   We will take soil samples from plots at each site for active soil carbon analysis (Weil et al., 2003). We will determine if there is a correlation between these results and the threshold wind velocities.