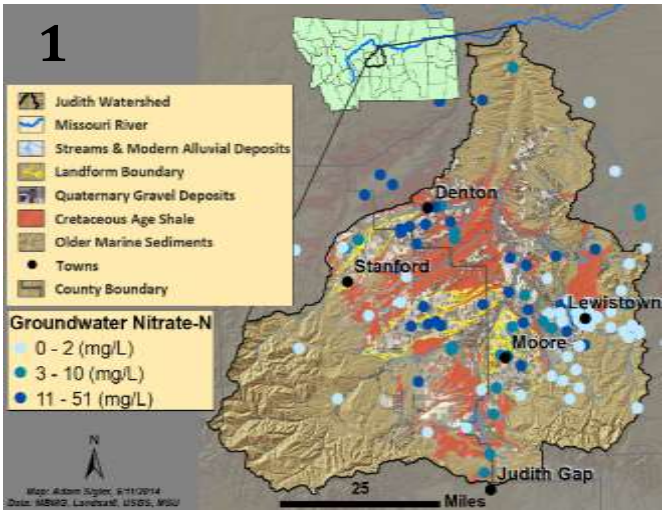
Research Update: October 2014
Judith River Watershed Nitrogen Project

Newsletter #1: Project Overview & Highlights from 2014 Field Day

Background

Happy fall everyone. This is the 1st in a series of newsletters on the Judith River Watershed Nitrogen Project (JRWNP), a USDA-funded research effort led by Montana State University and Utah State University researchers, with invaluable help from members of two advisory groups who are mainly residents of Fergus and Judith Basin Counties.



The drinking water standard for Nitrate-N is 10 mg/L

The primary goals of the JRWNP are to: 1) determine sources of high nitrate levels in some groundwater wells in the region (Panel 1 at right), 2) evaluate the effects of alternative farm management practices on nitrate leaching and profitability, and 3) use a highly participatory approach to make sure the findings can be used by area residents to develop locally appropriate solutions. The project started in 2011 and will finish in summer of 2015.

It's been another interesting water year in the Judith Watershed. Several inches of rain in August brought creeks up fast and had us scrambling to collect a last round of water samples, check our data loggers, and wrap up soil and crop sampling on the study fields at Jim Kulish, Greg Grove and Brandon Morris's farms.

If you have questions about the project, contact Clain Jones, MSU Extension specialist, at 406-994-6076; or Stephanie Ewing, MSU soil scientist, at 406-994-5247.

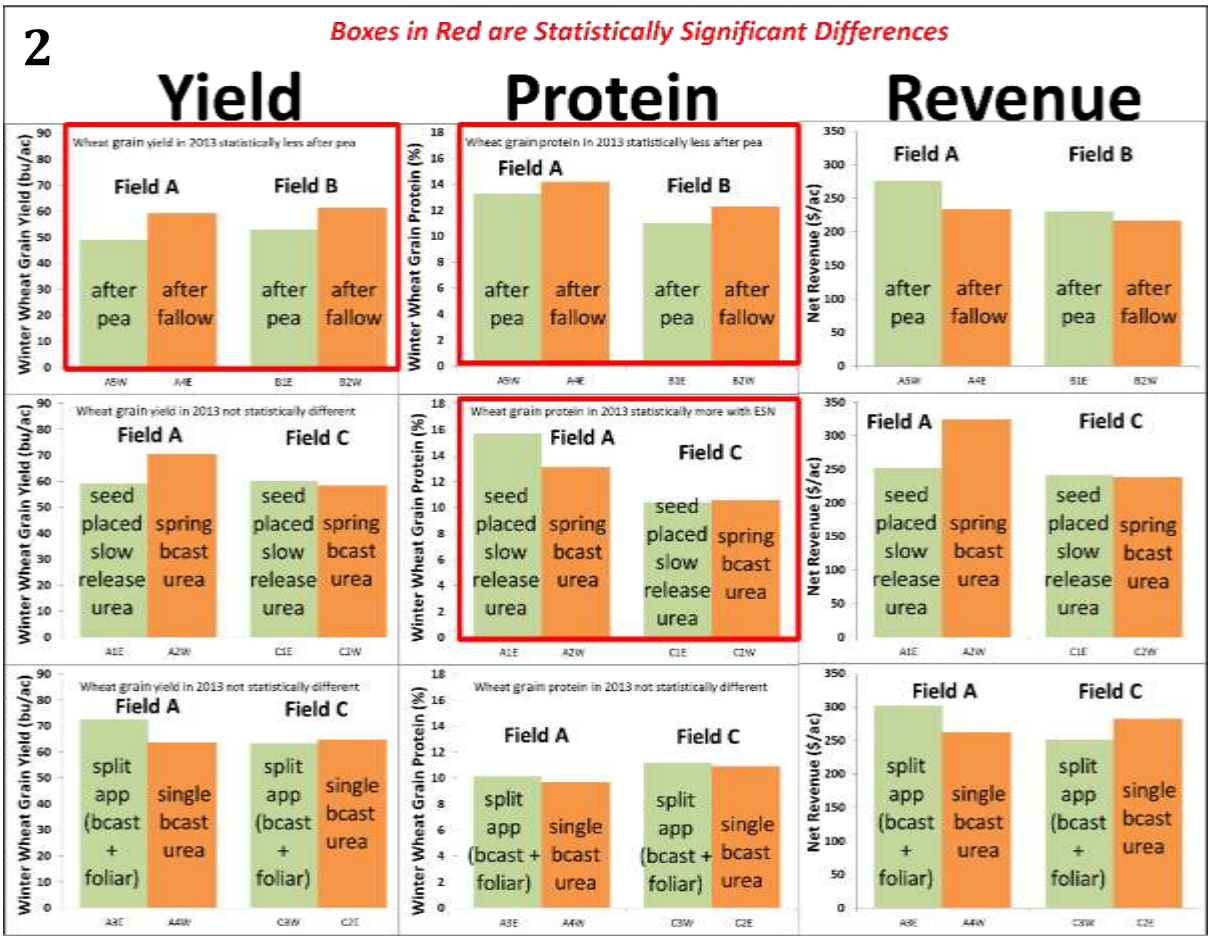
Field Day, June 18, 2014

Thanks everyone who participated in our first field day, held in mid-June on the Morris and Kulish farms. There was a good turnout (despite some heavy morning rain) and the feedback we received was positive.

The images labeled 1 to 5 on this and subsequent pages are from the poster displays that the research team and collaborating farmers showed and discussed with those in attendance at the field day. They summarize some of the emerging research findings from the JWRNP. They also led to valuable discussions about viability of the management practices being tested.

Alternative Management Practices

Based on discussions with local producers, we decided to test the economic and environmental performance of three alternative practices under real-world conditions: planting peas instead of leaving fields fallow in a wheat rotation, using a 'slow-release' form of nitrogen (N) fertilizer, and splitting spring fertilizer into two separate applications. Panel 2 shows that yield, protein, and net revenue for alternative practices were generally competitive with conventional methods in our first year of the study. The research team is continuing to evaluate effects on wheat yield and protein from trials on cooperator farms looking at different fertilizer sources, fertilizer timing and peas-for-fallow treatments along with modeled leaching loss by mass balance. ***Coming up in next month's newsletter: yield results for entire study.***



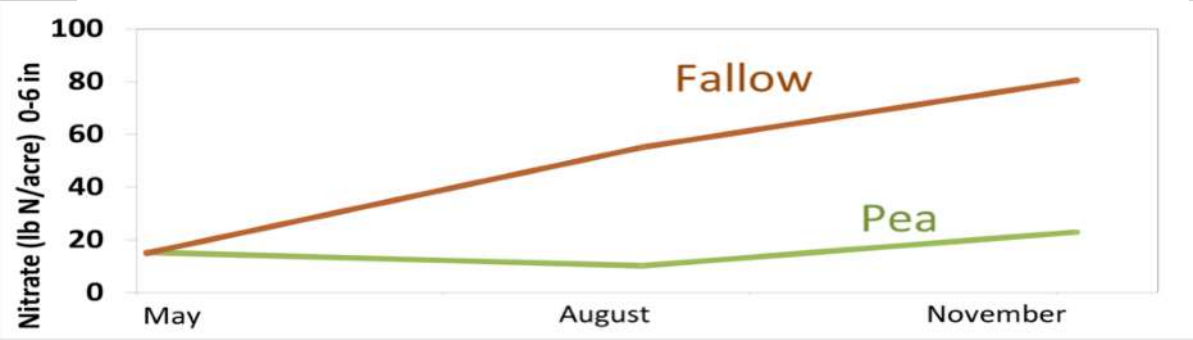
Alternatives to Fallow

One emerging story relates to the pros and cons of alternatives to fallowing in wheat rotations. Initial results from monitoring and modeling in our farmer cooperators' fields suggest that growing peas instead of fallowing broke even in terms of net revenue (Panel 2), but reduced the chances of nitrate leaching (Panel 3). This is because nitrate from conversion of organic matter into plant-available N (mineralization) is accumulating in fallow fields, but there is no crop there to take it up.

When peas (or other crops) are growing, they can use this mineralized N, leaving less nitrate in the soil to leach in the following fall, winter and spring. Also, crops leave less water in the soil than fallow, reducing the amount of downward water movement that can happen with additional rainfall or snowmelt. A comparison of simulated water and N levels in the soil under fallow versus peas in rotation is shown in Panels 4-5.

Field tests, models, and ongoing discussions with the Producer Research Advisory Group (PRAG) members suggest that identifying economically-viable crops to replace fallow in wheat rotations could be an important management option in this region to address the high groundwater nitrate levels.

3 Change in Soil Nitrate near Moccasin in top 6 inches under Fallow vs Pea



Other emerging findings

Soil to landscape scale water and nitrogen movement

Water sampling: Analysis of about 900 samples from wells, springs and streams is ongoing, and is starting to shed light on the longer-term results of leaching from soils and other influences on water quality. These results will be highlighted in an upcoming newsletter on ***sources of nitrogen*** and ***landscape hydrology and nitrogen movement***.

Soil water samples collected from depths of about 20 to 50 inches from treatment fields over the last two years show sustained high nitrate levels. These samples are being coupled with soil moisture measurements, rainfall and evapotranspiration to help refine the research team's understanding of root zone processes that supply nitrate in soils. This will be the topic of an upcoming newsletter on ***nitrate leaching from soils,*** including consideration of how native range and agricultural systems compare.

Finding local solutions

The initial farmer survey gave the research team and advisory groups important baseline information about cropping and fertilization practices in the Judith Basin, as well as information about how familiar farmers were with the causes and management solutions to the local nitrate issue. Response rate was high (~60%). The survey found that there is a large opportunity for adopting alternative practices that could decrease leaching. A follow-up survey of producers ***will take place in February 2015.*** We will be curious to see if our research and outreach efforts are familiar to local producers, and to learn if farmer perceptions of the nitrate issue have shifted since spring 2012.

Meanwhile, the research team's ongoing conversations with our advisory groups and with farmers at field days over the last three years have expanded our understanding of what kinds of management options will work for local farmers, and provided information about which production practices or strategies are likely to be effective for protecting water quality.

This project is based on the idea that research should help address local questions and should empower local residents to find appropriate solutions to their watershed's water quality challenges. For this to succeed, we need to find ways in the coming months to use the information from our Judith River Watershed research to develop appropriate recommendations and information resources to share with the larger community.

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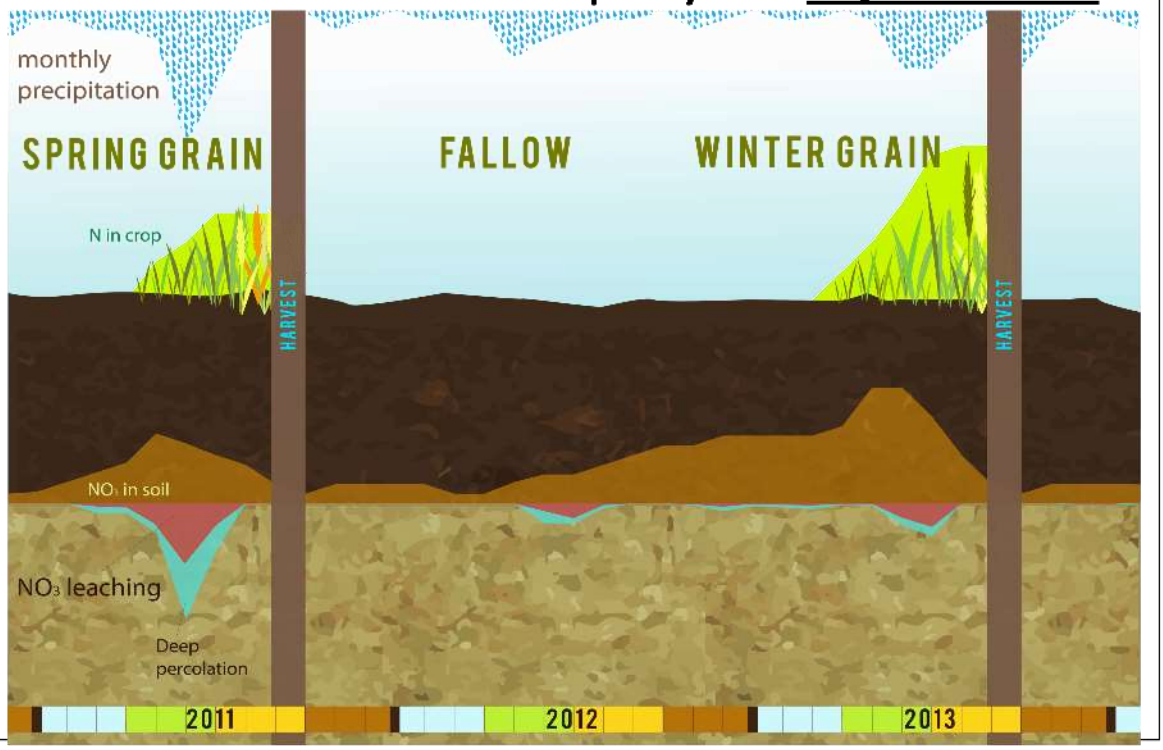
Water and Nitrogen Movement over a 3 Year Crop Cycle **w/ Fallow**



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Water and Nitrogen Movement over a 3 Year Crop Cycle **w/ Peas**