MONTANA'S PULSE INDUSTRY

HOW IT HAS DEVELOPED, ECONOMIC IMPACT & POTENTIAL FOR GROWTH

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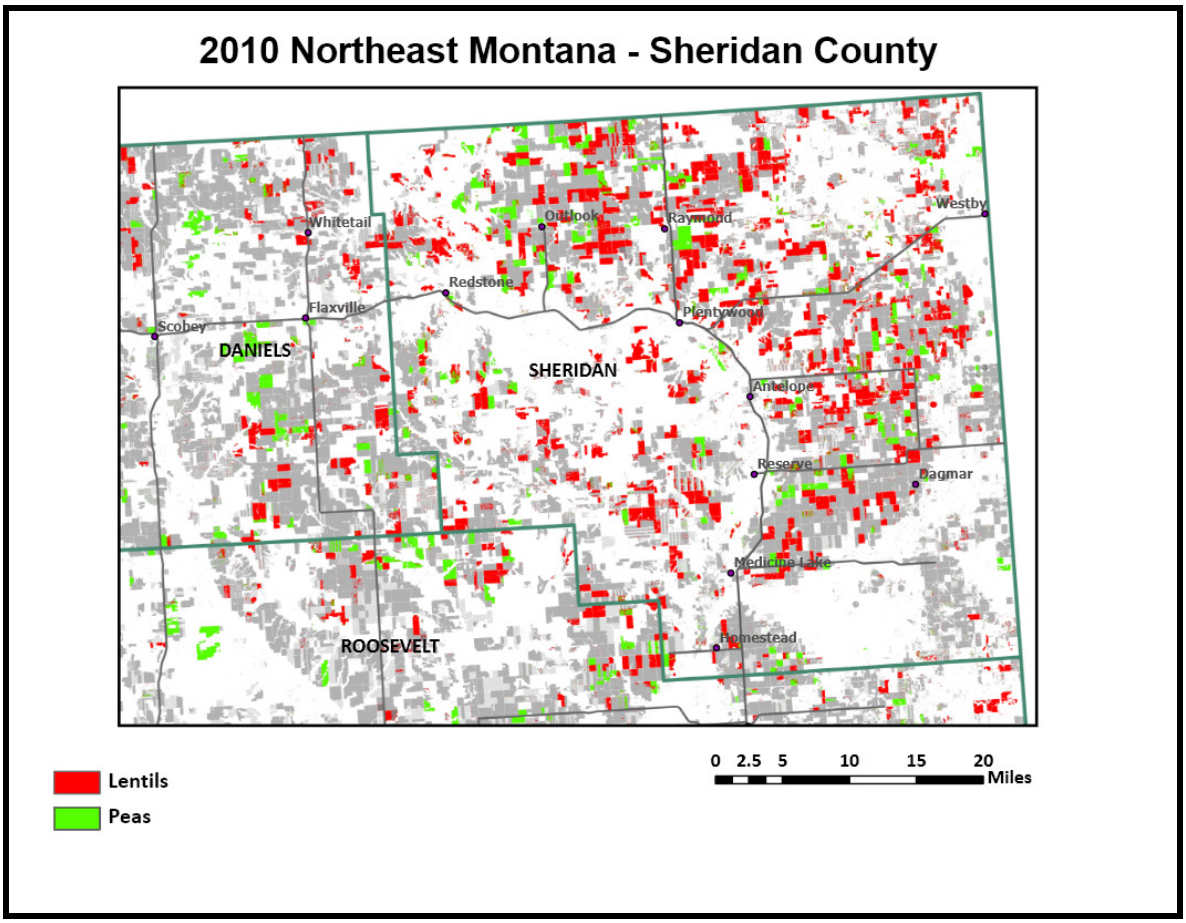

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EXECUTIVE SUMMARY

For over a decade, the production of pulse crops (peas, lentils, and chickpeas) has seen substantial growth in Montana. Looking ahead, Montana is poised to become a world-class pulse production region as acreages continue to expand and as Montana's reputation for quality becomes increasingly recognized across the globe.

Pea acres increased from 35,000 in 1998 to 227,000 acres in 2010. Lentil acres increased from 16,000 acres in 1998 to 255,000 acres in 2010. In recent years, there has been some substitution of lentil acres for pea acres attributable to lentil's high profit potential. In 2011, Montana took over the lead in lentil and pea production in United States, accounting for over half of all lentil acres and nearly half of all pea acres. Pulse production in Montana is not a fad. The current level of production and industry investment is firmly rooted, and there are fundamental reasons why significant future growth may occur.

Northeastern Montana is the leading pulse production region in Montana, accounting for 75 – 80% of the state's pulse crop acreage. The story from Northeastern Montana is not how much pulse production has increased there; rather, that the farmers of Northeastern Montana raise pulse crops on cropland that they previously left fallow for a growing season. Between 1998 and 2010, Northeastern Montana farmers increased pulse crop production by 341,000 acres while decreasing fallow by 390,000 acres. "Fallow" refers to cropland left idle for a year in non-irrigated (dryland) cropping systems.

Peas and lentils have shallow roots and are very efficient in their use of soil moisture. Peas and lentils also fix nitrogen in the soil and provide significant rotational benefits that help break crop disease cycles. These attributes allow farmers to adopt more intensive crop rotations that reduce or eliminate fallow, add more acres of cash crop production, and improve cereal grain yield and quality (higher protein, better test weights) in the crops that follow.

An estimate of the economic benefits attributable to the 2010 pulse crop in Northeastern Montana is $102 million. This estimate represents the incremental increase of economic activity relative to what would have occurred if the land planted in pulse crops was left in fallow (*as was largely the case before 1998*). Of this, $85 million is directly associated to the impact of pulse crops replacing fallow. The remaining $17 million is an estimate of the economic benefit that the 2010 pulse crop will have on the following wheat crop in terms of increasing yield and improving wheat protein levels.

There is significant potential for increased pulse production throughout Montana. If only 12.5% of Montana's 3.46 million acres of fallow was replaced with pulse crops, production would increase by over 430,000 acres, resulting in a near-doubling of Montana's record 2010 pulse crop. Within the next five to fifteen years, Montana's dryland pulse crop acreage could increase by 500,000 to 1,250,000 acres, without significantly changing wheat acreages. In situations where fallow is not replaced by pulse crops, pulse crops could displace some acreage of cereal grain crops. Increased pulse production may also occur on irrigated cropland, possibly in excess of 50,000 acres. Increased irrigated pulse production may play a critical role in encouraging the development of additional pulse processing facilities.

The economic benefits of expanded pulse production in Montana are substantial. Even a modest level of replacement of fallow by pulse crops would generate an economic benefit similar to what has been realized in Northeastern Montana. An illustration discussed in this paper shows that replacement of approximately 25% of Montana's fallow cropland with pulse crops could generate an annual economic benefit of about $243 million (*based on recent market conditions*). Of this, approximately $207 million

would be attributed to the replacement of fallow with pulse crops and $36 million would be attributed to benefits affecting the following wheat crop.

The economic benefits that may be realized if pulse crops replace dryland cereal grain acreage are more modest in comparison to pulse crops replacing fallow. The reason for this is that the change in economic activity and profits is incrementally smaller and the acreage involved would likely be less. Similarly, the economic benefits of increased irrigated pulse production are also modest in comparison. Irrigated cropland is already continuously cropped; so there is no fallow to displace. The acreage of irrigated cropland in Montana is also much smaller than dry cropland. However, the potential economic benefit of increased irrigated pulse production is significant, and increased irrigated pulse production may provide environmental services to society through decreased irrigation water withdrawal.

Pulse processing facilities help strengthen the market for pulse crops and contribute to Montana's economy. Pulse processing is often limited to cleaning and bagging, but also can include decorticating (taking the outer skin off), splitting, and pulse flour milling. Financial information is closely held by pulse processing companies, so only estimates can be made about the value added to pulse crops by facilities located in the state. An estimate explained in this paper discusses how pulse processing in Montana may have added as much as $15 million in value to the 2010 pulse crop. Value added is allocated to wages, operating costs, capital investment recovery, taxes, shipping costs, and profits. As of December 2011, Montana had three large pulse processing plants, located in Plentywood, Chinook, and Hingham. The capital investment in these facilities may exceed $10 million. The capacity of the existing processing facilities is not known, but it is reasonable to assume that each processing facility has the capacity to process 20,000 – 75,000 acres of pulse crops. Additional investment is scheduled for the facility located in Chinook. A processing facility is slated to be constructed in the near future at Tiber (west of Chester). Several companies are actively seeking to identify and secure sites for processing facilities in Montana or are evaluating future investments.

There are a number of factors driving expansion of the pulse industry. Global demand is being driven by population growth and economic gains in other parts of the world, particularly in India where dietary protein needs are not being met by domestic production and imports. Additionally, peas and lentils serve as less expensive substitutes for other pulses and beans grown in south Asia. Exports from the United States are not limited to south Asia and China; significant volumes are exported to countries in Europe, South America, Latin America, Africa, and the Middle East. In recent years, the world pulse supply has been tight because of demand factors, weather events, and loss of acres to other crops. This has encouraged the pulse industry and major importing countries to look for new sources of supply. The decline of the U.S. dollar has been useful in putting the U.S. in a better competitive position relative to major exporting countries like Canada and Australia. Efforts made in research and product development are close to paying off in creating substantial new demand for pulses in the United States and developed countries. Pulse crops have very favorable nutritional attributes that can address health issues such as heart disease, diabetes, weight control, digestive tract health, some types of cancer, food allergies, and pre-natal health. Pulses can be fractionated into highly functional components (protein, fiber, and starch) utilized as ingredients to enhance processed foods. Products made from pulse crops will have added market appeal in the developed world because they are economically, environmentally, and socially sustainable.

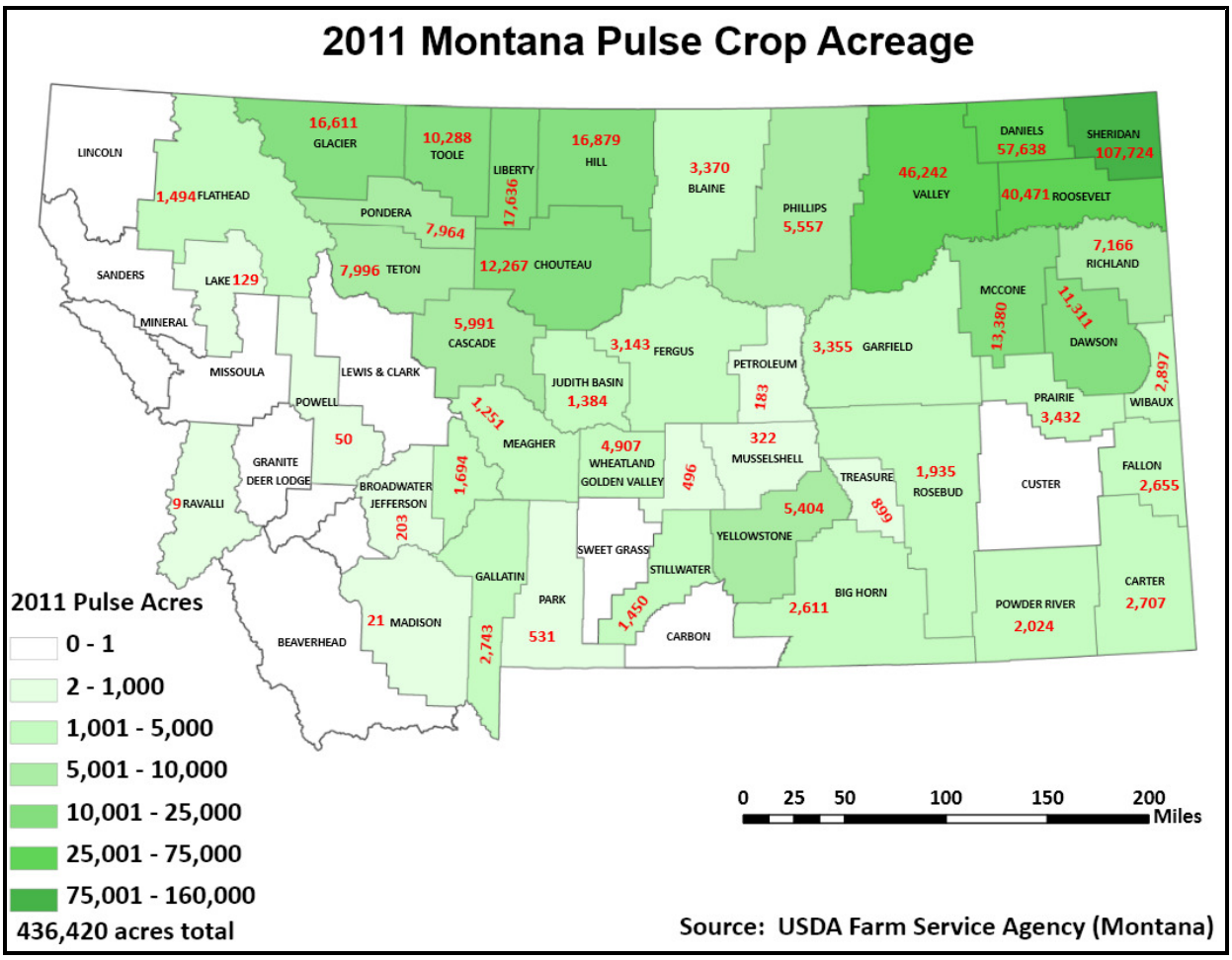
Clearly, Montana's economy, farmers, and communities have a lot to gain from expanded pulse production; there may be no single opportunity available to Montana's agricultural industry that offers as much potential benefit. It may be beneficial for Montana stakeholders and policy makers to review, consider, and prioritize actions that will assist Montana's pulse industry reach its potential and do so in an expedited timeframe. Montana commodity check-off funds for pulses and cereal grains can be focused to address the opportunity to advance Montana cropping systems to replace fallow with pulse crops and utilize pulse crops to enhance cereal grain yields and quality. Escalating many facets of research impacting the pulse industry may yield a disproportionate level of benefit. Efforts to improve market reporting and dissemination of industry information would improve market transparency and could reduce the hesitation of farmers starting to raise pulse crops or expanding production. Additional efforts could further substantiate Montana's reputation for high quality pulse crops and promote Montana as a premier origination point. Public-private partnerships and cooperation amongst pulse shippers may help address pulse shippers' rail shipping challenges. Actions that would encourage further development of pulse processing and milling in Montana will not only generate economic activity and create jobs, but will provide for greater resiliency for volatility in prices and variability in crop quality. Montana's pulse industry and policy makers can evaluate their level of engagement in federal policy development, which can influence the advancement of the United States pulse industry in numerous ways, such as research, crop insurance, conservation programs, school nutrition, and free trade agreements.

1.0 PULSE & FALLOW ACREAGE STATISTICS

Crop acreage data from 1998 through 2011 collected by the USDA Farm Service Agency (USDA-FSA) was used to develop the information presented here. USDA-FSA collects crop acreage data during its annual farm program sign-up process. This section also discusses the March 2011 USDA Prospective Plantings Report and July 2011 USDA Crop Production Report.

Montana's major pulse crop production region is Northeastern Montana. In the past decade, Northeastern Montana has accounted for roughly 80% of Montana's pulse crop acreages. In 2010, Northeastern Montana's share dropped to 75%. In 2011, it was 65%. Despite the likelihood that pulse acres will continue to increase in Northeastern Montana, its *share* of total pulse acreage in Montana will likely decline as pulse acreage growth accelerates elsewhere in the state, particularly in the Golden Triangle *(the region in north central Montana defined by an imaginary line between Great Falls, Havre, and Cut Bank that includes Cascade, Chouteau, Glacier, Hill, Pondera, Teton, and Toole counties)*.

Appendix A provides additional maps describing pulse production, as well as maps and tables on pulse crop acreages. Tables and maps in Appendix I provide additional crop acreage information.



1.1 ACREAGE STATISTICS HIGHLIGHTS

Peas

Statewide, peas raised for grain increased from 35,000 acres in 1998 to 175,000 acres in 2011. Montana's record year for pea acreage occurred in 2007 with 254,000 acres.

The March 2011 USDA Prospective Plantings Report estimated that Montana farmers would plant 215,000 acres in 2011. In 2010, Montana farmers planted 227,000 acres of peas. The reduction of peas acres reflected in the 2011 planting intentions is likely the result of farmers choosing to grow lentils instead of peas.

The July 2011 USDA Crop Production Report estimated 2011 Montana pea production at 190,000 acres, a downward adjustment from the Prospective Planting Report attributed to difficult seeding conditions.

The 2011 USDA-FSA reported acreage shows farmers growing 175,000 acres of peas for grain. Farmers reported to USDA-FSA that they were prevented from planting 20,600 acres of peas (due to difficult seeding conditions).

Lentils

Statewide, lentils raised for grain increased from 16,000 acres in 1998 to 253,000 acres in 2011. 2011 production was down 2,000 acres from 2010's record crop. 2010 was an explosive year for lentil production in Montana, considering that the previous record acreage was in 2005 at 146,000 acres.

The March USDA Prospective Plantings Report estimated that Montana farmers would plant 320,000 acres in 2011. Had the forecast come to fruition, it would have been the second consecutive year for record-breaking plantings.

The July 2011 USDA Crop Production Report estimated 2011 Montana lentil production at 280,000 acres, a downward adjustment from the Prospective Planting Report attributed to difficult seeding conditions.

The 2011 USDA-FSA reported acreage shows farmers growing 253,000 acres of lentils for grain. Farmers reported to USDA-FSA that they were prevented from planting 30,500 acres of lentils (due to difficult seeding conditions).

Chickpeas

The 2011 USDA-FSA reported acreage shows farmers growing 8,300 acres of chickpeas for grain. Farmers reported to USDA-FSA that they were prevented from planting 800 acres of chickpeas (due to difficult seeding conditions).

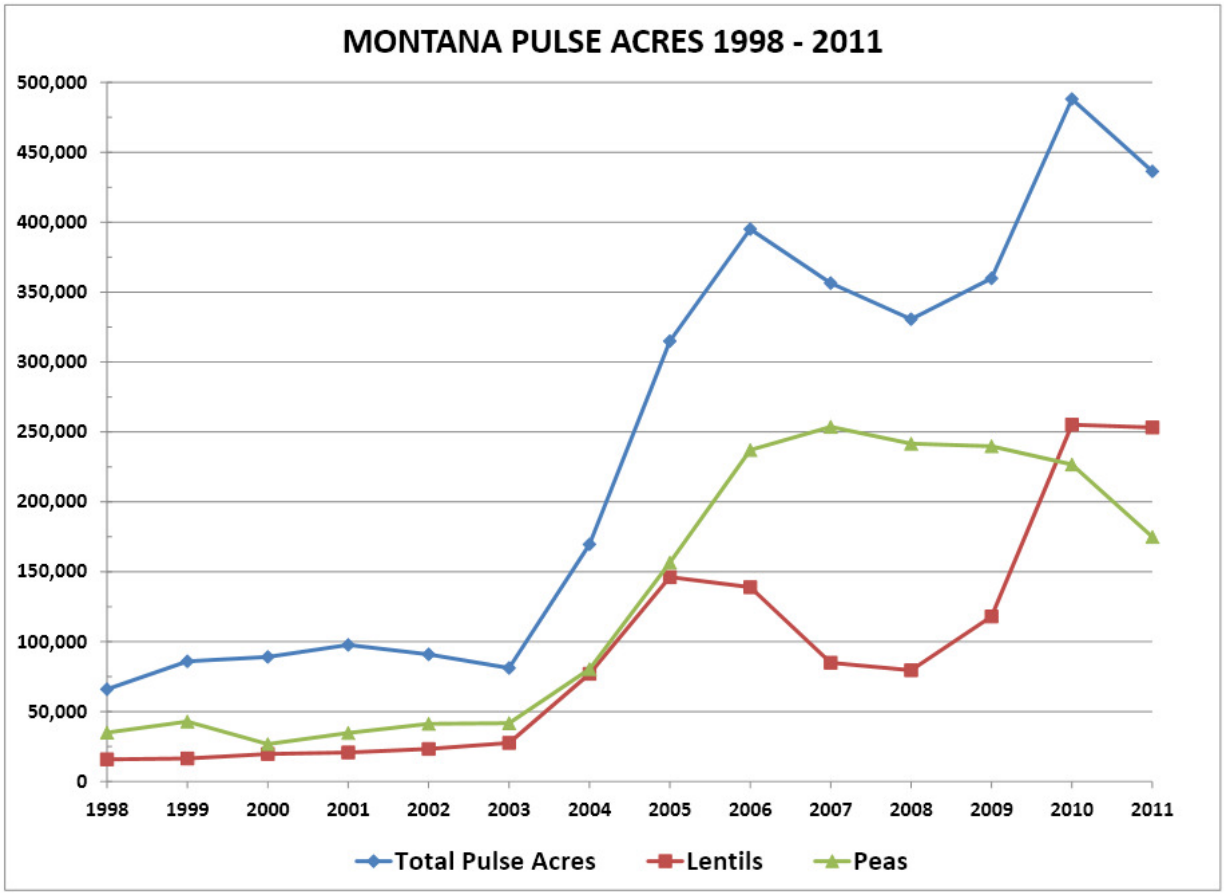
The March USDA Prospective Plantings Report estimated that Montana farmers would plant 18,000 acres in 2011. No estimate of chickpea acres was provided in the July 2011 USDA Crop Production Report.

It is very difficult to establish a good estimate of chickpea acreages prior to 2009, because data released from USDA-FSA blended chickpeas acres with dry bean acres. In 1998, there were roughly 15,000 acres of dry beans and chickpeas. Most likely 11,000 acres of these were dry beans, leaving approximately 4,000 acres of chickpeas. In 2011, there were roughly 8,300 acres of chickpeas raised for grain. Chickpea production peaked in Montana in 2000 and 2001, with an estimated 23,000 acres and 27,000 acres, respectively.

Pulse crop buyers indicate interest in seeing Montana chickpea production increase to levels greater than previous peak acreages. For farmers, chickpeas offer a high profit potential, but also have the highest risk in terms of production (disease susceptibility).

1.2 RECENT JUMPS IN PULSE CROP ACREAGE

In 2010, Montana pulse crop acres increased 36% to 488,000 acres (from 360,000 acres in 2009). Were it not for 2011's difficult seeding conditions, 2011 pulse crop production would have tied 2010's record acreage. Notably, the Golden Triangle region has increased its pulse acres significantly two years in a row, from 27,000 acres in 2009 to 66,000 acres in 2010 to nearly 96,000 acres in 2011. Noticeable increases in pulse production occurred in 2011 in South Central Montana (in Big Horn, Wheatland, and Yellowstone counties) and in Southwestern Montana (in Gallatin and Broadwater counties).



Source: USDA Farm Service Agency (Montana)

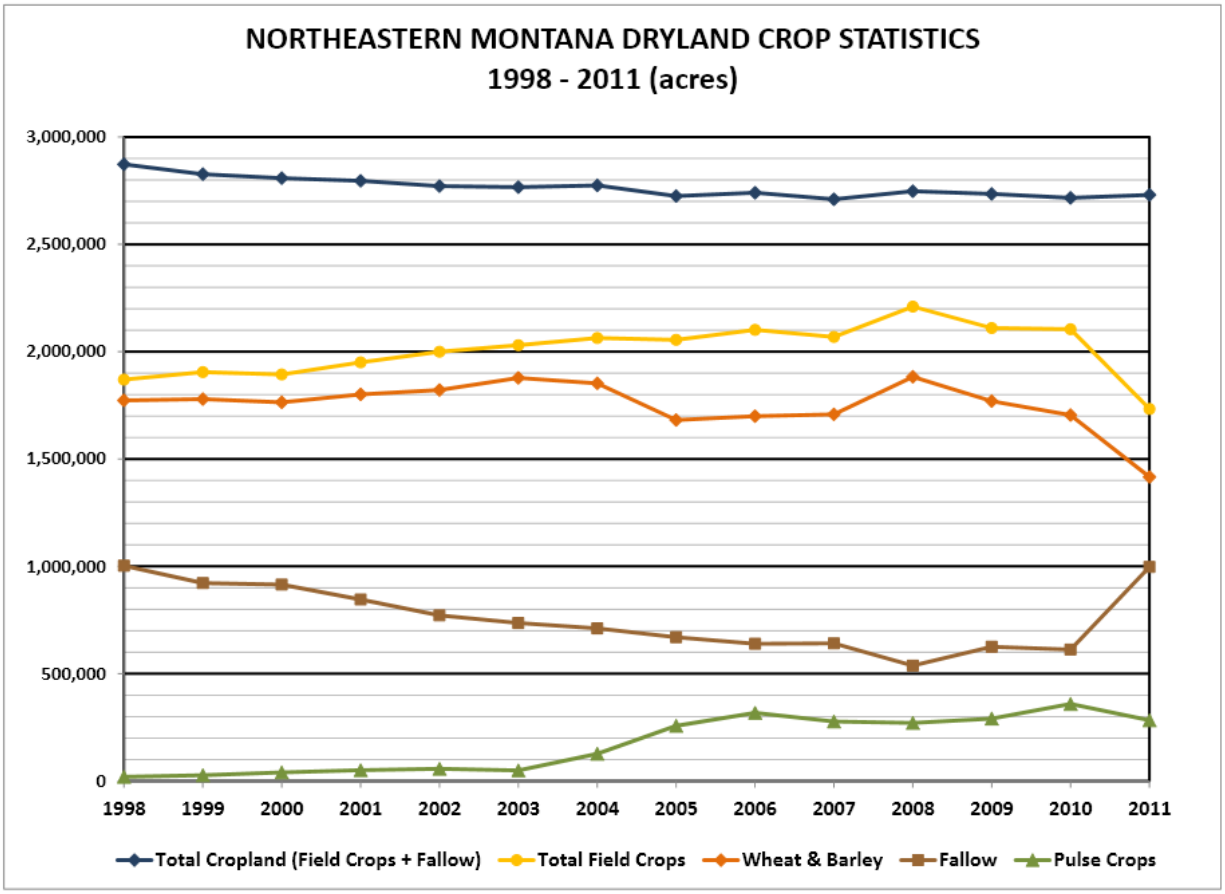
1.3 RELATIONSHIP BETWEEN INCREASED PULSE CROP ACREAGE AND DECREASED FALLOW CROPLAND IN NORTHEASTERN MONTANA

"Fallow" refers to cropland left idle for a year in non-irrigated (dryland) cropping systems. Farmers fallow cropland primarily to store precipitation for the following crop. Between 1998 and 2010, farmers in Northeastern Montana decreased fallow by 390,000 acres. During this time, the percentage of non-irrigated cropland left in fallow decreased from 35% to 23% (*a 34% reduction in fallow*). This essentially means that, on average, farmers in the region went from fallowing once every three years to fallowing once every four years. In actuality, some farmers may have eliminated fallow altogether, while others did not change cropping practices.

Major pulse counties reduced fallow the most. The top two pulse counties have almost eliminated fallow. Sheridan County, (the #1 pulse producing county in Montana) reduced its fallow from 32% in 1998 to 6% in 2010. Daniels County (the #2 pulse producing county) reduced its fallow from 30% to 12%. Two other significant pulse counties, Valley County (#3) and Roosevelt County (#4), reduced fallow from 37% to 27%. During this time period, farmers in northwestern North Dakota also made substantial reductions in fallow acreage.

While the region's fallow acreage decreased by 390,000 acres, pulse crop acreage increased by 341,000 acres. The increase in pulse crop acreage explains the majority of the change in land use. Even though the total acreage of dry cropland involved in field crop production (*which excludes land planted in forage crops and pasture*) decreased by 156,000 acres, the total acreage planted in field crops increased by 234,000 acres, mostly because of increased pulse crop production. Dryland wheat and barley production decreased by approximately 68,000 acres, with barley accounting for most of the decrease. Since the addition of pulse acres was less than the decrease in fallow acres, it would be reasonable to assume that pulse crops were <u>not</u> responsible for the decrease in wheat and barley acreage. The reduction of wheat and barley acres is best accounted for by the decrease in cropland involved in field crop production and slight increase in land enrolled in USDA's Conservation Reserve Program.

In 2011, fallow acres increased because difficult seeding conditions prevented farmers in Northeastern Montana from planting nearly 550,000 acres of dry cropland.



Source: USDA Farm Service Agency (Montana)

2.0 ECONOMIC IMPACT OF PULSE CROPS REPLACING FALLOW IN NORTHEASTERN MONTANA

The economic impact in Northeastern Montana of replacing fallow with pulse crops is dramatic. Farmers began this process in the mid to late 1990's and are still continuing to replace additional fallow acreage with pulse crops.

An estimate developed using a simple methodology indicates that Northeastern Montana's 2010 pulse crop generated $102 million of economic benefits. Of this amount, $85 million is directly associated to pulse crops replacing fallow. The economic benefits to the following wheat crop *(attributable to the 2010 pulse crop)* are estimated to be $17 million, for higher yields and higher protein levels.

The $102 million estimate represents the *incremental increase of economic activity relative to what would have occurred if the land planted in pulse crops in 2010 was left in fallow, as was the case over a decade ago*. These estimates are not factored by economic multipliers that attempt to quantify the ripple effect (churning) of the economic benefits to the region. Such a multiplier would likely be less than 2, and possibly be less than 1.5. Additional explanation of the assumptions used to calculate the estimate of the economic benefits attributable to the 2010 pulse crop replacing fallow in Northeastern Montana can be found in the Appendix B.

The increase in farm profits in Northeastern Montana attributable to the 2010 pulse crop may exceed $61 million *($44 million directly attributable to the pulse crops replacing fallow and $17 million related to economic benefits of 2010 pulse crop production on the following wheat crop).* It is estimated that in 2010, pea production increased profits by approximately $58/acre compared to leaving cropland fallow. It is estimated that in 2010, lentil and chickpea production increased profits by approximately $168/acre compared to leaving cropland fallow. Based on estimated rotation benefits and recent market conditions, the 2010 pulse crop may improve the profitability of the following spring wheat crop by $48/acre *(through improvements in yield and grain protein content)*. Appendix C provides additional explanation of the assumptions used to calculate the estimate of increased farm profits attributable to the 2010 pulse crop replacing fallow in Northeastern Montana.

The distinction between "economic benefits" and "improved farm profits" is that "economic benefits" is a measure in the change of total economic activity. "Improved farm profits" is the net economic benefit realized by growers. The difference between the two economic measures is likely realized by agribusinesses serving farmers. The additional farm profits are likely to be utilized in a variety of ways, including capital expenditures on farm equipment and facilities, accelerated debt repayment, savings, improved lifestyles for farm owners, and additional compensation for labor, whether it be higher wages, more hours, or more employees.

It is important to point out that "economic benefit" discussed in this section ignores the additional economic impact resulting from the growth of the pulse industry that relates to grain handling, processing, and shipping that transpire after growers sell their crop. These impacts occur in northeastern Montana, northwestern North Dakota, and outside the region.

The magnitude of the estimated economic benefits and increased farm profits discussed here is impacted by strong pulse crop prices received in the 2010 marketing year, high wheat prices (spring and summer 2011), and high price differentials for protein (spring and summer 2011). Even in more "normal" times, the economic impact would be large. However, in more normal times, farm profitability would be lower, *making the improvements in farm profitability attributable to pulse production even more important*.

3.0 POTENTIAL FOR INCREASED PULSE ACREAGE IN MONTANA DRYLAND CROPPING SYSTEMS

The USA Dry Pea & Lentil Council projects pulse crop acreage in the United States will double from 1.5 million acres in 2009 to 3 million acres in 2015, with a large amount of the increase occurring in Montana.

Within the next five to fifteen years, Montana's dryland pulse crop acreage could increase by 500,000 – 1.25 million acres, to a total of 1 – 1.75 million acres of pulse crops. If this occurs, Montana may lead the United States in pulse crop production and rank globally with major pulse exporting countries. Canada (led by Saskatchewan) will remain the dominant global exporter of pulse crops. There still is potential to increase pulse acres in the western half of North Dakota (*which was the leading pulse production state in the United States until difficult seeding conditions in 2011 led Montana to surpass it*). However, competition for acreage from other crops (corn, soybeans, canola), may displace pulse acreage elsewhere in North Dakota.

In Montana, the largest portion of the additional acres will likely result from raising pulse crops on non-irrigated cropland that otherwise would have been left fallow. The degree of replacement of fallow will vary between regions and microclimates, mostly as a function of quantity and timing of rainfall. Actual fallow replacement will be impacted by farmers' observations or perceptions of whether rotational benefits from pulse crops outweigh yield reductions that may result from reduced soil moisture attributable to more intense cropping. Many areas of the state receive less precipitation than Northeastern Montana and may receive it at different times. Because of this, the level of replacement of fallow with pulse crops in many areas of Montana may not be as high as has already occurred in Northeastern Montana. Prior herbicide selection and use will also impact the rate of expansion of pulse crops since certain herbicides that would kill or damage pulse crops may persist in the soil several years.

The table below lists total fallow acreages for different agricultural regions in Montana. The table also illustrates the potential replacement of fallow acres by pulse crops that the author believes might occur in the next five to fifteen years.

Montana Fallow Acres – Potential for Increased Pulse Crop Production

Region	Fallow Acres (2007 – 2010 average)	Illustrated Fallow Replacement (Acres / *% of 2007-2010 Average Fallow Acres*)
Golden Triangle	1,828,000	485,500 / *26.55%*
Northeast	604,000	178,000 / *29.47%*
Blaine/Phillips	299,000	70,700 / *23.68%*
Fergus / Judith Basin	145,000	47,500 / *32.70%*
Upper Yellowstone	221,000	40,900 / *18.54%*
Other Counties	367,000	55,900 / *15.23%*
Total	**3,464,000**	**878,500 / *25.36%***

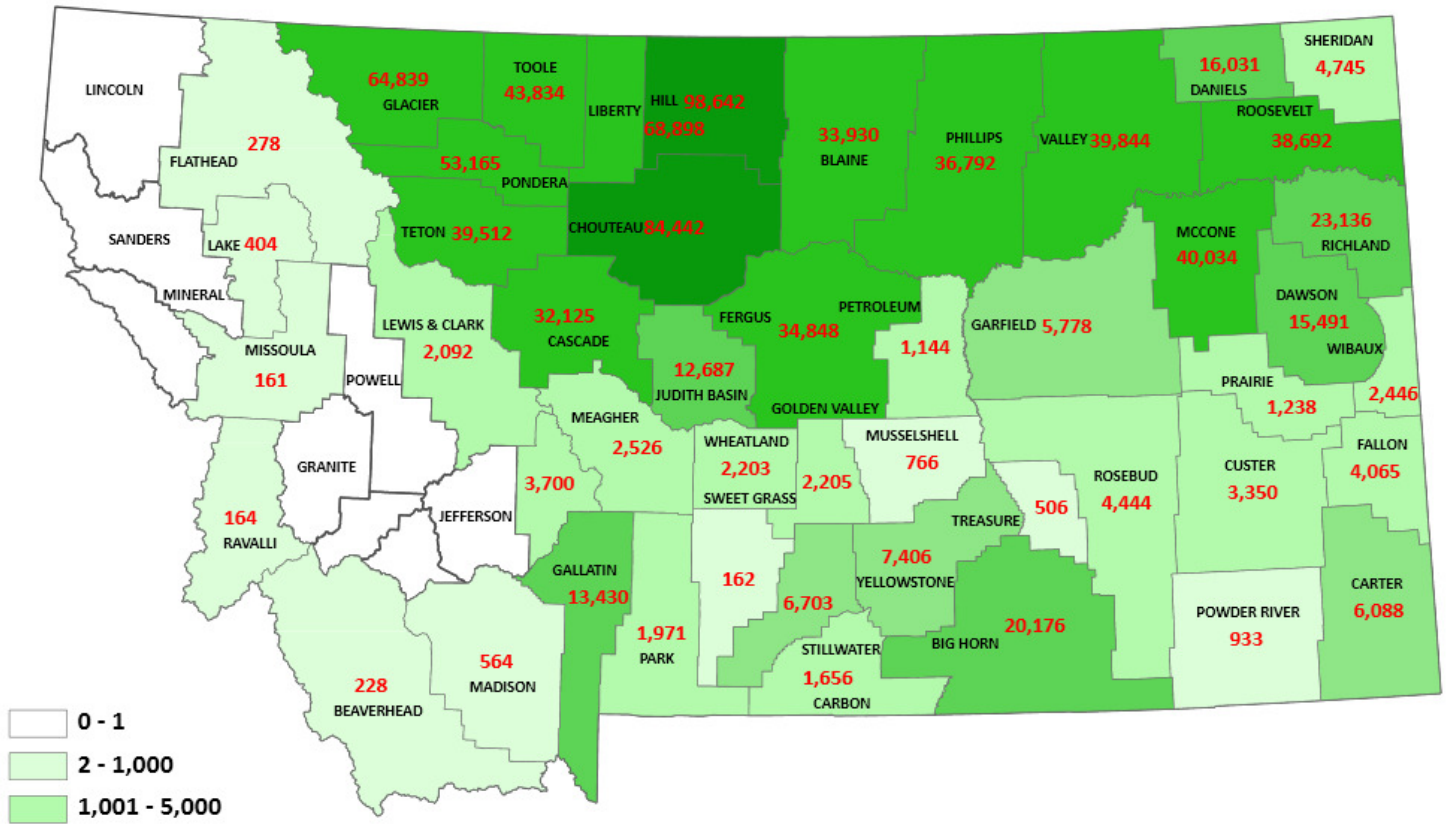
Northeastern Montana Counties: Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, Valley
Golden Triangle Counties: Cascade, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, Toole
Upper Yellowstone Counties: Bighorn, Carbon, Rosebud, Stillwater, Treasure, Yellowstone

The "illustrated fallow replacement" ignores the potential increase in pulse acres that may occur when some of Montana's 3 million acres of idled cropland enrolled in the USDA Conservation Reserve Program (CRP) are put back into production. Appendix I includes tables showing county-level CRP acreages and the percentage of dry cropland enrolled in CRP from 1998 to 2011. Appendix I also includes a map showing each county's average CRP acreage for the 2007 – 2010 time period. It is not anticipated that more than 35% of the land currently in CRP to be returned to crop production. Of the amount returned

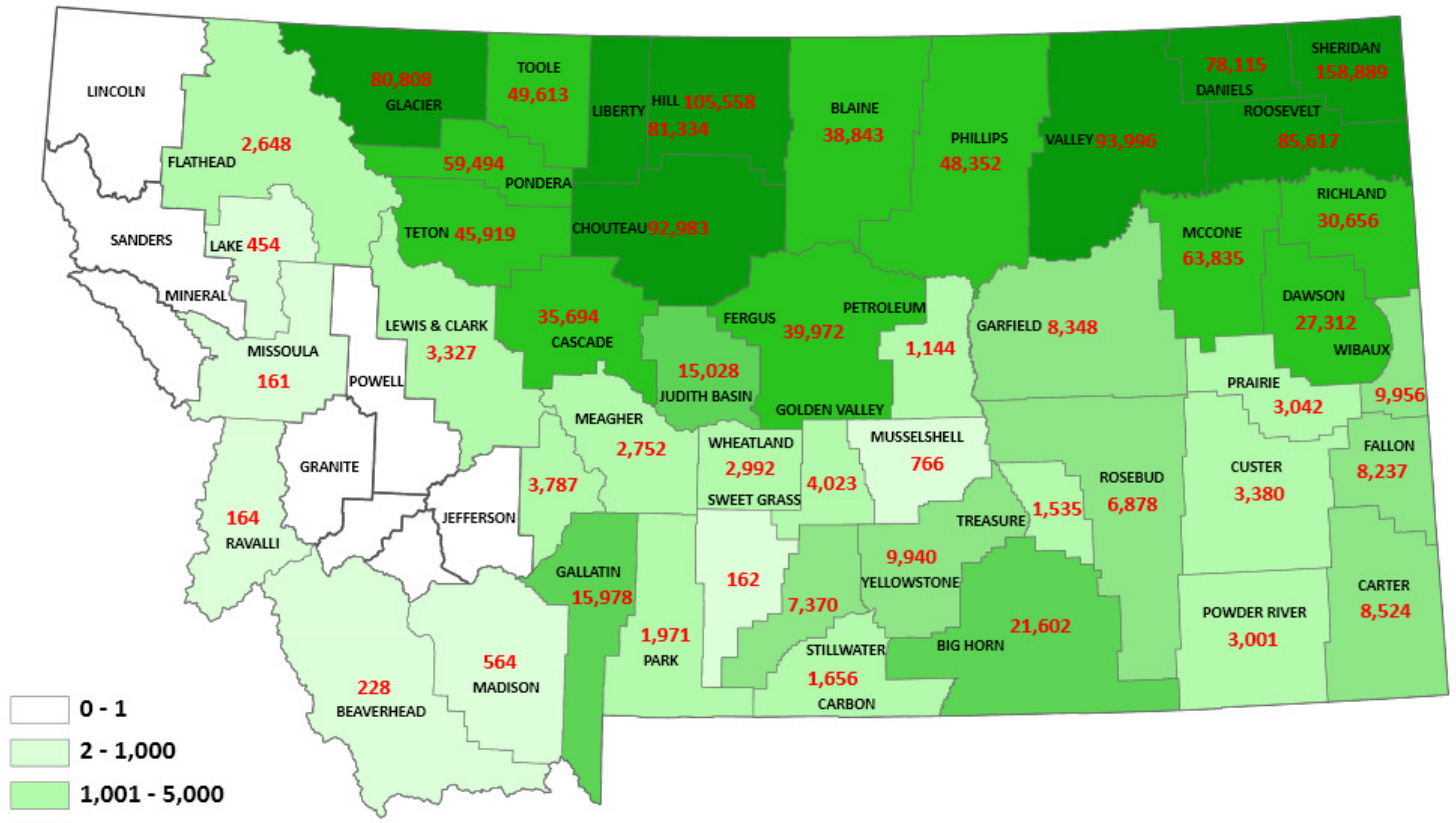
to crop production, it is anticipated that no more than 12.5% - 25% would be used to raise pulse crops (131,000 - 263,000 acres).

Appendix D discusses the estimates made for the illustration and provides a table that shows the author's acreage estimates of replacement of fallow by pulse crops at the county level. Other information provided in the table includes each county's current percentage of non-irrigated cropland fallowed and each county's anticipated percentage of non-irrigated cropland fallowed in the future, after the illustrated replacement of fallow by pulse crops.

Potential Replacement of Fallow with Pulse Crops (5 - 15 Years)



Potential Pulse Crop Acreage (5 - 15 Years)



1,366,605 acres Total

4.0 ILLUSTRATION OF POTENTIAL STATEWIDE ECONOMIC BENEFITS FROM REPLACEMENT OF FALLOW WITH PULSE CROPS IN DRYLAND CROPPING SYSTEMS

Using economic assumptions based on recent (2010 marketing year) conditions, the potential annual economic benefit of replacing fallow cropland in Montana with pulse crops is in the neighborhood of $243 million, if it occurs as illustrated here. Of this amount, $207 million is attributable to the replacement of fallow with pulse crops and $36 million is from benefits to the following wheat crop attributable to the pulse crop.

The methodology used to come to this estimate is similar to the method used to calculate the economic benefit of Northeastern Montana's 2010 pulse crop, discussed in Section 2. The conversion of fallow to pulse crop acreage is based on the illustration shown in Section 3. The estimate was made with the assumption that 2010 pulse crop economics and 2011 wheat price information are applicable in the future. The assumptions for the economic benefit of pulse crops to the following wheat crop are adjusted by region to reflect 2011 winter wheat and spring wheat market conditions and rotation benefits for wheat *(5 bushels/acre yield improvement for winter wheat, 3 bushels/acre yield improvement for spring wheat, 0.25% higher protein content for winter wheat, and 0.5% higher protein content for spring wheat)*.

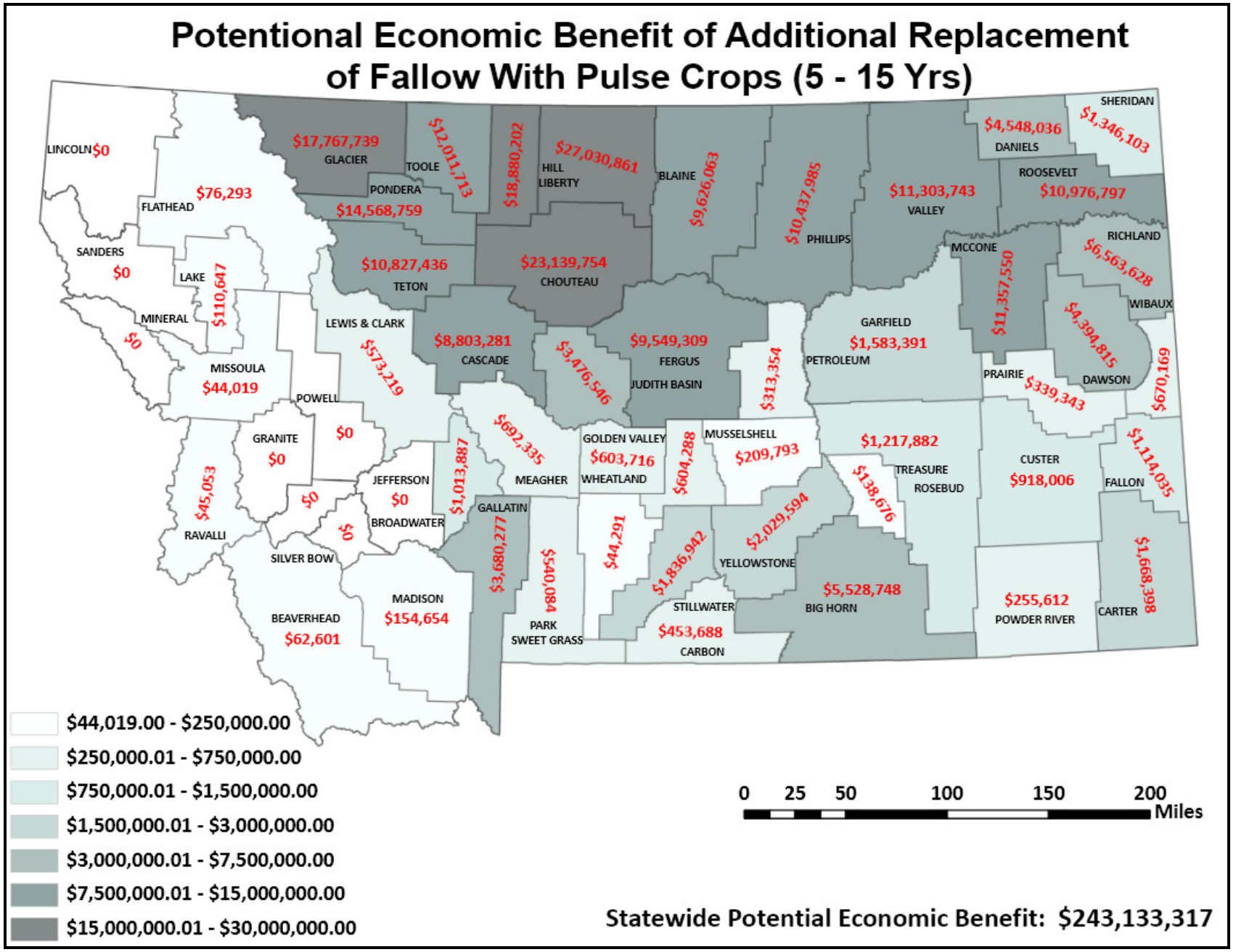
In developing this illustration, the projected replacement of fallow might be achieved in the next five to fifteen years. No assurances are provided about the assumptions used, whether similar market conditions will persist into the future, or about the likelihood of the illustrated fallow replacement.

Estimate of Potential Annual Economic Benefits of Additional Replacement of Fallow with Pulse Crops in Montana

Region	Illustrated Conversion of Fallow (Additional Pulse Crop Acres / *% of 2007-2010 Average Fallow Acres*)	Economic Benefit from Replacement of Fallow *(using 2010 crop information)*	Economic Benefit to Following Wheat Crop *(using 2010 crop information)*	Total Estimated Annual Economic Benefit *(using 2010 crop information)*
Golden Triangle	485,500 / *26.55%*	$114.5 million	$18.6 million	$133.0 million
Northeast	178,000 / 29.47*%*	$42.0 million	$8.5 million	$50.5 million
Blaine/Phillips	70,700 / *23.68%*	$16.7 million	$3.4 million	$20.1 million
Fergus / Judith Basin	47,500 / *32.70%*	$11.2 million	$1.8 million	$13.0 million
Upper Yellowstone	40,900 / *18.54%*	$9.6 million	$1.6 million	$11.2 million
Other Counties	55,900 / *15.23%*	$13.2 million	$2.1 million	$15.3 million
Total	**878,500 / *25.36%***	**$207.2 million**	**$36.0 million**	**$243.1 million**

Northeastern Montana Counties: Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, Valley
Golden Triangle Counties: Cascade, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, Toole
Upper Yellowstone Counties: Bighorn, Carbon, Rosebud, Stillwater, Treasure, Yellowstone

Additional explanations of the assumptions and calculations for economic benefit estimates used in this illustration can be found in the Appendix E. The magnitude of these estimates is impacted by good pulse crop prices received in the 2010 marketing year, high wheat prices (spring and summer 2011), and high price differentials for protein (spring and summer 2011).


Potentional Economic Benefit of Additional Replacement of Fallow With Pulse Crops (5 - 15 Yrs)
LINCOLN $0
FLATHEAD $76,293
SANDERS $0
LAKE $110,647
MINERAL $0
MISSOULA $44,019
GLACIER $17,767,739
TOOLE $12,011,713
PONDERA $14,568,759
TETON $10,827,436
HILL LIBERTY $18,880,202 $27,030,861
CHOUTEAU $23,139,754
BLAINE $9,626,063
PHILLIPS $10,437,985
VALLEY $11,303,743
DANIELS $4,548,036
SHERIDAN $1,346,103
ROOSEVELT $10,976,797
MCCONE $11,357,550
RICHLAND $6,563,628
WIBAUX $4,394,815
DAWSON $670,169
PRAIRIE $339,343
GARFIELD $1,583,391
PETROLEUM $313,354
LEWIS & CLARK $573,219
CASCADE $8,803,281
FERGUS $3,476,546
JUDITH BASIN $9,549,309
POWELL $0
GRANITE $0
JEFFERSON $0
BROADWATER $0
RAVALLI $45,053
SILVER BOW $0
BEAVERHEAD $62,601
MADISON $154,654
GALLATIN $1,013,887
MEAGHER $692,335
GOLDEN VALLEY $603,716
WHEATLAND $3,680,277
PARK $540,084
SWEET GRASS
MUSSELSHELL $604,288 $209,793
TREASURE $1,217,882
ROSEBUD $138,676
CUSTER $918,006
FALLON $1,114,035
YELLOWSTONE $2,029,594
STILLWATER $44,291 $1,836,942
CARBON $453,688
BIG HORN $5,528,748
POWDER RIVER $255,612
CARTER $1,668,398
$44,019.00 - $250,000.00
$250,000.01 - $750,000.00
$750,000.01 - $1,500,000.00
$1,500,000.01 - $3,000,000.00
$3,000,000.01 - $7,500,000.00
$7,500,000.01 - $15,000,000.00
$15,000,000.01 - $30,000,000.00
0 25 50 100 150 200
Miles
Statewide Potential Economic Benefit: $243,133,317

5.0 POTENTIAL FOR INCREASED IRRIGATED PULSE PRODUCTION

There is potential for a meaningful increase in irrigated pulse production. The table below illustrates a simplified estimate for potential irrigated pulse acreage in Montana (excluding dry beans). The author believes that statewide irrigated pulse production (in addition to dry bean production) of 37,000 acres might be achieved in the next five to fifteen years. An explanation of the methodology for reaching this estimate is presented in Appendix F.

The estimates in this illustration assume that not all irrigated farm operations will incorporate pulse crops into their rotations. Ultimately acreages could be higher *(particularly if irrigated pulse production took off in the Golden Triangle, Southwestern Montana, and in the Upper Yellowstone Region)* possibly allowing for as much as 90,000 acres of irrigated pulse production statewide. It is known that farmers have had success with irrigated pulse crops in the Golden Triangle, Gallatin County, and Flathead County. More analysis needs to be done to get a better understanding of the suitability of irrigated pulse production in various areas of the state with regard to soil types, climatology, agronomics, and comparative economics. Acreages of irrigated pulse crops could change significantly year-to-year based on the profit potential of competing crops.

In 2011, approximately 6,200 acres of irrigated pulse crops (excluding dry beans) were grown in Montana , with the Golden Triangle accounting for 30.4%, Southwestern Montana accounting for 34.4%, and Northeastern Montana accounting for 10.8%. In 2010, there were approximately 12,000 acres of irrigated pulse crops (excluding dry beans), with the Golden Triangle accounting for 56.5%, Southwestern Montana accounting for 18.2%, and Northeastern Montana accounting for 13.4%.

Illustration of Potential Irrigated Pulse Crop Production in Montana *(excluding dry beans)*

Region	Good Quality Irrigated Cropland (Acres)	Irrigated Acres Producing Non-forage Crops (Acres)	Estimate of Acres that Might be Switched to Pulse Production (Acres) / % of Irrigated Acres Producing Non-forage Crops
Golden Triangle	237,300	153,500	12,740 / 8.30%
Southwest	213,300	87,600	6,670 / 7.61%
Upper Yellowstone	203,400	111,000	6,390 / 5.76%
Northeast	139,700	81,100	5,270 / 6.50%
West	94,800	31,300	2,360 / 7.53%
Blaine/Phillips	70,500	16,700	1,330 / 7.95%
Other Counties	149,300	31,400	2,300 / 7.35%
Total	**1,108,300**	**512,600**	**37,060 / 7.23%**

Golden Triangle Counties: Cascade, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, Toole
Southwestern Counties: Beaverhead, Broadwater, Gallatin, Jefferson, Lewis & Clark, Madison
Upper Yellowstone Counties: Bighorn, Carbon, Rosebud, Stillwater, Treasure, Yellowstone
Northeastern Montana Counties: Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, Valley
Western Montana Counties: Deer Lodge, Flathead, Granite, Lake, Lincoln, Mineral, Missoula, Powell, Ravalli, Sanders, Silver Bow

6.0 POTENTIAL ECONOMIC BENEFITS OF INCREASED IRRIGATED PULSE ACREAGE

The magnitude of economic benefits that may result from increased irrigated pulse acreage is smaller than what might occur in dryland cropping systems. Montana has far fewer irrigated cropland acres than dry cropland. Also, the potential economic gain that may be achieved by increasing irrigated pulse crop production is incremental in nature because irrigated cropland normally is continuously cropped with no fallow acreage to replace.

Irrigated cropland tends to be geographically concentrated. So, while the potential economic benefits may be modest on a state-wide scale, economic benefits will be focused on certain communities. The regions most likely to benefit from expanded irrigated pulse acreage include the western Golden Triangle Region (between Great Falls and Cut Bank), southwestern Montana, the Yellowstone River Valley, the Milk River Valley, and the Lower Missouri River Valley. Of these, the areas most likely to see substantial increases in irrigated pulse production are the western Golden Triangle and southwestern Montana, where the potential for increased irrigated pulse acreage is the highest due to the climatic conditions and economics of competing crops.

It is difficult to estimate the economic benefit of increased irrigated pulse production for several reasons. Compared to dryland pulse production, there is less information and experience to draw from in estimating profitability and economic benefits. The regions with irrigated cropland vary significantly from each other, and as a result, the potential economic benefits vary with location. Additionally, some of the potential economic benefits may not occur every year and may be location-specific. For example, economic benefits from reduced irrigation water usage might be limited to specific irrigation districts and may occur infrequently.

Because of the difficulty in estimating the economic benefit of increased irrigated pulse production, the author advises readers to view the estimates made in this section cautiously and warns against adding all the potential economic benefits together to calculate a total estimated economic benefit. However, this caution is not meant to take away from the message that significant economic benefits *(possibly in excess of $5 million, annually)* might be realized from increased irrigated pulse production on a modest amount of acreage.

Economic benefits might be realized in the following ways:

- rotational benefits benefiting cereal crops that follow pulse crops;
- incrementally higher returns that might be achieved by some pulse crops (relative to other crops grown);
- potential reduction in irrigation water requirements (particularly in dry years);
- potential increases in prices attributed to increased competition between buyers of crops grown under irrigation; and
- potential increases in agricultural processing that may be brought about because of increased irrigated pulse production.

6.1 ROTATION BENEFITS – FOR ILLUSTRATED INCREASE IN IRRIGATED PULSE ACRES

For the illustrated potential acreage of irrigated pulse crops (described in Section 5), the economic benefit of irrigated pulse crops to the following wheat and barley crop is estimated to be $2.8 million. Relative to dryland cropping systems, the economic benefit of rotating pulse crops into cereal grain production may be even greater on a dollar-per-acre basis ($50 - $103/acre). Explanation of the methodology used to estimate the economic benefit of irrigated pulse crops to the following wheat and barley crop is discussed in Appendix G. The rotational benefits of irrigated pulse production may

improve yield and crop quality, help break disease cycles, and potentially benefit weed control through use of different herbicides and altering weeds' habitat.

Estimated Economic Benefit of Irrigated Pulse Crops to the Following Wheat and Barley Crop

	Acres of Following Crop Benefited by Pulse Production	Economic Benefit from Yield Improvement	Economic Benefit from Increased Protein Content	Total Economic Benefit
Spring Wheat	18,530	$1,260,040	$652,256	$1,912,296 / $103.20/acre
Barley	18,530	$926,500	$0	$926,500 / $50.00/acre
Total	**37,060**	**$2,186,540**	**$652,256**	**$2,838,796 / $76.60/acre**

6.2 ECONOMIC BENEFIT RESULTING FROM PULSE CROPS GENERATING INCREMENTALLY HIGHER RETURNS *(THAN CROPS BEING REPLACED)*

For the illustrated potential acreage of irrigated pulse crops, the improvement in farm profits resulting from irrigated pulse crops generating incrementally higher returns is estimated to be roughly $1.2 million.

Assumptions:

- 1/3 of the irrigated pulse acres (12,353 acres) are $100/acre more profitable than the crop(s) being compared and
- 2/3 of the irrigated pulse acreage (24,707 acres) is equally profitable to the crop(s) being compared.

For farmers to plant irrigated pulse crops, the profit potential of irrigated pulse crops will need to equal or exceed crops currently being planted *(even though separate economic benefits may be realized as a result of crop rotation)*. In economic models developed by the Montana Department of Agriculture (*which can be downloaded from* http://www.agr.mt.gov/business/cropandrotationtools.asp), irrigated pulse crops appear to be economically competitive in many situations. However, with the volatility of commodity prices and costs of production in recent years, it is difficult to make economic comparisons of crops with reasonable accuracy and timeliness.

In some cases it would be appropriate to compare pulse crops to the most profitable crop alternative. In other cases, the profitability of pulse crops would be compared to certain crops that serve a particular role within a crop rotation. Such a crop may be planted by farmers even though it may not have the highest profitability. The risk tolerance of the individual farmer (and financial ability / capacity of the farm to take risk) plays an important role in determining which pulse crops the farmer considers. Additionally, historic weather patterns and each field's soil type and type of irrigation system may dictate if pulse crops should be considered and which pulse crops are considered. Because of the volatility of commodity markets and costs of production, pulse crop profitability may not always offer a favorable alternative to the crops they might replace.

Compared to peas, chickpeas and lentils offer higher profit potential. However, irrigated chickpeas and lentils likely have higher levels of risk and variability. Less information is available to farmers for growing irrigated chickpeas and lentils, and farmers have less collective experience in growing chickpeas and lentils under irrigation. If Montana farmers establish a record of consistent successful production of irrigated chickpeas and lentils, the percentage of the irrigated cropland planted in higher value pulse crops will likely increase.

Some pulse buyers have expressed interest in seeing increased irrigated chickpea production. If grown successfully, irrigated chickpeas would generate high returns, similar in profitability to dry beans. In comparison to dry beans, chickpeas do not have federal farm program base acreage restrictions. Irrigated chickpea production is not common in Montana, but it has been done successfully in some other locations (and at least twice in Montana).

6.3 REDUCTION IN IRRIGATION WATER REQUIREMENTS

Pulse crops are efficient when it comes to water consumption. Irrigated pulse production on 37,060 acres could reduce statewide irrigation water consumption by roughly 18,530 acre feet, if the pulse production replaced small grains. If the pulse production replaced alfalfa, irrigation water consumption might be reduced by 37,060 acre feet.

During a growing season, irrigation water is often applied on crops at the following rates:

- Alfalfa: 15 – 24 inches
- Small Grains (wheat/barley): 12 – 15 inches
- Pulse Crops: 6 – 12 inches

It is difficult to place an economic value on the potential water savings because Montana does not have active water markets. The value would vary depending on the year (stream flow shortage vs. surplus), the time of the year, and the party interested in using the water (other irrigators, municipalities, industrial users, and parties valuing water for its in-stream environmental services). A study conducted for the Montana Department of Natural Resources and Conservation in 2008 indicates that Montana farmers may value irrigation water at a rate of over $40/acre foot, while the value to municipal water users may exceed $100/acre foot. This indicates the potential annual value of water savings achieved by growing irrigated pulse crops instead of small grains might range from $740,000 to over $1.85 million. The potential annual value of water savings achieved by growing irrigated pulse crops instead of alfalfa might range from $1.85 million to over $3.7 million.

Farmers in some locations raise irrigated alfalfa for rotation purposes. A switch from irrigated alfalfa to a crop rotation that utilizes pulse crops for rotation benefits should decrease total irrigation water consumption when crops are grown that have low to moderate moisture requirements. Crops such as potatoes and sugar beets may have water requirements similar to or greater than alfalfa.

Until water markets are developed, the only situation in which water savings could be monetized might occur during drought years in which insufficient water is available to irrigate all the cropland that is deemed to be irrigable. During these dry years, irrigated pulse crops could play a role in extending irrigation water supplies. Pulse crops may enable farmers to irrigate more acreage in dry years, reducing the amount of irrigated acreage abandoned to dryland production or left fallow. In such a situation, the economic benefit of raising irrigated pulse crops could be relatively high to farmers.

Surface water originating from mountain snowmelt is the source of water for irrigated cropland in the Golden Triangle and southwestern Montana, as well as most of Montana. The drainages in the Golden Triangle and southwestern Montana are essentially fully appropriated, with irrigated agriculture accounting for the majority of the consumptive use. In the past 15 years, critical water shortages occurred (particularly in the Valier/Conrad area) that impacted water available for irrigation and generated conflict with non-agricultural water users. Over the long term, water conservation will become increasingly important for irrigated agriculture if climate change predictions prove to be correct that the northern Rocky Mountains will have smaller snowpacks and that snowmelt runoff will occur earlier.

Illustration of Economic Value of Increasing Irrigated Pulse Production in Drought Years

In water-constrained conditions (such that only 0.5 acre-feet of water per acre is available) a farmer managing a pivot irrigated field could decide between the following alternatives:

- plant peas and irrigate the entire field or
- plant and irrigate barley on half of the field and raise barley under dryland conditions on the other half of the field

Farm Level Profits Perspective

Using crop economics spreadsheets developed by the Montana Department of Agriculture to estimate relative crop profitability in 2011, the estimated return after direct costs for the field of irrigated peas would be $372/acre, while the estimated return after direct costs for the barley field (*of which only half the field is irrigated*) would be $200/acre. In this case, the advantage of planting peas would be $172/acre. The methodology used to make these estimate is discussed in Appendix G.

The difference could vary in future years. Analysis of irrigated crop production economics for recent years indicates that the profitability of irrigated barley and irrigated peas has been fairly similar to each other in the past. Even if irrigated peas were less profitable than irrigated barley, most likely raising irrigated peas on the entire field would be more profitable than raising irrigated barley on half the field and dryland barley on half the field. The return after direct costs of dryland barley is likely to be considerably less than either irrigated barley or irrigated peas.

Regional Economic Perspective

If a region impacted by an irrigation water shortage was large enough that 20,000 acres of irrigated peas were planted in response to conditions, the estimated economic benefit of utilizing peas as a means to cope with the irrigation water shortage would be $4.25 million or $212.50/acre of irrigated cropland planted in peas. The calculation of this estimate is discussed in Appendix G.

6.4 INCREASE IN AGRICULTURAL PROCESSING: VALUE ADDED, EMPLOYMENT, CAPITAL INVESTMENT

Some pulse buyers/processors considering investment in handling and processing facilities in Montana may look at the potential of irrigated pulse production to help ensure dependable supply and consistent quality characteristics. Such facilities would also purchase dryland pulse crops. In this way, irrigated production might play a key role in attracting expanded pulse processing that benefits dryland production.

One example of irrigated crop production in Montana influencing the construction of a processing facility is the malting plant in Great Falls. The malting plant buys substantial volumes of dryland malting barley, but unquestionably would not have been built were it not for the consistent, large, high-quality irrigated malting barley crop grown in Teton, Pondera, Cascade, Glacier, and northern Lewis & Clark counties.

Expanded agricultural processing is beneficial to both producers and affected communities. For farmers, processing facilities create strong markets. Processors have a natural incentive to aggressively pursue commodity supplies to keep their plants fully utilized. In theory, this should result in famers receiving higher prices than they would otherwise. The impact of processing impacting local prices has been demonstrated in the Corn Belt in the mid-2000's, when ethanol plants boosted nearby corn prices approximately $0.05 - $0.10/bushel (Dave Swenson, "*Input-Outrageous: The Economic Impacts of Modern Biofuels Production*", June 2006, Iowa State University Department of Economics). In theory, as long as the margins are profitable, processing facilities should optimize net income by maximizing throughput. For communities, processing facilities create jobs, generate tax revenues, and increase economic activity to benefit many local businesses.

Expanded irrigated pulse production could potentially influence the construction of pulse processing facilities. The magnitude and types of economic impacts that might result from a pulse processing facility are discussed in Section 7. If dryland farmers in the Golden Triangle are particularly cautious about adapting pulse crops into their rotations, a pulse processing facility (that relies on irrigated production) may help generate higher levels of local market demand and industry visibility that positively influences dryland pulse crop production.

6.5 INCREASED COMPETITION – POTENTIAL FOR LOCALIZED INCREASE IN COMMODITY PRICES

The developing pulse industry is attracting new commodity buyers to Montana that will compete for acres of supply. As a result, the developing pulse industry is helping to reinvigorate competition between buyers and crops.

There are several reasons why competition might be more likely to impact prices on crops grown on irrigated cropland (*as compared to dryland crops*). Some buyers (particularly malting barley buyers) specifically want crops produced from irrigated cropland, and there are only a few regions in North America that grow high quality malting barley. The Golden Triangle, which is Montana's center of irrigated malting barley production, is also the area most likely to have the largest acreage of irrigated pulse crops. In Montana, certain crops (such as sugar beets, potatoes, dry beans, and dairy-quality alfalfa) can only be grown under irrigation. Seed production often occurs on irrigated cropland because of the dependability and consistency of yields and quality. Nationally, the quantity of irrigated cropland is relatively limited, and there are factors that are reducing the amount of irrigated cropland, including competition for water resources, dwindling groundwater supplies, and conversion of irrigated cropland to nonagricultural uses.

If it can be presumed that additional competition (*resulting from increased irrigated pulse production*) raises irrigated barley prices by 0.5%, then the potential statewide increase in farm revenue could be approximately $0.5 million.

Explanation:

- 200,000 acres (of irrigated barley) * $500/acre revenue * 0.5% increase in price attributable to competition for irrigated cropland acres = $0.5 million.

The net economic benefit to Montana might be less than the increase in farm revenue since the profits of commodity buyers might be reduced. However, the in-state economic multiplier effect of farm profits likely is greater than the in-state economic multiplier of commodity buyer profits.

7.0 ECONOMIC IMPACT OF PULSE PROCESSING & MERCHANDISING

It is difficult to develop estimates for the economic benefits attributable to pulse processing and merchandising in Montana because the information needed to assess the benefits is (not surprisingly) closely held by businesses, including the volume of pulses being processed and the degree of processing. Most likely, the majority of Montana-grown pulse crops are currently shipped out of the state unprocessed. It is clear that processing facilities provide incremental economic benefits because additional operating costs are incurred and value is added through processing.

7.1 PULSE PROCESSING

A recent increase in pulse processing in Montana and growing interest by pulse processors in Montana represent bright spots at a time when U.S. manufacturing continues to move overseas.

As of December 2011, there were three large processing facilities in Montana (located in Plentywood, Chinook, and Hingham) and a small processing facility in Ulm. The Chinook pulse processing facility began operations in 1997. At Plentywood, processing began in 1996. Significant additional investment was made in the Plentywood facility in the 2009 – 2010 time period. The Hingham processing facility began operations in 2010. All of these facilities were existing grain handling facilities that were modified for pulse processing. An expansion is planned at the Chinook processing facility, and a new facility is slated to be constructed west of Chester in the near future.

Pulse processing can include cleaning; cleaning and bagging; splitting; decorticating (taking the skin off of lentils); or milling pulses into flour. The facilities in Chinook, Plentywood, and Hingham perform cleaning and bagging. The facility in Hingham also decorticates and splits lentils and is one of three facilities in the U.S. capable of splitting lentils.

Several processing facilities outside of Montana process Montana-grown pulse crops. Two other facilities located outside of Montana (in Williston, ND and Spokane, WA) process significant volumes of Montana pulse crops. Four other processing facilities located in North Dakota (Ray, Minot, Garrison, and Bowman) directly purchase pulse crops from Montana growers. Additional Montana-grown pulses are processed at other facilities located in North Dakota, Idaho, Washington, and Saskatchewan.

7.2 ESTIMATES OF ECONOMIC IMPACTS OF PULSE PROCESSING FACILITIES

The following provides rough estimates of different types of economic impacts generated by pulse processing facilities. The estimates provided are not to be seen as reflective of any of the existing processing facilities in Montana, but rather a hypothetical processing facility. Because such information is not readily available, rough estimates with ranges were used. At the low end of the range, a facility might process approximately 23,000 – 35,000 acres of pulse crops. At the high end of the range, a facility might process approximately 50,000 – 75,000 acres of pulse crops.

- Capital investment: $3 - $15 million per processing facility
- Property tax revenue: $45,000 – $225,000 per year (if no property tax incentives are provided)
- Annual payroll: $175,000 - $700,000 (5 – 20 employees)
- Annual purchases of pulse crops for processing: $7 million - $15 million, depending on the type and volume of pulses purchased.
- Annual value added: $1.75 million - $10.5+ million, depending upon the type of processing being done, the mix of crops being processed, and the end market.

7.3 ESTIMATE OF VALUE ADDED THROUGH PULSE PROCESSING IN MONTANA FOR THE 2010 CROP

In 2010, Montana farmers harvested 4,140,000 cwt of peas *(cwt = hundred weight = 100 lbs)* and 3,359,000 cwt of lentils. Based on the assumptions described below, the value added to the 2010 Montana pea and lentil crop **may** have been approximately $15 million. In the coming years, the value added to Montana pulses will increase as processing plants operate at higher levels of utilization and as the capacity of new or expanded plants comes on line. The value added by processing manifests itself in several ways: profits earned by the processor companies, wages, other operating costs, capital investment recovery, taxes, and shipping costs.

Assumptions for Estimating Value Added to 2010 Montana Pulse Crop

Pea Cleaning Assumptions: estimated $4.3 million value added

- 15% of Montana's the peas were cleaned in Montana (621,000 cwt)
- $6.88/cwt value added

Lentil Cleaning Assumptions: estimated $10.1 million value added

- 40% of Montana's lentils were cleaned in Montana (1,343,600 cwt)
- $7.50/cwt value added

Lentil Decorticating/Splitting Assumptions: estimated $1 million value added

- 3% of Montana's lentils were split in Montana (100,770 cwt)
- $10/cwt value added (combination of cleaning & splitting)

No estimate was made for the value added to lentils processed and packaged for retail sale, but at least one facility is involved in retail packaging at a commercial level.

Pulse Processing Value Added Matrix

	Grower Price $/cwt	Dealer Price (Whole, Cleaned) $/cwt) / *$ Value Added ($/cwt)* / % Value Added	Dealer Price (Split) ($/cwt) / Net Price per Whole Pea Processed*** / *$ Value Added ($/cwt) to Cleaned Grain* / % Value Added to Cleaned Grain
Green Peas*	$11.00	$17.75 / ***$6.75*** / **61.3%**	$22.25 / **$19.81** / ***$2.06*** / **11.6%**
Yellow Peas*	$9.50	$16.50 / ***$7.00*** / **73.7%**	$21.50 / **$19.18** / ***$2.68*** / **16.2%**
Richlea Lentils**	$31.50	$39.00 / ***$7.50*** / **23.8%**	Prices Not Reported, possibly $2.50/cwt value added by splitting cleaned lentils

* Based on 1/29/2011 USDA Prices for Washington/Idaho

** Based pm 1/29/2011 USDA Prices for Montana / North Dakota

***Assumes 15% loss during splitting, with byproduct being sold for $6/cwt: (85%* Dealer Split Price + 15% * $6/cwt)

7.3.1 Factors Influencing Additional Development of Pulse Processing Capacity

There are market forces both encouraging and discouraging additional development of pulse processing capacity in Montana.

Factors Encouraging Additional Development:

- Trend of expanding pulse acreage, with potential for significant growth. Put simply, as more acres of pulse crops are grown, more pulse processing facilities (and delivery points) are likely to be established. There is strong interest by pulse processors and merchandisers in expanding operations in Montana.
- Strict enforcement of India's import standards may force exporters to clean pulse crops prior to shipping to India. In recent years there has been inconsistent enforcement of those import standards (particularly regarding weed seed) that has allowed uncleaned pulses to be exported to India. Enforcement (albeit inconsistent) has created difficulties for large shipments of uncleaned pulses to India in the last year.

- Several years ago, India banned exports of pulse crops from India in response to a food supply crisis. This ban has yet to be lifted. The ban opened up markets for processed pulses from other countries and seems to be enticing some foreign investment in the U.S. and Canada by foreign entrepreneurs looking to help fill the gap.
- For some markets and companies, processing near the point of origin can improve the economics of pulse trading and allow for greater quality focus (see next bullet). Processing can reduce the total amount of mass that is shipped. Splitting or decorticating pulses results in as much as 15% of "waste" (byproduct that is marketed locally as animal feed or be milled into flours for the food ingredient market).
- It appears that some pulse market participants are seeking greater control over their supply chain for purposes of quality control, supply assurance, and cost control. Some of these participants perceive that owning and operating pulse processing facilities near the crop origin is a good strategy for meeting their objectives. Montana has a growing reputation as being an origination point for high quality peas and lentils. Quality is particularly important to the market participants involved with marketing branded products in countries with growing middle classes. Modest-sized, quality-focused market participants are more likely to benefit from processing near the crop origin than large market participants focused on throughput and cost efficiency.
- There is significant potential for large increases in domestic demand for pulse-derived manufactured functional ingredients used to enhance processed foods. Additional investment in milling facilities may be required to provide specialized capabilities and milling capacity.

Factors Discouraging Additional Development:

- An increase in pulse processing along busy rail routes of major rail lines is not in sync with major rail lines' operational objectives. The majority of pulse production in Montana occurs near BNSF's busy northern transcontinental rail line. Strong economic forces and operational goals drive BNSF's desire to have as many shipments as possible be on dedicated 110 car unit trains, with regular scheduled service and fast turnaround times. Besides maximizing utilization of equipment and efficiency of operations, dedicated 110 car unit trains allow BNSF and other major railroads to maximize the throughput of their rail infrastructure and avoid rail capacity constraints. To-date, pulse processing facilities have not been shipping 110 car unit car trains of processed pulses. However, at least one company has made unit car train shipments of raw unprocessed peas. Local rail services that deliver and retrieve individual cars potentially cause interruptions with the flow of trains across busy routes. BNSF anticipates its major lines to become even busier.
- Fuel costs (which could increase dramatically in the future) discourage development of pulse processing facilities that might utilize long-haul trucking to counter discouraging factors related to rail freight.
- The absence of intermodal shipping hubs in Montana that enable international containers to be loaded and shipped in a cost-effective and efficient manner may be a limiting factor to the expansion of the pulse processing industry in Montana. Access to competitively-priced international container shipping would encourage additional development of pulse processing facilities.
    - Containers are important for exports of processed pulses to preserve cleanliness, quality, and lot identity of processed pulses. Processed pulses are generally packaged in bags that need to be loaded into containers. Uncleaned pulses are often shipped by container because the volume being shipped is too small to be shipped in the hold of a bulk freighter.
    - The nearest intermodal facilities that handle containers are distant, and it is inefficient and expensive to truck containers from these intermodal hubs. It has been more cost-competitive to rail bagged processed pulses in boxcars to transloaders to be loaded into

containers or rail cleaned pulses in bulk to transloaders at ports to be loaded into containers.

  - The biggest factor in enabling container shipping from Montana is drawing the interest of shipping lines (which own the containers). Once empty containers are loaded on trains to be shipped the West Coast from the Midwest, the shipping lines have not been interested in dropping off empty containers along the way to be filled. In order for the shipping lines to be interested *(and for container shipping from Montana to be cost-competitive)* there needs to be a sufficient volume of inbound freight *(loaded containers being delivered to Montana)*. To date, sufficient inbound freight has yet to be identified. The key to the current success of an intermodal facility in Minot, North Dakota is inbound containers loaded with ceramic materials made in China that are used in oilfield fracking. To be considered by BNSF, the minimum requirement for establishing container transport service would likely be the commitment of an intermodal facility to make a weekly shipment of a 110 car unit train. Due largely to increasing pulse production and processing capacity, Montana's potential outbound container shipment volume may reach "minimum required" volumes in the foreseeable future. Most likely, a single shipping point would aggregate containers loaded with pulses from multiple pulse processors and loaded with other products, such as identity-preserved cereal grains. However, the key constraint of identifying sufficient inbound container volume remains unresolved at this time.

- Montana's two major pulse growing regions are not proximate to intermodal shipping hubs providing trailer service (truck trailer on train) for shipments to distant locations in the United States. This may potentially be a limiting factor to the expansion of the pulse processing industry in Montana. However in comparison to establishment of an international container handling facility, the hurdles to establishing this service may be lower.
- U.S. immigration policies have made it difficult for foreign investors to bring in skilled employees on a temporary basis. The foreign investors have communicated the need of such employees for the installation of specialized pulse processing equipment (lentil splitting equipment), the startup of such equipment, the operation of lentil splitting equipment, and the training of U.S. citizens to become master splitters. One pulse processing company is expressing reservations about continuing with its (*substantial*) capital investment plan because of the experience it has had. This company may choose to make those investments in Canada instead. Canada's immigration policies are much more reasonable and welcoming in this regard. It is possible that more than one processing company pursuing business in Montana will be at risk of delays in the installation and startup of lentil splitting equipment because of United States' immigration policies. Problems will be avoided only if these companies have been very deliberate (and lucky) in integrating their workforce planning elements into their equipment acquisition and installation. Another approach to bringing in necessary foreign workers is to use visas that allow for intercompany transfers; however, this remedy is not available for startup companies that may have foreign investors, but lack established foreign parent companies.
- Labor supply shortages in northeastern Montana, combined with high wage rates influenced by the oil boom in the Williston Basin are a major business risk to new pulse processing plants becoming established in northeastern Montana. These conditions have presented very difficult and frustrating conditions for the existing pulse processing facilities in the region. This situation is encouraging projects developers to look to other regions of Montana (such as the Golden Triangle and south central Montana). However, in these other locations, project developers are concerned about the adequacy of the supply of locally-grown pulse crops in the current and short-term time frame.

7.4 PULSE MERCHANDISING

Unquestionably, value is added in the aggregation of pulse inventories; otherwise grain merchandisers would not be in business. No estimate is made in this paper of the incremental economic benefits generated by grain handling facilities that handle pulse crops but do not process the crops in any manner. In terms of capital investment, investment has been made to some existing facilities related to pulse handling, but no new elevators have been built to handle pulses yet.

Pulse crop buyers in Montana are utilizing grain handling facilities that otherwise might be economically obsolete for shipping wheat (due to economic efficiencies of new 110 railcar shuttle elevator facilities). Pulse crop delivery points encourage farmers to grow pulse crops. Delivery points also help pulse growers reduce shipping costs, since they otherwise would have to haul farther distances by truck. In the cases where grain handling facilities would otherwise be shuttered, merchandising clearly provides economic benefits of employment and economic activity that can be attributed to the developing pulse industry.

Roughly two dozen facilities in Montana are delivery points for approximately ten buyers. A number of companies are exploring the establishment of additional pulse delivery points with rail access in Montana. New construction will be considered by some of these companies. Expansion may occur in a staged manner, with very basic storage and rail loading facilities eventually expanding to large handling and processing facilities.

The increased volume of Montana commodity shipments resulting from replacement of fallow by pulse crops has increased the economic activity in the transportation sector (trucking and rail) as well.

8.0 MARKET DYNAMICS – WHY THE PULSE MARKET WILL CONTINUE TO EXPAND

There are a number of demand and supply factors driving expansion of the pulse industry in the United States.

8.1 WORLD POPULATION AND ECONOMIC GROWTH

Population growth and economic gains in India, China, and developing countries are driving global demand. Unless India's economy stagnates or tumbles, demand will continue to increase from India. To meet dietary recommendations, India's consumption of pulse crops should be 22 million metric tons. India's normal production of a wide variety of pulse crops is 16 million metric tons, and it normally imports 3 million metric tons *(March 2010 Saskatchewan Pulse Growers Association Market Report, Martin Chidwick, Bissma Pacific, Inc.)*. The gap between recommended consumption vs. production has increased every decade in the last 30 years. In the last 10 years, the gap has averaged 5.3 million metric tons per year *(March 2010 Saskatchewan Pulse Growers Association Market Report, Brian Clancey, STAT Publishing)*. As India becomes more prosperous, demand for protein will increase to match or exceed dietary needs. For cultural/religious reasons, India's increased consumption of protein will largely come from pulse crops. Pulse crops will always be a low cost source of protein compared to meat. United States' exports are not limited to south Asian countries; the U.S. exports significant volumes to South America, Latin America, Europe, North Africa, the Middle East, and China. China has started importing large quantities of yellow peas from the U.S. and Canada. A major use of yellow peas in China is vermicelli noodle production. Interestingly, vermicelli noodle makers have valued yellow peas more for their starch than protein, but Chinese food manufacturers are starting to make broader use of yellow peas. In the August 2010 Saskatchewan Pulse Growers Pulse Market Report, Brian Clancey reports that "*China's food industry has been finding more uses for pea starch and bran. These new developments have seen* [Canadian] *sales increase from approximately 250,000 MT a season to more than 435,000 during the 2010/11 marketing year*."

8.2 PRODUCT SUBSTITUTION

Product substitution is another factor in increased demand for the pulse crops. Peas and lentils can serve as less expensive substitutes for other pulses and beans grown in south Asia. Globally, dry peas are the low-cost pulse crop. In recent years, when India faced food supply shortages and high prices, yellow peas were substituted for chickpeas; decorticated green lentils were substituted for pigeon peas; and green peas were substituted for mung beans. When the price of mung beans spiked, China started importing large quantities of yellow peas to substitute for mung beans in the production of vermicelli noodles.

8.3 WEATHER

Weather patterns and major weather events have worked to tighten global inventories. Poor growing conditions in recent years impacted pulse production in major growing regions like India, Turkey, and Australia. In 2010, the Ukraine and Russia were impacted by severe drought. In 2011, France (a major pea producer) was impacted by severe drought. In recent years, flooding in Pakistan and Bangladesh likely increased the need for imports into those countries. It seems as though challenging growing conditions that reduce supply are the norm, the location just changes. This has encouraged the pulse industry and major importing countries to look for new sources of supply. The United States, Montana in particular, is one of those new sources of supply. Large increases in production of pulse crops in the United States and Canada have helped sustain global supplies. Since much of the increase in production in North America has occurred on land that previously was left fallow, the growth in pulse supply has not come at the expense of other food commodities. Multiple cycles of supply volatility within a short period of time have caused foreign governments to be fearful about food shortages causing domestic

unrest in some countries. A result is that since 2008, India has prohibited pulse exports. A ripple effect has been the opening of markets previously served by Indian exports.

8.4 GLOBALIZATION

The forces of globalization, modernization, and trade liberalization are creating more opportunity for pulse exports from the United States. Besides expanding global trade of pulses, globalization is working to drive land use changes in traditional pulse production regions, where some pulse acreage is being lost to other crops and nonagricultural uses. An example of modernization impacting pulse acreage is the reduction of pulse acres in certain farming districts in Turkey, where the completion of irrigation projects led farmers to raise other crops in place of pulses.

8.5 DECLINE OF THE U.S. DOLLAR

The decline of the U.S. dollar has been very useful in making pulses grown in the U.S. more affordable and putting the U.S. exporters in a more competitive trading position. Both the Canadian and Australian dollars have appreciated relative to the U.S. dollar. Both are major pulse exporting countries, with Canada being the largest pulse exporter in the world by a large margin. While currency markets can be volatile, there appear to be fundamental forces at play that will keep the U.S. dollar weak for some time, although recent global economic volatility has caused the U.S. dollar to strengthen. Barring an unlikely collapse in oil, natural gas, and metal commodities demand, it seems unlikely that the Canadian and Australian dollars will weaken significantly.

8.6 OPPORTUNITY IN DOMESTIC & DEVELOPED-WORLD MARKETS

There is significant opportunity in domestic and developed-world markets for utilization of pulse ingredients in processed foods and for increased incorporation of pulses in diets. Pulse crops are high in protein, high in fiber, have a low glycemic index, and contain significant amounts of micronutrients. Pulses can be fractionated into components (protein, fiber, and starch) to yield highly functional ingredients in food processing. The proportion of world pulse production that is processed into protein, starch, and fiber fractions remains very small to date, but the potential markets for fractionated pulse ingredients are enormous.

8.6.1 Pulse Protein

Protein from pulse crops can be used to increase the protein content in processed foods and to make concentrated protein ingredients. Lentil flour is being incorporated into a nationally distributed, premium line of pasta. Compared to traditional pasta, this pasta is higher in protein and fiber, with a lower glycemic index, and has a full protein profile. The lentil flour gives the pasta some very favorable cooking attributes that make it firm and less likely to become waterlogged and soft when overcooked. It is anticipated that more pasta manufacturers will start incorporating pulse flours into their products. Pea protein ingredients have been successfully demonstrated to be a viable replacement for eggs in some food products. Certain fractionated pulse ingredients have advantages over other vegetable protein sources. Pea protein also is high in lysine, giving it an advantage over soy protein.

8.6.2 Pulse Fiber

Fiber from pulse crops can be used to increase the fiber content in processed foods. The use of pulse fiber is economical compared to fiber-fortifying gums or soy protein products. Pulse crops contain high amounts of both soluble and insoluble fiber. Soluble dietary fiber can reduce intestinal absorption of fat and cholesterol. Diets high in soluble fiber may reduce the risk of heart disease via favorable effects on blood pressure, blood glucose and insulin moderation, and reduced likelihood of obesity. Insoluble and soluble fiber are beneficial to the lower intestine in that they help eliminate harmful bacteria and promote good bacteria, plus promote regularity. Besides benefits to cardiovascular and digestive tract health, fiber helps prevent large swings in blood sugar levels.

Incorporating unprocessed pulses into diets can greatly increase fiber intake. Where a serving of most commonly consumed grains, fruits, and vegetables contain 1 – 3 grams of dietary fiber, a serving of one-half cup of cooked split peas provides 10 grams of dietary fiber, 40% of the daily recommended 25 grams ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 25).

8.6.3 Pulse Starch

The properties of the starch in pulse crops cause whole pulses and ingredients derived from pulses to have a low glycemic index. Having a low glycemic index means that the carbohydrates in pulses digest slower. This helps with the regulation of blood sugar, which is good for people suffering from diabetes or at risk of diabetes and also helps extend periods of satiation. One in four Americans are insulin resistant and at risk of developing type 2 diabetes ("*Pulses the Heart of Healthy Food*", a brochure produced by the Northern Pulse Growers Association and USA Dry Pea & Lentil Council). Pulse starch ingredients can enable food manufacturers to reduce carbohydrates. For example, gels made from pulse starch can be prepared with 50% less starch than corn starch ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 101).

Starch made from pulse crops, particularly peas have functional properties that can make them useful for manufacturing processed foods. Pulse starches can be used to modify food texture, which is important for both processing and consumer acceptance. Pulse starch properties include good stability at high temperatures, high viscosity compared to cereal and tuber starches, excellent gel strength and bland taste (pea starch isolates), and ability to contribute to increased volume and expansion in extruded products and puffed snacks. These properties can enable food manufacturers to reduce fat in products and mimic the mouth-feel of fats. ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pgs.99- 103)

Starch from peas has been used in deep frozen dishes, dressings, extruded bakery products, cookies, crackers, sauces, instant soups, and puddings, but the volume of pea starch used in food manufacturing is not yet large ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 100). The potential for growth in pulse starch utilization is significant, considering that current manufacture of pulse starch makes up only a small amount of the 6 million tons/year of starch produced in the United States ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 25).

8.6.4 Pulse Nutrients

Pulse crops are good sources of important minerals like iron, magnesium, phosphorous, and manganese. They also contain significant amounts of phosphorous and the B vitamins (including folate). Lentils and chickpeas boast among the highest concentrations of folate. Adequate folate intake is important for fetal development. A single cup of lentils or chickpeas provides 37% of the recommended daily allowance ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 27). Folate is necessary for the formation and development of new and normal tissue, helps break down an amino acid associated with heart disease, improves metabolism functions, and may reduce asthma and allergy suffering.

8.6.5 Nonallergenic Qualities

Pulse protein concentrates can be used to replace eggs as food ingredients in some applications. Eggs are the fourth most common food to trigger allergic reactions in adults in the United States, affecting over 30 million consumers ("*Pea Protein – Eggs Optional*", a brochure produced by the Northern Pulse Growers Association and USA Dry Pea & Lentil Council, pgs. 1-2). Pulses are also gluten free. The development of functional pulse ingredient products could be very useful to the $7 billion gluten-free industry which serves the celiac/gluten intolerant population ("*Pea Protein – Eggs Optional*", a brochure

produced by the Northern Pulse Growers Association and USA Dry Pea & Lentil Council, pg. 8). In the United States, one of every 133 people are gluten intolerant ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 109). Pulse ingredients may become important ingredients for baby food manufactured for infants with lactose intolerance and allergies to soy products ("*Processing Information & Technical Manual*", USA Dry Pea & Lentil Council, pg. 116).

8.6.6 Pulse Product Development

Northern Pulse Growers Association, USA Dry Pea & Lentil Council, Northern Crops Institute, universities in Canada and the U.S., and other organizations have conducted some excellent research on pulse nutrition and health benefits, as well as innovative pulse product development. The progress made has been achieved with relatively modest investments. Continued research and product development will be a major driver in increasing pulse utilization in the United States and developed-world countries.

Although there is no information indicating that the potential product described in this paragraph is under development, the following provides an example of a high-value product that could potentially utilize pulse ingredients. A Wall Street Journal article (*"Feeding May Help Brain Injuries", April 21, 2011*) stated that brain injury trauma is lessened when the victims receive at least 50% of their typical caloric intake in the first 24 hours after the injury. During the first 24 hours, the dietary intake needs to be high in protein and avoid extremes in blood sugar levels. Such a diet helps reduce inflammation and swelling of the brain and provides energy to help the brain heal. The properties of pulse ingredients (high protein and low glycemic index) would seem to address some of the requirements of this medical treatment. The market for such a product is significant. Annual cases of reported traumatic brain injury in the U.S. military exceeded 30,000 in 2010. According to the Brain Trauma Foundation, about 1.5 million patients report to emergency rooms each year with head injuries and as many as 3.8 million people suffer head injuries annually playing sports.

8.7 SUSTAINABILITY

The concept of sustainability is becoming increasingly important in terms of societal values, marketing, quality of life, and economic performance. Products made from pulse crops will have added market appeal because they are economically, environmentally, and socially sustainable. Efforts to advance the U.S. pulse industry and further develop the industry in Montana will have lasting benefit because pulse crops and the pulse industry address all of these facets of sustainability.

8.7.1 Economic Sustainability

Consumers' economic sustainability can benefit from increased pulse crop consumption. Previous paragraphs discussed potential health benefits that may occur from increasing pulse consumption and utilization of pulse crop ingredients in processed foods. As medical costs continue to escalate, consumers will increasingly turn to nutrition as a form of preventative medicine. In theory, a substantial increase in pulse consumption in the United States could translate into lower health care costs. The economic benefit to consumers would be compounded because pulses are inexpensive and protein from pulses costs considerably less than meat.

Increased pulse crop cultivation can improve the economic sustainability of farms. Earlier sections of this paper demonstrate how inclusion of pulse crops in crop rotations in Montana can improve economic sustainability of farm operations. High value pulse crops, such as lentils and chickpeas, in recent years have often been more profitable than other dryland crops in Montana. Diversifying crop rotations to include pulse crops may also reduce costs and damage caused by weed, crop disease, and insect problems.

With the likely prospect of large increases in energy costs and the possibility of future taxes on fossil fuels or carbon trading regimes, pulse crops will likely play an increasingly important role in the economic sustainability of Montana farms, as it pertains to energy. A recent report written by Mac Burgess (Montana State University Ph.D. candidate) titled "*Telling the Energy Story of Pulse Crops*" shows pulse crops having a 53% lower energy input than cereal crops. In this study, the net energy productivity of pulse crops exceeded cereal crops. A major reason for this is that nitrogen fertilizer derived from natural gas is not used in the production of pulse crops. Interestingly, the rotational effect (*of pulse crops increasing the yield of the following cereal crop)* resulted in a net energy productivity that actually exceeded pulse crops' energy advantage attributable to reduced nitrogen fertilizer use.

Utilization of pulse crops and pulse ingredients by food manufacturers may allow food manufacturers to offer premium products that generate better profit margins, thereby improving the food manufacturers' economic sustainability.

8.7.2 Environmental Sustainability

Beyond economic impact to U.S. communities, farm operations, and food manufacturers, pulse crops provide other benefits to society. These benefits include better nutrition from foods derived from crops that use less natural resources, and conservation of cropland through improved soil health. Less fossil energy is used to produce pulse crops. Pulse crops use water efficiently, which can enable more intensive crop rotations in dryland farming systems or reduce water consumption in irrigated farming systems. Pulse crops can be incorporated into crop rotations to increase organic matter, improve soil health, and reduce erosion. Increased organic matter helps soil retain water and be less susceptible to leaching of nutrients, thereby making the entire cropping system more resilient. From a marketing perspective, pulse protein is "green" because the nitrogen that pulse crops synthesize into protein comes from the atmosphere, not from synthetic fertilizers made from nonrenewable natural gas. Additionally, nitrogen fixed by pulse crops helps reduce the amount of synthetic nitrogen needed to grow the cereal crops that follow pulse crops.

8.7.3 Social Sustainability

Pulse crops contribute toward social sustainability through:

- improved health;
- expanding agricultural production to meet the world's increasing food demand *(through rotational benefits and replacement of fallow with crops)*;
- enhancing rural economies;
- helping family farms remain economically viable through improved profits; and
- creating new employment opportunities in the United States.

9.0 WHAT MIGHT HELP MONTANA REALIZE ITS PULSE POTENTIAL?

Clearly, Montana's economy, farmers, and communities have a lot to gain from expanded pulse production. **There may be no single opportunity available to Montana's agricultural industry that offers as much potential benefit in the near term.** Many factors will influence whether and how fast Montana farmers increase pulse acreage. The largest factors, weather and commodity markets, are beyond the control of Montana's agriculture industry, universities, governments, and communities. But, there are a variety of actions to be considered, prioritized, and pursued by Montana stakeholders and policy makers that could assist Montana's pulse industry reach its potential and shorten the timeframe for the realization of economic benefits. Many of these actions are already being taken, but it may be worthwhile to evaluate the amount of resources being allocated and priority given.

In the short-term, efforts that support farmers in the process of replacing fallow with pulse crops and assist inexperienced farmers to start growing pulse crops successfully are likely to have the greatest economic impact in Montana. These efforts are most likely to be of the following nature: information support, widespread crop and rotation demonstration plots, variety trials, and production research.

Stewardship of Commodity Check-offs & Industry Organization Efforts

The Montana Pulse Crop Check-off helps fund pulse crop research, market promotion, and product development efforts carried out by the Northern Pulse Growers Association and the USA Dry Pea & Lentil Council. Their efforts seek to aid crop production and strengthen demand. If successful, these efforts should help yield profitable opportunities, solid prices, and diverse markets that support acreage expansion.

Check-off funds have been successfully used to advance the industry. Requests for refunds of check-offs should be discouraged. To this end, farmers should be kept informed of the value of their check-off contributions. The more Montana farmers that are actively engaged with check-off committees and industry organization representatives, the more broad-based the communication of farmers' needs and expectations will be to these organizations and to the agricultural research community. Similarly, farmers will be benefited by being attentive to and responsive to communications from specialists employed by these organizations pertaining to research findings, industry conditions, trends, and opportunities.

Pulse production can provide sizeable economic benefits to Montana's cereal grain industry. Pulse production can become integral to improved cereal grain cropping systems. Considering the magnitude of the potential benefits to be realized by cereal grain crops and the constraints on the developing pulse industry to sufficiently fund crop research, the Montana Wheat & Barley Committee should consider the making significant investments of wheat and barley check-off dollars into cropping system research (utilizing pulse crops within cereal grain rotations) and pulse variety development.

Escalation of Research Activity

The pulse industry is entering a growth stage from which disproportionate benefit may be realized from increased levels of research. There are many topic areas that need attention, of which the following is an abbreviated list:

- strategies and rotations for replacing fallow with pulse crops
- pulse breeding, particularly for winter varieties of peas and lentils, disease resistance, improved harvesting ease, traits benefiting consumers and processors
- widespread on-farm demonstration trials to build farmers' confidence and possibly aid in crop insurance policy development
- weed control

- irrigated production
- production economics analysis
- market research
- continued product development research and health benefits analysis to enhance utilization and expand processing

Improved Market Reporting
One factor that causes Montana farmers to hesitate to start growing pulse crops is inferior price and market information *(in comparison to what is available for cereal grain crops)*. As the pulse industry grows in Montana, theoretically it should become possible to have more detailed price information available for different classes and grades of pulse crops. USDA Agriculture Marketing Service should be encouraged to expand its market reporting to provide more information, and the agriculture media should be encouraged to add pulse price reporting to farm reports.

Pulse crops are an excellent source of animal feed. The Alberta Pulse Growers Association publishes a bi-weekly report titled the "Feed Pea Benchmark", which functions as a pricing reference. This report provides a consistent, unbiased estimate of the economic value of peas as a feed ingredient in three regions (central Alberta, central Saskatchewan, and southern Manitoba). The Feed Pea Benchmark Price is based on market prices of feed ingredients for which peas would be substituted in swine rations (barley, wheat, corn, corn distillers grains, canola meal, and soybean meal). The Feed Pea Benchmark helps animal feeders identify when peas offer an economic value and helps provide a tool for feed sellers and buyers to establish a fair price for feed grade peas. A similar market report applicable to Montana could be beneficial to animal feeders, farmers with off-quality peas, and farmers that are distant from traditional food-pea delivery points. A Montana report might expand upon the Alberta report by providing information applicable to both swine and feeder beef rations. Good market information and a strong market for off-quality pulse crops will help lessen farmers' hesitation to expand production.

Establishing a Montana Identity in the International Market
Montana's pulse industry could consider promoting Montana as a premier origination source for pulse crops at international trade shows. Montana's pulse industry has benefited from promotion of the United States pulse industry, but benefit might be realized by establishing some additional market identity. Such differentiation could be subtle, but meaningful, and would not have to be at the expense of the larger U.S. pulse industry identity.

Addressing Challenges Related to Delivery Points & Shipping
As a state deep in the U.S. interior, transportation has always presented challenges for Montana industries. Some pulse merchants and processors expanding operations in Montana are struggling to find suitable and affordable locations and facilities. One of the complications is identifying locations that are compatible with the operations of Montana's rail carriers, not only now, but in the future, when rail traffic is anticipated to increase substantially. Montana government officials and stakeholders may have a role in supporting the fair treatment of pulse shippers by railroads. Members of the pulse industry that need or desire identity-preserved shipping and do not anticipate being able to ship using 110 car unit trains may need to work cooperatively to address future constraints of rail traffic. Public – private partnerships in infrastructure development are something to be considered with regard to development of industrial parks providing rail access and capabilities for international container shipping and domestic truck-trailer-on-train shipments.

Encouraging Pulse Processing & Milling

Montana policy makers could consider actions that encourage or champion further development of pulse processing and milling in Montana. Besides increasing economic activity, creating jobs, and expanding the tax base, expanded pulse processing and milling would create stronger markets and more competition for Montana pulse crops. Pulse processing, such as decorticating, splitting, and milling can allow processors to utilize lesser quality pulse crops and add value to byproducts, providing stronger markets on the occasions that Montana's pulse crop has quality problems.

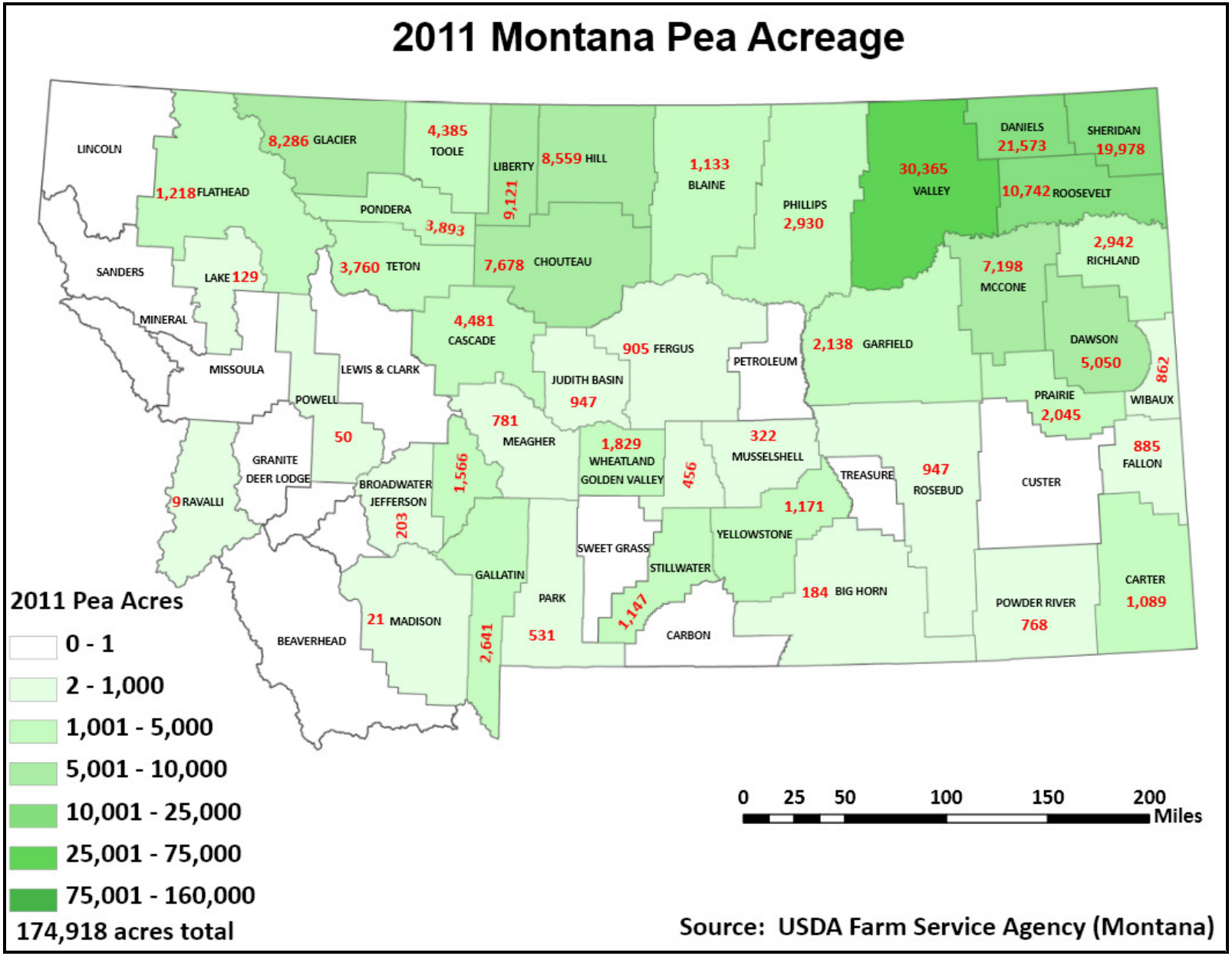
Montana's pulse industry is largely dependent upon foreign exports. Pulse milling and food manufacturing using pulse ingredients in Montana would help Montana's pulse industry diversify its market between foreign and domestic sales, which would strengthen Montana pulse markets and hedge Montana's exposure to changes in currency rates and volatility of global markets.

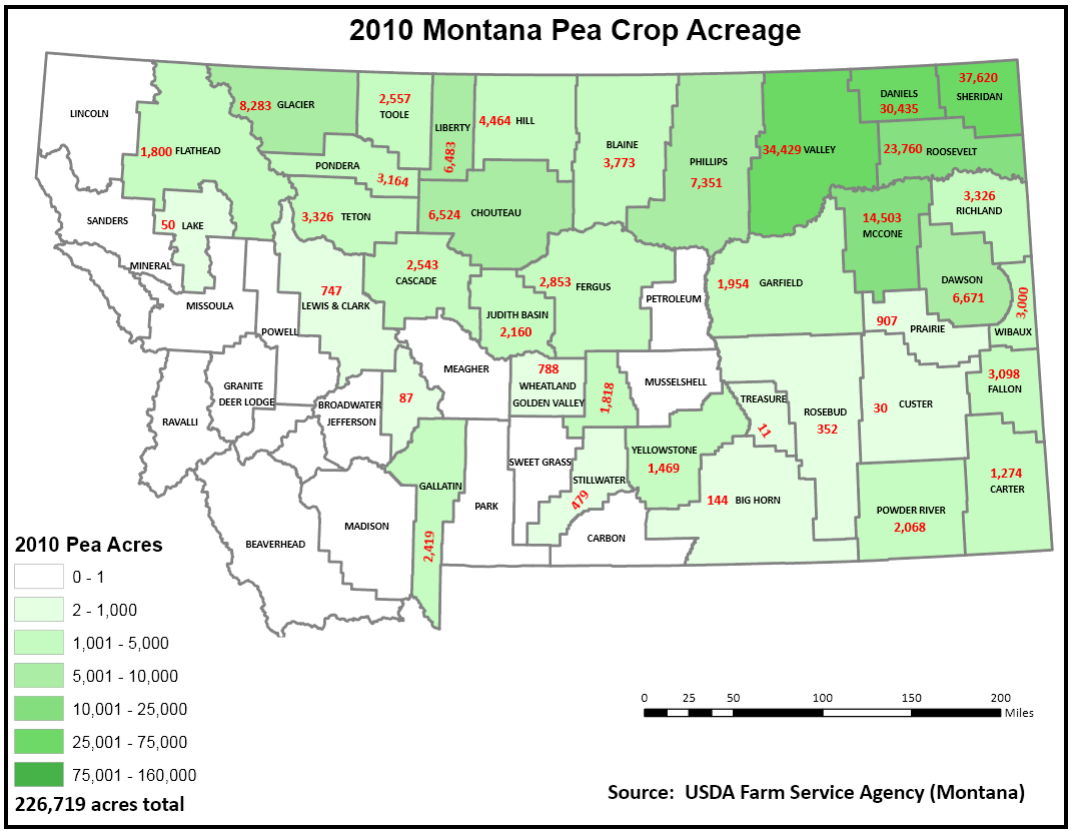
Engagement in Federal Policy Development

Federal government programs and policies impact the pulse industry and Montana's pursuit for expanded production. Some of the areas of potential impact include research (such as crop production, product development, economic analysis, health, and nutrition); multiperil crop insurance, USDA conservation programs, USDA subsidies, school nutrition, and free trade agreements.

APPENDIX A

MONTANA PULSE CROP ACREAGE INFORMATION


2011 Montana Pea Acreage
LINCOLN
8,286 GLACIER
4,385 TOOLE
LIBERTY
8,559 HILL
1,133 BLAINE
PHILLIPS 2,930
30,365 VALLEY
DANIELS 21,573
SHERIDAN 19,978
1,218 FLATHEAD
PONDERA
9,121
3,893
10,742 ROOSEVELT
SANDERS
LAKE 129
3,760 TETON
7,678 CHOUTEAU
7,198 MCCONE
2,942 RICHLAND
MINERAL
4,481 CASCADE
905 FERGUS
2,138 GARFIELD
DAWSON 5,050
862
MISSOULA
LEWIS & CLARK
JUDITH BASIN 947
PETROLEUM
PRAIRIE 2,045
WIBAUX
POWELL
781 MEAGHER
50
1,829 WHEATLAND
GOLDEN VALLEY
322 MUSSELSHELL
885 FALLON
GRANITE
DEER LODGE
1,566
456
947 ROSEBUD
TREASURE
CUSTER
9 RAVALLI
BROADWATER
JEFFERSON
203
1,171
YELLOWSTONE
SWEET GRASS
STILLWATER
GALLATIN
PARK
184 BIG HORN
CARTER 1,089
POWDER RIVER 768
21 MADISON
1,147
BEAVERHEAD
2,641
531
CARBON
2011 Pea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
174,918 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2010 Montana Pea Crop Acreage
LINCOLN
8,283 GLACIER
2,557 TOOLE
LIBERTY
4,464 HILL
BLAINE 3,773
PHILLIPS 7,351
34,429 VALLEY
DANIELS 30,435
37,620 SHERIDAN
23,760 ROOSEVELT
1,800 FLATHEAD
PONDERA
3,164
6,483
3,326 TETON
6,524 CHOUTEAU
SANDERS
50 LAKE
3,326 RICHLAND
14,503 MCCONE
MINERAL
2,543 CASCADE
747 LEWIS & CLARK
2,853 FERGUS
PETROLEUM
1,954 GARFIELD
DAWSON 6,671
3,000
MISSOULA
JUDITH BASIN 2,160
907 PRAIRIE
WIBAUX
POWELL
MEAGHER
788 WHEATLAND
GOLDEN VALLEY
1,818
MUSSELSHELL
3,098 FALLON
GRANITE
DEER LODGE
BROADWATER
JEFFERSON
87
TREASURE
ROSEBUD 352
30 CUSTER
RAVALLI
11
YELLOWSTONE 1,469
SWEET GRASS
STILLWATER
GALLATIN
PARK
144 BIG HORN
1,274 CARTER
MADISON
479
POWDER RIVER 2,068
BEAVERHEAD
2,419
CARBON
2010 Pea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
226,719 acres total
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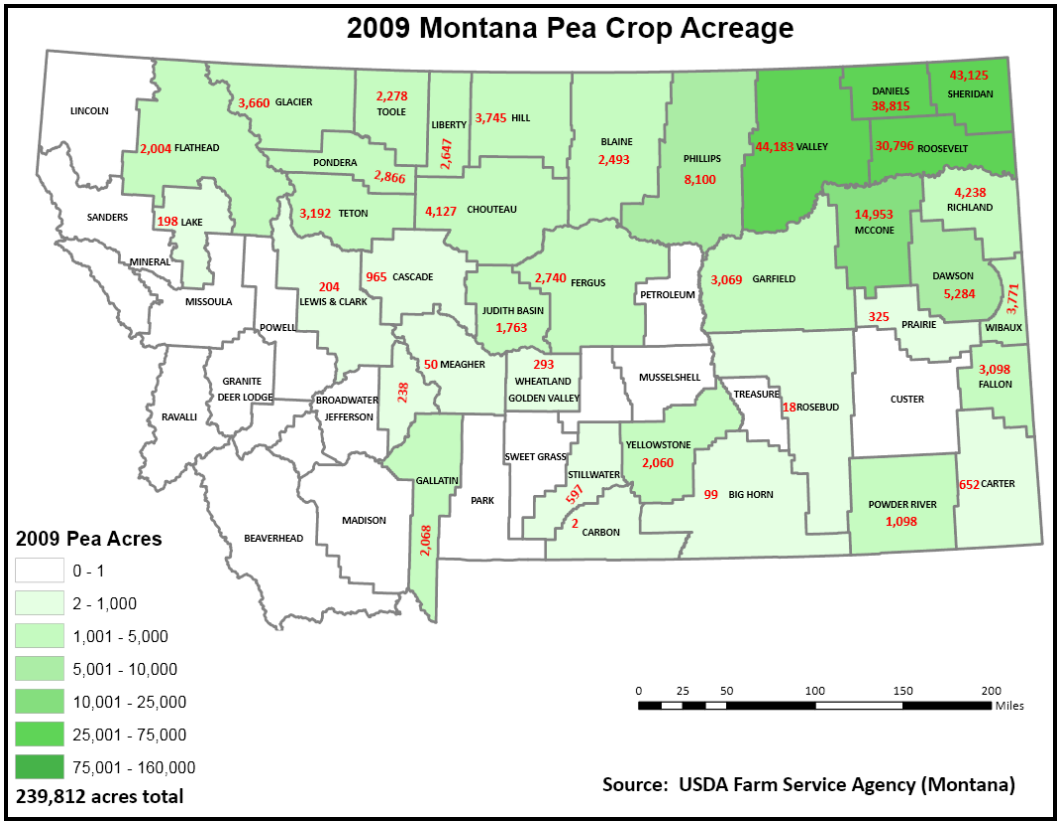
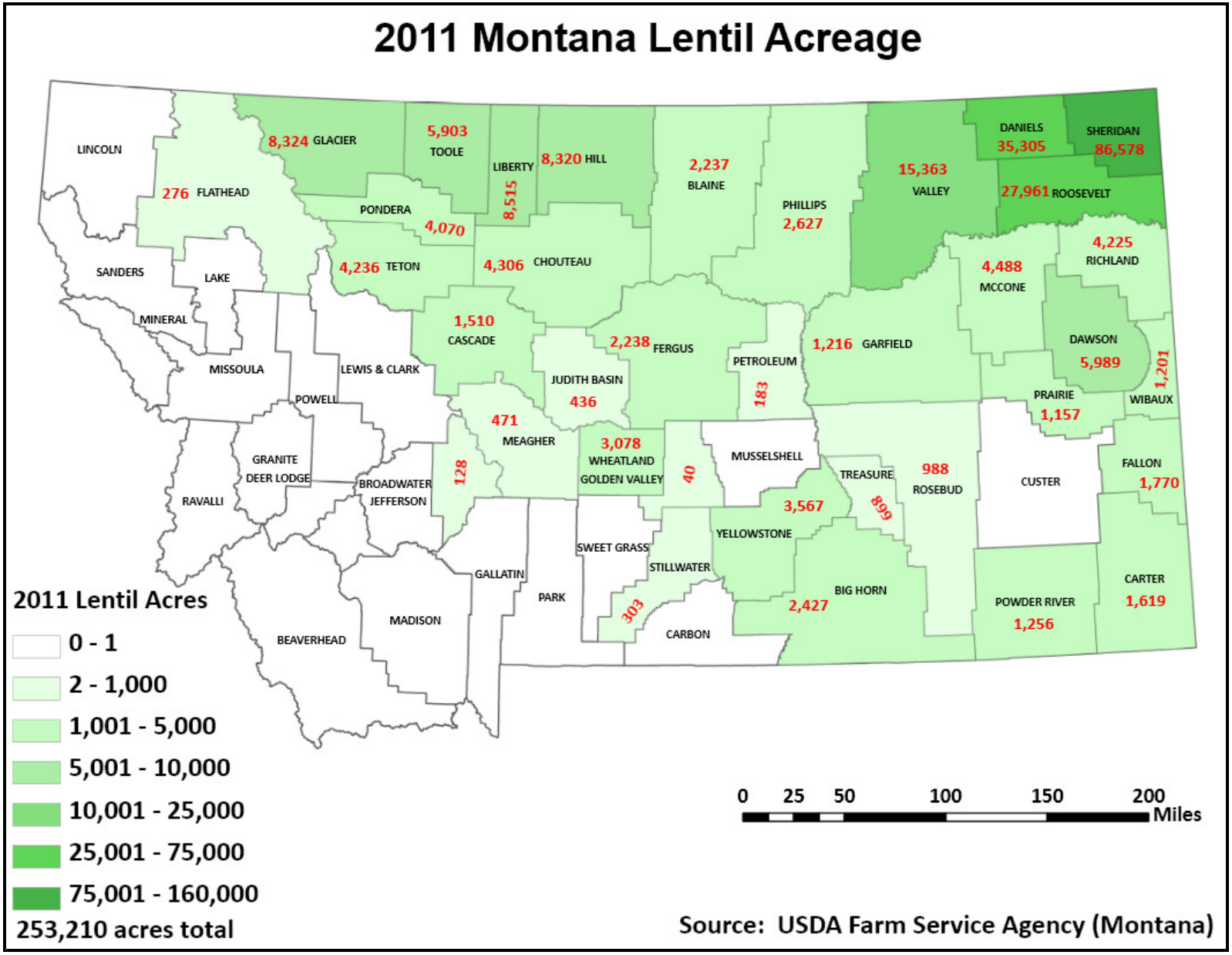
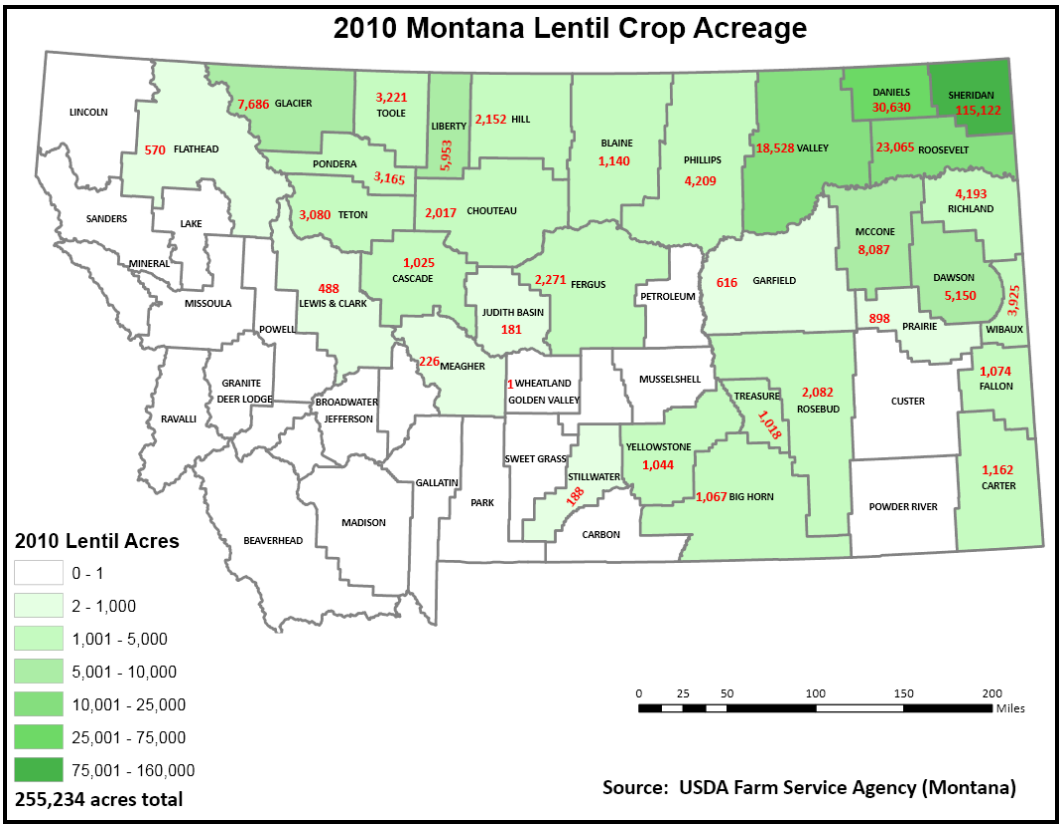
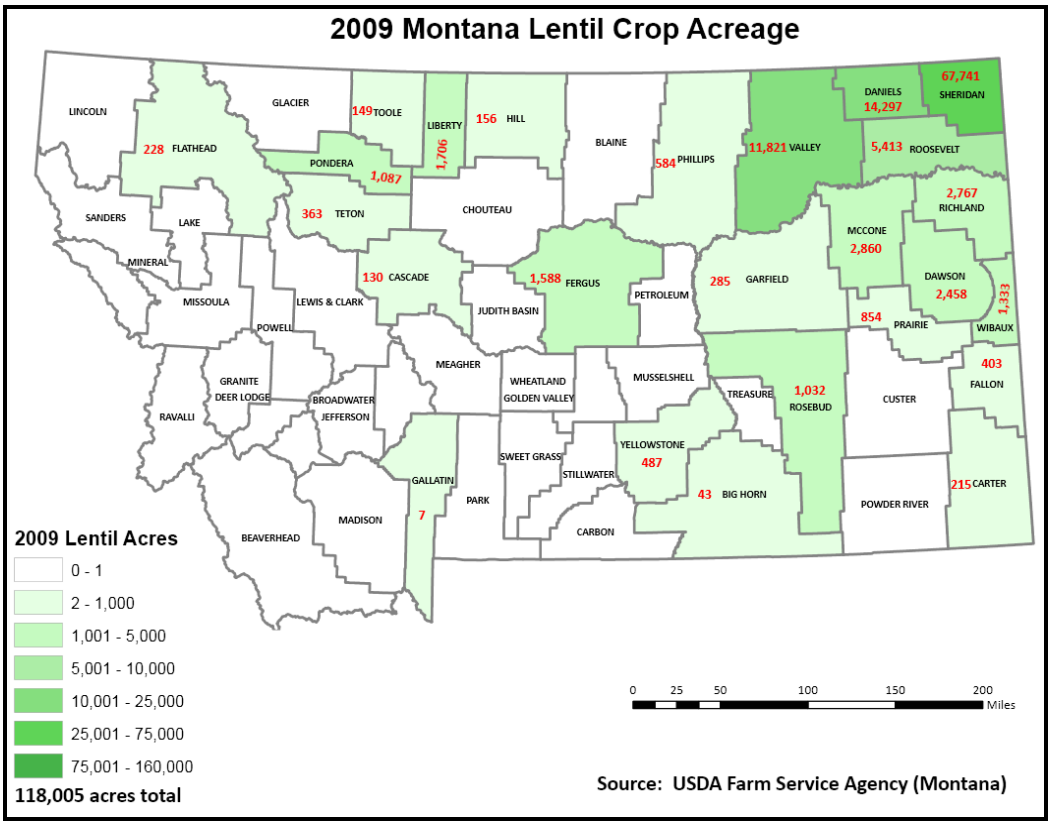
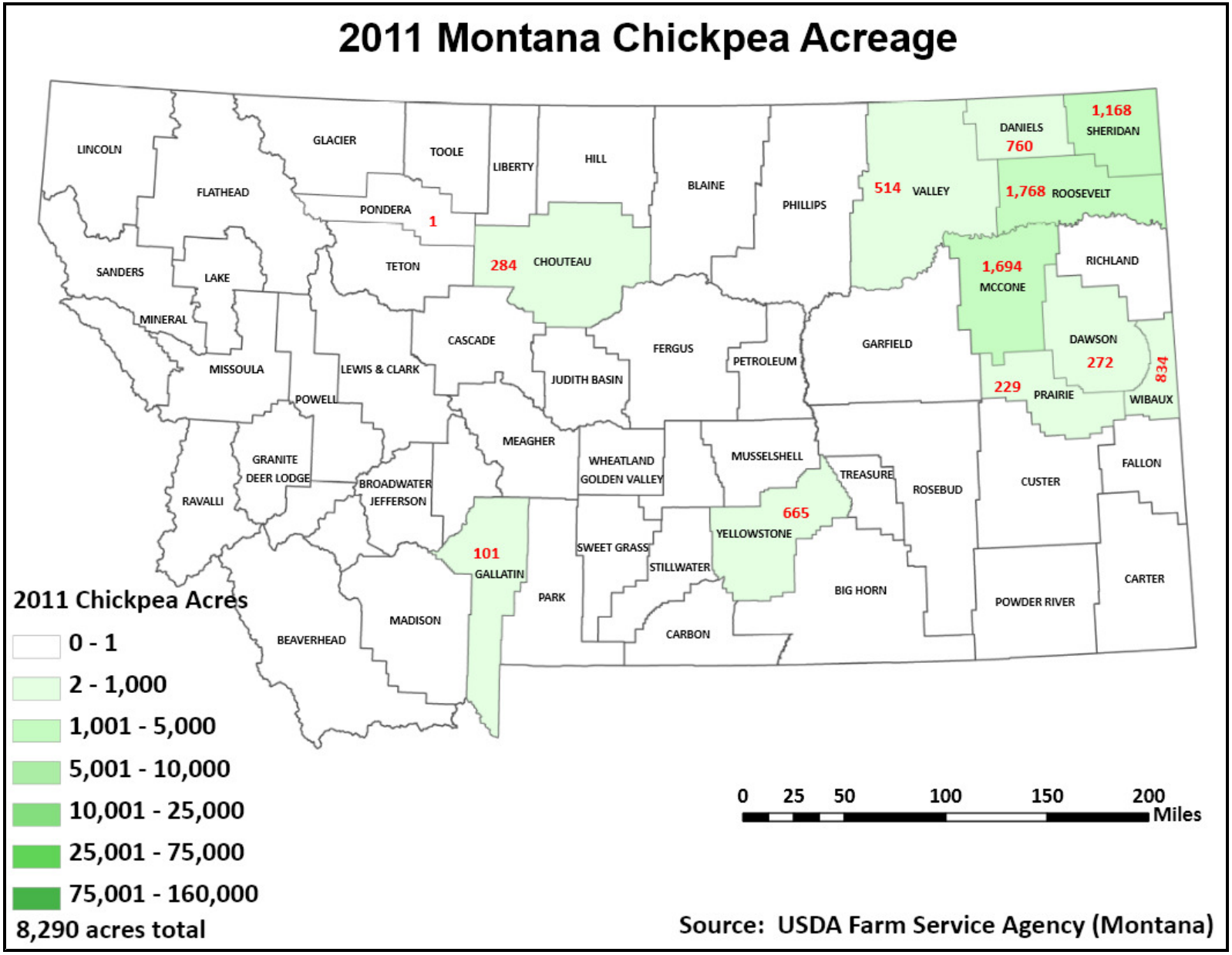
Miles
Source: USDA Farm Service Agency (Montana)

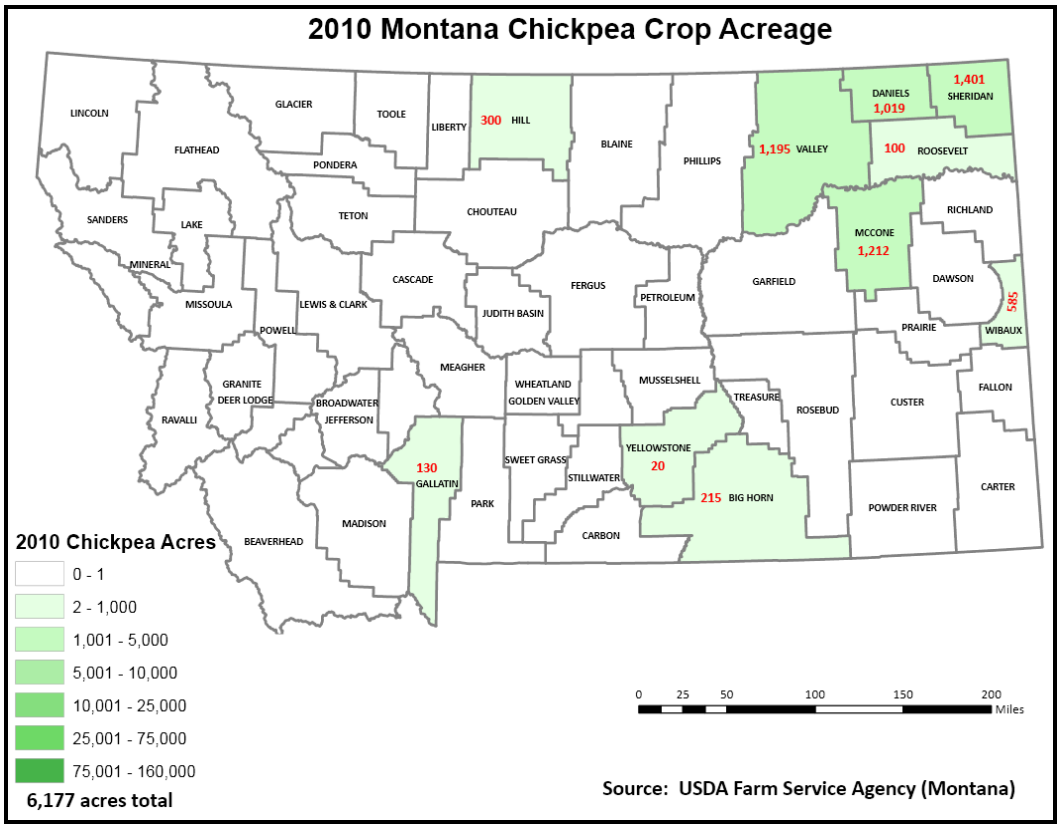

2009 Montana Pea Crop Acreage
LINCOLN
3,660 GLACIER
2,278 TOOLE
LIBERTY
3,745 HILL
BLAINE 2,493
PHILLIPS 8,100
44,183 VALLEY
DANIELS 38,815
43,125 SHERIDAN
30,796 ROOSEVELT
2,004 FLATHEAD
PONDERA
2,866
2,647
3,192 TETON
4,127 CHOUTEAU
SANDERS
198 LAKE
4,238 RICHLAND
14,953 MCCONE
MINERAL
965 CASCADE
204 LEWIS & CLARK
2,740 FERGUS
PETROLEUM
3,069 GARFIELD
DAWSON 5,284
3,771
MISSOULA
JUDITH BASIN 1,763
325 PRAIRIE
WIBAUX
POWELL
50 MEAGHER
293 WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
3,098 FALLON
GRANITE
DEER LODGE
BROADWATER
JEFFERSON
238
TREASURE
18 ROSEBUD
CUSTER
RAVALLI
SWEET GRASS
YELLOWSTONE 2,060
GALLATIN
STILLWATER
PARK
99 BIG HORN
652 CARTER
MADISON
597
POWDER RIVER 1,098
BEAVERHEAD
2,068
2
CARBON
2009 Pea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
239,812 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)

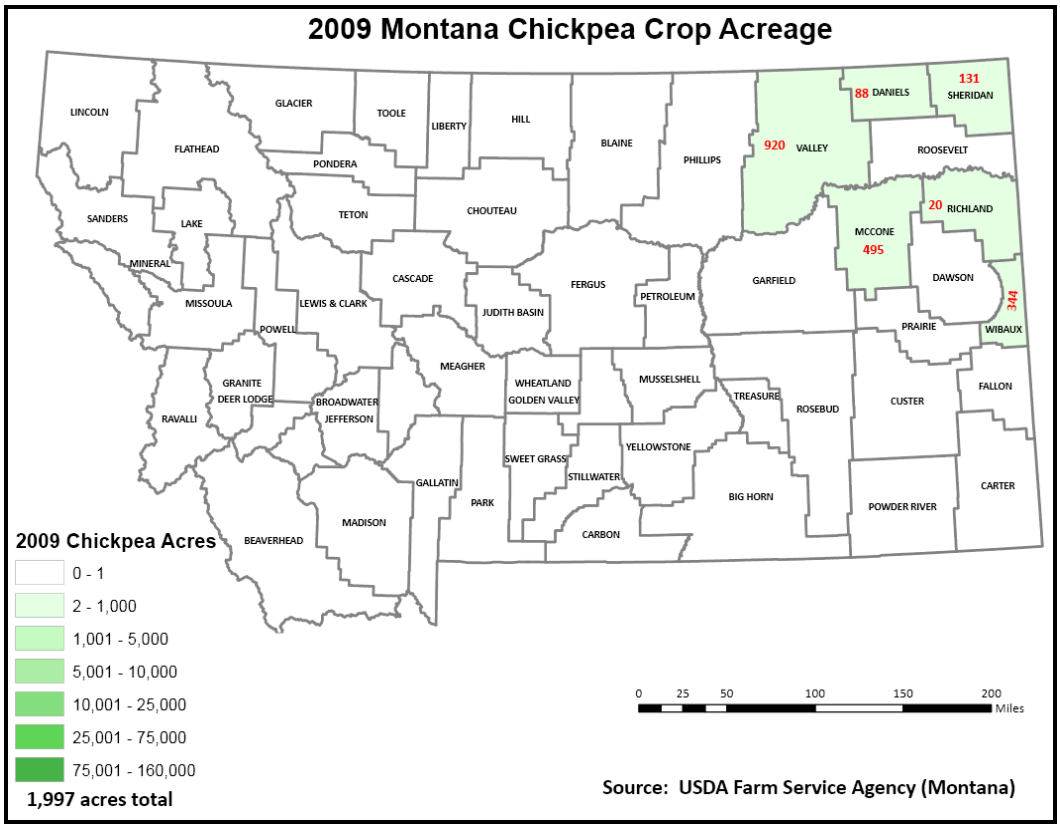

2011 Montana Lentil Acreage
LINCOLN
8,324 GLACIER
5,903 TOOLE
LIBERTY 8,515
8,320 HILL
2,237 BLAINE
15,363 VALLEY
DANIELS 35,305
SHERIDAN 86,578
276 FLATHEAD
PONDERA 4,070
PHILLIPS 2,627
27,961 ROOSEVELT
SANDERS
LAKE
4,236 TETON
4,306 CHOUTEAU
4,488 MCCONE
4,225 RICHLAND
MINERAL
1,510 CASCADE
2,238 FERGUS
PETROLEUM 183
1,216 GARFIELD
DAWSON 5,989
1,201 WIBAUX
MISSOULA
LEWIS & CLARK
JUDITH BASIN 436
POWELL
PRAIRIE 1,157
471 MEAGHER
3,078 WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
GRANITE
DEER LODGE
128
40
TREASURE
988 ROSEBUD
CUSTER
FALLON 1,770
RAVALLI
BROADWATER
JEFFERSON
3,567
899
YELLOWSTONE
SWEET GRASS
STILLWATER
GALLATIN
PARK
BIG HORN 2,427
POWDER RIVER 1,256
CARTER 1,619
303
MADISON
BEAVERHEAD
CARBON
2011 Lentil Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
253,210 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)

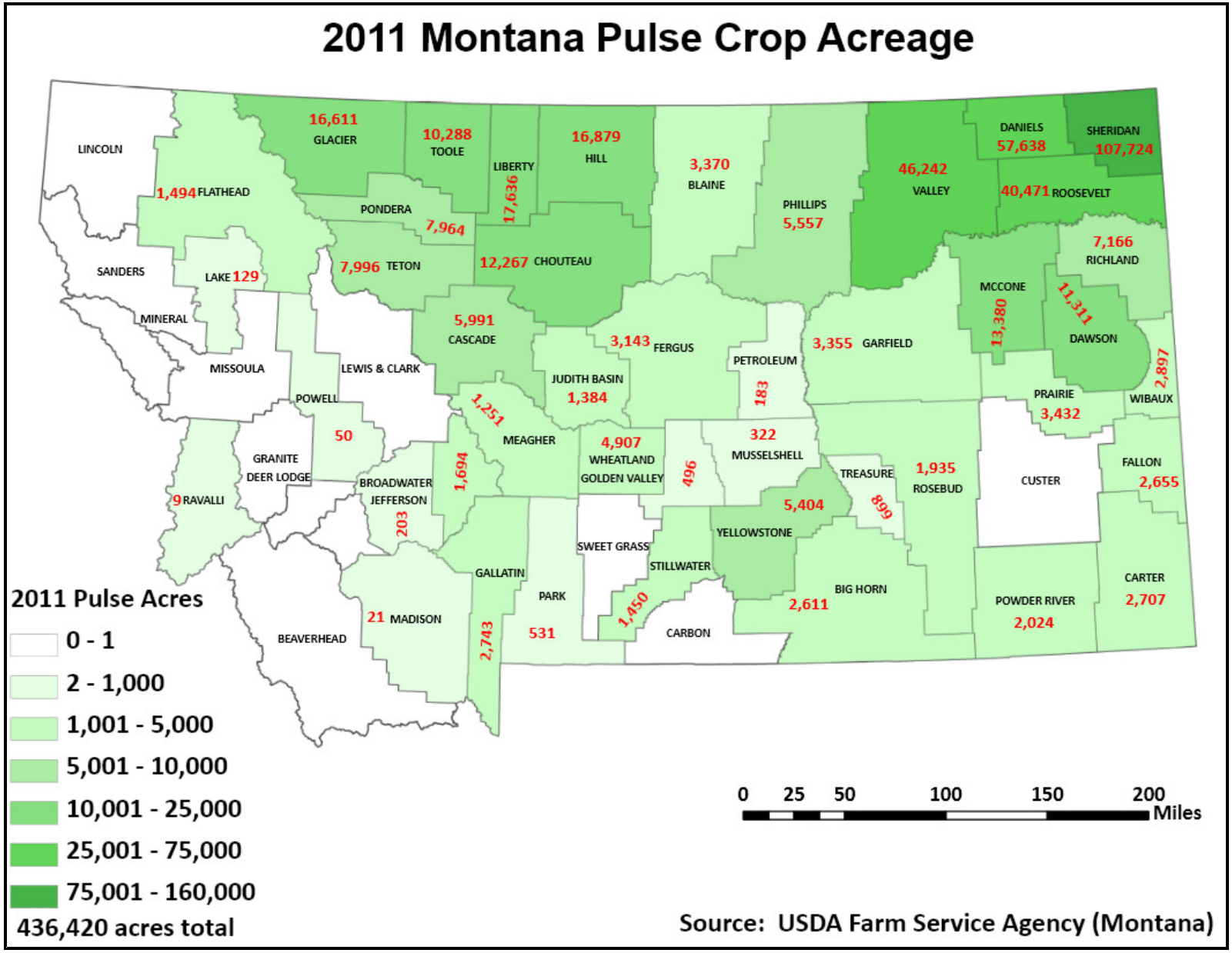

2010 Montana Lentil Crop Acreage
LINCOLN
7,686 GLACIER
3,221 TOOLE
LIBERTY
2,152 HILL
BLAINE 1,140
PHILLIPS 4,209
DANIELS 30,630
SHERIDAN 115,122
570 FLATHEAD
PONDERA
5,953
3,165
18,528 VALLEY
23,065 ROOSEVELT
SANDERS
LAKE
3,080 TETON
2,017 CHOUTEAU
4,193 RICHLAND
MINERAL
1,025 CASCADE
MCCONE 8,087
488 LEWIS & CLARK
2,271 FERGUS
616 GARFIELD
DAWSON 5,150
3,925
MISSOULA
JUDITH BASIN 181
PETROLEUM
898 PRAIRIE
WIBAUX
POWELL
226 MEAGHER
GRANITE
DEER LODGE
1 WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
1,074 FALLON
BROADWATER
JEFFERSON
TREASURE
2,082 ROSEBUD
CUSTER
RAVALLI
1,018
SWEET GRASS
YELLOWSTONE 1,044
1,162 CARTER
GALLATIN
STILLWATER
188
1,067 BIG HORN
PARK
POWDER RIVER
MADISON
CARBON
BEAVERHEAD
2010 Lentil Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
255,234 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2009 Montana Lentil Crop Acreage
LINCOLN
GLACIER
149 TOOLE
LIBERTY
156 HILL
BLAINE
67,741 SHERIDAN
DANIELS 14,297
228 FLATHEAD
PONDERA
1,706
1,087
584 PHILLIPS
11,821 VALLEY
5,413 ROOSEVELT
SANDERS
LAKE
363 TETON
CHOUTEAU
2,767 RICHLAND
MINERAL
MCCONE 2,860
130 CASCADE
1,588 FERGUS
285 GARFIELD
DAWSON 2,458
1,333
MISSOULA
LEWIS & CLARK
PETROLEUM
854 PRAIRIE
WIBAUX
POWELL
JUDITH BASIN
MEAGHER
403 FALLON
GRANITE
DEER LODGE
WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
TREASURE
1,032 ROSEBUD
CUSTER
BROADWATER
JEFFERSON
RAVALLI
SWEET GRASS
YELLOWSTONE 487
GALLATIN
STILLWATER
215 CARTER
PARK
43 BIG HORN
POWDER RIVER
MADISON
7
CARBON
BEAVERHEAD
2009 Lentil Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
118,005 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)

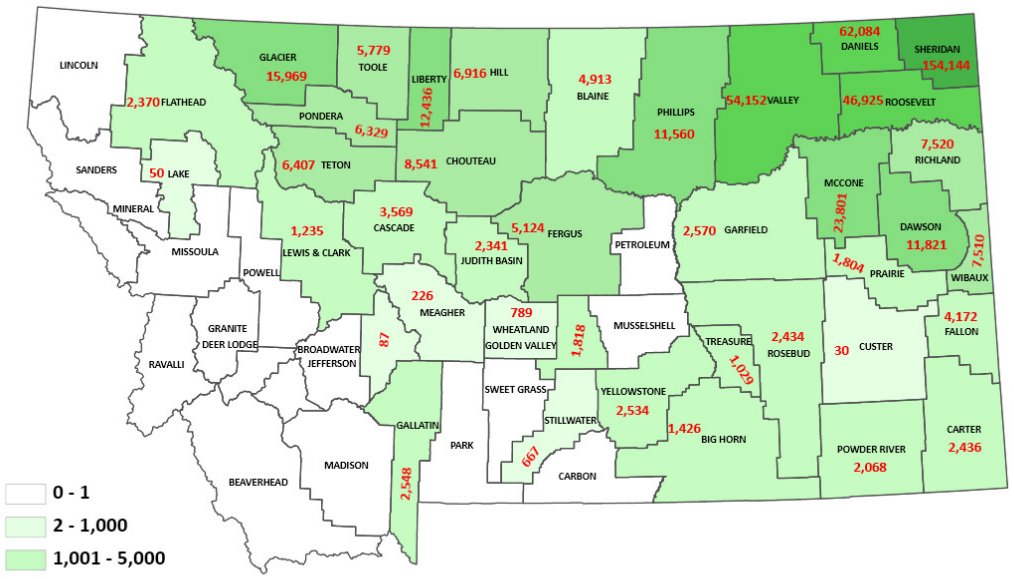

2011 Montana Chickpea Acreage
LINCOLN
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
DANIELS
760
1,168
SHERIDAN
514 VALLEY
1,768 ROOSEVELT
FLATHEAD
PONDERA
1
284 CHOUTEAU
SANDERS
LAKE
TETON
1,694
MCCONE
RICHLAND
MINERAL
CASCADE
FERGUS
PETROLEUM
GARFIELD
DAWSON
272
834
MISSOULA
LEWIS & CLARK
JUDITH BASIN
229
PRAIRIE
WIBAUX
POWELL
MEAGHER
WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
TREASURE
ROSEBUD
CUSTER
FALLON
GRANITE
DEER LODGE
RAVALLI
BROADWATER
JEFFERSON
665
YELLOWSTONE
101
GALLATIN
SWEET GRASS
STILLWATER
PARK
BIG HORN
POWDER RIVER
CARTER
MADISON
BEAVERHEAD
CARBON
2011 Chickpea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
8,290 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2010 Montana Chickpea Crop Acreage
LINCOLN
GLACIER
TOOLE
LIBERTY
300 HILL
BLAINE
PHILLIPS
1,195 VALLEY
DANIELS 1,019
1,401 SHERIDAN
100 ROOSEVELT
RICHLAND
MCCONE 1,212
DAWSON
585
PRAIRIE
WIBAUX
FALLON
CARTER
POWDER RIVER
CUSTER
ROSEBUD
TREASURE
MUSSELSHELL
GARFIELD
PETROLEUM
FERGUS
JUDITH BASIN
CHOUTEAU
PONDERA
TETON
FLATHEAD
SANDERS
LAKE
MINERAL
MISSOULA
LEWIS & CLARK
CASCADE
POWELL
GRANITE
DEER LODGE
RAVALLI
BROADWATER
JEFFERSON
MEAGHER
WHEATLAND
GOLDEN VALLEY
SWEET GRASS
STILLWATER
YELLOWSTONE 20
215 BIG HORN
130 GALLATIN
PARK
CARBON
MADISON
BEAVERHEAD
2010 Chickpea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
6,177 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2009 Montana Chickpea Crop Acreage
LINCOLN
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
920 VALLEY
88 DANIELS
131 SHERIDAN
ROOSEVELT
20 RICHLAND
MCCONE 495
DAWSON
344
PRAIRIE
WIBAUX
FALLON
CARTER
POWDER RIVER
CUSTER
ROSEBUD
TREASURE
MUSSELSHELL
GARFIELD
PETROLEUM
FERGUS
JUDITH BASIN
CHOUTEAU
PONDERA
TETON
FLATHEAD
SANDERS
LAKE
MINERAL
MISSOULA
LEWIS & CLARK
CASCADE
POWELL
GRANITE
DEER LODGE
RAVALLI
BROADWATER
JEFFERSON
MEAGHER
WHEATLAND
GOLDEN VALLEY
SWEET GRASS
STILLWATER
YELLOWSTONE
BIG HORN
GALLATIN
PARK
CARBON
MADISON
BEAVERHEAD
2009 Chickpea Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
1,997 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2011 Montana Pulse Crop Acreage
LINCOLN
16,611 GLACIER
10,288 TOOLE
LIBERTY
16,879 HILL
3,370 BLAINE
PHILLIPS 5,557
46,242 VALLEY
DANIELS 57,638
SHERIDAN 107,724
1,494 FLATHEAD
PONDERA
17,636
7,964
40,471 ROOSEVELT
7,166 RICHLAND
SANDERS
LAKE 129
7,996 TETON
12,267 CHOUTEAU
MCCONE
13,380
11,311
DAWSON
MINERAL
5,991 CASCADE
3,143 FERGUS
PETROLEUM
183
3,355 GARFIELD
2,897
WIBAUX
MISSOULA
LEWIS & CLARK
JUDITH BASIN 1,384
PRAIRIE 3,432
POWELL
50
1,251
MEAGHER
4,907 WHEATLAND
GOLDEN VALLEY
322 MUSSELSHELL
FALLON 2,655
GRANITE
DEER LODGE
9 RAVALLI
BROADWATER
JEFFERSON
203
1,694
496
TREASURE
1,935 ROSEBUD
CUSTER
5,404
899
YELLOWSTONE
SWEET GRASS
STILLWATER
GALLATIN
PARK
531
1,450
BIG HORN
2,611
POWDER RIVER
2,024
CARTER
2,707
21 MADISON
BEAVERHEAD
2,743
CARBON
2011 Pulse Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
436,420 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)

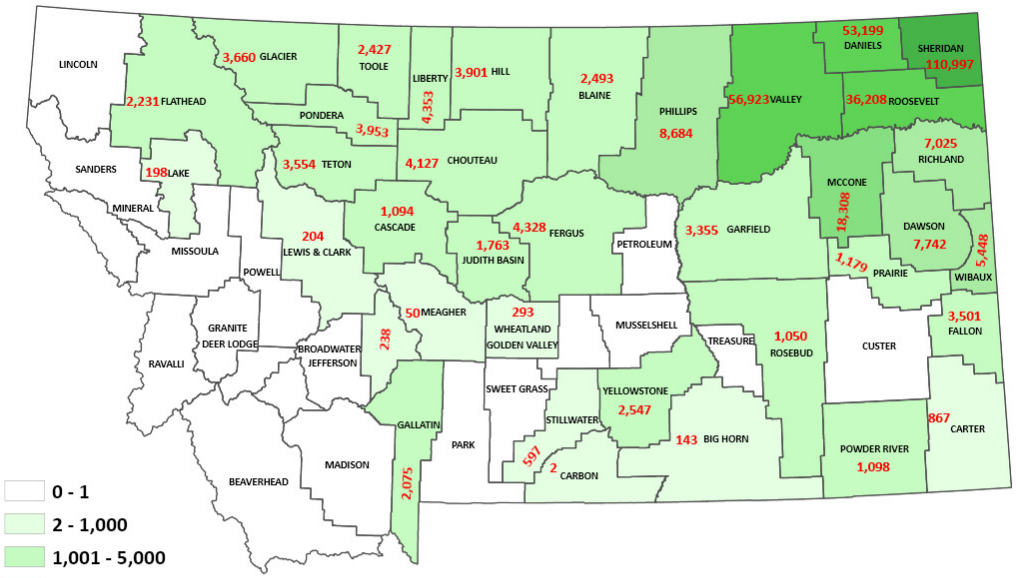
2010 Montana Pulse Crop Acreage



488,130 acres total

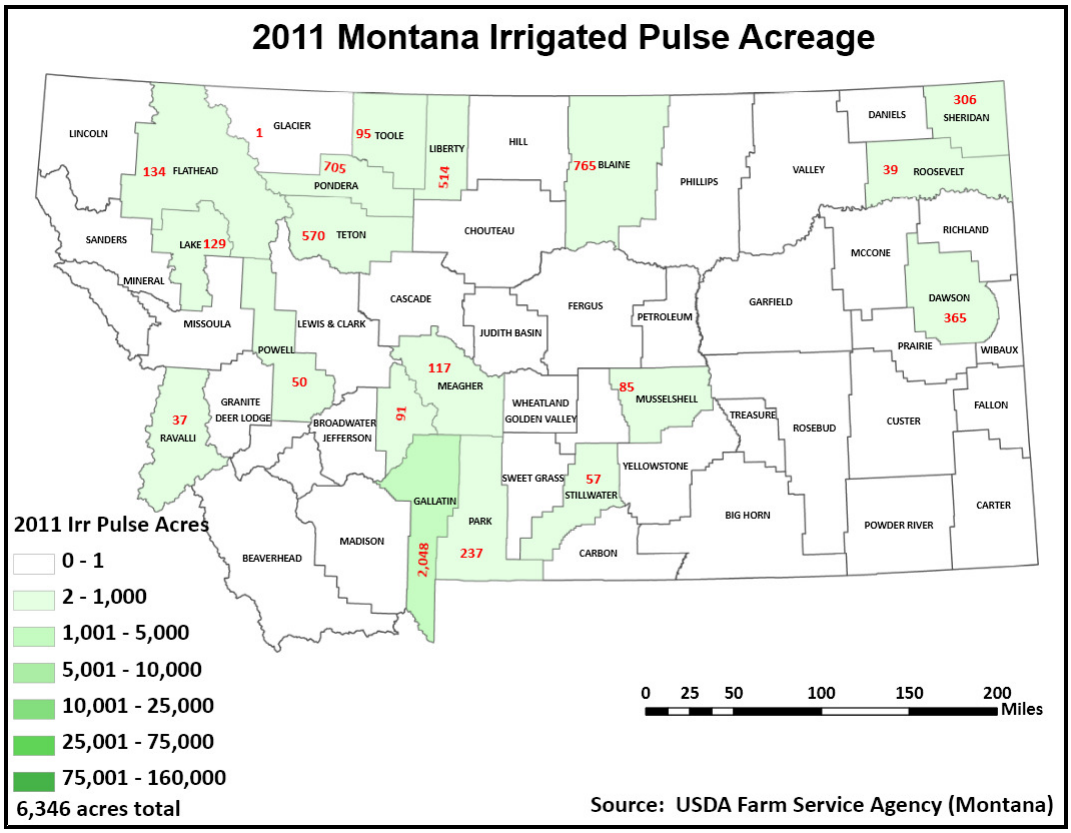
Source: USDA Farm Service Agency (Montana)

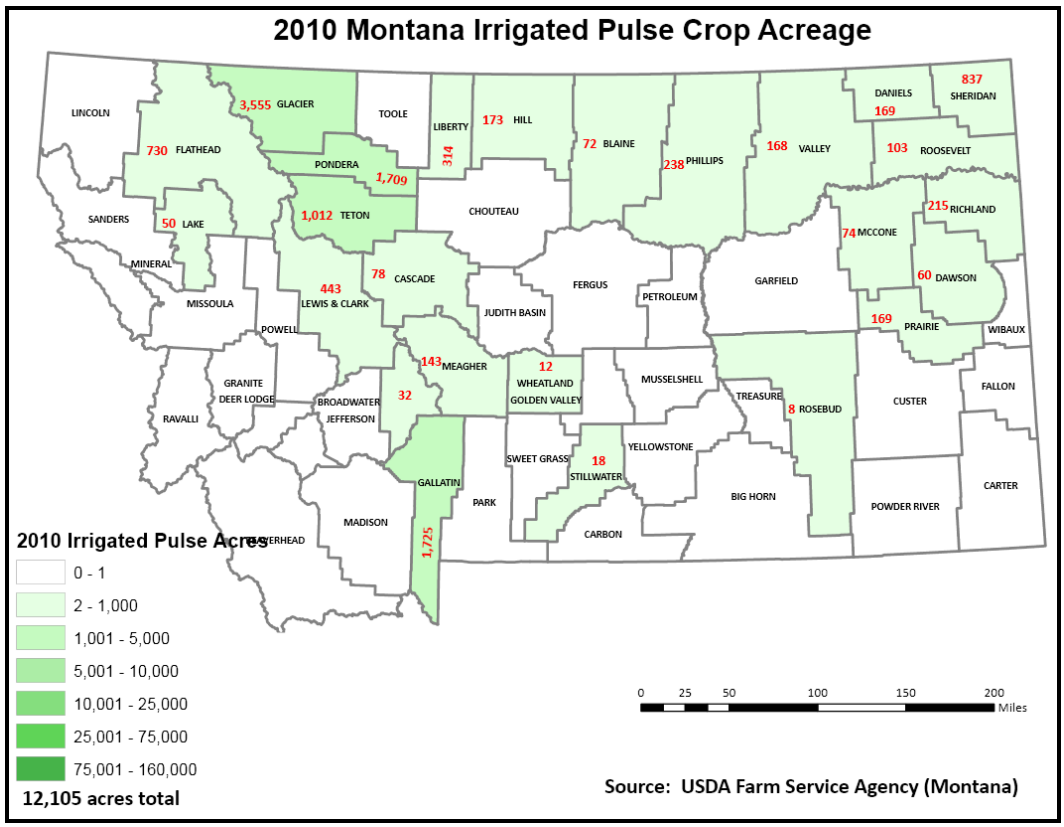
2009 Montana Pulse Crop Acreage



359,815 acres total

Source: USDA Farm Service Agency (Montana)


2011 Montana Irrigated Pulse Acreage
LINCOLN
GLACIER
1
95 TOOLE
LIBERTY
HILL
765 BLAINE
PHILLIPS
VALLEY
DANIELS
306 SHERIDAN
134 FLATHEAD
705 PONDERA
514
39 ROOSEVELT
SANDERS
LAKE 129
570 TETON
CHOUTEAU
RICHLAND
MCCONE
MINERAL
CASCADE
FERGUS
GARFIELD
DAWSON
365
MISSOULA
LEWIS & CLARK
JUDITH BASIN
PETROLEUM
PRAIRIE
WIBAUX
POWELL
50
117 MEAGHER
85 MUSSELSHELL
GRANITE
DEER LODGE
WHEATLAND
GOLDEN VALLEY
TREASURE
ROSEBUD
CUSTER
FALLON
37 RAVALLI
BROADWATER
JEFFERSON
91
YELLOWSTONE
SWEET GRASS
57 STILLWATER
GALLATIN
PARK
BIG HORN
POWDER RIVER
CARTER
MADISON
BEAVERHEAD
2,048
237
CARBON
2011 Irr Pulse Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
6,346 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)


2010 Montana Irrigated Pulse Crop Acreage
LINCOLN
3,555 GLACIER
TOOLE
LIBERTY
173 HILL
72 BLAINE
PHILLIPS
168 VALLEY
DANIELS
837 SHERIDAN
169
730 FLATHEAD
PONDERA
1,709
314
103 ROOSEVELT
238
SANDERS
50 LAKE
1,012 TETON
CHOUTEAU
215 RICHLAND
74 MCCONE
MINERAL
78 CASCADE
FERGUS
GARFIELD
60 DAWSON
MISSOULA
443 LEWIS & CLARK
JUDITH BASIN
PETROLEUM
169 PRAIRIE
WIBAUX
POWELL
143 MEAGHER
12 WHEATLAND GOLDEN VALLEY
MUSSELSHELL
TREASURE
8 ROSEBUD
CUSTER
FALLON
GRANITE
DEER LODGE
RAVALLI
BROADWATER
JEFFERSON
32
YELLOWSTONE
SWEET GRASS
18 STILLWATER
GALLATIN
PARK
BIG HORN
POWDER RIVER
CARTER
MADISON
BEAVERHEAD
1,725
CARBON
2010 Irrigated Pulse Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
12,105 acres total
0 25 50 100 150 200
Miles
Source: USDA Farm Service Agency (Montana)

MONTANA PULSE ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	1,444	3,376	4,203	5,457	5,144	5,040	31,568	79,537	77,597	56,140	53,973	53,199	62,084	57,638
Dawson	8,216	6,993	7,389	6,063	7,382	4,198	3,621	3,526	7,215	8,941	9,865	7,742	11,821	11,311
McCone	1,354	942	952	1,944	1,886	1,433	1,327	3,419	8,113	8,235	14,284	18,308	23,801	13,380
Richland	2,169	2,686	6,042	5,450	5,157	2,775	4,831	8,967	9,468	8,589	8,659	7,025	7,520	7,166
Roosevelt	1,373	4,821	8,814	14,502	15,695	10,772	19,353	37,917	40,515	33,544	33,054	36,208	46,925	40,471
Sheridan	3,245	6,585	10,276	14,216	16,754	16,647	44,487	82,471	119,639	110,631	95,261	110,997	154,144	107,724
Valley	1,420	1,338	2,442	2,660	5,003	8,744	21,474	41,136	55,042	51,258	55,328	56,923	54,152	46,242
Northeast MT	19,222	26,741	40,118	50,292	57,020	49,609	126,661	256,972	317,589	277,338	270,423	290,402	360,446	283,932
Blaine	1,346	1,892	2,071	2,221	755	543	976	3,350	2,365	2,162	2,393	2,493	4,913	3,370
Phillips	596	851	2,523	1,654	3,022	1,444	1,231	3,870	6,571	6,395	8,119	8,684	11,560	5,557
Blaine-Phillips	1,942	2,742	4,594	3,874	3,777	1,987	2,207	7,220	8,936	8,557	10,512	11,177	16,473	8,927
Big Horn	872	5,521	4,475	4,515	947	766	495	1,916	7,806	7,619	119	143	1,426	2,611
Carbon	2,051	2,149	2,418	1,903	2,607	2,051	2,146	2,146	2,388	1,709	1,301	2	0	0
Rosebud	2,316	1,825	2,043	1,961	1,898	1,064	1,705	1,254	1,400	1,229	1,157	1,050	2,434	1,935
Stillwater	811	927	470	618	1,402	1,219	1,886	1,495	1,795	716	1,884	597	667	1,450
Treasure	753	1,090	939	955	919	408	461	700	216	636	548	0	1,029	899
Yellowstone	2,409	2,325	2,559	2,142	2,261	1,373	1,570	1,419	1,180	1,167	1,969	2,547	2,534	5,404
Upper Yellowstone Corridor	9,211	13,837	12,904	12,092	10,033	6,882	8,262	8,930	14,784	13,076	6,978	4,338	8,089	12,299
Custer	719	2,138	1,370	1,226	1,075	746	694	791	997	697	615	0	30	0
Dawson **(also in NE MT)**	8,216	6,993	7,389	6,063	7,382	4,198	3,621	3,526	7,215	8,941	9,865	7,742	11,821	11,311
Prairie	1,730	1,977	2,857	2,067	2,568	1,722	2,002	1,681	1,966	1,211	2,265	1,179	1,804	3,432
Richland **(also in NE MT)**	2,169	2,686	6,042	5,450	5,157	2,775	4,831	8,967	9,468	8,589	8,659	7,025	7,520	7,166
Lower Yellowstone Corridor	12,834	13,794	17,658	14,806	16,181	9,441	11,147	14,965	19,646	19,439	21,404	15,945	21,174	21,909
Beaverhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broadwater	786	606	475	661	852	610	1,042	1,042	1,596	903	0	238	87	1,694
Gallatin	235	1,132	615	744	974	1,231	1,131	1,353	1,834	1,752	1,294	2,075	2,548	2,743
Jefferson	196	0	0	0	0	0	0	0	0	0	0	0	0	203
Lewis & Clark	50	40	1	0	0	0	0	0	0	0	0	204	1,235	0
Madison	239	457	164	55	38	103	0	0	15	25	92	0	0	21
Southwest MT	1,505	2,235	1,254	1,460	1,863	1,944	2,172	2,395	3,445	2,680	1,385	2,517	3,870	4,660
Cascade	1,004	737	885	683	318	726	543	686	1,160	1,685	1,198	1,094	3,569	5,991
Chouteau	4,073	9,343	6,602	4,818	2,108	3,873	3,603	4,261	2,890	4,038	3,788	4,127	8,541	12,267
Glacier	2,246	824	490	523	523	880	972	2,625	8,719	8,318	2,773	3,660	15,969	16,611
Hill	7,864	7,292	6,091	2,943	479	1,643	2,942	3,585	3,912	3,832	3,062	3,901	6,916	16,879
Liberty	7,152	1,825	3,155	2,611	1,175	1,626	3,947	5,916	4,004	5,699	2,485	4,353	12,436	17,636
Pondera	205	1,202	329	1,671	1,015	1,525	3,517	4,709	4,457	4,485	1,920	3,953	6,329	7,964
Teton	554	1,335	883	630	730	1,009	755	1,094	2,840	4,565	1,623	3,554	6,407	7,996
Toole	456	692	437	638	130	434	225	543	2,766	2,390	743	2,427	5,779	10,288
Golden Triangle	23,554	23,249	18,870	14,517	6,477	11,717	16,503	23,419	30,747	35,012	17,592	27,069	65,945	95,632
Fergus	1,216	1,763	1,143	1,035	593	233	718	818	1,239	1,646	2,718	4,328	5,124	3,143
Judith Basin	61	111	127	41	57	20	109	466	2,480	3,362	3,312	1,763	2,341	1,384
Central MT	1,277	1,873	1,271	1,076	650	253	826	1,284	3,719	5,007	6,030	6,090	7,466	4,527
Golden Valley	0	0	0	3,268	0	0	0	405	0	0	407	0	1,818	496
Meagher	100	537	0	0	0	134	215	428	0	0	0	50	226	1,251
Park	124	60	45	94	0	65	30	308	209	294	0	0	0	531
Sweet Grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland	0	0	0	0	0	298	395	881	0	441	1,159	293	789	4,907
South Central MT	224	597	45	3,362	0	497	640	2,022	209	735	1,565	343	2,833	7,185

Source: USDA Farm Service Agency (Montana)

MONTANA PULSE ACREAGE BY COUNTY 1998 – 2011(continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	84	1,094	1,025	1,176	873	233	281	306	1,793	1,904	1,962	867	2,436	2,707
Fallon	416	341	418	1,080	1,416	784	797	949	1,020	1,213	0	3,501	4,172	2,655
Powder River	0	0	0	0	0	0	0	80	55	37	247	1,098	2,068	2,024
Wibaux	613	1,137	1,443	1,506	2,574	2,459	6,037	4,599	6,819	3,979	6,018	5,448	7,510	2,897
Southeast MT	1,113	2,572	2,886	3,763	4,863	3,477	7,114	5,934	9,686	7,132	8,227	10,915	16,186	10,283
Garfield	0	152	288	840	558	507	885	2,779	2,303	2,946	3,352	3,355	2,570	3,355
Musselshell	3,121	5,841	1,148	1,220	0	566	53	165	0	41	0	0	0	322
Petroleum	73	44	25	0	0	0	0	0	0	0	0	0	0	183
East Central	3,194	6,038	1,461	2,060	558	1,073	938	2,944	2,303	2,987	3,352	3,355	2,570	3,859
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flathead	2,139	1,768	1,233	1,457	1,514	993	1,288	1,098	648	1,919	1,750	2,231	2,370	1,494
Granite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	154	194	246	445	515	321	247	287	89	106	0	198	50	129
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	80	0	0	0	0	0	0	0
Missoula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Ravalli	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Sanders	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	2,293	1,962	1,479	1,902	2,029	1,314	1,615	1,385	737	2,025	1,750	2,430	2,420	1,682
State Total	**65,984**	**85,962**	**89,108**	**97,689**	**90,911**	**81,220**	**169,634**	**314,976**	**395,117**	**356,457**	**330,695**	**359,815**	**488,130**	**436,418**

Source: USDA Farm Service Agency (Montana)

MONTANA LENTIL ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	185	760	1,415	593	1,633	1,662	20,119	44,720	20,859	7,718	11,199	14,297	30,630	35,305
Dawson	0	0	0	79	249	142	0	888	1,519	1,923	2,407	2,458	5,150	5,989
McCone	0	119	158	161	402	538	721	795	1,528	1,516	2,523	2,860	8,087	4,488
Richland	0	335	525	974	1,358	1,495	1,947	3,376	2,868	2,282	3,275	2,767	4,193	4,225
Roosevelt	623	1,182	2,002	4,802	4,028	5,285	8,261	13,276	8,456	3,626	3,605	5,413	23,065	27,961
Sheridan	1,719	3,498	6,746	6,334	8,951	11,033	32,366	58,920	78,156	55,088	44,646	67,741	115,122	86,578
Valley	1,067	495	707	362	387	1,182	4,995	13,496	14,885	5,854	7,015	11,821	18,528	15,363
Northeast MT	3,594	6,388	11,553	13,307	17,009	21,337	68,409	135,471	128,272	78,007	74,670	107,355	204,775	179,908
Blaine	1,001	806	539	286	0	0	0	0	0	0	0	0	1,140	2,237
Phillips	283	167	512	627	608	123	23	61	15	0	0	584	4,209	2,627
Blaine-Phillips	1,285	973	1,051	913	608	123	23	61	15	0	0	584	5,349	4,864
Big Horn	225	0	0	362	0	187	0	0	0	0	0	43	1,067	2,427
Carbon	0	0	0	227	137	223	0	0	241	0	0	0	0	0
Rosebud	1,188	820	838	847	918	669	675	492	936	568	564	1,032	2,082	988
Stillwater	73	0	0	374	238	0	26	0	0	0	95	0	188	303
Treasure	152	337	152	348	158	152	349	588	0	525	438	0	1,018	899
Yellowstone	126	254	334	836	893	130	168	30	0	0	0	487	1,044	3,567
Upper Yellowstone Corridor	1,763	1,412	1,324	2,993	2,343	1,361	1,218	1,110	1,177	1,093	1,097	1,563	5,399	8,184
Custer	22	1,225	0	0	0	0	0	0	0	0	0	0	0	0
Dawson **(also in NE MT)**	0	0	0	79	249	142	0	888	1,519	1,923	2,407	2,458	5,150	5,989
Prairie	0	236	289	0	0	287	612	291	565	0	679	854	898	1,157
Richland **(also in NE MT)**	0	335	525	974	1,358	1,495	1,947	3,376	2,868	2,282	3,275	2,767	4,193	4,225
Lower Yellowstone Corridor	22	1,795	814	1,054	1,607	1,923	2,559	4,555	4,952	4,205	6,362	6,078	10,241	11,371
Beaverhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broadwater	0	0	0	0	0	0	0	0	0	0	0	0	0	128
Gallatin	0	0	0	0	0	0	0	0	11	0	0	7	0	0
Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lewis & Clark	0	0	1	0	0	0	0	0	0	0	0	0	488	0
Madison	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southwest MT	0	0	1	0	0	0	0	0	11	0	0	7	488	128
Cascade	339	215	317	205	200	605	404	364	341	341	224	130	1,025	1,510
Chouteau	1,212	1,069	615	310	52	539	391	449	127	108	59	0	2,017	4,306
Glacier	95	0	0	0	0	0	0	0	514	247	332	0	7,686	8,324
Hill	2,991	1,496	1,331	547	0	443	901	1,216	864	1,243	0	156	2,152	8,320
Liberty	2,166	678	1,181	282	396	0	798	2,481	1,409	1,504	0	1,706	5,953	8,515
Pondera	205	213	135	0	0	47	146	131	93	82	0	1,087	3,165	4,070
Teton	228	319	77	42	0	0	1	127	314	0	0	363	3,080	4,236
Toole	236	147	222	0	0	78	41	0	0	0	0	149	3,221	5,903
Golden Triangle	7,472	4,136	3,878	1,385	648	1,712	2,682	4,768	3,661	3,524	614	3,589	28,300	45,184
Fergus	284	392	149	228	154	176	455	513	735	802	734	1,588	2,271	2,238
Judith Basin	61	45	90	41	0	0	0	20	133	267	119	0	181	436
Central MT	345	437	239	269	154	176	455	533	868	1,069	852	1,588	2,452	2,675
Golden Valley	0	0	0	0	0	0	0	0	0	0	0	0	0	40
Meagher	0	0	0	0	0	0	60	428	0	0	0	0	226	471
Park	48	0	45	0	0	0	0	93	102	0	0	0	0	0
Sweet Grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland	0	0	0	0	0	0	0	0	0	0	92	0	1	3,078
South Central MT	48	0	45	0	0	0	60	521	102	0	92	0	227	3,588

Source: USDA Farm Service Agency (Montana)

MONTANA LENTIL ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	0	0	0	0	0	233	0	0	225	185	111	215	1,162	1,619
Fallon	0	0	42	791	1,356	657	419	592	563	148	0	403	1,074	1,770
Powder River	0	0	0	0	0	0	0	0	0	0	0	0	0	1,256
Wibaux	70	592	262	355	753	1,204	2,201	2,033	3,484	901	1,449	1,333	3,925	1,201
Southeast MT	70	592	305	1,146	2,109	2,094	2,620	2,625	4,272	1,234	1,560	1,952	6,161	5,845
Garfield	0	45	82	20	0	0	0	0	0	0	0	286	616	1,216
Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum	0	0	8	0	0	0	0	0	0	0	0	0	0	183
East Central	0	45	90	20	0	0	0	0	0	0	0	286	616	1,399
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flathead	1,245	1,011	908	716	460	521	942	819	61	0	50	228	570	276
Granite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missoula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ravalli	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanders	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	1,245	1,011	908	716	460	521	942	819	61	0	50	228	570	276
State Total	**15,843**	**16,454**	**19,682**	**20,748**	**23,332**	**27,610**	**77,020**	**146,199**	**139,003**	**84,927**	**79,614**	**118,005**	**255,234**	**253,209**

Source: USDA Farm Service Agency (Montana)

MONTANA PEA ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	752	503	421	1,819	2,773	2,773	10,386	33,754	54,397	47,822	42,456	38,815	30,435	21,573
Dawson	6,229	3,651	2,303	2,700	4,395	2,308	2,194	1,211	4,623	6,468	6,231	5,284	6,671	5,050
McCone	1,238	691	113	466	1,023	559	607	2,623	6,585	5,890	11,591	14,953	14,503	7,198
Richland	1,476	1,232	2,262	3,322	3,272	1,250	2,830	5,537	6,484	6,080	5,327	4,238	3,326	2,942
Roosevelt	150	715	569	3,547	6,994	5,351	10,239	23,788	31,172	28,297	28,305	30,796	23,760	10,742
Sheridan	1,177	2,160	1,892	4,476	5,289	5,497	11,968	23,398	37,655	49,361	49,605	43,125	37,620	19,978
Valley	353	227	504	912	2,830	6,491	15,993	27,153	38,371	44,277	47,890	44,183	34,429	30,365
Northeast MT	11,376	9,179	8,064	17,243	26,576	24,229	54,216	117,465	179,287	188,193	191,404	181,393	150,744	97,848
Blaine	0	787	1,092	1,935	755	543	976	3,350	2,288	2,092	2,312	2,493	3,773	1,133
Phillips	313	158	568	327	1,417	873	1,208	3,809	6,456	6,395	8,119	8,100	7,351	2,930
Blaine-Phillips	313	945	1,661	2,262	2,172	1,416	2,184	7,159	8,743	8,487	10,432	10,593	11,124	4,063
Big Horn	176	5,367	2,388	1,059	633	388	362	1,784	7,619	7,619	53	99	144	184
Carbon	18	0	0	0	0	0	0	0	10	0	0	2	0	0
Rosebud	282	39	160	404	217	0	268	0	0	211	168	18	352	947
Stillwater	443	721	288	160	1,028	963	1,765	1,401	1,484	393	1,587	597	479	1,147
Treasure	0	0	0	0	0	0	0	0	0	0	0	0	11	0
Yellowstone	39	0	697	0	0	0	14	0	387	322	1,226	2,060	1,469	1,171
Upper Yellowstone Corridor	957	6,126	3,534	1,622	1,878	1,351	2,409	3,184	9,500	8,544	3,033	2,776	2,455	3,450
Custer	0	73	0	278	93	0	30	128	0	16	0	0	30	0
Dawson (also in NE MT)	6,229	3,651	2,303	2,700	4,395	2,308	2,194	1,211	4,623	6,468	6,231	5,284	6,671	5,050
Prairie	431	147	241	0	0	0	0	0	0	19	164	325	907	2,045
Richland (also in NE MT)	1,476	1,232	2,262	3,322	3,272	1,250	2,830	5,537	6,484	6,080	5,327	4,238	3,326	2,942
Lower Yellowstone Corridor	8,136	5,104	4,806	6,300	7,759	3,558	5,054	6,876	11,108	12,583	11,721	9,847	10,933	10,037
Beaverhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broadwater	750	473	88	220	0	0	0	0	0	0	0	238	87	1,566
Gallatin	235	1,056	615	641	834	1,231	1,131	1,353	1,525	1,606	1,294	2,068	2,419	2,641
Jefferson	196	0	0	0	0	0	0	0	0	0	0	0	0	203
Lewis & Clark	50	40	0	0	0	0	0	0	0	0	0	204	747	0
Madison	239	457	164	55	38	103	0	0	15	25	92	0	0	21
Southwest MT	1,470	2,025	866	916	871	1,334	1,131	1,353	1,540	1,631	1,385	2,510	3,252	4,430
Cascade	586	435	375	279	97	61	140	322	819	1,345	974	965	2,543	4,481
Chouteau	2,861	5,371	3,360	3,074	1,948	3,334	3,212	3,811	2,703	3,930	3,729	4,127	6,524	7,678
Glacier	2,151	824	490	523	523	880	972	2,625	8,205	8,070	2,442	3,660	8,283	8,286
Hill	3,422	4,457	2,928	791	72	1,117	2,041	2,370	2,875	2,589	2,934	3,745	4,464	8,559
Liberty	4,630	481	936	1,549	666	1,626	2,834	3,120	2,595	4,195	2,485	2,647	6,483	9,121
Pondera	0	989	194	1,591	1,015	1,478	3,371	4,578	4,362	4,376	1,920	2,866	3,164	3,893
Teton	326	937	720	588	631	931	754	967	2,519	4,565	1,623	3,192	3,326	3,760
Toole	220	545	215	427	15	355	184	543	2,671	2,390	743	2,278	2,557	4,385
Golden Triangle	14,195	14,039	9,216	8,822	4,966	9,783	13,507	18,336	26,748	31,458	16,850	23,480	37,345	50,163
Fergus	928	1,360	994	808	439	57	189	231	504	843	1,984	2,740	2,853	905
Judith Basin	0	53	29	0	57	20	109	446	2,347	3,095	3,194	1,763	2,160	947
Central MT	928	1,413	1,023	808	496	77	297	677	2,851	3,939	5,178	4,503	5,013	1,852
Golden Valley	0	0	0	0	0	0	0	405	0	0	407	0	1,818	456
Meagher	100	537	0	0	0	134	155	0	0	0	0	50	0	781
Park	76	35	0	94	0	0	30	214	107	294	0	0	0	531
Sweet Grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland	0	0	0	0	0	298	395	881	0	441	1,067	293	788	1,829
South Central MT	177	572	0	94	0	432	581	1,501	107	735	1,473	343	2,606	3,597

Source: USDA Farm Service Agency (Montana)

MONTANA PEA ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	84	886	458	0	488	0	281	306	1,568	1,719	1,851	652	1,274	1,089
Fallon	331	255	231	239	60	128	378	357	457	1,065	0	3,098	3,098	885
Powder River	0	0	0	0	0	0	0	80	55	37	247	1,098	2,068	768
Wibaux	543	279	643	423	1,517	1,156	3,765	2,496	3,273	2,854	4,569	3,771	3,000	862
Southeast MT	958	1,420	1,332	662	2,065	1,283	4,424	3,239	5,353	5,674	6,667	8,619	9,440	3,604
Garfield	0	107	206	819	558	507	885	2,779	2,303	2,946	3,352	3,069	1,954	2,138
Musselshell	3,060	5,841	0	0	0	566	53	165	0	41	0	0	0	322
Petroleum	73	44	17	0	0	0	0	0	0	0	0	0	0	0
East Central	3,132	5,993	223	819	558	1,073	938	2,944	2,303	2,987	3,352	3,069	1,954	2,460
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flathead	894	757	326	741	1,053	472	346	279	587	1,909	1,700	2,004	1,800	1,218
Granite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	154	194	246	445	515	321	247	287	89	106	0	198	50	129
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	80	0	0	0	0	0	0	0
Missoula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Ravalli	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Sanders	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	1,048	951	572	1,186	1,568	794	673	566	676	2,015	1,700	2,202	1,850	1,406
State Total	**34,985**	**42,883**	**26,732**	**34,712**	**41,243**	**41,771**	**80,389**	**156,552**	**237,107**	**253,699**	**241,637**	**239,812**	**226,719**	**174,918**

Source: USDA Farm Service Agency (Montana)

APPENDIX B

EXPLANATION OF ESTIMATE OF ECONOMIC BENEFITS ATTRIBUTABLE TO NORTHEASTERN MONTANA'S 2010 PULSE CROP *(relative to leaving cropland fallow)*

$102,132,000 Total Economic Benefits Attributable to Northeastern Montana's 2010 Pulse Crop

- $84,888,000 directly attributed to pulse crop replacing fallow
- $17,244,000 attributable to 2010 pulse crops' rotation benefits to following wheat crop

Economic benefits directly attributable to the pulse crops replacing fallow: $84.9 million

Equation: 360,000 acres * ($258.3/acre average additional crop sales - $22.50/acre chem fallow costs)

Assumptions:

- Methodology: Pulse crop revenues are spent or invested in one way or another. Therefore, the economic benefit directly attributable to the replacement of fallow with pulse crops is the whole revenue amount *reduced* by the avoided cost of chem fallow (the practice of using herbicides for weed control instead of tillage when cropland is left fallow). While an expense to the farmer, chem fallow costs are an economic activity that would have occurred within the region if the land was fallowed instead of used to grow pulse crops.
    - This methodology assumes that acreage planted in pulse crops would have been left fallow if farmers in Northeastern Montana had not adopted cropping systems that replaced fallow with pulse crops.
    - It is also assumed that the addition of pulse crops did not come at the expense of other crops.
    - Peas and lentils are key to intensifying dryland crop rotations (decreasing fallow) because they are very efficient in their water use and allow for sufficient moisture to remain in the soil for the following crop.
- Acreage impacted is 360,000 acres, the acreage of the 2010 pulse crop in Northeastern Montana counties (Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, and Valley counties).
- Additional crop sales of $258.30/acre: Pulse crop average revenue: ($200/acre pea revenue * 150,000 acres of peas + $300/acre lentil and chickpea revenue * 210,000 acres of lentils and chickpeas) / 360,000 acres = $258.33/acre pulse crop revenue.
    - The 2010 revenue estimates are "average" estimates. Some farmers did not do as well. Anecdotally, some farmers did much better, with revenue from lentils near $600/acre in 2010 and 2009.
- Chem fallow costs (including chemical and application costs): $22.50/acre

Economic benefits attributable to pulse crops' benefits to the following wheat crop: $17.2 million

$9,180,000 attributable to increased <u>yield</u> of the spring wheat crop

Equation for Value of Increased Yield: ***360,000 acres * 3 bushels/acre yield boost * $8.50/bu***

Assumptions:

- Acreage impacted is 360,000 acres, the acreage of the 2010 pulse crop in Northeastern Montana counties (Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, and Valley counties).
- Improvement in spring wheat yield is 3 bushels/acre from rotational benefits attributable to pulse crop. A 3 bu/acre yield boost is approximately a 12% yield improvement for spring wheat.
    - Spring wheat is the predominant class of wheat grown in Northeastern Montana.
    - The range of yield improvement might be 5% - 20%. Additionally, the yield benefit may last more than one year, thereby impacting more acres than used in the estimate.
- $8.50/bushel spring wheat price
    - At planting time, farmers were likely using this price to compare spring wheat to other crop options. Since that time, spring wheat prices had been considerably higher, until prices declined to the $8.50/bu level for 14% protein hard red spring wheat in late July 2011. Some farmers may use hedging instruments and forward contracts to lock in the higher prices. However, the actual protein content of harvested grain and spreads of price due to protein content can complicate risk mitigation in the marketing of hard red spring wheat.

$8,064,000 attributed to <u>increase in spring wheat protein level</u> of 0.5%

Equation for Value of Increasing Spring Wheat Protein level by 0.5%:

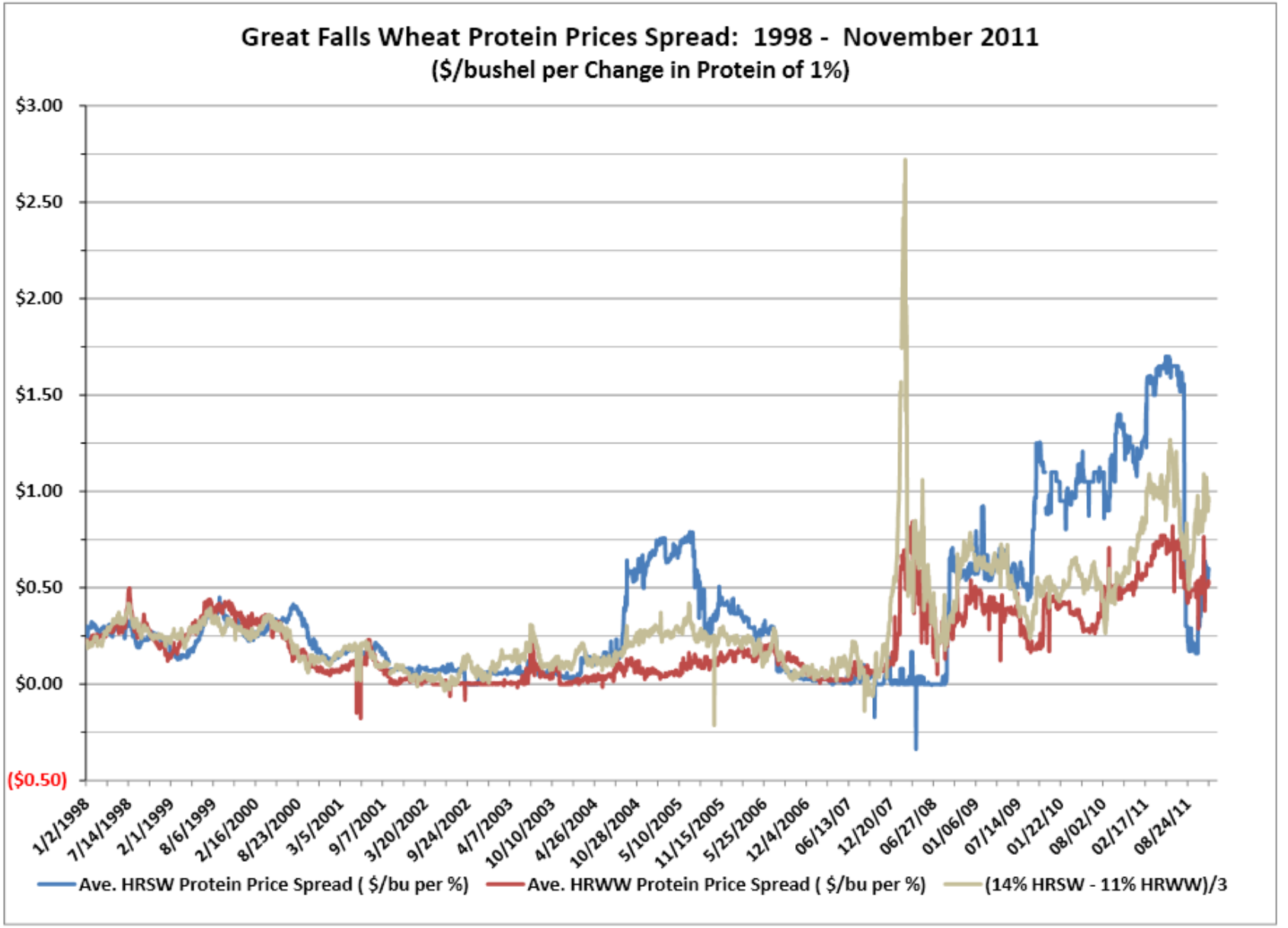
360,000 acres * 28 bushels/acre * $1.60/bushel Price Premium per 1% higher protein level * 0.5% Protein Level Improvement

Assumptions:

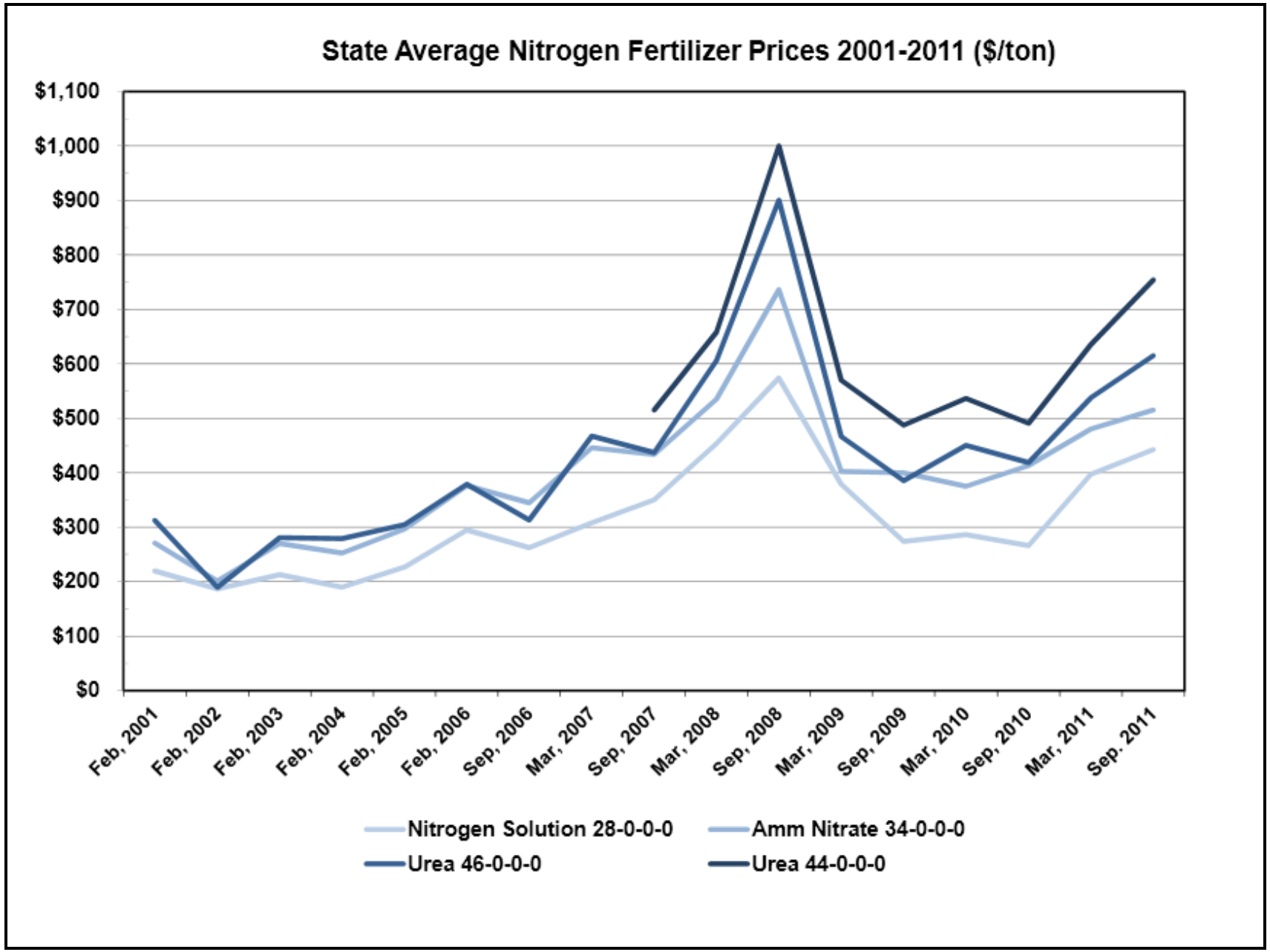
- Acreage affected is 360,000 acres of future wheat crops benefitted by the 2010 pulse crop in Northeastern Montana counties
- Spring wheat yield following a pulse crop is 28 bushels/acre yield
- Spring wheat price premium for 1% higher level of protein is $1.60/bushel
    - Until August 10, 2011, wheat prices for dark northern spring wheat show that for every percent increase/decrease of protein, the price changes by about $1.60/bushel. Beginning on August 10, 2011, the price differential based on protein dropped dramatically to as low as $0.30/bushel per percent increase/decrease of protein (by August 17, 2011).
    - Until August 2011:
        - the price spread has been over $1.50/bushel per 1% protein since late February 2011
        - the price spread has been close to (or over) $1.00/bushel per 1% protein since late September 2009
        - the price spread has been close to (or over) $0.50/bushel per 1% protein since early September 2008.
- Growing pulse crops will improve the protein level in the following spring wheat crop by 0.5%.
    - Canadian research at Swift Current, Saskatchewan measured a consistent 1% boost in wheat protein content during a long term lentil-wheat rotation study.
    - For the purposes of estimating the economic benefit of pulse crop to spring wheat, the author assumed a lower protein level boost than was observed in Swift Current. This was done to calculate a more conservative economic benefit from improved protein, which is very sensitive to the current market's high protein price differentials. The author also scaled back the protein improvement to take into account input from a researcher that fertilizer recommendations are higher in Montana, which likely leads Montana farmers to apply nitrogen fertilizer at higher rates. At full recommended nitrogen levels, the difference in protein content between wheat grown on pulse crop stubble vs. wheat grown on wheat stubble may not be as high as was indicated by the Swift Current study.

Value of Nitrogen Fixed by Pulse Crop Benefiting Following Wheat Crop: ***<u>None</u> included in the economic benefit calculations***

- The methodology assumes that an outcome of the rotational benefit of pulse crops and nitrogen fixed by pulse crops is increased yield and protein content in the wheat crop follows the pulse crop. Because the methodology used here accounts for wheat yield improvement and protein enhancement, no additional economic benefit is attributed to pulse crops for nitrogen fixation.
- The value of yield improvement and protein enhancement (at current prices) exceeds the economic value of nitrogen fertilizer that would be equivalent to the amount of nitrogen fixed by pulse crops ($0.55 per pound of nitrogen fixed, based on statewide fertilizer price information collected by the Montana Department of Agriculture Fertilizer Program in the spring of 2011).
- Pulse crops under dryland conditions can fix as much as 50 lbs N/acre depending on conditions. However, many farmers do not change fertilizer application to take this into account and likely realize a yield and/or protein (grain quality) benefit as the result of the nitrogen fixation and rotation benefit.



Source: USDA National Agriculture Statistics Service & Montana Wheat & Barley Committee (1/2/1998 - 11/30/2011)



Source: Montana Department of Agriculture

APPENDIX C

EXPLANATION OF ESTIMATE OF IMPROVED FARM PROFITS ATTRIBUTABLE TO NORTHEASTERN MONTANA'S 2010 PULSE CROP *(relative to leaving cropland fallow)*

Improved farm profits directly attributable to pulse crops replacing fallow:

$61 million attributable to replacing fallow with pulse crops on 360,000 acres (2010 crop)

- $8,625,000 attributable to additional profit from growing peas in place of fallow
- $35,175,000 attributable to additional profit from growing lentils in place of fallow
- $17,244,000 attributable to pulse crops' rotational benefits to the following wheat crop

Additional profit from growing peas in place of fallow in 2010: $8,625,000

Equation: 150,000 acres * $57.50/acre Additional Profit *(compared to if cropland had been fallowed)*

Additional Profit = $57.0/acre

$70/acre return after direct costs + $22.50/acre avoided chem fallow costs - $35/acre additional costs for equipment & labor

Assumptions:

- 150,000 acres of peas grown in 2010 pulse crop in Northeastern Montana counties in place of fallow (from USDA-FSA crop statistics)
  - This assumes that this acreage would have been left fallow if farmers in Northeastern Montana had not planted it in peas.
- $70/acre return after direct costs for pea production (from crop economics spreadsheets developed by the Montana Department of Agriculture for 2010)
- $22.50/acre avoided chem fallow herbicide application costs
  - Average of $20 - $25/acre for 3 - 4 applications.
  - Estimate includes amortized cost of machinery and labor.
- $35/acre for equipment costs and additional labor
  - $25/acre additional cost for equipment (based off of equipment costs projected for pulse production by North Dakota State University for northwestern North Dakota.
    - Seeding and harvesting equipment will be used on additional acres. While the equipment on a farm may have capacity to handle the additional crop acreage, the equipment may need to be replaced sooner, assuming that equipment cost is a function of how many acres a machine covers over its lifetime.
  - $10/acre cost for additional labor ($20/hr * 0.5 hours labor/acre)
    - Additional time will be spent on field operations growing pulse crops compared to leaving fields fallow. For some farms, the additional time spent on field operations may translate to greater labor costs, but would not if labor cost is a fixed cost and the farm has sufficient spare labor capacity.
- Assumes cropland is either owned by the farm or is cash leased. No adjustment to profitability is needed for land that is owned or cash leased because the cost is the same regardless of the crop or whether the land is left fallow. For reference, land rent is approximately $32/acre in Northeastern Montana. There are differences in rental costs between different crops and fallow when cropland is rented on a crop share basis. Preliminary analysis indicates that under current crop economics scenarios, improvement in tenants' profits resulting from replacement of fallow with pulse crops may be significantly less for land rented under traditional crop share terms than if the land was rented on a cash lease basis. It is not known whether or to what degree the terms of crop share agreements in Northeastern Montana have been adjusted since pulse crops began significantly reducing fallow acreage over the last decade.

Additional profit from growing lentils and chickpeas in place of fallow in 2010: $35,175,000

Equation: 210,000 acres * $167.50/acre Additional Profit *(compared to if cropland had been fallowed)*

Additional Profit = $167.50/acre
$180/acre return after direct costs + $22.50/acre avoided chem fallow costs - $35/acre additional costs for equipment & labor

Assumptions:

- 205,000 acres of lentils plus 5,000 acres of chickpeas grown in 2010 pulse crop in Northeastern Montana counties in place of fallow (from USDA-FSA crop statistics)
  - This assumes that this acreage would have been left fallow if farmers in Northeastern Montana had not planted it in peas.
  - Chickpeas are included with lentils in this estimate because they have similar profitability.
- $180/acre return after direct costs for lentil and chickpea production (from crop economics spreadsheets developed by the Montana Department of Agriculture for 2010)
- $22.50/acre avoided chem fallow herbicide application costs
  - Average of $20 - $25/acre for 3 - 4 applications.
  - Estimate includes amortized cost of machinery and labor.
- $35/acre for equipment costs and additional labor
  - $25/acre additional cost for equipment (based off of equipment costs projected for pulse production by North Dakota State University for northwestern North Dakota.
    - Seeding and harvesting equipment will be used on additional acres. While the equipment on a farm may have capacity to handle the additional crop acreage, the equipment may need to be replaced sooner, assuming that equipment cost is a function of how many acres a machine covers over its lifetime.
  - $10/acre cost for additional labor ($20/hr * 0.5 hours labor/acre)
    - Additional time will be spent on field operations growing pulse crops compared to leaving fields fallow. For some farms, the additional time spent on field operations may translate to greater labor costs, but would not if labor cost is a fixed cost and the farm has sufficient spare labor capacity.
- Assumes cropland is either owned by the farm or is cash leased. No adjustment to profitability is needed for land that is owned or cash leased because the cost is the same regardless of the crop or whether the land is left fallow. For reference, land rent is approximately $32/acre in Northeastern Montana. There are differences in rental costs between different crops and fallow when cropland is rented on a crop share basis. Preliminary analysis indicates that under current crop economics scenarios, improvement in tenants' profits resulting from replacement of fallow with pulse crops may be significantly less for land rented under traditional crop share terms than if the land was rented on a cash lease basis. It is not known whether or to what degree the terms of crop share agreements in Northeastern Montana have been adjusted since pulse crops began significantly reducing fallow acreage over the last decade.

Improved farm profits attributable to the 2010 pulse crop's rotational benefits to the following wheat crop: $17,244,000

$9,180,000 attributable to increased <u>yield</u> of spring wheat crop

Equation for Value of Increased Yield: ***360,000 acres * 3 bushels/acre yield boost * $8.50/bu***

Assumptions:

- Acreage impacted is 360,000 acres, the acreage of the 2010 pulse crop in Northeastern Montana counties (Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, and Valley counties).
- Improvement in spring wheat yield is 3 bushels/acre from rotational benefits attributable to pulse crop. A 3 bu/acre yield boost is approximately a 12% yield improvement for spring wheat.
  - Spring wheat is the predominant class of wheat grown in Northeastern Montana.
  - The range of yield improvement might be 5% - 20%. Additionally, the yield benefit may last more than one year, thereby impacting more acres than used in the estimate.
- $8.50/bushel spring wheat price
  - At planting time, farmers were likely using this price to compare spring wheat to other crop options. After that time, spring wheat prices rose considerably, until declining to the $8.50/bu level for 14% protein hard red spring wheat in late July 2011. Some farmers may use hedging instruments and forward contracts to lock in the higher prices. However, the actual protein content of harvested grain and spreads of price due to protein content can complicate risk mitigation in the marketing of hard red spring wheat.

$8,064,000 attributed to <u>increase in spring wheat protein level</u> of 0.5%

Equation for Value of Increasing Spring Wheat Protein level by 0.5%:

360,000 acres * 28 bushels/acre * $1.60/bushel Price Premium per 1% higher protein level * 0.5% Protein Level Improvement

Assumptions:

- Acreage affected is 360,000 acres of future wheat crops benefitted by the 2010 pulse crop in Northeastern Montana counties
- Spring wheat yield following a pulse crop is 28 bushels/acre yield
- Spring wheat price premium for 1% higher level of protein is $1.60/bushel
    - Until August 10, 2011, wheat prices for dark northern spring wheat show that for every percent increase/decrease of protein, the price changes by about $1.60/bushel. Beginning on August 10, 2011, the price differential based on protein dropped dramatically to as low as $0.30/bushel per 1%t increase/decrease of protein (by August 17, 2011). By November 2011, the price differential recovered to roughly $0.50/bushel per 1% increase/decrease of protein.
    - Until August 2011:
        - the price spread had been over $1.50/bushel per 1% protein since late February 2011
        - the price spread had been close to (or over) $1.00/bushel per 1% protein since late September 2009
        - the price spread had been close to (or over) $0.50/bushel per 1% protein since early September 2008.
- Growing pulse crops will improve the protein level in the following spring wheat crop by 0.5%.
    - Canadian research at Swift Current, Saskatchewan measured a consistent 1% boost in wheat protein content during a long term lentil-wheat rotation study.
    - For the purposes of estimating the economic benefit of pulse crop to spring wheat, the author assumed a lower protein level boost than was observed in Swift Current. This was done to calculate a more conservative economic benefit from improved protein, which is very sensitive to the current market's high protein price differentials. The author also scaled back the protein improvement to take into account input from a researcher that fertilizer recommendations are higher in Montana, which likely leads Montana farmers to apply nitrogen fertilizer at higher rates. At full recommended nitrogen levels, the difference in protein content between wheat grown on pulse crop stubble vs. wheat grown on wheat stubble may not be as high as was indicated by the Swift Current study.

Value of Nitrogen Fixed by Pulse Crop Benefiting Following Wheat Crop: ***none included in the economic benefit calculations***

- The methodology assumes that an outcome of the rotational benefit of pulse crops and nitrogen fixed by pulse crops is increased yield and protein content in the wheat crop follows the pulse crop. Because the methodology used here accounts for wheat yield improvement and protein enhancement, no additional economic benefit is attributed to pulse crops for nitrogen fixation.
- The value of yield improvement and protein enhancement (at current prices) exceeds the economic value of nitrogen fertilizer that would be equivalent to the amount of nitrogen fixed by pulse crops ($0.55 per pound of nitrogen fixed, based on statewide fertilizer price information collected by the Montana Department of Agriculture Fertilizer Program in the spring of 2011).
- Pulse crops can fix as much as 50 lbs N/acre depending on conditions. However, many farmers do not change fertilizer application to take this into account and likely realize a yield and/or protein (grain quality) benefit as the result of the nitrogen fixation and rotation benefit.

Additional Discussion

- In recent years, profit margins for peas have been similar to, or greater than, spring wheat.
- In recent years profit margins for lentils have been significantly higher than spring wheat.
- Even though peas are less profitable than lentils, peas will continue to be grown because their profit margin has often been the same or better than spring wheat. In general, peas are easier and less risky for farmers to grown than lentils. More importantly, growing both peas and lentils in a crop rotation allows for an intense dryland crop rotation that addresses crop insurance constraints and is agronomically sound. For crop insurance purposes, peas can only be planted once every three years, lentils once every four years. This constraint is in place to help reduce of risk of crop disease, which increases when peas or lentils are grown more frequently on the same cropland.
    - Normal rotations might include:
        - *Wheat-Pea(or Lentil)-Wheat-Fallow (4 Yr)*
        - *Wheat-Wheat-Pea (3 Yr)*
        - *Pea-Wheat-Fallow (3 Yr)*
        - *Wheat-Wheat-Wheat-Lentil (or Pea) (4 Yr)*
        - *Wheat-Pea-Wheat-Lentil (4 Yr)*
- Inserting pulse crops into wheat crop rotations may help combat the economic damage inflicted on wheat crops by sawfly. In April 2011, Montana State University wheat breeder Luther Talbert estimated that wheat stem sawfly costs Montana farmers $25 million annually. It is important to note that sawfly is a mobile pest; so scientists do not believe that pulse crop rotations can eliminate sawfly problems. However, there are many anecdotes from farmers across the state that growing pulse crops has helped reduce their sawfly problems the following year. At the very least, acreage in pulse crops is not affected by sawfly in the year of pulse production and reduces sawfly habitat.

APPENDIX D

EXPLANATION OF ILLUSTRATION OF POTENTIAL ADDITIONAL REPLACEMENT OF FALLOW (STATEWIDE) WITH PULSE CROPS IN DRYLAND CROPPING SYSTEMS *(relative to leaving cropland fallow)*

Golden Triangle Region (approximately 485,000 acres)

The illustration shows the largest replacement of fallow with pulse crops occurring in the Golden Triangle Region. The Golden Triangle has the largest amount of fallow cropland and has considerable potential for increasing cropping intensity. If the projections in the illustration are realized, the Golden Triangle region will eventually surpass Northeastern Montana in total pulse crop acreage.

A large portion of the cropland in the Golden Triangle is currently in a two-year rotation that is 50% wheat – 50% fallow. Changing the rotation to be a four-year Wheat-Pulse-Wheat-Fallow rotation would result in a 50% reduction in fallow. Fallow would continue to play a major role in the cropping system on these farms. The 26.5% regional composite fallow replacement rate assumes that a significant percentage of farmers (almost half) do not incorporate pulses into their crop rotation. In Northeastern Montana farms, pulse production has enabled some farms to completely eliminate fallow; this may be achievable at some locations within the Golden Triangle as well.

Farmers' interest in pulse crops in the Golden Triangle has been increasing, with large turnouts at several pulse crop workshops in the last two years. Pulse production in the Golden Triangle more than doubled in 2010 and increased nearly 50% in 2011. The region's Hutterite farming operations may act as a catalyst for pulse production by the example they are setting with increased incorporation of pulse crops in rotations and by the strong market created by their livestock operations (which can absorb off-quality or low-priced pulse crops). Pulse buyers/processors also have been increasing their attention on this region, in part because of its potential to provide additional supply, but also because of the high quality of pulses grown in the region.

There are a number of reasons why farmers in the Golden Triangle may not replace fallow with pulse crops as aggressively as farmers in Northeastern Montana did in the last decade. Portions of the Golden Triangle historically receive less precipitation, lack significant precipitation in July, or have relatively hot temperatures in July. These are all factors that make intensifying cropping systems with pulse crops more risky than in Northeastern Montana. The Golden Triangle was more adversely impacted (than Northeastern Montana) by the drought of the late 1990's and early-to-mid 2000's. This has made many farmers more risk-adverse and hesitant to make any change to their cropping systems that might impact soil moisture. Soils in much of the Golden Triangle allow for deep moisture storage that is particularly beneficial for high-yield winter wheat production when following a fallow season. Farmers in such locations may be resistant to changes in cropping practices that they believe will impact these high yields. In much of the region, there has been widespread use of herbicides that have long residual effectiveness in the soil that will damage or kill broadleaf crops like pulse crops. As a result, many farmers may be forced to wait several years before it is economically safe to plant pulse crops. In the meantime, they will need to change herbicides to be able to grow pulse crops.

Northeastern Montana (approximately 178,000 acres)

Pulse production is still on the increase in the counties of this region. The illustration shows Northeastern Montana replacing a significant percentage of the remaining fallow with pulse crops (a regional composite fallow replacement rate of over 29%). Much of the increase in pulse acres (through replacement of fallow) is likely to occur in the region's southern counties (McCone, Richland, and Dawson). These counties and portions of Valley and Roosevelt counties have slightly more challenging growing conditions in terms of precipitation and heat. Because of this, farmers in these areas will likely still continue to use fallow as a management practice (as opposed to eliminating it). Some will not reduce fallow at all. However, because replacement of fallow with pulse crops has been so successful in adjacent areas and because the market is well established, there will be less hesitation about replacing fallow with pulse crops than in the Golden Triangle. Sheridan County probably has reached its capacity for pulse production, and its pulse acreage could actually decline if major crop disease problems develop.

Blaine & Phillips Counties (approximately 71,000 acres)
These counties were treated as a separate region because they have substantial acreages of cropland and are geographically between the Golden Triangle and Northeastern Montana. They also may have different agronomic and climatological characteristics than either of the two major agricultural regions.

The illustration shows pulse crops displacing significant acreages of fallow in Blaine and Phillips counties, with a regional composite fallow replacement rate of almost 24%. However, the anticipated fallow replacement rate is lower than several regions because these two counties are "drier" counties. In response to the conditions, farmers of these counties fallow cropland at some of the highest levels in the state. The farmers in Blaine County fallow close to 50% of their non-irrigated cropland. Because of this, the rate of change (substitution of fallow with pulse crops) may be slower, particularly in Blaine County. In contrast, Phillips County has seen steady increases in its pulse crop production, and has become a significant county for pulse production. The degree of success achieved in Phillips County could influence the rate of adaption by Blaine County farmers.

Fergus & Judith Basin Counties (approximately 48,000 acres)
These counties were treated as a separate region because they have substantial acreages of cropland and seem to have their own geographical, agronomical, and climatological identity. In the illustration, Fergus and Judith Basin counties are anticipated to have the highest regional level of fallow replacement (33%). Much of the cropland in Fergus and Judith Basin counties receives above-average amounts of precipitation (for the eastern two-thirds of Montana). Much of the cropland does not have a deep soil profile, which limits its ability to store surplus moisture. For such cropland, it might be possible to eliminate fallow completely. If farmers replace 33% of the fallow, the resulting amount of fallow will be 22% of the dry cropland involved in field crop production. It would be expected that some farmers will continuously crop; some will fallow once every four years; and some (in the more dry locations) will not incorporate pulse crops into their rotation at all.

Pulse acres may increase by more than just the replacement of fallow with pulse crops. In Fergus and Judith Basin counties, there is a considerable amount of continuous cropping, where cereal crops are grown without a rotation crop. Farmers may decide to replace some of the cereal crop acres with pulse crops.

Upper Yellowstone Agricultural Region (approximately 41,000 acres)
The illustration shows pulse crops displacing 41,000 acres of fallow in the Upper Yellowstone agricultural region. Almost half of the displacement of fallow is likely to occur in Big Horn County. Winter wheat is the primary dryland crop in this region. The integration of pulse crops into crop rotations will be dependent upon how well pulse crops can be incorporated into dryland winter wheat rotations and how well pulse crops perform in the area's climate. The region's growing season starts earlier than northern Montana and tends to be warmer, which could threaten pulse crops during blooming and seed development stages. Because of these challenges, the fallow replacement rates were set lower (18.5% composite regional fallow replacement rate). The success of pulse production achieved in the region will be dependent upon early seeding and on the innovation of the area's farmers in adjusting cropping systems. The region has the potential to be important to the pulse industry because it has the potential to be the "first to market" in North America. The region's aridness may contribute to pulse crops recognized for high quality (similar to the Golden Triangle).

Previously, distance to markets discouraged pulse production in the region. That changed in 2011 when an existing facility in Hardin became a delivery point. A second pulse crop buyer owns grain handling facilities in Broadview, but has not yet been using the facility as a delivery point. There was approximately a 3,000 acre jump in lentil production in the area in 2011. The new acreage was likely influenced by the new marketing opportunities.

Other Montana Counties (approximately 56,000 acres)
The illustration shows pulse crops displacing 56,000 acres of fallow elsewhere in the state, with composite fallow replacement rate of just over 15%. The counties in this grouping are not a part of the larger agricultural regions identified in the tables and are spread throughout the state. Most of these counties tend to have smaller dry cropland acreages. In the illustration, the estimated fallow replacement rate varies widely between counties. A

number of counties may see no replacement of fallow acres with pulse crops, while potential fallow replacement is estimated to be as high as 37.5% in Gallatin County. Some of the counties in this group are located in areas with growing seasons that are challenging for pulse crops. Many counties are not located close to markets (delivery points). Some counties may have limited potential to convert additional fallow acres to pulse production for different reasons. One example is Wibaux County, which already has significant pulse production and fallow is already down to 21% of non-irrigated cropland. Another example is Garfield County, where growing conditions are challenging and fallow makes up nearly 48% of cropland. In situations where delivery points are not nearby, efforts to educate cattle and hog feeders about the high feed value of peas could help develop local markets and encourage pulse production.

ILLUSTRATED REPLACEMENT OF FALLOW BY PULSE CROPS *(in the next 5 – 15 years)*

	Fallow: 2007-2010 Average (acres)	Estimated Replacement of Fallow by Pulse Crops (%)	Estimated Replacement of Fallow by Pulse Crops (acres)	% of Dry Cropland in Fallow *(before Replacement)*	% of Dry Cropland in Fallow *(after Replacement)*	2010 Dryland Pulse Acres	Projected Dryland Pulse Acres (excluding dryland pulse acres, *where pulse crops replace other crops*)
Cascade	102,801	31.25%	32,125	39.64%	27.25%	3,491	35,616
Chouteau	450,360	18.75%	84,442	45.04%	36.59%	8,676	93,118
Glacier	129,677	50.00%	64,839	36.43%	18.21%	12,421	77,260
Hill	394,568	25.00%	98,642	47.53%	35.64%	6,743	105,385
Liberty	220,475	31.25%	68,898	43.59%	29.97%	12,158	81,056
Pondera	170,127	31.25%	53,165	43.29%	29.76%	4,620	57,785
Teton	126,438	31.25%	39,512	42.22%	29.02%	5,395	44,907
Toole	233,779	18.75%	43,834	45.08%	36.63%	5,779	49,612
Golden Triangle	**1,828,225**	**26.55%**	**485,457**	**43.92%**	**32.26%**	**59,283**	**544,740**
Daniels	51,300	31.25%	16,031	13.04%	8.97%	61,941	77,972
Dawson	82,619	18.75%	15,491	30.96%	25.16%	11,761	27,252
McCone	106,756	37.50%	40,034	30.82%	19.26%	23,728	63,761
Richland	74,035	31.25%	23,136	28.19%	19.38%	7,352	30,487
Roosevelt	123,813	31.25%	38,692	25.01%	17.19%	46,902	85,593
Sheridan	37,958	12.50%	4,745	8.12%	7.11%	153,307	158,052
Valley	127,501	31.25%	39,844	25.72%	17.68%	53,985	93,829
Northeast MT	**603,982**	**29.47%**	**177,972**	**22.14%**	**15.62%**	**358,975**	**536,947**
Blaine	180,962	18.75%	33,930	47.57%	38.65%	4,841	38,771
Phillips	117,735	31.25%	36,792	44.87%	30.85%	11,322	48,114
Blaine-Phillips	**298,698**	**23.68%**	**70,723**	**46.47%**	**35.46%**	**16,163**	**86,886**
Fergus	111,513	31.25%	34,848	35.01%	24.07%	5,124	39,972
Judith Basin	33,831	37.50%	12,687	26.20%	16.37%	2,341	15,028
Central MT	**145,344**	**32.70%**	**47,534**	**32.47%**	**21.85%**	**7,466**	**55,000**
Big Horn	80,703	25.00%	20,176	40.81%	30.61%	1,426	21,602
Carbon	6,622	25.00%	1,656	46.02%	34.51%	0	1,656
Rosebud	35,555	12.50%	4,444	43.98%	38.49%	2,426	6,870
Stillwater	35,752	18.75%	6,703	43.58%	35.41%	715	7,418
Treasure	2,699	18.75%	506	40.75%	33.11%	1,029	1,535
Yellowstone	59,252	12.50%	7,406	38.40%	33.60%	2,534	9,940
Upper Yellowstone	**220,582**	**18.54%**	**40,892**	**41.16%**	**33.53%**	**8,129**	**49,020**
Custer	26,800	12.50%	3,350	51.79%	45.31%	30	3,380
Prairie	19,814	6.25%	1,238	35.87%	33.62%	1,635	2,873
Carter	24,354	25.00%	6,088	35.63%	26.72%	2,436	8,524
Fallon	21,682	18.75%	4,065	30.16%	24.50%	4,172	8,238
Powder River	14,925	6.25%	933	55.20%	51.75%	2,068	3,001
Wibaux	13,043	18.75%	2,446	20.67%	16.80%	7,510	9,955
Garfield	92,451	6.25%	5,778	48.21%	45.19%	2,570	8,348
Musselshell	12,249	6.25%	766	26.90%	25.22%	0	766
Petroleum	18,296	6.25%	1,144	48.26%	45.24%	0	1,144
Golden Valley	17,642	12.50%	2,205	37.80%	33.08%	1,818	4,023
Meagher	8,085	31.25%	2,526	38.16%	26.23%	83	2,610
Park	6,307	31.25%	1,971	43.98%	30.23%	0	1,971
Sweet Grass	862	18.75%	162	28.88%	23.46%	0	162
Wheatland	17,625	12.50%	2,203	28.43%	24.88%	777	2,980
Beaverhead	609	37.50%	228	57.44%	35.90%	0	228
Broadwater	14,800	25.00%	3,700	38.33%	28.75%	54	3,754
Gallatin	35,814	37.50%	13,430	41.78%	26.11%	823	14,253
Jefferson	241	0.00%	0	42.18%	42.18%	0	0
Lewis & Clark	8,367	25.00%	2,092	35.17%	26.38%	792	2,884
Madison	2,257	25.00%	564	36.91%	27.68%	0	564
Deer Lodge	141	0.00%	0	97.65%	97.65%	0	0
Flathead	4,455	6.25%	278	19.96%	18.71%	1,640	1,919
Granite	16	0.00%	0	100.00%	100.00%	0	0
Lake	3,230	12.50%	404	44.47%	38.91%	0	404
Lincoln	0	0.00%	0	0.00%	0.00%	0	0
Mineral	160	0.00%	0	36.53%	36.53%	0	0
Missoula	1,285	12.50%	161	69.49%	60.80%	0	161
Powell	132	0.00%	0	35.54%	35.54%	0	0
Ravalli	658	25.00%	164	43.98%	32.99%	0	164
Sanders	788	0.00%	0	59.43%	59.43%	0	0
Silver Bow	0	0.00%	0	0.00%	0.00%	0	0
Other Counties	**367,048**	**15.23%**	**55,897**	**38.60%**	**32.73%**	**26,408**	**82,305**
State Total	**3,463,878**	**25.36%**	**878,475**	**36.59%**	**27.31%**	**476,422**	**1,354,897**

APPENDIX E

EXPLANATION OF ILLUSTRATION OF POTENTIAL STATEWIDE ECONOMIC BENEFITS FROM REPLACEMENT OF FALLOW WITH PULSE CROPS IN DRYLAND CROPPING SYSTEMS

(relative to leaving cropland fallow)

$243,137,135 Total Economic Benefits Attributable to the Illustrated Potential Replacement of Fallow with Pulse Crops *(using 2010 crop and market information)*

- $207,150,300 directly attributed to pulse crop replacing fallow on 878,500 acres
- $35,986,835 attributable to pulse crops' rotation benefits to following wheat crop
    - $6,341,850 attributable to increased yield of spring wheat crop on 248,700 acres
    - $18,894,000 attributable to increased yield of winter wheat crop on 629,800 acres
    - $5,570,880 attributed to increase in spring wheat protein level of 0.5% on 248,700 acres
    - $5,180,105 attributed to increase in winter wheat protein level of 0.25% on 629,800 acres

Economic benefits directly attributable to the pulse crops replacing fallow: $207.2 million

Equation for Value of Additional Pulse Crops Replacing Fallow:

878,500 acres * ($258.3/acre average pulse crop sales - $22.50/acre chem fallow costs)

Assumptions:

- Methodology: Pulse crop revenues are spent or invested in one way or another. Therefore, the economic benefit directly attributable to the replacement of fallow with pulse crops is the whole revenue amount reduced by the avoided cost of chem fallow. Chem fallow is economic activity that would have occurred within the region if the land was left fallow instead of used to grow pulse crops.
    - This methodology assumes that acreage planted in pulse crops will be left fallow if farmers do not adopt cropping systems that replace fallow with pulse crops.
- Acreage impacted is 878,500 acres, the illustrated statewide replacement of fallow by pulse crop acres.
- Additional crop sales of $258.30/acre: Pulse crop average revenue based on 2010 pulse crop production in Northeastern Montana, as shown in Appendix A.
- Chem fallow costs (including chemical and application costs): $22.50/acre

Economic benefits attributable to pulse crops' benefits to the following wheat crop: $36.0 million

$6,341,850 attributable to increased yield of spring wheat crop on 248,700 acres

Equation for Value of Increased Spring Wheat Yield:

3 bushels/acre yield boost * $8.50/bu * 248,700 Projected Acres of Additional Pulse Crops

(in Northeastern Montana and Blaine & Phillips Counties)

Assumptions:

- 3 bushels/acre yield improvement from rotational benefits attributable to pulse crop.
    - A 3 bu/acre yield boost is approximately a 12% yield improvement for spring wheat, which is what is predominantly grown in Northeastern Montana and Blaine and Phillips counties.
    - The range of yield improvement might be 5% - 20%. Additionally, the yield benefit may last more than one year, thereby impacting more acres than used in the estimate.
- $8.50/bushel spring wheat price.
    - At planting time, farmers were likely using this price to compare spring wheat to other crop options. Prices rose after this time until they declined to the $8.50/bu level for 14% protein hard red spring wheat in late July 2011. Some farmers may use hedging instruments and forward contracts to lock in the higher prices. However, the actual protein content of harvested grain and spreads of price due to protein content can complicate risk mitigation in the marketing of hard red spring wheat.
- 248,700 acres affected
    - 178,000 acres of future spring wheat crop benefitted by additional pulse crops replacing fallow in Northeastern Montana.
    - 70,700 acres of future spring wheat crop benefitted by additional pulse crops replacing fallow in Blaine and Phillips counties.

Economic benefits attributable to pulse crops' benefits to the following wheat crop: $36.0 million

$18,894,000 attributable to increased yield of winter wheat crop on 629,800 acres

Equation for Value of Increased Winter Wheat Yield:

5 bushels/acre yield boost * $6.00/bu * 629,800 Projected Acres of Additional Pulse Crops

(in Golden Triangle, Fergus & Judith Basin Counties, Upper Yellowstone Agricultural Region, and Other Montana Counties)

Assumptions:

- 5 bushels/acre yield improvement from rotational benefits attributable to pulse crop.
  - A 5 bu/acre yield boost is approximately a 12% yield improvement for winter wheat, which is main class of wheat grown in the majority of the regions in this grouping.
  - The range of yield improvement might be 5% - 20%. Additionally, the yield benefit may last more than one year, thereby impacting more acres than used in the estimate.
- $6.00/bushel winter wheat price.
  - During the early spring of 2011, farmers were likely using this price to compare to other crops if they were considering reseeding cropland planted into winter wheat.
- 629,800 acres affected
  - 485,500 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in the Golden Triangle.
  - 47,500 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in Fergus and Judith Basin counties.
  - 40,900 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in the Upper Yellowstone Agricultural Region.
  - 55,900 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in other Montana counties.

$5,570,880 attributed to increase in spring wheat protein level 0.5% on 248,700 acres

Equation for Value of Increasing Spring Wheat Protein Percentage by 0.5 %:

0.5% Protein Level Improvement * $1.60/bushel Price Premium per 1% higher protein level) * 28 bushels/acre * 248,700 Projected Acres of Additional Pulse Crops

(in Northeastern Montana and Blaine & Phillips Counties)

Assumptions:

- Growing pulse crops will improve spring wheat protein content levels by 0.5%.
  - Canadian research at Swift Current, Saskatchewan measured a consistent 1% boost in wheat protein content during a long term lentil-wheat rotation study.
  - For the purposes of estimating the economic benefit of pulse crop to spring wheat, the author assumed a lower protein level boost than was observed in the Swift Current. This was done to calculate a more conservative economic benefit from improved protein, which is very sensitive to the current market's high protein price differentials. The author also scaled back the protein improvement to take into account input from a researcher that fertilizer recommendations are higher in Montana, which likely leads Montana farmers to apply nitrogen fertilizer at higher rates. At full recommended nitrogen levels, the difference in protein content between wheat grown on pulse crop stubble vs. wheat grown on wheat stubble may not be as high as was indicated by the Swift Current study.
- Spring wheat price premium for 1% higher level of protein is $1.60/bushel
  - Until August 10, 2011, wheat prices for dark northern spring wheat show that for every percent increase/decrease of protein, the price changes by about $1.60/bushel. Beginning on August 10, 2011, the price differential based on protein dropped dramatically to as low as $0.30/bushel per percent increase/decrease of protein (by August 17, 2011). By November 2011, the price differential recovered to roughly $0.60/bushel per percent increase/decrease of protein.
  - Until August 2011:
    - the price spread had been over $1.50/bushel per 1% protein since late February 2011
    - the price spread had been close to (or over) $1.00/bushel per 1% protein since late September 2009
    - the price spread had been close to (or over) $0.50/bushel per 1% protein since early September 2008.
- 28 bushels/acre yield for spring wheat grown after a pulse crop
- 248,700 acres affected:
  - 178,000 acres of future spring wheat crop benefitted by additional pulse crops replacing fallow in Northeastern Montana.
  - 70,700 acres of future spring wheat crop benefitted by additional pulse crops replacing fallow in Blaine and Phillips counties.

Economic benefits attributable to pulse crops' benefits to the following wheat crop: $36.0 million

$5,180,105 attributed to increase in winter wheat protein level 0.25% on 629,800 acres

Equation for Value of Increasing Winter Wheat Protein Percentage by 0.25%:

0.25% Protein Level Improvement * $0.70/bushel Price Premium per 1% higher protein level) * 47 bushels/acre * 629,800 Projected Acres of Additional Pulse Crops

(in Golden Triangle, Fergus & Judith Basin Counties, Upper Yellowstone Agricultural Region, and Other Montana Counties)

Assumptions:

- Growing pulse crops will improve winter wheat protein content levels by 0.25%.
    - The protein improvement for winter wheat was assumed to be less than spring wheat to account for the "dilution" in protein that occurs as a result of higher winter wheat yields.
    - Canadian research at Swift Current, Saskatchewan measured a consistent 1% boost in wheat protein content during a long term lentil-wheat rotation study.
    - For the purposes of estimating the economic benefit of pulse crop to spring wheat, the author assumed a lower protein level boost than was observed in the Swift Current. This was done to calculate a more conservative economic benefit from improved protein, which is very sensitive to the current market's high protein price differentials. The author also scaled back the protein improvement to take into account input from a researcher that fertilizer recommendations are higher in Montana, which likely leads Montana farmers to apply nitrogen fertilizer at higher rates. At full recommended nitrogen levels, the difference in protein content between wheat grown on pulse crop stubble vs. wheat grown on wheat stubble may not be as high as was indicated by the Swift Current study.
- $0.70/bushel price premium per 1% higher protein level
    - Hard red winter wheat prices from March through July 2011 show that for every percent increase of protein above 11%, the price changes by about $0.70/bushel.
        - the price spread had been close to (or over) $0.70/bushel per 1% protein over 11% from March through July 2011, until falling to roughly $0.50/bushel per 1% protein from August through November 2011.
        - the price spread has been close to (or over) $0.50/bushel per 1% protein over 11% since early August 2010
        - the price spread has been close to (or over) $0.25/bushel per 1% protein over 11% since January 2008.
- 47 bushels/acre yield for spring wheat grown after a pulse crop
- 629,800 acres affected:
    - 485,500 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in the Golden Triangle.
    - 47,500 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in Fergus and Judith Basin counties.
    - 40,900 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in the Upper Yellowstone Agricultural Region.
    - 55,900 acres of future winter wheat crop benefitted by additional pulse crops replacing fallow in other Montana counties.

Value of Nitrogen Fixed by Pulse Crop Benefiting Following Wheat Crop: ***<u>None</u> included in the economic benefit calculations***

- The methodology assumes that an outcome of the rotational benefit of pulse crops and nitrogen fixed by pulse crops is increased yield and protein content in the wheat crop follows the pulse crop. Because the methodology used here accounts for wheat yield improvement and protein enhancement, no additional economic benefit is attributed to pulse crops for nitrogen fixation.
- The value of yield improvement and protein enhancement (at current prices) exceeds the economic value of nitrogen fertilizer that would be equivalent to the amount of nitrogen fixed by pulse crops ($0.55 per pound of nitrogen fixed, based on statewide fertilizer price information collected by the Montana Department of Agriculture Fertilizer Program in the spring of 2011). Dryland pulse crops can fix as much as 50 lbs N/acre depending on conditions. However, many farmers do not change fertilizer application to take this into account and likely realize a yield and/or protein (grain quality) benefit as the result of the nitrogen fixation and rotation benefit.

Economic Benefit Calculation for Pulse Crops Replacing Fallow *(using 2010 price/cost information)*

	Fallow Acres Replaced by Pulse Crops	Incremental Economic Benefit of Pulse Crop Replacing Fallow	Economic Benefit to Following Cereal From Yield Improvement	Economic Benefit to Following Cereal From Improvement in Protein Content	Economic Benefit to Following Cereal Crop Attributable to 2010 Pulse Crop	Total Economic Benefit of 2010 Pulse Crop
Golden Triangle	485,500	$114,480,900	$14,565,000	$3,993,238	$18,558,238	**$133,039,138**
NE MT	178,000	$41,972,400	$4,539,000	$3,987,200	$8,526,200	**$50,498,600**
Blaine / Phillips	70,700	$16,671,060	$1,802,850	$1,583,680	$3,386,530	**$20,057,590**
Fergus / Judith Basin	47,500	$11,200,500	$1,425,000	$390,688	$1,815,688	**$13,016,188**
Upper Yellowstone	40,900	$9,644,220	$1,227,000	$336,403	$1,563,403	**$11,207,623**
Other Counties	55,900	$13,181,220	$1,677,000	$459,778	$2,136,778	**$15,317,998**
Total	**878,500**	$207,150,300	$25,235,850	$10,750,985	$35,986,835	**$243,137,135**

Value of Pulse Crop ($/acre)	$258.30	
Chem Fallow Expenditures/Costs Eliminated ($/acre)	$22.50	subtracted from value of pulse crop because this is economic activity that is reduced when pulse crops replace chem fallow
Increase in Spring Wheat Yield (bu/acre)	3	
Increase in Winter Wheat Yield (bu/acre)'	5	
Spring Wheat Price ($/bu)	$8.50	
Winter Wheat Price ($/bu)	$6.00	
Spring Wheat Yield (bu/acre)	28	
Winter Wheat Yield (bu/acre)	47	
Spring Wheat Protein Price Premium ($/bu/% protein)	$1.60	
Winter Wheat Protein Price Premium ($/bu/% protein)	$0.70	
Increase in Spring Wheat Protein Test (%)	0.50	
Increase in Winter Wheat Protein Test (%)	0.25	

Northeastern Montana Counties: Daniels, Dawson, McCone, Richland, Roosevelt, Sheridan, Valley
Golden Triangle Counties: Cascade, Chouteau, Glacier, Hill, Liberty, Pondera, Teton, Toole
Upper Yellowstone Counties: Bighorn, Carbon, Rosebud, Stillwater, Treasure, Yellowstone

ILLUSTRATED ECONOMIC BENEFITS OF REPLACEMENT OF FALLOW BY PULSE CROPS
(in the next 5 – 15 years)

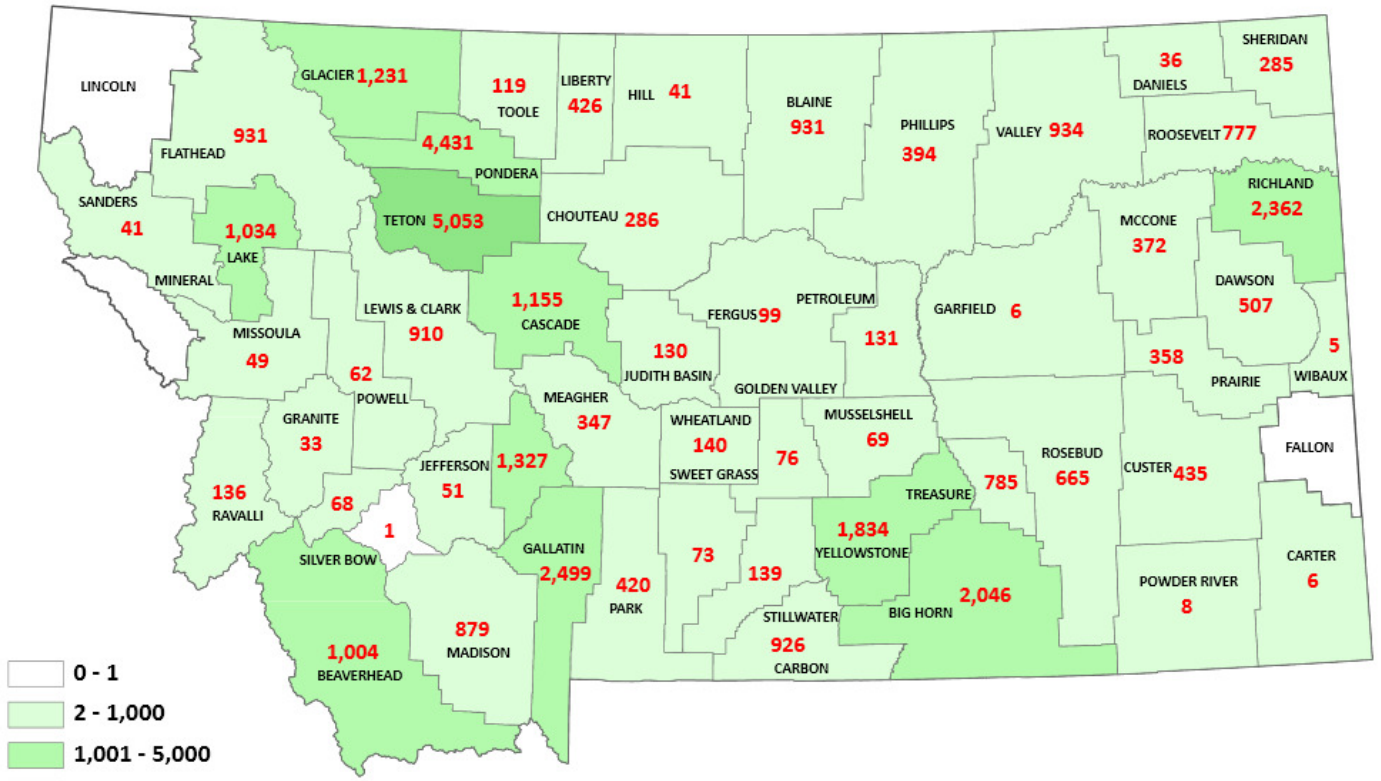
	Estimated Replacement of Fallow by Pulse Crops (acres)	Economic Benefit from Replacement of Fallow (using 2010 crop information)	Economic Benefit to Following Wheat Crop (using 2010 crop information)	Total Estimated Annual Economic Benefit (using 2010 crop information)
Cascade	32,125	$7,575,133	$1,228,148	$8,803,281
Chouteau	84,442	$19,911,520	$3,228,233	$23,139,754
Glacier	64,839	$15,288,957	$2,478,782	$17,767,739
Hill	98,642	$23,259,778	$3,771,083	$27,030,861
Liberty	68,898	$16,246,220	$2,633,982	$18,880,202
Pondera	53,165	$12,536,268	$2,032,492	$14,568,759
Teton	39,512	$9,316,898	$1,510,539	$10,827,436
Toole	43,834	$10,335,955	$1,675,757	$12,011,713
Golden Triangle	**485,457**	**$114,470,729**	**$18,559,016**	**$133,029,745**
Daniels	16,031	$3,780,144	$767,892	$4,548,036
Dawson	15,491	$3,652,793	$742,022	$4,394,815
McCone	40,034	$9,439,937	$1,917,612	$11,357,550
Richland	23,136	$5,455,423	$1,108,205	$6,563,628
Roosevelt	38,692	$9,123,471	$1,853,326	$10,976,797
Sheridan	4,745	$1,118,826	$227,276	$1,346,103
Valley	39,844	$9,395,215	$1,908,528	$11,303,743
Northeast MT	**177,972**	**$41,965,810**	**$8,524,861**	**$50,490,671**
Blaine	33,930	$8,000,796	$1,625,268	$9,626,063
Phillips	36,792	$8,675,633	$1,762,353	$10,437,985
Blaine-Phillips	**70,723**	**$16,676,428**	**$3,387,621**	**$20,064,049**
Fergus	34,848	$8,217,083	$1,332,227	$9,549,309
Judith Basin	12,687	$2,991,532	$485,014	$3,476,546
Central MT	**47,534**	**$11,208,615**	**$1,817,241**	**$13,025,856**
Big Horn	20,176	$4,757,431	$771,317	$5,528,748
Carbon	1,656	$390,394	$63,294	$453,688
Rosebud	4,444	$1,047,975	$169,907	$1,217,882
Stillwater	6,703	$1,580,669	$256,272	$1,836,942
Treasure	506	$119,329	$19,347	$138,676
Yellowstone	7,406	$1,746,445	$283,149	$2,029,594
Upper Yellowstone	**40,892**	**$9,642,244**	**$1,563,287**	**$11,205,531**
Custer	3,350	$789,935	$128,071	$918,006
Prairie	1,238	$292,002	$47,342	$339,343
Carter	6,088	$1,435,639	$232,759	$1,668,398
Fallon	4,065	$958,616	$155,419	$1,114,035
Powder River	933	$219,952	$35,661	$255,612
Wibaux	2,446	$576,674	$93,495	$670,169
Garfield	5,778	$1,362,491	$220,899	$1,583,391
Musselshell	766	$180,525	$29,268	$209,793
Petroleum	1,144	$269,638	$43,716	$313,354
Golden Valley	2,205	$519,984	$84,304	$604,288
Meagher	2,526	$595,747	$96,588	$692,335
Park	1,971	$464,737	$75,347	$540,084
Sweet Grass	162	$38,112	$6,179	$44,291
Wheatland	2,203	$519,491	$84,225	$603,716
Beaverhead	228	$53,867	$8,733	$62,601
Broadwater	3,700	$872,439	$141,448	$1,013,887
Gallatin	13,430	$3,166,840	$513,436	$3,680,277
Jefferson	0	$0	$0	$0
Lewis & Clark	2,092	$493,249	$79,970	$573,219
Madison	564	$133,078	$21,576	$154,654
Deer Lodge	0	$0	$0	$0
Flathead	278	$65,650	$10,644	$76,293
Granite	0	$0	$0	$0
Lake	404	$95,211	$15,436	$110,647
Lincoln	0	$0	$0	$0
Mineral	0	$0	$0	$0
Missoula	161	$37,878	$6,141	$44,019
Powell	0	$0	$0	$0
Ravalli	164	$38,767	$6,285	$45,053
Sanders	0	$0	$0	$0
Silver Bow	0	$0	$0	$0
Other Counties	**55,897**	**$13,180,521**	**$2,136,944**	**$15,317,465**
State Total	**878,475**	**$207,144,348**	**$35,988,969**	**$243,133,317**

APPENDIX F

Methodology Used for Estimating Irrigated Acreage that Might be Switched to Pulse Production

1. Develop an estimate of "good quality irrigated acres" based on USDA Farm Service Agency crop reporting.
    - For the purposes of making an estimate, this estimate excludes irrigated pasture and irrigated grass hay from the acreage defined as "good quality irrigated cropland". In many cases, irrigated cropland that is used to grow irrigated grass hay and pasture is not as likely to have any other agricultural use.
        - It is acknowledged that this methodology is imperfect. Analyzing soil characteristics and methods of water application would be better measures of "good quality irrigated cropland". Developing such an estimate would have been much more involved and was considered beyond the scope of this analysis.
2. Determine the acreage of irrigated crops not planted into forage (alfalfa, grass alfalfa mix, silage corn, and cereal crops raised for forage). The assumption is that irrigated forage acreage will not change. There are several reasons that irrigated cropland used for forage production is assumed to not be likely to switch to crop production. However, there is some possibility that increased irrigated pulse production could impact irrigated forage acreage.
    - In many cases, irrigated cropland planted in forage crops is controlled by and relied upon by livestock operations. It is not possible to quantify what portion of irrigated forage crop production is controlled by livestock operations, but it is reasonable to assume that such acres would continue to be used for forage production.
    - In other cases, forage is grown on irrigated cropland because it is most suitable to the land's soil, climate, and water supply.
    - Often cropland in irrigated forage production lacks irrigation improvements such as pivot sprinklers; wheel line sprinklers; or enhancements for flood irrigation, such as laser leveling, border dikes, and other drainage modifications. To be productive and profitable, irrigated pulse crops need to be grown on improved irrigated land that is well-drained.
    - The farm operations most inclined to replace forage acres with field crops are irrigated farms that raise forage crops as a cash crop. Farms that do not have livestock often grow alfalfa or alfalfa-grass mixed hay for rotation purposes and for income diversification. As irrigated pulse production practices advance and market opportunities develop, some acreage may switch from forage production to crop production (with pulse crops being grown as much as 25% of the time).
    - A number of factors are present that could induce reduction in forage production: declining cattle numbers, increasing fuel costs, declining labor availability, declining profitability of forage crops relative to grain crops, and increasing opportunity/need to expand farm size. In general, the profitability of forage production is more sensitive to fuel prices than field crop production. Forage production requires more fuel than field crop production, with possible exceptions for sugar beet and potato production. Additionally, trucks cannot be loaded as heavily with hay, so long distance shipping is less efficient for forage than most crops. More labor is involved per acre in forage production than most crop production. With regard potential constraints involved with farm expansion, forage production involves more field operations, more labor hours, and utilizes narrower equipment, thereby making it more difficult to cover more acres with the same resources.
3. Subtract the acreage of high value crops (potatoes, sugar beets, alfalfa seed, and dry beans) from the irrigated non-forage crop acreage, presuming that it is unlikely that these acres will be reduced for pulse crop production.
    - Irrigated chickpeas and lentils have the potential to be as profitable as or more profitable than irrigated dry beans and someday may become a recognized high value crop.
4. The fourth step was to multiply the remaining acres by 8.33% (25% * 1/3 = 8.33%).
    - Because of disease concerns, the maximum incorporation for pulse crops into irrigated crop rotations would likely be 25% (once every four years).
    - The estimation assumes that not all farm operations would integrate pulse crops into a crop rotation. As a result, the estimation presumes that only 1/3 of the irrigated cropland not planted into forage crops or high value crops would be planted into pulse crops 25% of the time (once every four years),

Illustrated Potential Irrigated Pulse Crop Acreage (5 - 15 Years)



37,067 acres Total

APPENDIX G

POTENTIAL ECONOMIC BENEFITS OF INCREASED IRRIGATED PULSE PRODUCTION

Assumptions Used to Estimate Economic Benefit of Irrigated Pulse crops to Wheat & Barley

Formula for Estimating Economic Benefit from Yield Improvement:

*Acreage Benefiting from Irrigated Pulse Production * Yield Improvement * Crop Price*

Spring Wheat: 18,530 acres * 8 bu/acre * $8.50/bu = $1,260,040

Barley: 18,530 acres * 10 bu/acre * $5.00/bu = $926,500

Formula for Estimating Economic Benefit from Increased Protein:

*Wheat Acreage Benefiting from Pulse Production * Yield * Protein Price Premium (per % protein) * Protein Level Improvement (%)*

Spring Wheat: 18,530 acres * 88 bu/acre * $1.60/%/bu * 0.25% protein improvement = $652,256

Key Assumptions:

- That pulse crops are inserted into a monocrop cereal production or are being inserted in crop rotations where rotational benefits can be realized and impact the yield of barley and spring wheat and the protein content of spring wheat.
- 37,060 acres of irrigated pulse crops benefiting the following crops of spring wheat and barley
  - 18,530 acres of spring wheat
  - 18,530 acres of barley
  - In Montana, there are approximately 200,000 acres of irrigated barley and 200,000 acres of irrigated wheat. For the purpose of making an estimate, half of the acres are planted in wheat and half in barley (following the irrigated pulse crop).
- 10% yield improvements to spring wheat and barley attributable to pulse crop:
  - 8 bushel/acre for spring wheat (increasing the spring wheat yield from 80 bushels/acre to 88 bushels/acre)
  - 10 bushels/acre for barley (increasing the barley yield from 100 bushels/acre to 110 bushels/acre)
  - Anecdotes exist of both higher and lower cereal crop yield improvements following irrigated pulse crops
- Grain prices:
  - $8.50/bu for spring wheat
  - $5.00/bu for barley
- Increase in wheat protein level of 0.25%
  - Compared to dryland spring wheat, a lower increase in spring wheat protein was used for irrigated production because of the additional nitrogen fixed will be spread over higher yields.
- Spring wheat protein price differential of $1.60 per percent increase in protein level
  - Because spring wheat accounts for most of irrigated wheat production, a spring wheat protein price differential was used for calculating the economic benefit of increased protein.
- No economic impact from increase in barley protein levels
  - It is important to note that increased protein in malting barley is not valued by the malting industry and can result in price discounts if contract specifications for protein are exceeded.
  - The rotational benefits of pulse crops may improve grain test weight and barley plumpness, but these potential benefits are not factored into this economic benefit estimation.

Illustration of Estimated Economic Value of Increasing Irrigated Pulse Production in Drought Years

In water-constrained conditions (such that only 0.5 acre-feet of water per acre is available) a farmer managing a pivot irrigated field could decide between the following alternatives:

- plant peas and irrigate the entire field or
- plant barley and irrigate half the field and on the other half raise barley under dryland conditions

Note: This illustration assumes that farmers have good reason to believe that irrigation water supplies will be severely constrained prior to seeding.

Farm Level Profits Perspective - $172/acre estimated profit advantage for planting irrigated peas

Estimation of Comparative Profitability of Peas vs. Barley When Irrigation Water Supply is Limited:

Irrigated Pea Return After Direct Costs/acre – (½ Irrigated Barley Return After Direct Costs/acre + ½ Dryland Barley Return After Direct Costs/acre)

[$372/acre return after direct costs for irrigated peas – (½ * $282/acre irrigated barley return after direct costs/acre + ½ * $118 dryland barley return after direct costs/acre) = $172/acre

Assumptions:

- Water delivery limited to 0.5 acre-feet/acre (6 inches of water application per acre)
- 2011 conditions for commodity prices and input costs
- Pea Return After Direct Costs = $372, based on 70 bushel/acre yield @ $8.00/bushel and direct production costs of $188/acre
- Irrigated Barley Return After Direct Costs = $282, based on 100 bushels/acre @ $5.00/bushel and direct production costs of $218/acre
- Dryland Barley Return After Direct Costs = $118, based on 45 bushels/acre @ $5.00/bushel and direct production costs of $107/acre

Regional Economic Perspective - $4.25 million estimated economic benefit for planting 20,000 acres of irrigated peas as a means of coping with an irrigation water supply shortage

This estimation uses an approach similar to what was applied analyzing the impact of pulse production replacing fallow in Northeastern Montana. If the comparison was made with the alternative of farmers choosing to leave half of the acreage fallow instead, the impact to region's economy would be even greater.

Estimation of Economic Benefit of Planting Peas Instead of Barley When Irrigation Water Supply is Limited:

Acreage Impacted * [Irrigated Pea Revenue/acre – (½ Irrigated Barley Revenue/acre + ½ Dryland Barley Revenue/acre)]

20,000 acres * [$560/acre irrigated pea revenue – (½* $500/acre irrigated barley revenue acre + ½ * $225 dryland barley revenue)] = $4,250,000

Assumptions:

- 20,000 irrigated acres impacted by water rationing, limiting water delivery to 0.5 acre-feet/acre (6 inches of water application per acre)
- 2011 conditions for commodity market prices
- Pea Revenue = 70 bushels/acre @ $8.00/bushel
- Irrigated Barley Revenue = 100 bushels/acre @ $5.00/bushel
- Dryland Barley Revenue = 45 bushels/acre @ $5.00/bushel

APPENDIX H

SOURCES OF INFORMATION ABOUT PULSE NUTRITION, HEALTH BENEFITS & PRODUCT FUNCTIONALITY

Food Research International - Special Edition on Pulse Food Functionality *(Food Research International is a journal of the Canadian Institute of Food Science and Technology). The special issue (Volume 43 Issue 2) includes 6 review papers and 27 original scientific papers and was published in March 2010.*
http://www.sciencedirect.com/science/journal/09639969/43/2

USA Dry Pea & Lentil Council Pulse Processing Technical Manual
http://www.pea-lentil.com/food-industry

Northern Pulse Growers Association Food Professional Brochures Webpage
http://www.northernpulse.com/products/

Northern Pulse Growers Association Pea Protein Brochure
http://www.northernpulse.com/uploads/resources/658/pea-protein-brochure.pdf

Northern Pulse Growers Association Pulse Flour Brochure
http://www.northernpulse.com/uploads/resources/661/pulse-flour-brochure.pdf

Northern Pulse Growers Association Food Service Industry Guide
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Northern Pulse Growers Association Consumer Nutrition Brochure
http://www.northernpulse.com/uploads/resources/655/consumer-nutrtion-brochure.pdf

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http://www.pulsecanada.com/uploads/b1/d6/b1d6e08fdff0a3158ad808fb1510ba86/2010-Pulse-Processing-Functionality-and-Application-Litera..pdf

APPENDIX I

ADDITIONAL MONTANA CROP ACREAGE STATISTICS

MONTANA DRY CROPLAND (FIELD CROPS & FALLOW) ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	383,504	383,263	393,094	391,634	391,562	390,166	397,433	389,119	397,822	391,492	394,278	393,263	394,500	390,890
Dawson	304,950	299,279	289,588	284,233	280,698	276,912	274,793	259,406	268,669	267,193	271,495	267,527	261,207	286,316
McCone	370,699	353,090	363,342	368,158	360,264	361,678	359,757	346,048	351,910	348,190	349,326	346,701	341,528	334,546
Richland	300,763	288,056	281,436	269,916	264,731	266,429	267,451	258,401	263,142	261,929	266,401	264,298	257,779	249,716
Roosevelt	552,111	540,918	521,993	517,841	511,027	507,469	506,949	508,461	495,158	488,124	500,846	497,403	494,149	512,434
Sheridan	465,765	466,230	472,830	479,010	475,300	471,334	476,487	474,300	473,869	466,183	467,993	466,681	468,406	450,095
Valley	495,037	496,010	486,313	485,126	488,150	492,821	491,927	489,599	490,120	487,061	497,209	499,208	499,261	506,517
Northeast MT	2,872,829	2,826,845	2,808,596	2,795,917	2,771,731	2,766,809	2,774,797	2,725,334	2,740,690	2,710,172	2,747,547	2,735,081	2,716,830	2,730,515
Blaine	385,089	362,379	355,038	361,314	369,352	364,423	372,653	359,140	364,625	370,333	381,883	382,389	387,117	390,330
Phillips	307,703	266,106	262,442	266,649	260,483	254,184	256,538	245,902	255,924	263,029	263,175	260,753	262,624	279,024
Blaine-Phillips	692,791	628,485	617,479	627,963	629,835	618,607	629,191	605,043	620,549	633,362	645,058	643,142	649,740	669,353
Big Horn	235,740	157,617	189,130	210,902	215,645	201,435	210,828	199,408	205,553	192,182	211,761	198,708	188,388	188,545
Carbon	24,633	21,405	20,430	17,975	18,651	17,021	16,472	23,956	16,082	15,873	14,653	14,189	12,848	11,011
Rosebud	114,864	97,767	95,850	87,801	87,972	80,127	83,990	87,227	82,717	80,901	81,167	83,936	77,337	68,807
Stillwater	91,418	90,631	86,549	82,364	83,326	78,135	83,049	77,918	84,051	80,744	83,997	83,235	80,203	77,917
Treasure	8,186	7,973	7,444	7,721	6,525	6,691	6,333	9,004	7,190	6,575	6,422	6,302	7,195	9,311
Yellowstone	172,886	170,494	174,237	166,235	172,795	163,307	156,859	167,846	149,696	150,633	156,195	156,568	153,839	150,653
Upper Yellowstone Corridor	647,727	545,887	573,640	572,998	584,914	546,717	557,531	565,357	545,288	526,909	554,194	542,937	519,811	506,244
Custer	66,611	64,520	63,913	63,159	63,615	61,647	63,768	59,072	56,259	54,015	52,245	51,975	48,766	50,226
Dawson (also in NE MT)	304,950	299,279	289,588	284,233	280,698	276,912	274,793	259,406	268,669	267,193	271,495	267,527	261,207	286,316
Prairie	65,059	58,969	61,377	63,074	49,039	57,349	61,010	56,402	56,903	55,253	55,952	54,659	55,113	45,416
Richland (also in NE MT)	300,763	288,056	281,436	269,916	264,731	266,429	267,451	258,401	263,142	261,929	266,401	264,298	257,779	249,716
Lower Yellowstone Corridor	737,382	710,824	696,314	680,382	658,083	662,337	667,023	633,280	644,973	638,389	646,092	638,458	622,866	631,673
Beaverhead	7,257	7,885	7,757	7,398	7,229	7,213	4,105	5,157	1,365	1,381	887	915	1,060	498
Broadwater	54,971	53,685	55,134	52,163	55,214	54,223	52,579	51,428	45,411	41,767	37,196	37,815	37,664	39,479
Gallatin	95,346	91,770	84,349	90,429	91,523	90,597	89,970	81,922	87,849	86,588	86,996	85,854	83,429	81,616
Jefferson	4,338	4,154	2,318	2,749	982	981	882	1,351	1,722	837	585	410	454	5,136
Lewis & Clark	21,949	23,280	28,642	25,278	22,635	23,133	20,703	22,809	19,724	23,564	24,389	24,017	23,195	21,951
Madison	10,166	8,807	8,080	8,753	8,452	8,490	9,006	10,454	6,215	6,409	6,372	6,471	5,212	7,504
Southwest MT	194,027	189,581	186,280	186,770	186,035	184,636	177,245	173,120	162,287	160,545	156,424	155,481	151,015	156,182
Cascade	290,364	279,999	270,425	274,684	278,150	252,450	266,622	244,706	263,128	252,554	259,629	264,076	261,154	260,854
Chouteau	1,093,417	1,092,855	1,018,642	1,033,065	1,170,318	1,002,250	994,535	958,044	980,220	983,045	1,004,633	1,006,247	1,005,852	1,013,301
Glacier	351,129	354,659	353,583	351,003	352,018	346,286	361,287	281,315	346,239	353,484	354,124	360,663	355,652	341,638
Hill	987,252	939,460	894,980	868,040	958,876	861,823	925,359	843,562	842,494	841,681	833,324	815,128	830,690	891,438
Liberty	538,895	491,519	468,833	493,861	572,961	464,651	483,124	444,572	461,558	478,696	509,024	515,928	519,695	457,460
Pondera	423,770	419,039	407,001	432,215	457,266	393,918	412,346	375,859	389,734	389,612	399,745	391,684	390,862	370,311
Teton	329,548	317,556	296,823	303,177	315,629	284,818	297,333	304,814	282,381	284,469	299,898	307,719	305,869	296,976
Toole	523,416	507,495	502,798	512,187	535,374	506,005	509,818	464,899	511,357	510,924	517,790	527,048	518,701	529,840
Golden Triangle	4,537,790	4,402,581	4,213,085	4,268,233	4,640,590	4,112,201	4,250,423	3,917,771	4,077,111	4,094,465	4,178,165	4,188,493	4,188,473	4,161,817
Fergus	371,351	361,354	354,090	344,311	341,968	330,500	325,921	300,335	320,613	314,281	319,891	318,058	321,813	308,910
Judith Basin	165,912	159,964	147,499	146,757	146,510	139,778	137,384	124,075	131,547	130,901	132,985	128,327	124,343	132,263
Central MT	537,263	521,317	501,589	491,069	488,478	470,278	463,306	424,410	452,160	445,182	452,876	446,385	446,157	441,173
Golden Valley	64,333	59,159	53,401	53,475	53,818	44,274	46,771	42,874	47,059	45,114	44,599	47,943	49,021	58,830
Meagher	25,028	25,797	26,282	24,802	24,510	23,541	23,456	22,347	22,487	21,917	22,088	20,459	20,290	20,275
Park	20,001	20,460	18,964	17,169	17,843	17,800	18,319	17,347	16,781	13,294	15,792	14,015	14,264	14,210
Sweet Grass	8,571	8,242	5,276	4,893	3,799	3,022	2,959	2,840	3,233	2,791	3,443	3,414	2,292	6,670
Wheatland	82,550	82,727	79,079	73,068	71,342	70,070	73,215	57,898	64,640	60,799	62,979	63,297	60,887	60,017
South Central MT	200,482	196,384	183,003	173,407	171,313	158,706	164,720	143,306	154,199	143,914	148,900	149,127	146,755	160,002

Source: USDA Farm Service Agency (Montana)

MONTANA DRY CROPLAND (FIELD CROPS & FALLOW) ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	83,868	90,957	80,906	78,349	74,102	82,979	71,407	68,418	70,200	65,959	74,994	67,527	64,962	66,592
Fallon	94,232	90,840	88,068	87,030	84,690	80,515	80,024	75,527	74,717	72,941	73,727	71,186	69,749	69,300
Powder River	48,871	47,227	46,675	42,513	40,862	41,803	39,778	31,949	25,322	16,618	20,592	35,951	34,996	29,811
Wibaux	73,374	72,363	72,521	67,290	68,385	67,316	70,000	63,816	66,150	62,180	64,507	63,738	61,960	69,306
Southeast MT	300,344	301,387	288,171	275,182	268,038	272,613	261,209	239,710	236,390	217,699	233,820	238,402	231,666	235,009
Garfield	217,690	221,420	218,519	206,091	154,622	201,412	203,887	195,583	197,014	192,541	198,474	193,000	183,116	190,866
Musselshell	56,376	48,559	59,244	59,056	54,436	48,341	45,029	41,344	44,905	44,602	47,343	45,190	45,009	36,970
Petroleum	32,458	30,671	31,754	35,660	37,614	34,899	38,717	35,705	35,540	35,192	35,070	39,188	42,202	53,765
East Central	306,523	300,650	309,516	300,807	246,671	284,653	287,633	272,633	277,458	272,335	280,887	277,378	270,327	281,602
Deer Lodge	20	29	50	63	29	361	364	477	68	98	22	135	325	44
Flathead	22,183	23,042	23,217	22,573	21,242	21,007	22,233	20,490	22,156	22,774	22,393	22,104	22,022	22,037
Granite	10	0	0	0	75	83	419	158	69	0	0	27	39	152
Lake	11,015	10,003	9,083	7,358	8,064	8,291	8,336	10,258	7,524	7,509	7,940	7,317	6,289	7,343
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	1,267	1,241	917	745	563	731	576	625	392	486	457	376	0	632
Missoula	3,579	4,064	4,410	4,225	4,085	3,705	3,052	1,955	2,150	2,093	2,166	1,905	1,234	1,277
Powell	1,081	790	1,246	421	531	586	313	1,002	547	401	441	566	83	202
Ravalli	1,772	2,314	2,096	690	1,489	2,137	2,279	2,047	1,588	1,650	1,302	1,617	1,412	1,060
Sanders	4,153	3,814	2,001	2,178	1,599	3,074	1,521	1,720	1,323	1,174	1,463	1,602	1,067	954
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	45,079	45,297	43,020	38,252	37,675	39,974	39,093	38,732	35,817	36,184	36,183	35,649	32,469	33,701
State Total	**10,466,525**	**10,081,904**	**9,849,669**	**9,856,831**	**10,137,933**	**9,574,190**	**9,729,928**	**9,220,889**	**9,415,112**	**9,350,035**	**9,542,253**	**9,518,710**	**9,457,123**	**9,471,240**

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND FIELD CROPS (EXCLUDING FORAGE) ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	270,249	274,938	285,796	302,013	309,825	316,773	321,144	327,802	340,343	330,883	347,664	341,281	348,508	316,197
Dawson	201,261	197,000	191,604	188,476	198,032	191,783	179,481	169,032	185,723	186,864	196,494	177,303	176,284	166,234
McCone	230,013	237,163	233,961	244,114	245,929	252,147	247,967	235,706	245,303	234,205	258,653	234,453	231,410	162,445
Richland	188,791	191,062	178,034	173,792	178,288	180,050	180,171	175,221	183,773	184,845	197,851	188,431	183,142	158,573
Roosevelt	347,793	363,036	346,190	356,315	363,944	366,026	379,719	381,996	367,877	360,392	394,036	368,132	362,711	302,483
Sheridan	317,825	337,476	354,787	380,634	386,661	393,429	414,925	421,975	423,027	416,532	433,411	428,998	438,488	329,999
Valley	314,244	304,226	303,386	305,131	317,429	330,245	340,248	343,695	355,479	355,187	382,090	371,439	364,018	296,978
Northeast MT	1,870,176	1,904,901	1,893,758	1,950,474	2,000,109	2,030,453	2,063,654	2,055,426	2,101,525	2,068,909	2,210,198	2,110,037	2,104,560	1,732,909
Blaine	222,652	206,654	196,795	187,481	195,054	197,268	198,378	193,678	192,715	194,266	203,098	203,499	197,010	171,696
Phillips	181,177	142,837	136,327	138,561	135,412	141,760	136,240	131,424	137,857	141,740	148,122	147,579	141,198	122,946
Blaine-Phillips	403,828	349,491	333,122	326,042	330,466	339,028	334,617	325,101	330,573	336,006	351,220	351,078	338,208	294,643
Big Horn	142,581	99,438	109,367	120,301	115,810	115,490	105,850	111,548	114,956	119,431	126,368	113,353	109,076	103,158
Carbon	13,433	12,566	11,058	10,573	10,535	8,482	8,722	15,570	8,428	8,464	9,090	6,201	7,319	5,495
Rosebud	65,056	56,865	46,503	49,117	49,755	41,496	44,075	44,948	41,205	41,994	47,755	44,844	46,529	32,796
Stillwater	54,198	51,647	45,978	45,347	52,089	44,738	46,908	40,483	45,668	44,896	48,988	46,729	44,559	42,746
Treasure	5,012	3,911	4,522	4,124	4,160	3,661	3,955	6,016	4,293	3,942	4,144	3,329	4,283	5,922
Yellowstone	104,898	101,559	106,203	92,251	108,180	95,397	88,717	108,793	89,204	89,241	97,395	96,436	97,156	96,645
Upper Yellowstone Corridor	385,178	325,986	323,632	321,713	340,529	309,264	298,227	327,358	303,754	307,968	333,740	310,891	308,922	286,763
Custer	36,904	32,665	33,435	32,746	31,849	31,369	30,819	27,874	26,021	26,307	27,798	25,510	20,184	18,330
Dawson (also in NE MT)	201,261	197,000	191,604	188,476	198,032	191,783	179,481	169,032	185,723	186,864	196,494	177,303	176,284	166,234
Prairie	40,349	35,875	36,802	39,464	24,776	34,994	32,602	34,003	32,532	34,126	37,093	34,527	35,978	26,062
Richland (also in NE MT)	188,791	191,062	178,034	173,792	178,288	180,050	180,171	175,221	183,773	184,845	197,851	188,431	183,142	158,573
Lower Yellowstone Corridor	467,305	456,602	439,875	434,478	432,945	438,196	423,073	406,130	428,049	432,143	459,236	425,771	415,587	369,199
Beaverhead	4,566	5,031	4,097	4,077	3,574	4,399	2,436	4,512	620	267	533	737	268	339
Broadwater	30,948	30,341	32,850	28,082	33,701	30,997	33,229	29,817	29,148	24,408	25,042	23,299	22,494	25,246
Gallatin	56,606	54,771	47,824	53,297	57,821	57,411	51,583	46,257	49,908	53,702	51,464	49,408	45,037	48,825
Jefferson	2,079	2,183	1,056	1,449	210	421	276	905	635	556	510	23	234	3,535
Lewis & Clark	14,097	17,262	16,678	17,663	13,106	16,440	11,108	15,779	13,153	15,507	15,973	15,060	15,156	14,090
Madison	6,522	4,811	5,110	5,956	3,543	5,051	3,764	5,836	3,494	4,358	3,800	3,579	3,698	3,981
Southwest MT	114,818	114,399	107,616	110,522	111,955	114,719	102,396	103,105	96,957	98,797	97,322	92,105	86,887	96,015
Cascade	195,415	183,232	170,744	170,764	179,485	162,577	160,527	147,118	154,397	151,580	159,959	159,572	155,098	160,883
Chouteau	670,339	672,446	609,588	602,134	774,783	586,662	561,952	526,837	532,743	539,421	561,017	550,242	547,659	546,051
Glacier	212,635	207,264	207,387	205,507	217,196	215,179	219,769	140,813	218,409	223,104	224,223	229,274	228,614	229,271
Hill	547,686	529,887	477,513	459,224	560,096	466,024	523,247	438,389	438,618	440,860	439,207	429,180	433,304	486,322
Liberty	299,543	278,073	254,230	279,733	386,452	269,098	271,267	247,307	258,857	269,923	289,155	291,377	290,990	271,304
Pondera	244,315	246,450	230,362	246,242	292,169	235,468	238,553	211,872	216,642	220,402	228,309	222,913	219,769	214,587
Teton	207,783	202,114	182,144	186,559	202,566	171,859	176,365	188,702	164,942	163,976	176,078	177,931	174,218	175,030
Toole	282,435	278,324	272,927	273,110	332,597	287,909	273,479	235,396	276,683	276,502	287,266	293,720	281,860	301,866
Golden Triangle	2,660,148	2,597,790	2,404,895	2,423,273	2,945,345	2,394,776	2,425,158	2,136,433	2,261,291	2,285,767	2,365,213	2,354,206	2,331,511	2,385,313
Fergus	252,763	243,174	236,611	226,589	233,449	221,680	210,599	183,944	200,402	203,631	219,499	198,464	206,399	180,768
Judith Basin	129,835	121,728	112,567	112,761	113,970	111,515	105,982	90,333	96,795	97,110	105,250	91,511	87,359	80,857
Central MT	382,598	364,902	349,178	339,351	347,419	333,194	316,582	274,277	297,197	300,741	324,749	289,975	293,758	261,625
Golden Valley	44,202	41,983	33,833	35,371	37,394	27,289	28,671	24,565	28,718	27,573	28,202	30,410	29,926	37,569
Meagher	19,262	18,104	18,198	13,883	17,718	16,530	14,147	15,334	13,303	14,520	14,454	11,474	11,966	14,423
Park	11,455	11,280	11,180	9,359	11,205	10,767	10,296	10,361	8,809	7,905	9,321	6,998	7,914	8,244
Sweet Grass	5,428	4,422	3,964	3,294	2,359	1,950	2,024	2,297	2,391	1,775	2,580	2,754	1,382	3,954
Wheatland	65,240	61,354	59,272	61,002	61,258	59,194	59,722	46,943	49,899	43,914	48,481	43,278	41,791	47,572
South Central MT	145,586	137,144	126,447	122,908	129,935	115,730	114,859	99,501	103,120	95,686	103,037	94,913	92,979	111,763

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND FIELD CROPS (EXCLUDING FORAGE) ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	59,734	59,248	52,491	50,332	49,136	60,522	48,878	43,585	41,199	43,579	47,435	45,094	39,921	35,351
Fallon	64,662	60,752	57,547	53,086	54,309	50,482	52,921	44,826	45,224	48,917	52,082	49,061	50,815	39,008
Powder River	28,479	29,157	23,200	23,071	21,934	25,361	21,738	15,433	9,466	2,165	5,555	20,123	20,615	15,977
Wibaux	48,696	51,003	48,943	45,520	47,809	47,278	51,003	45,241	50,846	47,556	50,156	50,920	51,580	27,248
Southeast MT	201,570	200,160	182,181	172,008	173,187	183,642	174,540	149,085	146,736	142,217	155,228	165,198	162,931	117,584
Garfield	112,269	123,705	114,344	106,845	77,421	99,128	104,547	95,115	104,189	93,561	113,352	96,334	94,081	83,133
Musselshell	47,162	39,546	50,663	46,257	40,164	38,809	35,522	33,942	34,616	36,308	37,851	32,862	26,125	21,676
Petroleum	19,521	18,260	17,932	19,039	23,602	20,614	24,593	18,284	20,732	17,662	18,180	21,233	21,394	29,475
East Central	178,953	181,510	182,939	172,141	141,187	158,551	164,662	147,341	159,537	147,532	169,383	150,429	141,599	134,284
Deer Lodge	0	0	0	0	0	0	0	118	0	0	7	6	0	0
Flathead	18,190	19,194	19,441	18,944	17,323	17,959	15,886	15,955	17,203	18,153	18,868	17,496	16,957	17,805
Granite	10	0	0	0	75	0	378	96	0	0	0	0	0	0
Lake	8,821	7,529	6,862	4,887	4,713	5,257	4,296	7,146	4,206	4,226	4,511	3,518	3,880	4,054
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	850	758	144	504	217	0	305	74	96	280	294	262	0	486
Missoula	1,904	2,039	2,263	2,450	2,341	1,939	1,529	917	782	748	516	590	403	808
Powell	755	492	976	292	376	415	177	902	328	229	320	412	0	135
Ravalli	784	1,394	776	545	812	927	791	1,245	991	884	822	996	649	585
Sanders	2,328	1,801	979	965	382	1,010	595	547	463	149	868	673	463	417
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	33,641	33,207	31,441	28,587	26,237	27,507	23,958	27,000	24,068	24,669	26,207	23,953	22,352	24,291
State Total	6,453,750	6,278,029	6,005,447	6,039,230	6,602,994	6,073,226	6,082,073	5,706,505	5,883,311	5,868,726	6,201,189	6,002,823	5,939,869	5,489,581

Source: USDA Farm Service Agency (Montana)

MONTANA FALLOW ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	113,255	108,325	107,298	89,621	81,737	73,393	76,290	61,317	57,479	60,609	46,615	51,982	45,993	74,693
Dawson	103,689	102,279	97,984	95,757	82,666	85,130	95,312	90,374	82,946	80,329	75,001	90,224	84,923	120,082
McCone	140,686	115,927	129,382	124,044	114,334	109,531	111,791	110,342	106,606	113,986	90,674	112,249	110,118	172,102
Richland	111,972	96,994	103,402	96,123	86,442	86,379	87,280	83,180	79,369	77,083	68,550	75,867	74,638	91,142
Roosevelt	204,318	177,882	175,803	161,527	147,083	141,442	127,230	126,465	127,281	127,732	106,810	129,272	131,439	209,951
Sheridan	147,940	128,754	118,043	98,376	88,638	77,905	61,563	52,325	50,842	49,651	34,582	37,683	29,918	120,097
Valley	180,792	191,783	182,926	179,995	170,721	162,575	151,679	145,904	134,641	131,874	115,118	127,769	135,243	209,539
Northeast MT	1,002,653	921,944	914,838	845,443	771,622	736,356	711,143	669,907	639,164	641,263	537,349	625,045	612,271	997,606
Blaine	162,437	155,725	158,242	173,833	174,298	167,155	174,275	165,463	171,910	176,066	178,785	178,891	190,107	218,633
Phillips	126,526	123,269	126,114	128,088	125,071	112,424	120,299	114,478	118,067	121,290	115,053	113,174	121,426	156,077
Blaine-Phillips	288,963	278,994	284,357	301,921	299,369	279,579	294,574	279,941	289,977	297,356	293,838	292,065	311,532	374,710
Big Horn	93,159	58,179	79,763	90,601	99,835	85,945	104,978	87,860	90,597	72,751	85,392	85,355	79,313	85,387
Carbon	11,200	8,839	9,372	7,402	8,116	8,539	7,750	8,385	7,653	7,409	5,564	7,988	5,529	5,516
Rosebud	49,808	40,902	49,347	38,684	38,217	38,631	39,915	42,279	41,512	38,907	33,412	39,092	30,808	36,011
Stillwater	37,220	38,984	40,571	37,018	31,237	33,397	36,140	37,435	38,383	35,848	35,009	36,506	35,644	35,172
Treasure	3,174	4,062	2,921	3,597	2,365	3,030	2,378	2,988	2,897	2,634	2,277	2,973	2,911	3,388
Yellowstone	67,988	68,935	68,034	73,984	64,616	67,910	68,142	59,052	60,492	61,392	58,800	60,132	56,683	54,008
Upper Yellowstone Corridor	262,549	219,901	250,008	251,285	244,386	237,453	259,304	237,999	241,534	218,941	220,454	232,046	210,888	219,482
Custer	29,707	31,855	30,478	30,413	31,766	30,278	32,950	31,198	30,238	27,708	24,446	26,465	28,582	31,896
Dawson **(also in NE MT)**	103,689	102,279	97,984	95,757	82,666	85,130	95,312	90,374	82,946	80,329	75,001	90,224	84,923	120,082
Prairie	24,709	23,094	24,575	23,611	24,263	22,355	28,409	22,399	24,371	21,127	18,859	20,132	19,135	19,354
Richland **(also in NE MT)**	111,972	96,994	103,402	96,123	86,442	86,379	87,280	83,180	79,369	77,083	68,550	75,867	74,638	91,142
Lower Yellowstone Corridor	270,077	254,222	256,438	245,904	225,138	224,142	243,950	227,151	216,924	206,247	186,857	212,688	207,278	262,474
Beaverhead	2,691	2,854	3,660	3,321	3,655	2,814	1,669	645	745	1,114	354	178	792	159
Broadwater	24,023	23,344	22,284	24,082	21,512	23,226	19,350	21,611	16,264	17,359	12,154	14,516	15,170	14,233
Gallatin	38,740	37,000	36,525	37,132	33,702	33,186	38,387	35,665	37,941	32,886	35,532	36,446	38,392	32,791
Jefferson	2,259	1,971	1,262	1,301	772	560	607	446	1,088	282	75	387	220	1,601
Lewis & Clark	7,852	6,018	11,964	7,616	9,529	6,693	9,595	7,030	6,572	8,057	8,416	8,958	8,039	7,861
Madison	3,644	3,996	2,970	2,796	4,909	3,439	5,242	4,618	2,721	2,051	2,573	2,892	1,514	3,523
Southwest MT	79,209	75,182	78,664	76,248	74,079	69,918	74,849	70,015	65,330	61,748	59,102	63,376	64,128	60,167
Cascade	94,949	96,767	99,681	103,920	98,666	89,873	106,096	97,588	108,732	100,973	99,670	104,504	106,056	99,971
Chouteau	423,078	420,409	409,054	430,931	395,535	415,588	432,583	431,207	447,477	443,624	443,617	456,005	458,193	467,250
Glacier	138,495	147,395	146,196	145,496	134,822	131,107	141,518	140,502	127,830	130,380	129,901	131,389	127,039	112,367
Hill	439,566	409,573	417,467	408,816	398,780	395,799	402,111	405,173	403,876	400,821	394,117	385,948	397,386	405,116
Liberty	239,352	213,446	214,603	214,128	186,509	195,554	211,857	197,266	202,701	208,773	219,868	224,552	228,705	186,156
Pondera	179,455	172,589	176,639	185,973	165,096	158,449	173,793	163,987	173,091	169,211	171,435	168,772	171,092	155,724
Teton	121,765	115,442	114,678	116,618	113,063	112,959	120,969	116,113	117,438	120,493	123,819	129,789	131,651	121,946
Toole	240,982	229,171	229,872	239,077	202,777	218,096	236,339	229,503	234,674	234,423	230,525	233,328	236,841	227,974
Golden Triangle	1,877,641	1,804,791	1,808,190	1,844,960	1,695,246	1,717,425	1,825,265	1,781,338	1,815,821	1,808,698	1,812,952	1,834,286	1,856,962	1,776,504
Fergus	118,588	118,179	117,479	117,722	108,519	108,821	115,322	116,391	120,211	110,649	100,392	119,594	115,414	128,142
Judith Basin	36,077	38,236	34,932	33,996	32,540	28,264	31,402	33,743	34,752	33,791	27,735	36,815	36,984	51,406
Central MT	154,665	156,415	152,411	151,718	141,058	137,084	146,724	150,134	154,963	144,440	128,127	156,410	152,398	179,548
Golden Valley	20,131	17,176	19,569	18,104	16,424	16,985	18,101	18,309	18,341	17,541	16,397	17,533	19,096	21,261
Meagher	5,767	7,693	8,084	10,920	6,792	7,011	9,310	7,013	9,184	7,396	7,634	8,985	8,324	5,852
Park	8,545	9,180	7,784	7,810	6,638	7,033	8,023	6,986	7,973	5,389	6,471	7,017	6,350	5,966
Sweet Grass	3,144	3,819	1,313	1,598	1,440	1,072	935	543	842	1,015	863	660	910	2,716
Wheatland	17,309	21,372	19,808	12,066	10,084	10,876	13,493	10,955	14,740	16,886	14,499	20,019	19,096	12,445
South Central MT	54,896	59,240	56,556	50,499	41,378	42,976	49,861	43,805	51,080	48,227	45,863	54,214	53,776	48,240

Source: USDA Farm Service Agency (Montana)

MONTANA FALLOW ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	24,134	31,710	28,415	28,016	24,966	22,457	22,529	24,833	29,001	22,381	27,559	22,433	25,041	31,241
Fallon	29,571	30,088	30,521	33,944	30,381	30,033	27,103	30,702	29,493	24,024	21,645	22,126	18,934	30,292
Powder River	20,392	18,070	23,475	19,442	18,929	16,442	18,040	16,515	15,856	14,453	15,037	15,828	14,382	13,834
Wibaux	24,677	21,359	23,578	21,771	20,576	20,038	18,997	18,574	15,304	14,625	14,351	12,818	10,379	42,057
Southeast MT	98,774	101,228	105,990	103,173	94,851	88,971	86,669	90,624	89,654	75,482	78,592	73,204	68,736	117,424
Garfield	105,420	97,716	104,175	99,246	77,201	102,284	99,340	100,468	92,825	98,980	85,122	96,666	89,035	107,733
Musselshell	9,213	9,014	8,581	12,799	14,272	9,533	9,507	7,402	10,289	8,293	9,492	12,328	18,885	15,294
Petroleum	12,938	12,411	13,821	16,621	14,012	14,285	14,124	17,421	14,807	17,530	16,891	17,955	20,808	24,290
East Central	127,571	119,140	126,577	128,666	105,484	126,102	122,970	125,291	117,921	124,803	111,504	126,949	128,728	147,318
Deer Lodge	20	29	50	63	29	361	364	360	68	98	14	128	325	44
Flathead	3,993	3,848	3,776	3,629	3,919	3,048	6,347	4,535	4,954	4,621	3,525	4,609	5,064	4,232
Granite	0	0	0	0	0	83	41	62	69	0	0	27	39	152
Lake	2,195	2,473	2,221	2,471	3,351	3,034	4,040	3,112	3,318	3,283	3,429	3,799	2,409	3,289
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	417	484	773	240	346	731	271	551	296	206	163	113	0	147
Missoula	1,675	2,025	2,147	1,775	1,744	1,766	1,522	1,038	1,368	1,345	1,650	1,315	830	469
Powell	326	298	270	129	155	171	136	100	219	172	121	154	83	66
Ravalli	987	919	1,319	145	677	1,210	1,488	803	597	766	480	621	763	475
Sanders	1,825	2,013	1,023	1,213	1,217	2,064	926	1,173	861	1,025	595	929	605	537
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	11,437	12,090	11,579	9,665	11,437	12,467	15,135	11,732	11,749	11,515	9,977	11,696	10,118	9,410
State Total	**4,012,775**	**3,803,875**	**3,844,222**	**3,817,601**	**3,534,939**	**3,500,964**	**3,647,854**	**3,514,384**	**3,531,801**	**3,481,309**	**3,341,064**	**3,515,887**	**3,517,254**	**3,981,659**

Source: USDA Farm Service Agency (Montana)

MONTANA FALLOW ACREAGE AS A PERCENTAGE OF DRY CROPLAND BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	30%	28%	27%	23%	21%	19%	19%	16%	14%	15%	12%	13%	12%	19%
Dawson	34%	34%	34%	34%	29%	31%	35%	35%	31%	30%	28%	34%	33%	42%
McCone	38%	33%	36%	34%	32%	30%	31%	32%	30%	33%	26%	32%	32%	51%
Richland	37%	34%	37%	36%	33%	32%	33%	32%	30%	29%	26%	29%	29%	36%
Roosevelt	37%	33%	34%	31%	29%	28%	25%	25%	26%	26%	21%	26%	27%	41%
Sheridan	32%	28%	25%	21%	19%	17%	13%	11%	11%	11%	7%	8%	6%	27%
Valley	37%	39%	38%	37%	35%	33%	31%	30%	27%	27%	23%	26%	27%	41%
Northeast MT	35%	33%	33%	30%	28%	27%	26%	25%	23%	24%	20%	23%	23%	37%
Blaine	42%	43%	45%	48%	47%	46%	47%	46%	47%	48%	47%	47%	49%	56%
Phillips	41%	46%	48%	48%	48%	44%	47%	47%	46%	46%	44%	43%	46%	56%
Blaine-Phillips	42%	44%	46%	48%	48%	45%	47%	46%	47%	47%	46%	45%	48%	56%
Big Horn	40%	37%	42%	43%	46%	43%	50%	44%	44%	38%	40%	43%	42%	45%
Carbon	45%	41%	46%	41%	44%	50%	47%	35%	48%	47%	38%	56%	43%	50%
Rosebud	43%	42%	51%	44%	43%	48%	48%	48%	50%	48%	41%	47%	40%	52%
Stillwater	41%	43%	47%	45%	37%	43%	44%	48%	46%	44%	42%	44%	44%	45%
Treasure	39%	51%	39%	47%	36%	45%	38%	33%	40%	40%	35%	47%	40%	36%
Yellowstone	39%	40%	39%	45%	37%	42%	43%	35%	40%	41%	38%	38%	37%	36%
Upper Yellowstone Corridor	41%	40%	44%	44%	42%	43%	47%	42%	44%	42%	40%	43%	41%	43%
Custer	45%	49%	48%	48%	50%	49%	52%	53%	54%	51%	47%	51%	59%	64%
Dawson **(also in NE MT)**	34%	34%	34%	34%	29%	31%	35%	35%	31%	30%	28%	34%	33%	42%
Prairie	38%	39%	40%	37%	49%	39%	47%	40%	43%	38%	34%	37%	35%	43%
Richland **(also in NE MT)**	37%	34%	37%	36%	33%	32%	33%	32%	30%	29%	26%	29%	29%	36%
Lower Yellowstone Corridor	37%	36%	37%	36%	34%	34%	37%	36%	34%	32%	29%	33%	33%	42%
Beaverhead	37%	36%	47%	45%	51%	39%	41%	13%	55%	81%	40%	19%	75%	32%
Broadwater	44%	43%	40%	46%	39%	43%	37%	42%	36%	42%	33%	38%	40%	36%
Gallatin	41%	40%	43%	41%	37%	37%	43%	44%	43%	38%	41%	42%	46%	40%
Jefferson	52%	47%	54%	47%	79%	57%	69%	33%	63%	34%	13%	94%	49%	31%
Lewis & Clark	36%	26%	42%	30%	42%	29%	46%	31%	33%	34%	35%	37%	35%	36%
Madison	36%	45%	37%	32%	58%	41%	58%	44%	44%	32%	40%	45%	29%	47%
Southwest MT	41%	40%	42%	41%	40%	38%	42%	40%	40%	38%	38%	41%	42%	39%
Cascade	33%	35%	37%	38%	35%	36%	40%	40%	41%	40%	38%	40%	41%	38%
Chouteau	39%	38%	40%	42%	34%	41%	43%	45%	46%	45%	44%	45%	46%	46%
Glacier	39%	42%	41%	41%	38%	38%	39%	50%	37%	37%	37%	36%	36%	33%
Hill	45%	44%	47%	47%	42%	46%	43%	48%	48%	48%	47%	47%	48%	45%
Liberty	44%	43%	46%	43%	33%	42%	44%	44%	44%	44%	43%	44%	44%	41%
Pondera	42%	41%	43%	43%	36%	40%	42%	44%	44%	43%	43%	43%	44%	42%
Teton	37%	36%	39%	38%	36%	40%	41%	38%	42%	42%	41%	42%	43%	41%
Toole	46%	45%	46%	47%	38%	43%	46%	49%	46%	46%	45%	44%	46%	43%
Golden Triangle	41%	41%	43%	43%	37%	42%	43%	45%	45%	44%	43%	44%	44%	43%
Fergus	32%	33%	33%	34%	32%	33%	35%	39%	37%	35%	31%	38%	36%	41%
Judith Basin	22%	24%	24%	23%	22%	20%	23%	27%	26%	26%	21%	29%	30%	39%
Central MT	29%	30%	30%	31%	29%	29%	32%	35%	34%	32%	28%	35%	34%	41%
Golden Valley	31%	29%	37%	34%	31%	38%	39%	43%	39%	39%	37%	37%	39%	36%
Meagher	23%	30%	31%	44%	28%	30%	40%	31%	41%	34%	35%	44%	41%	29%
Park	43%	45%	41%	45%	37%	40%	44%	40%	48%	41%	41%	50%	45%	42%
Sweet Grass	37%	46%	25%	33%	38%	35%	32%	19%	26%	36%	25%	19%	40%	41%
Wheatland	21%	26%	25%	17%	14%	16%	18%	19%	23%	28%	23%	32%	31%	21%
South Central MT	27%	30%	31%	29%	24%	27%	30%	31%	33%	34%	31%	36%	37%	30%

Source: USDA Farm Service Agency (Montana)

MONTANA FALLOW ACREAGE AS A PERCENTAGE OF DRY CROPLAND BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	29%	35%	35%	36%	34%	27%	32%	36%	41%	34%	37%	33%	39%	47%
Fallon	31%	33%	35%	39%	36%	37%	34%	41%	39%	33%	29%	31%	27%	44%
Powder River	42%	38%	50%	46%	46%	39%	45%	52%	63%	87%	73%	44%	41%	46%
Wibaux	34%	30%	33%	32%	30%	30%	27%	29%	23%	24%	22%	20%	17%	61%
Southeast MT	33%	34%	37%	37%	35%	33%	33%	38%	38%	35%	34%	31%	30%	50%
Garfield	48%	44%	48%	48%	50%	51%	49%	51%	47%	51%	43%	50%	49%	56%
Musselshell	16%	19%	14%	22%	26%	20%	21%	18%	23%	19%	20%	27%	42%	41%
Petroleum	40%	40%	44%	47%	37%	41%	36%	49%	42%	50%	48%	46%	49%	45%
East Central	42%	40%	41%	43%	43%	44%	43%	46%	43%	46%	40%	46%	48%	52%
Deer Lodge	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	66%	95%	100%	100%
Flathead	18%	17%	16%	16%	18%	15%	29%	22%	22%	20%	16%	21%	23%	19%
Granite	0%	0%	0%	0%	0%	100%	10%	39%	100%	0%	0%	100%	100%	100%
Lake	20%	25%	24%	34%	42%	37%	48%	30%	44%	44%	43%	52%	38%	45%
Lincoln	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Mineral	33%	39%	84%	32%	61%	100%	47%	88%	75%	42%	36%	30%		23%
Missoula	47%	50%	49%	42%	43%	48%	50%	53%	64%	64%	76%	69%	67%	37%
Powell	30%	38%	22%	31%	29%	29%	43%	10%	40%	43%	27%	27%	100%	33%
Ravalli	56%	40%	63%	21%	45%	57%	65%	39%	38%	46%	37%	38%	54%	45%
Sanders	44%	53%	51%	56%	76%	67%	61%	68%	65%	87%	41%	58%	57%	56%
Silver Bow	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Western MT	25%	27%	27%	25%	30%	31%	39%	30%	33%	32%	28%	33%	31%	28%
State Total	**38%**	**38%**	**39%**	**39%**	**35%**	**37%**	**37%**	**38%**	**38%**	**37%**	**35%**	**37%**	**37%**	**42%**

Source: USDA Farm Service Agency (Montana)

MONTANA CRP ACREAGE BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	124,662	143,105	146,752	146,909	146,928	147,486	147,509	147,062	147,144	147,248	145,536	144,335	142,349	138,940
Dawson	80,960	74,822	89,911	98,030	97,101	95,537	92,781	92,877	95,157	92,305	89,904	91,972	85,047	70,192
McCone	140,985	126,181	139,537	145,217	142,744	143,227	143,270	141,968	141,356	140,890	135,392	134,420	125,576	118,663
Richland	90,678	98,133	111,972	118,863	119,168	118,758	112,639	113,544	115,006	115,655	111,655	108,916	105,927	109,559
Roosevelt	141,787	152,577	173,458	176,757	176,231	173,943	172,113	170,504	174,840	176,454	170,139	168,078	166,702	169,132
Sheridan	160,573	159,454	154,793	158,661	157,031	157,399	157,247	158,116	153,713	159,967	156,953	153,206	148,050	137,031
Valley	207,883	209,849	203,622	211,910	209,043	209,031	203,176	211,073	209,968	203,845	201,574	195,664	191,747	178,224
Northeast MT	947,528	964,121	1,020,045	1,056,347	1,048,246	1,045,380	1,028,734	1,035,144	1,037,183	1,036,364	1,011,152	996,591	965,397	921,740
Blaine	129,455	154,110	162,394	162,903	162,866	162,811	158,969	161,908	165,954	165,794	155,047	146,416	142,281	134,905
Phillips	121,753	168,988	168,629	168,629	165,253	167,549	168,400	169,553	168,052	163,982	156,406	148,746	149,460	149,167
Blaine-Phillips	251,207	323,098	331,023	331,532	328,119	330,360	327,369	331,461	334,006	329,777	311,453	295,161	291,741	284,073
Big Horn	28,493	10,555	41,408	43,085	41,307	42,044	33,861	33,919	30,461	39,241	32,046	30,401	25,433	19,586
Carbon	10,205	10,431	10,835	11,050	11,656	9,889	11,991	11,989	13,624	13,654	13,529	13,039	9,781	7,502
Rosebud	30,730	50,999	48,862	50,348	48,055	47,066	50,430	50,161	51,294	53,049	51,745	45,084	41,874	28,493
Stillwater	47,987	42,717	40,150	52,690	51,403	51,403	52,051	53,110	53,536	55,990	49,241	47,950	45,036	40,684
Treasure	2,851	1,699	2,317	2,352	2,317	2,324	2,317	2,345	2,345	2,345	1,510	1,510	859	445
Yellowstone	56,366	50,164	49,540	56,633	55,881	55,868	53,663	54,711	56,805	57,553	49,094	50,229	48,771	47,287
Upper Yellowstone Corridor	176,631	166,565	193,112	216,157	210,618	208,592	204,313	206,233	208,065	221,831	197,165	188,213	171,755	143,997
Custer	13,699	16,540	15,417	15,498	15,471	15,810	15,290	15,415	15,328	15,772	16,758	16,600	15,254	4,483
Dawson (also in NE MT)	80,960	74,822	89,911	98,030	97,101	95,537	92,781	92,877	95,157	92,305	89,904	91,972	85,047	70,192
Prairie	40,182	45,782	41,818	41,707	41,321	41,096	38,217	38,238	42,132	40,631	38,951	38,473	38,405	37,285
Richland (also in NE MT)	90,678	98,133	111,972	118,863	119,168	118,758	112,639	113,544	115,006	115,655	111,655	108,916	105,927	109,559
Lower Yellowstone Corridor	225,519	235,278	259,118	274,097	273,060	271,200	258,926	260,074	267,623	264,362	257,268	255,961	244,632	221,519
Beaverhead	3,317	3,097	1,644	1,644	1,645	1,626	119	119	127	127	127	127	127	127
Broadwater	23,124	22,827	23,535	24,395	24,428	24,350	27,944	28,296	28,646	28,493	24,985	24,269	20,137	13,198
Gallatin	4,622	3,862	2,469	3,268	5,310	5,310	4,677	4,752	4,752	4,752	4,752	4,752	4,752	1,420
Jefferson	6,494	6,620	5,609	7,242	4,516	4,517	4,517	4,617	4,342	4,342	3,519	2,834	2,200	8,016
Lewis & Clark	5,476	3,549	3,851	4,004	4,004	4,022	4,592	3,552	3,398	4,678	2,953	2,551	2,288	2,850
Madison	4,640	3,946	4,741	3,823	4,511	4,503	4,514	4,712	5,365	5,377	5,077	5,018	4,672	4,391
Southwest MT	47,672	43,901	41,849	44,374	44,413	44,326	46,362	46,047	46,630	47,770	41,414	39,552	34,176	30,002
Cascade	63,246	66,680	73,426	75,247	74,825	71,741	80,652	81,225	83,894	83,822	71,795	68,953	67,389	67,558
Chouteau	152,829	165,158	231,763	252,375	258,059	258,042	259,401	262,909	272,187	278,917	274,861	271,677	263,673	238,494
Glacier	73,861	71,908	82,056	89,902	88,542	89,180	91,073	91,225	92,729	93,045	84,951	80,968	80,320	70,200
Hill	171,871	222,339	266,667	289,494	290,782	292,896	291,995	298,956	288,726	299,769	293,339	271,547	272,712	284,743
Liberty	72,238	93,119	120,002	135,899	135,901	136,547	139,429	139,507	141,892	153,637	154,084	151,711	149,389	125,048
Pondera	57,987	63,702	75,186	80,059	81,354	80,351	81,443	80,826	88,103	84,736	75,429	73,408	72,918	71,764
Teton	113,449	126,512	142,064	149,002	148,392	149,730	149,921	150,019	152,384	151,078	126,165	112,470	110,587	95,492
Toole	159,105	173,854	175,121	174,884	175,310	176,287	177,559	178,170	179,213	178,661	173,185	169,163	168,475	168,615
Golden Triangle	864,584	983,271	1,166,285	1,246,862	1,253,163	1,254,774	1,271,473	1,282,836	1,299,128	1,323,665	1,253,809	1,199,897	1,185,463	1,121,914
Fergus	51,831	56,580	64,988	76,218	76,061	76,127	76,258	73,664	74,729	74,162	69,916	64,071	57,407	44,176
Judith Basin	25,454	24,309	24,227	26,794	27,012	26,803	30,395	30,815	32,397	32,417	29,254	29,253	26,935	25,187
Central MT	77,285	80,889	89,214	103,011	103,073	102,930	106,653	104,479	107,126	106,579	99,169	93,324	84,342	69,363
Golden Valley	38,594	39,575	44,660	45,725	46,966	45,163	45,263	46,143	47,642	47,272	45,487	43,515	40,079	39,798
Meagher	7,759	7,850	7,683	7,683	7,683	7,728	7,676	7,676	7,674	7,676	6,343	6,343	5,643	2,302
Park	11,999	10,563	11,697	11,757	11,113	10,025	10,997	10,997	10,997	10,979	10,568	10,551	9,889	8,902
Sweet Grass	2,729	2,593	2,150	2,114	1,869	1,869	1,547	1,513	1,490	1,420	1,183	550	550	1,323
Wheatland	25,356	24,903	26,863	34,384	34,390	36,077	38,114	38,114	39,700	40,107	40,102	40,060	38,846	32,856
South Central MT	86,437	85,484	93,052	101,662	102,021	100,862	103,597	104,443	107,504	107,454	103,684	101,020	95,008	85,181

MONTANA CRP ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	22,144	19,751	19,751	19,750	19,750	19,750	19,643	19,790	19,731	20,955	18,592	18,487	12,996	9,981
Fallon	49,371	46,571	45,086	45,610	45,607	45,615	45,434	45,434	46,201	45,597	40,912	40,432	34,661	20,022
Powder River	15,405	7,861	7,635	7,702	7,701	7,701	7,598	7,728	8,082	8,080	7,698	7,503	6,838	3,909
Wibaux	44,547	39,637	37,875	38,182	38,177	38,105	36,015	36,062	36,515	36,649	35,827	35,070	26,341	16,242
Southeast MT	131,467	113,820	110,347	111,244	111,235	111,171	108,689	109,014	110,528	111,281	103,028	101,491	80,835	50,154
Garfield	71,215	77,410	71,606	83,833	58,733	83,576	78,488	78,464	85,467	86,174	82,682	79,120	71,258	49,182
Musselshell	34,897	40,160	40,306	42,369	40,631	40,639	41,341	41,325	41,706	39,970	39,163	37,443	36,070	28,773
Petroleum	11,611	10,214	11,296	11,296	11,296	11,296	12,157	12,299	12,299	12,299	11,157	9,904	7,920	8,708
East Central	117,723	127,783	123,208	137,497	110,659	135,510	131,986	132,088	139,472	138,443	133,002	126,467	115,248	86,663
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	
Flathead	33	33	33	58	58	55	144	157	136	205	202	202	202	202
Granite	0	0	0	0	117	117	117	117	117	117	117	117	117	117
Lake	868	180	54	77	112	112	170	170	170	170	170	162	154	154
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missoula	0	0	0	25	33	33	33	33	39	46	46	39	39	39
Powell	0	0	0	0	44	129	128	129	129	129	129	124	124	124
Ravalli	997	1,039	436	430	444	447	544	559	561	561	561	561	466	465
Sanders	172	172	0	0	0	0	0	102	0	102	102	102	102	445
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	2,070	1,424	524	590	808	892	1,136	1,266	1,151	1,330	1,326	1,306	1,203	1,545
State Total	**2,756,484**	**2,952,678**	**3,225,892**	**3,406,481**	**3,369,145**	**3,391,703**	**3,383,817**	**3,406,665**	**3,448,252**	**3,480,895**	**3,310,911**	**3,198,096**	**3,078,825**	**2,836,400**

MONTANA CRP ACREAGE AS A PERCENTAGE OF DRY CROPLAND BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	25%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	26.5%	26.2%
Dawson	21%	20%	24%	26%	26%	26%	25%	26%	26%	26%	25%	26%	24.6%	19.7%
McCone	28%	26%	28%	28%	28%	28%	28%	29%	29%	29%	28%	28%	26.9%	26.2%
Richland	23%	25%	28%	31%	31%	31%	30%	31%	30%	31%	30%	29%	29.1%	30.5%
Roosevelt	20%	22%	25%	25%	26%	26%	25%	25%	26%	27%	25%	25%	25.2%	24.8%
Sheridan	26%	25%	25%	25%	25%	25%	25%	25%	24%	26%	25%	25%	24.0%	23.3%
Valley	30%	30%	30%	30%	30%	30%	29%	30%	30%	30%	29%	28%	27.7%	26.0%
Northeast MT	25%	25%	27%	27%	27%	27%	27%	28%	27%	28%	27%	27%	26.2%	25.2%
Blaine	25%	30%	31%	31%	31%	31%	30%	31%	31%	31%	29%	28%	26.9%	25.7%
Phillips	28%	39%	39%	39%	39%	40%	40%	41%	40%	38%	37%	36%	36.3%	34.8%
Blaine-Phillips	27%	34%	35%	35%	34%	35%	34%	35%	35%	34%	33%	31%	31.0%	29.8%
Big Horn	11%	6%	18%	17%	16%	17%	14%	15%	13%	17%	13%	13%	11.9%	9.4%
Carbon	29%	33%	35%	38%	38%	37%	42%	33%	46%	46%	48%	48%	43.2%	40.5%
Rosebud	21%	34%	34%	36%	35%	37%	38%	37%	38%	40%	39%	35%	35.1%	29.3%
Stillwater	34%	32%	32%	39%	38%	40%	39%	41%	39%	41%	37%	37%	36.0%	34.3%
Treasure	26%	18%	24%	23%	26%	26%	27%	21%	25%	26%	19%	19%	10.7%	4.6%
Yellowstone	25%	23%	22%	25%	24%	25%	25%	25%	28%	28%	24%	24%	24.1%	23.9%
Upper Yellowstone Corridor	21%	23%	25%	27%	26%	28%	27%	27%	28%	30%	26%	26%	24.8%	22.1%
Custer	17%	20%	19%	20%	20%	20%	19%	21%	21%	23%	24%	24%	23.8%	8.2%
Dawson (also in NE MT)	21%	20%	24%	26%	26%	26%	25%	26%	26%	26%	25%	26%	24.6%	19.7%
Prairie	38%	44%	41%	40%	46%	42%	39%	40%	43%	42%	41%	41%	41.1%	45.1%
Richland (also in NE MT)	23%	25%	28%	31%	31%	31%	30%	31%	30%	31%	30%	29%	29.1%	30.5%
Lower Yellowstone Corridor	23%	25%	27%	29%	29%	29%	28%	29%	29%	29%	28%	29%	28.2%	26.0%
Beaverhead	31%	28%	17%	18%	19%	18%	3%	2%	9%	8%	13%	12%	10.7%	20.4%
Broadwater	30%	30%	30%	32%	31%	31%	35%	35%	39%	41%	40%	39%	34.8%	25.1%
Gallatin	5%	4%	3%	3%	5%	6%	5%	5%	5%	5%	5%	5%	5.4%	1.7%
Jefferson	60%	61%	71%	72%	82%	82%	84%	77%	72%	84%	86%	87%	82.9%	60.9%
Lewis & Clark	20%	13%	12%	14%	15%	15%	18%	13%	15%	17%	11%	10%	9.0%	11.5%
Madison	31%	31%	37%	30%	35%	35%	33%	31%	46%	46%	44%	44%	47.3%	36.9%
Southwest MT	20%	19%	18%	19%	19%	19%	21%	21%	22%	23%	21%	20%	18.5%	16.1%
Cascade	18%	19%	21%	22%	21%	22%	23%	25%	24%	25%	22%	21%	20.5%	20.6%
Chouteau	12%	13%	19%	20%	18%	20%	21%	22%	22%	22%	21%	21%	20.8%	19.1%
Glacier	17%	17%	19%	20%	20%	20%	20%	24%	21%	21%	19%	18%	18.4%	17.0%
Hill	15%	19%	23%	25%	23%	25%	24%	26%	26%	26%	26%	25%	24.7%	24.2%
Liberty	12%	16%	20%	22%	19%	23%	22%	24%	24%	24%	23%	23%	22.3%	21.5%
Pondera	12%	13%	16%	16%	15%	17%	16%	18%	18%	18%	16%	16%	15.7%	16.2%
Teton	26%	28%	32%	33%	32%	34%	34%	33%	35%	35%	30%	27%	26.6%	24.3%
Toole	23%	26%	26%	25%	25%	26%	26%	28%	26%	26%	25%	24%	24.5%	24.1%
Golden Triangle	16%	18%	22%	23%	21%	23%	23%	25%	24%	24%	23%	22%	22.1%	21.2%
Fergus	12%	14%	16%	18%	18%	19%	19%	20%	19%	19%	18%	17%	15.1%	12.5%
Judith Basin	13%	13%	14%	15%	16%	16%	18%	20%	20%	20%	18%	19%	17.8%	16.0%
Central MT	13%	13%	15%	17%	17%	18%	19%	20%	19%	19%	18%	17%	15.9%	13.6%
Golden Valley	37%	40%	46%	46%	47%	50%	49%	52%	50%	51%	50%	48%	45.0%	40.4%
Meagher	24%	23%	23%	24%	24%	25%	25%	26%	25%	26%	22%	24%	21.8%	10.2%
Park	37%	34%	38%	41%	38%	36%	38%	39%	40%	45%	40%	43%	40.9%	38.5%
Sweet Grass	24%	24%	29%	30%	33%	38%	34%	35%	32%	34%	26%	14%	19.4%	16.5%
Wheatland	23%	23%	25%	32%	33%	34%	34%	40%	38%	40%	39%	39%	39.0%	35.4%
South Central MT	30%	30%	34%	37%	37%	39%	39%	42%	41%	43%	41%	40%	39.3%	34.7%

MONTANA CRP ACREAGE AS A PERCENTAGE OF DRY CROPLAND BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	21%	18%	20%	20%	21%	19%	22%	22%	22%	24%	20%	21%	16.7%	13.0%
Fallon	34%	34%	34%	34%	35%	36%	36%	38%	38%	38%	36%	36%	33.2%	22.4%
Powder River	24%	14%	14%	15%	16%	16%	16%	19%	24%	33%	27%	17%	16.3%	11.6%
Wibaux	38%	35%	34%	36%	36%	36%	34%	36%	36%	37%	36%	35%	29.8%	19.0%
Southeast MT	30%	27%	28%	29%	29%	29%	29%	31%	32%	34%	31%	30%	25.9%	17.6%
Garfield	25%	26%	25%	29%	28%	29%	28%	29%	30%	31%	29%	29%	28.0%	20.5%
Musselshell	38%	45%	40%	42%	43%	46%	48%	50%	48%	47%	45%	45%	44.5%	43.8%
Petroleum	26%	25%	26%	24%	23%	24%	24%	26%	26%	26%	24%	20%	15.8%	13.9%
East Central	28%	30%	28%	31%	31%	32%	31%	33%	33%	34%	32%	31%	29.9%	23.5%
Deer Lodge	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.0%	0.0%
Flathead	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	0.9%	0.9%
Granite	0%	0%	0%	0%	61%	59%	22%	43%	63%	100%	100%	81%	75.1%	43.6%
Lake	7%	2%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2.4%	2.0%
Lincoln	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Mineral	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0.0%
Missoula	0%	0%	0%	1%	1%	1%	1%	2%	2%	2%	2%	2%	3.1%	3.0%
Powell	0%	0%	0%	0%	8%	18%	29%	11%	19%	24%	23%	18%	60.0%	38.1%
Ravalli	36%	31%	17%	38%	23%	17%	19%	21%	26%	25%	30%	26%	24.8%	30.5%
Sanders	4%	4%	0%	0%	0%	0%	0%	6%	0%	8%	6%	6%	8.7%	31.8%
Silver Bow	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.0%	
Western MT	4%	3%	1%	2%	2%	2%	3%	3%	3%	4%	4%	4%	3.6%	4.4%
State Total	**21%**	**23%**	**25%**	**26%**	**25%**	**26%**	**26%**	**27%**	**27%**	**27%**	**26%**	**25%**	**24.6%**	**23.0%**

MONTANA GENERAL SIGNUP CRP CONTRACT EXPIRATIONS – FY2011 – FY2017

contract expiration:	FY2011 (9/30/11)	FY2012 (9/30/12)	FY2013 (9/30/13)	FY2014 (9/30/14)	FY2015 (9/30/15)	FY2016 (9/30/16)	FY2017 (9/30/17)	TOTAL FY11 - FY17
first potential crop:	2012	2013	2014	2015	2016	2017	2018	
COUNTY								
DANIELS	9,190	31,005	6,650	2,794	0	0	52,485	102,124
DAWSON	24,949	24,894	4,284	1,168	2,272	690	785	59,041
MCCONE	49,327	27,076	6,152	587	0	2,167	943	86,253
RICHLAND	8,828	23,300	15,214	11,282	5,848	616	16,350	81,438
ROOSEVELT	20,033	44,039	27,629	17,432	7,068	2,123	24,354	142,678
SHERIDAN	34,471	54,337	17,724	9,065	2,676	871	21,005	140,149
VALLEY	34,596	53,889	23,276	15,426	3,971	0	31,996	163,154
NORTHEAST MT	181,393	258,541	100,929	57,754	21,835	6,467	147,918	774,836
BLAINE	23,786	37,729	25,556	17,142	4,127	2,395	8,010	118,745
PHILLIPS	32,910	46,491	28,796	681	0	0	15,059	123,937
BLAINE - PHILLIPS	56,696	84,220	54,352	17,823	4,127	2,395	23,070	242,682
BIG HORN	5,124	7,550	2,570	80	3,936	632	0	19,891
CARBON	1,307	1,358	401	0	2,122	440	0	5,627
ROSEBUD	13,283	5,610	3,755	1,280	685	1,885	0	26,498
STILLWATER	3,051	5,689	3,567	4,106	1,761	3,227	0	21,402
TREASURE								
YELLOWSTONE	5,667	6,918	1,934	397	3,575	846	928	20,265
UPPER YELLOWSTONE CORRIDOR	28,431	27,125	12,227	5,863	12,078	7,031	928	93,682
CUSTER	3,452	1,226	127	0	0	445	333	5,582
DAWSON (also in NE MT)	24,949	24,894	4,284	1,168	2,272	690	785	59,041
PRAIRIE	12,685	8,531	2,117	0	2,981	1,974	3,651	31,939
RICHLAND (also in NE MT)	8,828	23,300	15,214	11,282	5,848	616	16,350	81,438
LOWER YELLOWSTONE CORRIDOR	49,914	57,950	21,742	12,450	11,100	3,726	21,118	177,999
BEAVERHEAD								
BROADWATER	1,592	4,819	1,046	1,928	1,206	0	217	10,808
GALLATIN	1,417	241	1,700	755	201	0	0	4,315
JEFFERSON	0	62	0	232	0	0	0	293
LEWIS AND CLARK	44	1,696	291	0	0	0	0	2,031
MADISON	1,301	1,289	0	678	87	0	0	3,354
SOUTHWEST MT	4,355	8,107	3,037	3,593	1,493	0	217	20,802
CASCADE	5,063	8,934	8,622	7,042	3,590	1,164	18,819	53,234
CHOUTEAU	38,800	46,656	31,399	48,311	13,506	1,688	13,872	194,231
GLACIER	8,400	14,638	6,012	4,058	5,831	1,058	23,106	63,103
HILL	34,454	45,986	49,455	49,648	13,659	0	5,986	199,188
LIBERTY	20,228	26,614	25,441	27,731	7,257	0	6,627	113,898
PONDERA	2,030	10,289	8,435	5,702	10,058	252	9,265	46,032
TETON	5,736	13,145	9,372	8,358	1,174	2,246	17,607	57,639
TOOLE	15,653	44,428	20,857	6,644	706	63	47,384	135,734
GOLDEN TRIANGLE	130,365	210,691	159,593	157,494	55,781	6,470	142,666	863,059

MONTANA GENERAL SIGNUP CRP CONTRACT EXPIRATIONS – FY2011 – FY2017 (continued)

contract expiration:	FY2011 (9/30/11)	FY2012 (9/30/12)	FY2013 (9/30/13)	FY2014 (9/30/14)	FY2015 (9/30/15)	FY2016 (9/30/16)	FY2017 (9/30/17)	TOTAL FY11 - FY17
first potential crop:	2012	2013	2014	2015	2016	2017	2018	
COUNTY								
FERGUS	15,416	13,147	6,301	2,671	1,334	0	73	38,942
JUDITH BASIN	5,315	9,025	5,492	208	1,775	153	92	22,059
CENTRAL MT	20,731	22,172	11,793	2,879	3,109	153	164	61,001
GOLDEN VALLEY	12,625	10,872	2,038	871	1,395	858	5,185	33,845
MEAGHER	627	1,394	0	0	0	0	282	2,302
PARK	2,222	3,073	957	0	0	1,007	655	7,914
SWEET GRASS	0	121	179	0	0	0	0	299
WHEATLAND	4,504	13,769	6,119	1,170	1,408	1,404	1,928	30,302
SOUTH CENTRAL MT	19,978	29,228	9,292	2,041	2,803	3,270	8,050	74,662
CARTER	0	3,778	0	0	0	1,289	0	5,067
FALLON	7,259	6,900	602	0	0	82	392	15,236
POWDER RIVER	656	1,950	143	0	360	0	0	3,109
WIBAUX	6,124	4,856	129	180	0	421	622	12,333
SOUTHEAST MT	14,040	17,485	874	180	360	1,791	1,014	35,745
GARFIELD	11,227	18,849	3,413	411	7,000	4,708	0	45,607
MUSSELSHELL	8,708	8,852	3,020	0	1,015	0	3,449	25,044
PETROLEUM	2,907	711	864	366	0	0	0	4,847
EAST CENTRAL	22,842	28,412	7,297	776	8,014	4,708	3,449	75,498
DEER LODGE								
FLATHEAD	0	0	89	0	0	68	0	158
GRANITE								
LAKE	0	0	0	0	0	0	0	0
LINCOLN								
MINERAL								
MISSOULA								
POWELL	0	0	0	0	0	0	0	0
RAVALLI	326	0	0	0	0	0	0	326
SANDERS	0	0	102	0	0	0	0	102
SILVER BOW								
WESTERN MT	325.5	0	190.7	0	0	68.3	0	584.5
N.R.	67	0	0	0	0	0	0	67
STATE TOTAL	**495,360**	**695,736**	**361,828**	**248,403**	**112,581**	**34,771**	**331,459**	**2,280,138**

N.R. = County specific data not reported to prevent disclosure of information about individual operations.

Source: USDA Farm Service Agency

MONTANA DRYLAND WHEAT & BARLEY ACREAGE BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	262,815	261,431	271,119	281,634	289,497	297,402	272,471	219,259	247,186	258,140	285,421	279,739	277,211	252,010
Dawson	181,838	180,875	176,893	176,371	181,501	179,188	169,009	159,133	172,504	171,111	182,091	166,295	163,159	152,771
McCone	220,412	221,786	221,110	233,097	232,308	240,286	241,131	228,154	232,989	221,431	241,526	211,374	207,841	148,492
Richland	167,610	164,951	151,844	152,219	152,585	157,525	160,628	148,723	161,482	162,241	179,147	172,945	169,538	144,671
Roosevelt	338,102	348,239	328,608	326,629	328,829	343,710	350,211	328,953	315,596	316,615	352,505	327,944	312,980	258,385
Sheridan	302,573	308,894	324,704	335,019	337,267	355,418	355,294	319,086	285,945	294,184	330,735	309,456	279,914	220,773
Valley	299,856	292,819	289,764	296,033	299,735	304,551	303,925	278,391	283,988	284,481	311,565	301,723	294,037	237,473
Northeast MT	1,773,206	1,778,993	1,764,043	1,801,002	1,821,721	1,878,079	1,852,670	1,681,699	1,699,689	1,708,201	1,882,990	1,769,475	1,704,681	1,416,588
Blaine	217,480	196,957	186,338	181,840	191,972	193,920	194,803	188,038	187,785	189,842	198,728	198,947	192,908	166,680
Phillips	175,867	138,394	129,945	133,844	127,989	137,604	131,799	123,487	129,104	132,845	137,722	136,574	128,576	116,180
Blaine-Phillips	393,346	335,351	316,283	315,685	319,961	331,524	326,602	311,525	316,889	322,686	336,450	335,521	321,483	282,859
Big Horn	137,557	93,048	101,515	113,076	112,179	111,277	104,130	108,506	105,536	110,390	121,270	97,083	98,920	96,539
Carbon	11,308	9,952	8,300	8,485	7,533	6,116	6,536	12,899	5,935	6,455	7,780	6,101	7,086	5,465
Rosebud	61,088	52,936	42,746	46,232	46,896	39,678	41,928	42,182	38,726	40,184	46,253	42,811	42,471	29,784
Stillwater	52,629	49,455	44,427	44,354	49,811	42,231	44,511	37,862	42,844	42,551	46,321	45,283	42,231	39,684
Treasure	4,072	2,740	3,526	3,113	3,166	3,227	3,416	5,197	4,064	3,224	3,551	2,527	2,884	4,922
Yellowstone	102,177	98,392	102,371	89,692	105,364	93,097	86,768	106,925	87,900	86,876	94,512	93,410	90,903	83,433
Upper Yellowstone Corridor	368,831	306,523	302,885	304,953	324,948	295,626	287,290	313,571	285,006	289,679	319,687	287,215	284,495	259,829
Custer	34,960	29,200	31,144	30,213	29,012	29,727	28,847	25,257	24,479	24,946	26,565	25,140	19,918	18,233
Dawson (also in NE MT)	181,838	180,875	176,893	176,371	181,501	179,188	169,009	159,133	172,504	171,111	182,091	166,295	163,159	152,771
Prairie	37,643	33,191	33,505	37,001	21,731	32,678	30,379	32,023	29,813	32,177	34,705	32,430	33,866	22,414
Richland (also in NE MT)	167,610	164,951	151,844	152,219	152,585	157,525	160,628	148,723	161,482	162,241	179,147	172,945	169,538	144,671
Lower Yellowstone Corridor	422,052	408,217	393,386	395,804	384,829	399,117	388,862	365,137	388,277	390,474	422,508	396,809	386,481	338,090
Beaverhead	4,566	5,031	4,097	4,077	3,574	4,399	2,338	4,412	620	267	533	737	258	339
Broadwater	29,245	28,190	30,933	25,887	31,948	29,888	31,990	28,068	27,552	23,238	24,545	22,552	20,938	22,622
Gallatin	55,769	52,977	46,422	52,011	56,034	55,414	49,458	43,906	47,264	50,927	49,336	46,550	43,945	47,806
Jefferson	1,743	2,059	1,014	1,359	167	381	276	771	490	0	510	23	234	3,332
Lewis & Clark	13,365	17,008	15,384	16,901	12,838	16,383	11,086	15,743	13,153	15,457	15,973	14,855	14,364	13,896
Madison	6,071	4,209	4,850	5,703	3,443	4,918	3,651	5,732	3,326	3,847	3,416	3,356	3,555	3,715
Southwest MT	110,758	109,473	102,700	105,938	108,004	111,382	98,798	98,631	92,405	93,736	94,312	88,074	83,294	91,710
Cascade	188,878	176,347	165,003	168,366	178,503	160,638	159,435	145,832	152,416	149,187	158,160	157,679	150,385	154,099
Chouteau	651,172	649,972	595,744	592,125	769,545	577,919	555,044	520,147	526,651	529,479	552,674	542,323	536,388	530,169
Glacier	207,265	203,455	203,360	203,940	215,163	212,602	218,093	137,864	207,938	213,557	220,658	224,083	212,869	202,896
Hill	533,441	518,748	466,443	453,178	557,921	462,836	518,779	433,279	433,663	434,870	434,694	424,484	425,945	467,999
Liberty	284,828	273,657	248,290	276,278	384,638	265,893	266,867	241,537	254,144	262,385	285,384	285,378	277,458	252,592
Pondera	238,975	236,779	223,494	241,334	288,878	232,083	232,186	205,150	209,605	211,788	222,061	214,076	213,103	204,744
Teton	202,853	194,189	175,189	182,717	200,751	169,693	175,258	186,101	161,179	158,491	173,004	172,714	165,954	166,382
Toole	278,382	274,452	269,518	271,227	331,521	286,126	271,794	233,146	271,529	271,676	284,932	289,724	272,138	288,211
Golden Triangle	2,585,794	2,527,600	2,347,041	2,389,166	2,926,920	2,367,790	2,397,456	2,103,056	2,217,125	2,231,432	2,331,568	2,310,462	2,254,239	2,267,092
Fergus	248,520	236,510	231,455	221,852	227,967	218,402	208,073	181,906	197,215	199,818	213,963	192,475	199,682	176,261
Judith Basin	125,954	117,600	108,840	110,683	112,122	109,510	104,841	87,783	92,349	91,884	100,433	87,668	83,325	79,235
Central MT	374,474	354,110	340,295	332,535	340,088	327,913	312,914	269,688	289,564	291,701	314,396	280,143	283,007	255,495
Golden Valley	43,506	41,642	33,562	31,657	36,893	26,964	28,090	23,899	28,332	27,515	27,686	30,206	27,871	35,123
Meagher	19,111	17,522	18,034	13,586	17,506	16,256	13,887	14,764	13,303	14,520	14,266	11,331	11,689	13,289
Park	10,709	10,609	10,282	9,148	10,923	10,480	10,153	9,591	8,370	7,461	9,168	6,878	7,874	7,874
Sweet Grass	4,426	3,628	3,327	2,612	1,390	955	1,364	1,896	2,071	1,425	2,166	1,939	1,161	3,954
Wheatland	65,071	60,144	58,847	60,857	60,801	58,279	58,883	45,577	49,546	43,447	47,232	42,969	40,872	42,665
South Central MT	142,822	133,545	124,052	117,860	127,513	112,935	112,377	95,726	101,622	94,369	100,517	93,322	89,467	102,905

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND WHEAT & BARLEY ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	55,471	53,553	47,585	45,488	43,929	57,362	45,270	40,426	37,733	39,530	44,530	42,947	35,432	29,218
Fallon	59,634	56,780	53,405	48,618	48,179	44,144	47,147	39,808	40,900	44,606	48,899	41,467	39,424	33,174
Powder River	27,393	27,922	21,810	21,497	20,070	23,454	20,929	14,500	8,829	1,878	5,055	18,457	17,658	12,107
Wibaux	42,648	43,771	42,719	40,465	39,199	40,789	41,565	36,087	39,015	37,514	36,932	38,134	36,433	22,046
Southeast MT	185,146	182,026	165,518	156,067	151,377	165,748	154,910	130,821	126,478	123,528	135,416	141,003	128,946	96,546
Garfield	110,037	120,916	112,386	104,769	75,188	96,892	101,859	91,167	99,916	89,763	109,077	91,810	90,526	78,981
Musselshell	43,369	32,758	49,026	43,245	39,362	37,167	34,817	33,013	34,198	35,864	37,697	32,532	25,696	21,154
Petroleum	19,059	17,965	17,820	18,945	23,079	19,689	24,574	18,148	20,675	17,605	18,030	21,233	21,394	29,292
East Central	172,465	171,639	179,232	166,959	137,629	153,748	161,251	142,329	154,789	143,232	164,804	145,574	137,616	129,427
Deer Lodge	0	0	0	0	0	0	0	118	0	0	0	6	0	0
Flathead	15,562	17,082	17,316	17,066	15,300	16,637	14,514	14,606	15,582	15,146	15,641	13,655	14,196	13,728
Granite	10	0	0	0	75	0	378	96	0	0	0	0	0	0
Lake	7,832	6,628	5,920	4,136	4,178	4,854	3,966	6,421	3,916	4,015	4,351	3,231	3,761	3,864
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	842	724	139	499	214	0	199	74	96	280	294	261	0	475
Missoula	1,833	2,039	2,202	2,436	2,323	1,932	1,501	909	590	617	516	590	403	808
Powell	755	471	794	292	351	361	177	882	328	229	315	401	0	135
Ravalli	747	1,359	776	516	809	917	744	860	991	773	812	950	642	585
Sanders	2,037	1,497	966	823	248	923	446	497	173	134	782	673	463	400
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	29,618	29,800	28,112	25,767	23,498	25,625	21,925	24,463	21,675	21,193	22,710	19,768	19,466	19,996
State Total	6,209,064	5,991,451	5,734,809	5,783,145	6,332,402	5,832,775	5,785,416	5,228,790	5,359,533	5,376,880	5,764,119	5,528,127	5,360,479	4,963,095

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND SPRING WHEAT ACREAGE BY COUNTY 1998 – 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	207,147	220,565	205,717	206,262	194,847	192,446	184,952	125,091	181,724	170,787	178,695	175,222	182,131	181,091
Dawson	148,900	163,807	151,727	152,434	154,256	148,238	150,576	143,289	155,790	129,643	130,101	120,579	142,595	126,087
McCone	191,497	198,320	184,666	198,071	194,506	190,074	204,159	195,890	213,061	171,244	177,215	156,069	179,261	116,803
Richland	141,871	151,175	125,962	126,333	115,256	112,927	124,347	111,484	137,077	121,585	128,068	131,059	146,744	126,402
Roosevelt	280,371	299,143	263,806	264,376	238,076	244,318	263,926	233,890	257,657	231,372	235,505	219,495	240,206	192,729
Sheridan	83,639	104,664	77,817	72,855	47,476	38,245	38,094	34,285	72,672	46,006	42,935	38,797	38,755	32,352
Valley	275,233	276,496	265,115	270,589	273,081	273,890	279,689	254,638	262,164	251,646	262,462	254,192	266,859	209,312
Northeast MT	1,328,657	1,414,169	1,274,810	1,290,920	1,217,498	1,200,137	1,245,743	1,098,566	1,280,145	1,122,282	1,154,981	1,095,414	1,196,551	984,776
Blaine	181,082	177,291	151,458	146,994	160,468	149,304	147,353	141,619	138,437	117,584	105,474	97,701	130,591	101,787
Phillips	138,875	121,926	107,896	108,735	92,099	100,808	93,940	97,448	104,534	87,076	85,402	88,356	97,827	77,282
Blaine-Phillips	319,957	299,217	259,354	255,729	252,568	250,112	241,293	239,066	242,971	204,659	190,875	186,057	228,418	179,069
Big Horn	18,557	26,012	20,257	17,124	24,529	11,040	18,683	11,064	20,204	20,204	22,007	4,670	5,707	8,751
Carbon	1,419	1,347	1,586	2,080	1,608	908	1,478	1,317	1,520	1,463	2,465	1,652	1,834	1,438
Rosebud	39,341	25,031	18,570	26,219	21,744	12,779	23,302	13,006	16,141	17,766	16,191	12,472	16,582	5,683
Stillwater	10,798	14,637	9,323	12,239	17,733	13,391	11,576	10,435	10,195	10,714	13,180	7,230	12,681	10,098
Treasure	726	614	772	672	923	1,527	810	1,082	1,640	647	1,302	540	371	2,318
Yellowstone	21,392	28,575	22,279	27,410	27,706	17,138	24,673	23,825	17,802	23,387	15,870	11,861	9,978	10,185
Upper Yellowstone Corridor	92,233	96,214	72,787	85,744	94,242	56,782	80,523	60,729	67,501	74,180	71,015	38,426	47,153	38,473
Custer	24,293	18,791	15,375	19,995	14,747	16,457	13,951	10,692	12,333	10,841	12,901	8,187	6,742	5,200
Dawson (also in NE MT)	148,900	163,807	151,727	152,434	154,256	148,238	150,576	143,289	155,790	129,643	130,101	120,579	142,595	126,087
Prairie	19,100	20,779	17,471	22,843	19,023	18,162	17,016	15,231	19,848	15,078	19,765	15,323	23,969	10,811
Richland (also in NE MT)	141,871	151,175	125,962	126,333	115,256	112,927	124,347	111,484	137,077	121,585	128,068	131,059	146,744	126,402
Lower Yellowstone Corridor	334,164	354,551	310,535	321,605	303,282	295,783	305,889	280,697	325,048	277,147	290,835	275,148	320,051	268,500
Beaverhead	1,002	1,271	1,513	856	326	355	439	423	620	267	388	423	4	304
Broadwater	18,897	21,603	20,938	15,003	19,589	17,425	17,267	14,187	18,718	11,809	13,705	14,701	14,771	15,175
Gallatin	11,376	10,527	11,260	13,635	15,452	14,085	22,007	17,263	15,512	16,578	15,195	14,941	13,233	12,197
Jefferson	593	1,557	465	693	116	334	276	422	482	556	0	0	234	1,209
Lewis & Clark	4,966	9,092	8,650	8,585	5,135	8,561	7,119	6,360	4,689	3,133	7,850	3,674	8,554	3,632
Madison	2,720	2,048	2,111	3,996	1,900	1,959	2,418	1,870	2,164	2,477	2,194	2,880	2,674	2,192
Southwest MT	39,553	46,097	44,937	42,768	42,518	42,720	49,525	40,526	42,187	34,819	39,331	36,619	39,469	34,708
Cascade	43,280	59,041	39,484	44,926	50,669	26,564	27,348	20,233	25,973	19,615	23,121	18,659	24,940	23,220
Chouteau	277,006	347,087	195,655	235,342	367,323	144,072	103,735	86,249	100,642	67,332	78,375	76,290	101,476	90,835
Glacier	91,442	96,139	88,408	110,674	118,803	102,557	113,459	115,015	126,173	95,121	75,554	97,185	114,941	88,820
Hill	365,002	445,476	300,334	301,968	432,572	200,622	232,343	149,966	188,991	137,161	116,418	84,899	155,735	167,657
Liberty	225,414	222,417	151,887	205,781	240,234	129,752	145,783	90,958	99,294	84,564	62,205	52,822	119,176	87,010
Pondera	98,354	119,861	65,036	101,114	119,032	51,314	63,728	52,350	52,590	35,026	46,007	50,158	79,615	63,716
Teton	55,262	77,093	45,891	62,084	70,990	37,693	35,555	28,187	30,963	17,133	26,128	31,707	41,974	38,973
Toole	201,327	202,727	166,172	200,631	248,614	176,767	190,698	132,982	151,155	144,836	138,284	123,753	178,470	159,698
Golden Triangle	1,357,087	1,569,841	1,052,869	1,262,520	1,648,236	869,342	912,650	675,938	775,781	600,790	566,091	535,473	816,326	719,930
Fergus	75,488	83,476	63,189	65,749	61,465	48,000	49,494	45,968	50,426	34,934	41,362	41,578	49,344	30,178
Judith Basin	30,359	34,370	29,897	33,792	30,376	31,111	33,643	36,547	32,057	23,927	26,749	22,873	26,808	20,491
Central MT	105,847	117,846	93,087	99,541	91,841	79,111	83,137	82,514	82,483	58,861	68,111	64,451	76,152	50,669
Golden Valley	12,721	21,621	10,938	11,727	14,846	9,190	8,331	9,439	6,572	6,884	4,808	5,484	6,277	4,190
Meagher	3,403	3,022	2,603	2,456	3,204	2,561	3,651	3,002	3,228	2,820	2,806	1,846	2,762	3,326
Park	2,561	2,195	2,947	2,686	3,111	4,482	3,877	3,344	2,015	1,995	3,934	2,686	3,025	2,715
Sweet Grass	1,655	1,674	1,766	2,142	872	298	621	1,206	1,652	1,159	1,611	960	931	1,520
Wheatland	29,884	33,788	30,193	35,713	32,455	24,451	24,761	29,163	21,431	12,915	13,402	12,243	13,481	15,416
South Central MT	50,224	62,300	48,447	54,725	54,487	40,981	41,242	46,154	34,897	25,774	26,562	23,220	26,476	27,167

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND SPRING WHEAT ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	37,449	34,603	24,280	26,059	27,018	31,373	18,347	17,454	19,657	13,343	16,480	14,187	20,124	8,605
Fallon	45,041	43,817	35,839	32,063	26,146	19,902	21,822	20,125	29,222	22,310	23,236	20,840	28,924	16,082
Powder River	17,488	14,419	8,987	9,989	9,520	7,512	8,368	4,457	2,171	789	1,198	3,461	3,460	2,142
Wibaux	31,547	36,312	32,811	29,907	25,247	25,013	23,596	22,764	28,983	25,485	21,032	22,851	22,580	10,710
Southeast MT	131,526	129,151	101,918	98,018	87,930	83,799	72,132	64,799	80,033	61,926	61,945	61,339	75,088	37,539
Garfield	81,176	91,095	72,243	75,002	49,753	51,955	55,248	47,999	54,442	36,902	48,138	38,752	49,339	35,542
Musselshell	17,663	18,925	30,688	25,169	20,478	12,623	9,000	12,499	18,183	11,008	8,659	13,221	12,488	5,374
Petroleum	4,717	9,863	7,531	13,083	11,892	5,276	10,848	5,411	4,112	9,463	5,225	4,269	5,809	5,776
East Central	103,556	119,883	110,462	113,254	82,123	69,853	75,096	65,908	76,737	57,372	62,022	56,242	67,636	46,692
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	6	0	0
Flathead	7,878	11,228	11,987	10,394	9,209	10,444	8,169	9,085	9,524	3,581	5,587	5,110	6,906	5,511
Granite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	4,185	5,463	3,986	3,008	2,136	2,379	636	1,669	789	2,249	1,991	242	225	1,515
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	176	0	0	214	0	0	44	0	104	135	0	0	75
Missoula	443	636	988	636	739	163	417	51	235	324	28	150	153	199
Powell	6	31	33	23	63	53	0	14	0	19	0	16	0	18
Ravalli	243	295	253	211	151	109	418	105	688	542	102	71	100	359
Sanders	596	617	351	496	54	348	54	101	32	32	387	214	158	250
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	13,351	18,444	17,599	14,768	12,566	13,495	9,694	11,069	11,268	6,851	8,229	5,809	7,541	7,927
State Total	3,585,384	3,912,733	3,109,115	3,360,825	3,617,779	2,740,952	2,842,000	2,411,193	2,726,183	2,273,432	2,281,827	2,126,558	2,611,521	2,142,961

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND WINTER WHEAT ACREAGE BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	1,885	28	0	0	20	497	132	88	178	3,459	7,245	5,886	291	2,824
Dawson	5,222	1,696	6,629	5,420	6,440	8,089	2,719	10,782	7,123	23,458	33,505	35,442	14,226	22,657
McCone	10,879	12,510	23,179	20,415	12,133	24,556	17,673	22,880	12,895	30,675	41,640	41,171	20,363	27,895
Richland	3,822	1,046	2,925	1,979	4,135	8,163	2,945	6,506	5,432	11,409	15,326	15,339	8,574	10,393
Roosevelt	7,796	2,798	10,277	6,216	2,473	5,417	560	3,956	1,476	15,703	28,695	23,733	4,459	10,948
Sheridan	1,622	380	2,394	241	0	0	0	0	871	3,625	7,682	10,723	227	2,633
Valley	11,819	3,241	6,384	6,752	1,391	6,651	4,211	3,687	5,602	10,230	20,633	22,335	6,365	12,728
Northeast MT	43,044	21,699	51,786	41,023	26,592	53,373	28,240	47,900	33,576	98,558	154,726	154,629	54,504	90,078
Blaine	18,146	8,378	17,425	20,455	11,590	24,910	28,019	39,018	38,758	55,321	76,965	88,936	51,895	55,206
Phillips	11,791	4,742	7,656	5,956	3,713	19,303	19,408	21,394	18,801	30,271	38,530	40,008	22,835	33,741
Blaine-Phillips	29,937	13,120	25,081	26,411	15,303	44,213	47,427	60,412	57,559	85,592	115,495	128,944	74,730	88,947
Big Horn	108,721	59,544	75,831	84,554	78,621	93,219	77,651	91,530	80,597	80,597	93,041	85,721	89,359	85,713
Carbon	8,277	6,118	5,064	5,003	4,383	4,518	4,233	5,952	4,137	3,605	4,351	3,793	4,873	3,907
Rosebud	19,412	24,652	21,943	18,700	22,554	26,304	18,107	27,721	21,944	21,661	29,283	29,410	24,489	23,642
Stillwater	29,512	25,165	25,078	19,582	17,085	19,809	22,844	26,434	26,650	26,442	29,069	33,966	25,496	26,603
Treasure	2,593	1,664	2,227	1,864	1,528	1,064	2,131	1,694	2,193	2,312	1,839	1,702	2,018	2,399
Yellowstone	69,628	60,589	70,420	53,607	67,277	68,685	55,676	70,801	66,680	58,695	74,586	76,036	76,591	69,948
Upper Yellowstone Corridor	238,142	177,730	200,564	183,309	191,448	213,599	180,642	224,132	202,201	193,312	232,168	230,628	222,827	212,211
Custer	8,094	8,463	13,616	7,920	10,676	11,492	12,583	14,042	11,559	12,820	12,635	16,032	11,576	12,423
Dawson (also in NE MT)	5,222	1,696	6,629	5,420	6,440	8,089	2,719	10,782	7,123	23,458	33,505	35,442	14,226	22,657
Prairie	12,198	6,601	11,266	9,120	0	11,320	7,122	15,617	8,711	14,644	13,853	15,414	8,545	11,202
Richland (also in NE MT)	3,822	1,046	2,925	1,979	4,135	8,163	2,945	6,506	5,432	11,409	15,326	15,339	8,574	10,393
Lower Yellowstone Corridor	29,336	17,807	34,436	24,438	21,251	39,064	25,369	46,947	32,824	62,330	75,318	82,227	42,921	56,674
Beaverhead	3,211	3,221	2,145	3,221	3,237	3,731	1,564	648	0	0	145	314	254	35
Broadwater	8,126	3,961	8,046	7,535	8,658	9,278	11,776	10,562	7,980	10,620	8,807	6,643	5,659	6,751
Gallatin	20,501	17,541	16,652	19,573	17,724	19,194	11,125	17,713	19,632	17,584	19,094	15,352	15,403	19,274
Jefferson	802	70	0	0	0	0	0	0	0	0	0	0	0	2,123
Lewis & Clark	3,375	761	3,127	2,440	3,707	3,928	0	5,901	6,350	10,591	6,541	7,772	2,272	7,858
Madison	2,155	1,617	2,193	1,157	1,000	2,762	209	1,439	1,119	1,106	1,088	9	758	1,305
Southwest MT	38,170	27,170	32,163	33,924	34,327	38,893	24,673	36,263	35,080	39,901	35,675	30,090	24,346	37,347
Cascade	86,616	71,399	88,840	90,665	90,787	102,608	102,855	115,030	110,899	108,220	113,203	115,984	108,784	110,814
Chouteau	250,762	199,133	309,788	278,584	330,211	377,201	410,130	428,345	395,584	419,461	438,066	422,122	399,262	413,325
Glacier	7,422	806	1,241	7,490	4,758	14,943	16,152	6,821	10,732	27,075	47,881	37,105	23,078	39,955
Hill	134,660	41,231	134,567	126,653	103,226	234,665	266,881	282,212	230,786	269,010	301,584	325,183	251,259	283,858
Liberty	27,280	16,633	66,719	41,248	118,524	114,167	101,602	146,804	140,164	155,987	197,755	208,489	136,655	144,495
Pondera	36,025	12,588	58,282	54,676	78,203	89,421	93,383	105,436	105,428	124,618	121,351	101,883	82,988	95,332
Teton	75,195	48,435	70,851	60,333	70,099	78,348	99,977	104,868	107,919	115,272	124,689	109,443	95,097	102,277
Toole	2,856	1,039	25,736	9,322	28,952	49,378	32,295	91,483	77,284	77,344	94,249	102,569	37,616	52,864
Golden Triangle	620,814	391,264	756,025	668,971	824,761	1,060,730	1,123,275	1,280,999	1,178,796	1,296,987	1,438,778	1,422,779	1,134,739	1,242,919
Fergus	101,008	95,815	115,969	102,618	106,755	124,644	128,008	135,865	132,895	133,062	148,758	131,298	128,495	130,697
Judith Basin	37,479	35,305	42,774	42,528	42,999	49,749	51,666	51,111	51,705	53,296	57,424	50,429	43,487	48,499
Central MT	138,488	131,120	158,743	145,146	149,754	174,393	179,674	186,976	184,600	186,358	206,182	181,727	171,982	179,195
Golden Valley	25,126	14,897	16,880	15,938	17,513	13,369	14,168	14,293	19,019	16,768	18,124	20,513	17,887	26,752
Meagher	5,137	4,138	5,387	3,480	5,691	6,145	6,255	8,895	6,693	7,284	5,426	5,154	6,006	5,119
Park	3,849	3,704	4,337	3,876	4,526	4,097	5,025	4,289	5,069	4,645	4,301	3,838	3,961	4,177
Sweet Grass	1,486	1,193	941	222	71	374	325	245	314	88	392	788	27	1,844
Wheatland	9,265	6,624	9,109	6,355	4,719	13,250	17,361	13,287	20,557	22,768	23,782	20,430	19,328	19,294
South Central MT	44,863	30,556	36,654	29,872	32,520	37,234	43,133	41,009	51,651	51,553	52,024	50,723	47,209	57,186

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND WINTER WHEAT ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	13,054	13,945	20,840	15,640	11,914	22,118	22,678	22,312	16,173	23,901	25,943	27,146	14,299	20,356
Fallon	6,135	8,325	11,645	9,577	12,531	17,446	20,449	18,849	10,120	17,922	22,010	18,771	8,847	15,964
Powder River	6,843	10,663	10,131	8,531	6,906	12,875	10,509	10,044	5,730	766	3,640	13,581	13,120	9,509
Wibaux	672	1,876	1,869	110	3,135	3,892	7,787	4,580	5,603	7,458	10,941	9,660	4,209	6,411
Southeast MT	26,703	34,808	44,485	33,859	34,485	56,332	61,422	55,786	37,627	50,046	62,534	69,159	40,475	52,241
Garfield	19,494	22,147	33,100	22,128	20,630	40,044	42,734	43,168	41,129	47,131	56,558	50,242	37,855	41,445
Musselshell	22,265	11,597	16,148	15,200	15,803	22,516	22,682	20,099	14,266	23,981	27,695	18,457	12,333	14,611
Petroleum	11,021	7,136	9,117	5,068	10,169	13,948	13,546	12,651	16,440	7,734	12,623	16,825	15,252	23,360
East Central	52,779	40,880	58,365	42,395	46,602	76,509	78,963	75,918	71,836	78,846	96,876	85,524	65,440	79,416
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flathead	2,068	1,380	602	981	903	1,560	2,351	3,497	2,540	4,775	4,693	4,679	4,089	3,996
Granite	0	0	0	0	75	0	378	0	0	0	0	0	0	0
Lake	3,463	749	890	961	1,787	2,365	3,084	2,784	3,049	1,434	2,027	2,878	3,173	2,102
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	822	489	139	499	0	0	199	0	96	98	0	214	0	308
Missoula	847	1,367	1,166	1,682	704	1,189	780	825	355	292	488	440	250	586
Powell	0	0	12	0	0	30	0	0	114	146	155	166	0	29
Ravalli	350	734	306	164	457	451	209	470	242	102	628	813	169	68
Sanders	934	566	231	297	114	234	133	331	88	45	346	414	283	60
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	8,482	5,286	3,346	4,583	4,039	5,828	7,135	7,906	6,484	6,892	8,336	9,605	7,964	7,149
State Total	1,261,714	888,698	1,392,093	1,226,532	1,370,507	1,783,915	1,794,288	2,046,959	1,879,679	2,115,509	2,429,281	2,395,253	1,864,335	2,070,314

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND DURUM ACREAGE BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	49,382	36,974	62,806	71,865	90,786	101,130	86,339	94,020	64,441	82,107	97,289	97,086	94,760	67,475
Dawson	7,806	441	2,228	2,860	4,708	7,061	2,374	3,590	1,297	4,567	8,965	5,322	2,410	2,199
McCone	5,630	940	2,842	3,959	10,581	12,950	8,415	8,773	2,075	4,986	10,796	7,496	4,185	1,233
Richland	8,293	2,260	10,894	11,734	20,582	22,042	21,120	21,166	6,071	15,011	18,541	16,311	7,618	2,025
Roosevelt	44,196	40,283	47,566	50,342	76,244	84,340	78,635	89,574	52,869	65,634	84,832	82,496	67,472	54,157
Sheridan	212,142	198,900	236,665	250,845	277,367	306,693	308,345	283,705	208,767	239,115	274,595	256,867	239,970	185,590
Valley	3,256	5,619	11,670	10,614	14,020	15,368	12,813	18,972	12,384	15,775	21,795	19,909	16,406	12,792
Northeast MT	330,706	285,416	374,670	402,218	494,290	549,584	518,041	519,800	347,905	427,195	516,812	485,487	432,821	325,470
Blaine	3,298	326	2,405	1,975	2,403	3,438	4,112	3,983	1,550	2,721	3,533	4,632	3,309	1,672
Phillips	3,947	411	1,058	1,824	2,703	1,939	3,247	3,801	234	0	5,722	942	1,997	1,258
Blaine-Phillips	7,244	737	3,463	3,800	5,106	5,377	7,359	7,784	1,784	2,721	9,255	5,573	5,306	2,930
Big Horn	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosebud	228	418	595	0	0	0	0	0	0	0	0	0	0	0
Stillwater	473	0	0	0	0	0	0	0	0	0	0	0	0	0
Treasure	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellowstone	0	0	0	0	539	0	0	0	0	0	0	0	0	0
Upper Yellowstone Corridor	706	418	595	0	539	0	0	0	0	0	0	0	0	0
Custer	84	0	36	0	0	0	0	0	0	0	0	0	0	0
Dawson (also in NE MT)	7,806	441	2,228	2,860	4,708	7,061	2,374	3,590	1,297	4,567	8,965	5,322	2,410	2,199
Prairie	31	0	0	0	302	565	291	560	0	0	0	0	0	0
Richland (also in NE MT)	8,293	2,260	10,894	11,734	20,582	22,042	21,120	21,166	6,071	15,011	18,541	16,311	7,618	2,025
Lower Yellowstone Corridor	16,214	2,700	13,157	14,594	25,593	29,667	23,785	25,317	7,368	19,578	27,506	21,634	10,028	4,224
Beaverhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broadwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gallatin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lewis & Clark	0	79	0	0	0	0	0	0	0	0	0	0	0	0
Madison	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southwest MT	0	79	0	0	0	0	0	0	0	0	0	0	0	0
Cascade	5,120	1,621	1,774	1,983	1,410	1,467	567	567	859	516	1,099	2,679	1,333	1,166
Chouteau	4,044	6,587	5,898	5,613	5,083	4,386	346	3,974	2,648	2,495	3,505	4,143	1,611	1,192
Glacier	5,539	2,316	6,359	6,284	10,068	7,963	4,500	4,765	1,096	1,618	4,273	3,495	5,377	2,956
Hill	2,943	1,611	5,296	5,112	4,111	2,230	1,461	1,089	1,728	2,701	2,534	2,653	7,643	6,269
Liberty	6,864	3,698	7,506	5,573	4,237	2,393	1,502	1,741	2,247	1,235	2,257	1,850	4,585	5,129
Pondera	9,201	3,141	6,890	7,616	7,123	5,488	3,934	5,773	4,816	4,532	7,691	6,954	9,631	7,222
Teton	10,376	3,231	4,996	6,481	7,283	2,274	957	1,404	2,341	2,288	2,577	3,605	6,516	1,776
Toole	7,285	3,626	6,729	9,264	7,837	5,609	4,634	7,528	4,149	3,925	4,462	4,692	5,072	5,534
Golden Triangle	51,370	25,831	45,448	47,926	47,151	31,809	17,903	26,840	19,885	19,311	28,398	30,069	41,768	31,245
Fergus	1,287	322	592	427	818	103	0	0	0	203	0	0	0	0
Judith Basin	1,792	211	275	733	1,130	772	606	0	461	0	0	0	405	76
Central MT	3,079	532	867	1,159	1,948	876	606	0	461	203	0	0	405	76
Golden Valley	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meagher	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Park	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweet Grass	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland	8,661	6,155	6,092	3,620	7,848	6,089	4,967	2,063	0	0	949	0	0	0
South Central MT	8,661	6,155	6,092	3,620	7,848	6,089	4,967	2,063	0	0	949	0	0	0

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND DURUM ACREAGE BY COUNTY 1998 – 2011 (continued)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	0	182	188	617	2,292	1,083	1,338	456	0	0	0	0	0	0
Fallon	3,072	914	1,371	3,122	4,673	2,661	2,001	835	0	837	1,050	705	994	753
Powder River	220	124	0	0	468	0	0	0	0	0	0	0	0	0
Wibaux	7,899	3,210	6,143	8,273	9,177	10,032	8,511	8,742	2,744	2,840	3,410	4,376	9,207	4,727
Southeast MT	11,191	4,429	7,702	12,013	16,610	13,775	11,850	10,033	2,744	3,677	4,461	5,081	10,200	5,480
Garfield	1,569	0	0	0	0	0	0	0	0	0	103	135	0	197
Musselshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum	295	0	0	0	0	0	0	0	0	0	0	0	0	0
East Central	1,864	0	0	0	0	0	0	0	0	0	103	135	0	197
Deer Lodge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flathead	0	0	0	0	60	2	0	0	0	0	0	0	0	0
Granite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0	0	0	0	79	0	0	0
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Missoula	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ravalli	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanders	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	0	0	0	0	60	2	0	0	0	0	79	0	0	0
State Total	414,936	323,596	438,872	470,736	573,853	608,077	561,016	567,080	372,777	453,106	560,057	526,346	490,500	365,397

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND BARLEY ACREAGE BY COUNTY 1998 - 2011

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Daniels	4,401	3,863	2,596	3,507	3,844	3,328	1,048	60	843	1,786	2,192	1,545	29	619
Dawson	19,910	14,932	16,309	15,658	16,096	15,800	13,340	1,472	8,294	13,443	9,520	4,951	3,928	1,829
McCone	12,406	10,016	10,423	10,653	15,088	12,705	10,884	611	4,957	14,527	11,875	6,638	4,033	2,562
Richland	13,624	10,471	12,065	12,172	12,612	14,393	12,216	9,567	12,903	14,235	17,213	10,235	6,602	5,852
Roosevelt	5,739	6,015	6,960	5,696	12,036	9,636	7,091	1,532	3,593	3,906	3,474	2,220	842	551
Sheridan	5,170	4,951	7,829	11,078	12,424	10,481	8,855	1,097	3,635	5,439	5,522	3,069	962	197
Valley	9,549	7,463	6,595	8,078	11,242	8,642	7,212	1,094	3,838	6,830	6,676	5,287	4,407	2,641
Northeast MT	70,799	57,709	62,776	66,841	83,342	74,985	60,646	15,433	38,063	60,167	56,471	33,945	20,804	14,252
Blaine	14,954	10,962	15,050	12,417	17,511	16,268	15,319	3,419	9,041	14,217	12,757	7,677	7,112	8,015
Phillips	21,254	11,314	13,336	17,329	29,474	15,553	15,204	846	5,534	15,498	8,069	7,269	5,917	3,899
Blaine-Phillips	36,208	22,276	28,386	29,746	46,984	31,822	30,523	4,264	14,575	29,714	20,825	14,946	13,029	11,914
Big Horn	10,274	7,492	5,427	11,397	9,029	7,018	7,796	5,912	4,735	9,589	6,222	6,692	3,854	2,076
Carbon	1,612	2,488	1,649	1,402	1,543	689	825	5,631	278	1,386	964	656	379	121
Rosebud	2,107	2,836	1,638	1,313	2,598	595	519	1,455	642	758	779	929	1,400	459
Stillwater	11,847	9,653	10,026	12,533	14,994	9,031	10,091	993	6,000	5,396	4,072	4,087	4,054	2,983
Treasure	753	463	527	578	714	637	475	2,421	232	265	410	284	495	205
Yellowstone	11,157	9,228	9,672	8,676	9,841	7,274	6,419	12,299	3,418	4,795	4,057	5,513	4,335	3,301
Upper Yellowstone Corridor	37,749	32,161	28,939	35,899	38,719	25,244	26,124	28,710	15,304	22,188	16,504	18,161	14,516	9,145
Custer	2,490	1,946	2,118	2,298	3,589	1,778	2,314	523	587	1,285	1,029	921	1,599	610
Dawson (also in NE MT)	19,910	14,932	16,309	15,658	16,096	15,800	13,340	1,472	8,294	13,443	9,520	4,951	3,928	1,829
Prairie	6,315	5,811	4,767	5,038	2,407	2,631	5,950	615	1,254	2,455	1,087	1,693	1,351	400
Richland (also in NE MT)	13,624	10,471	12,065	12,172	12,612	14,393	12,216	9,567	12,903	14,235	17,213	10,235	6,602	5,852
Lower Yellowstone Corridor	42,338	33,159	35,259	35,166	34,703	34,602	33,819	12,177	23,038	31,418	28,849	17,800	13,481	8,691
Beaverhead	353	539	440	0	10	313	335	3,341	0	0	0	0	0	0
Broadwater	2,222	2,627	1,949	3,350	3,702	3,185	2,947	3,318	854	809	2,033	1,208	509	696
Gallatin	23,892	24,908	18,510	18,803	22,857	22,134	16,326	8,930	12,120	16,766	15,047	16,258	15,309	16,335
Jefferson	348	432	549	666	51	47	0	349	8		510	23	0	0
Lewis & Clark	5,025	7,076	3,606	5,877	3,996	3,894	3,967	3,482	2,114	1,734	1,582	3,410	3,539	2,406
Madison	1,196	545	547	550	543	197	1,024	2,422	43	264	134	467	124	218
Southwest MT	33,036	36,127	25,601	29,246	31,159	29,770	24,599	21,842	15,139	19,572	19,307	21,365	19,480	19,655
Cascade	53,863	44,287	34,905	30,792	35,637	29,999	28,665	10,003	14,685	20,836	20,737	20,357	15,328	18,900
Chouteau	119,360	97,166	84,402	72,585	66,928	52,260	40,833	1,579	27,778	40,190	32,729	39,768	34,038	24,817
Glacier	102,863	104,195	107,351	79,492	81,533	87,139	83,981	11,263	69,937	89,743	92,950	86,299	69,473	71,165
Hill	30,836	30,430	26,246	19,445	18,012	25,320	18,094	12	12,158	25,997	14,158	11,749	11,308	10,215
Liberty	25,270	30,910	22,179	23,677	21,644	19,581	17,979	2,035	12,438	20,599	23,168	22,217	17,043	15,957
Pondera	95,395	101,188	93,285	77,928	84,519	85,860	71,141	41,591	46,771	47,612	47,012	55,081	40,869	38,474
Teton	62,021	65,431	53,450	53,820	52,379	51,378	38,768	51,642	19,956	23,797	19,609	27,960	22,368	23,356
Toole	66,914	67,059	70,881	52,010	46,119	54,373	44,167	1,153	38,942	45,571	47,937	58,710	50,980	70,115
Golden Triangle	556,523	540,664	492,699	409,749	406,771	405,909	343,628	119,278	242,664	314,344	298,301	322,141	261,406	272,998
Fergus	70,736	56,897	51,705	53,059	58,929	45,656	30,572	73	13,894	31,618	23,844	19,599	21,844	15,386
Judith Basin	56,324	47,715	35,893	33,629	37,616	27,878	18,926	125	8,126	14,661	16,260	14,367	12,625	10,169
Central MT	127,060	104,612	87,598	86,688	96,545	73,534	49,498	198	22,020	46,279	40,103	33,966	34,469	25,554
Golden Valley	5,658	5,125	5,745	3,992	4,534	4,406	5,591	166	2,741	3,863	4,754	4,209	3,707	4,181
Meagher	10,570	10,362	10,044	7,650	8,612	7,550	3,981	2,867	3,383	4,416	6,034	4,330	2,922	4,844
Park	4,298	4,710	2,997	2,585	3,287	1,901	1,251	1,959	1,287	821	932	354	888	982
Sweet Grass	1,285	760	620	248	447	284	418	445	105	178	163	191	202	590
Wheatland	17,261	13,577	13,453	15,169	15,779	14,490	11,793	1,064	7,558	7,764	9,099	10,296	8,064	7,955
South Central MT	39,073	34,534	32,859	29,644	32,658	28,631	23,035	6,501	15,074	17,042	20,982	19,379	15,783	18,553

Source: USDA Farm Service Agency (Montana)

MONTANA DRYLAND BARLEY ACREAGE BY COUNTY 1998 – 2011 (continued)

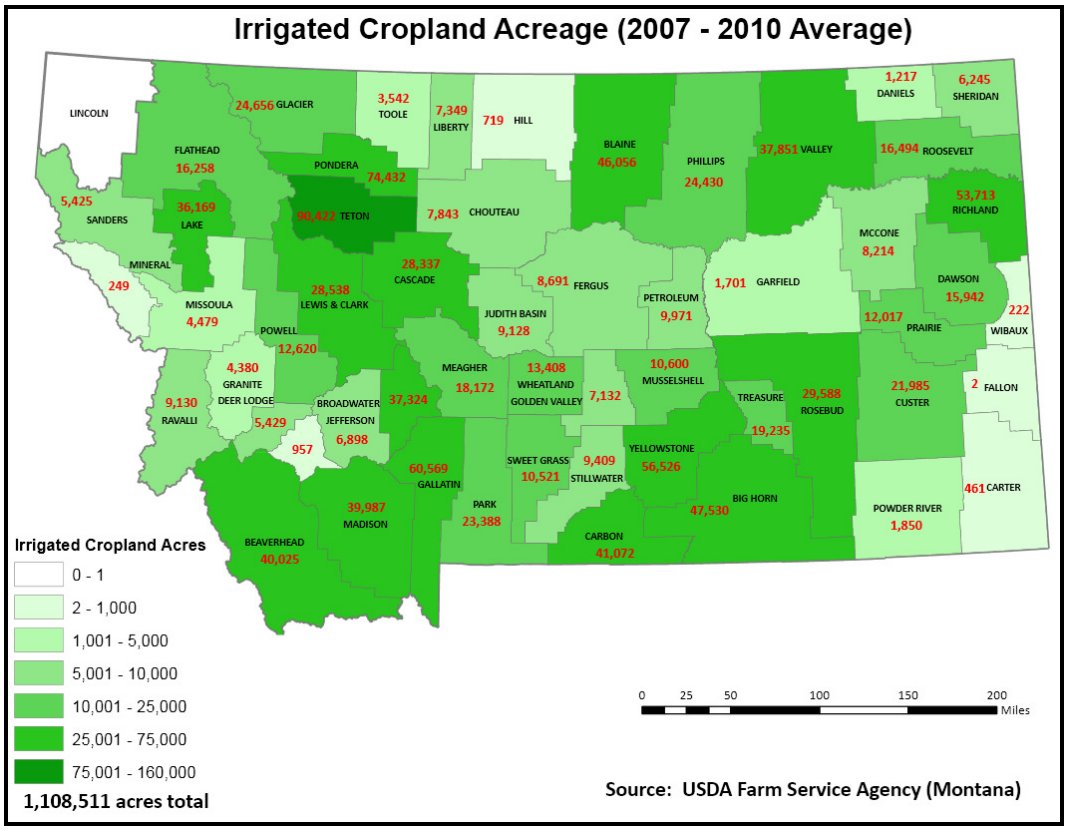
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carter	4,968	4,823	2,277	3,172	2,706	2,788	2,908	204	1,904	2,286	2,107	1,614	1,010	257
Fallon	5,386	3,725	4,550	3,856	4,830	4,135	2,876	0	1,558	3,537	2,603	1,151	659	375
Powder River	2,842	2,716	2,692	2,977	3,176	3,067	2,052	0	927	324	217	1,414	1,077	456
Wibaux	2,530	2,374	1,896	2,174	1,640	1,853	1,672	0	1,686	1,732	1,549	1,246	438	198
Southeast MT	15,727	13,637	11,414	12,179	12,352	11,842	9,508	204	6,074	7,878	6,477	5,425	3,184	1,287
Garfield	7,798	7,674	7,043	7,638	4,805	4,893	3,877	0	4,345	5,730	4,278	2,681	3,332	1,797
Musselshell	3,442	2,236	2,190	2,877	3,081	2,028	3,136	416	1,749	876	1,343	854	875	1,170
Petroleum	3,027	966	1,172	794	1,019	466	179	87	123	408	183	139	333	157
East Central	14,266	10,877	10,405	11,309	8,904	7,386	7,192	503	6,217	7,014	5,804	3,674	4,540	3,123
Deer Lodge	0	0	0	0	0	0	0	118	0	0	0	0	0	0
Flathead	5,616	4,475	4,727	5,690	5,129	4,631	3,994	2,024	3,518	6,790	5,361	3,867	3,201	4,221
Granite	10	0	0	0	0	0	0	96	0	0	0	0	0	0
Lake	184	415	1,044	167	256	110	246	1,968	78	332	254	110	364	247
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	20	58	0	0	0	0	0	30	0	78	159	48	0	93
Missoula	544	36	48	118	880	580	304	33	0	0	0	0	0	23
Powell	749	440	749	270	287	278	177	868	214	64	160	219	0	89
Ravalli	155	330	217	142	202	358	117	285	61	129	83	66	374	158
Sanders	507	314	384	30	80	342	259	65	53	57	49	45	22	90
Silver Bow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Western MT	7,785	6,069	7,168	6,417	6,834	6,300	5,097	5,488	3,924	7,450	6,066	4,355	3,961	4,920
State Total	947,030	866,423	794,729	725,052	770,263	699,832	588,112	203,558	380,894	535,388	492,954	479,971	394,122	382,411

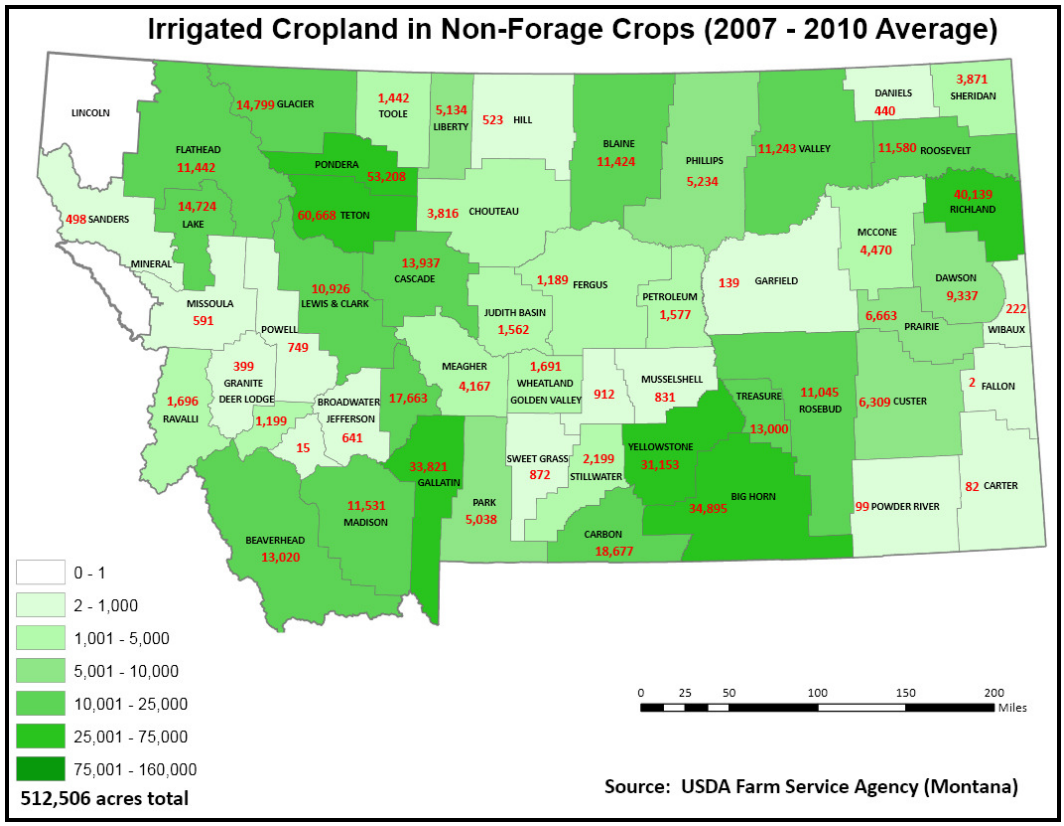
Source: USDA Farm Service Agency (Montana)

CRP ACREAGE (2007 - 2010 AVERAGE)

3,267,182 acres total

Source: USDA Farm Service Agency (Montana)


Irrigated Cropland Acreage (2007 - 2010 Average)
LINCOLN
24,656 GLACIER
3,542 TOOLE
7,349 LIBERTY
719 HILL
1,217 DANIELS
6,245 SHERIDAN
FLATHEAD 16,258
PONDERA 74,412
BLAINE 46,056
PHILLIPS 24,430
37,851 VALLEY
16,494 ROOSEVELT
5,425 SANDERS
36,169 LAKE
98,422 TETON
7,843 CHOUTEAU
53,713 RICHLAND
MCCONE 8,214
MINERAL 249
28,337 CASCADE
8,691 FERGUS
1,701 GARFIELD
DAWSON 15,942
MISSOULA 4,479
28,538 LEWIS & CLARK
PETROLEUM 9,971
JUDITH BASIN 9,128
12,017 PRAIRIE
222 WIBAUX
POWELL 12,620
4,380 GRANITE
MEAGHER 18,172
13,408 WHEATLAND
10,600 MUSSELSHELL
9,130 RAVALLI
DEER LODGE
BROADWATER 37,324
GOLDEN VALLEY 7,132
TREASURE 29,588
21,985 CUSTER
2 FALLON
5,429
JEFFERSON 6,898
957
ROSEBUD 19,235
SWEET GRASS 10,521
9,409 STILLWATER
YELLOWSTONE 56,526
60,569 GALLATIN
461 CARTER
39,987 MADISON
PARK 23,388
BIG HORN 47,530
POWDER RIVER 1,850
BEAVERHEAD 40,025
CARBON 41,072
Irrigated Cropland Acres
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
1,108,511 acres total
0 25 50 100 150 200 Miles
Source: USDA Farm Service Agency (Montana)


Irrigated Cropland in Non-Forage Crops (2007 - 2010 Average)
LINCOLN
14,799 GLACIER
1,442 TOOLE
5,134 LIBERTY
523 HILL
DANIELS 440
3,871 SHERIDAN
FLATHEAD 11,442
PONDERA 53,208
BLAINE 11,424
PHILLIPS 5,234
11,243 VALLEY
11,580 ROOSEVELT
14,724 LAKE
498 SANDERS
60,668 TETON
3,816 CHOUTEAU
40,139 RICHLAND
MCCONE 4,470
MINERAL
13,937 CASCADE
1,189 FERGUS
139 GARFIELD
DAWSON 9,337
MISSOULA 591
10,926 LEWIS & CLARK
PETROLEUM 1,577
JUDITH BASIN 1,562
6,663 PRAIRIE
222 WIBAUX
POWELL 749
399 GRANITE
MEAGHER 4,167
1,691 WHEATLAND
MUSSELSHELL 831
1,696 RAVALLI
DEER LODGE
BROADWATER 17,663
GOLDEN VALLEY 912
TREASURE 11,045
6,309 CUSTER
2 FALLON
1,199
JEFFERSON 641
15
ROSEBUD 13,000
SWEET GRASS 872
2,199 STILLWATER
YELLOWSTONE 11,153
33,821 GALLATIN
82 CARTER
11,531 MADISON
PARK 5,038
BIG HORN 34,895
99 POWDER RIVER
BEAVERHEAD 13,020
CARBON 18,677
0 - 1
2 - 1,000
1,001 - 5,000
5,001 - 10,000
10,001 - 25,000
25,001 - 75,000
75,001 - 160,000
512,506 acres total
0 25 50 100 150 200 Miles
Source: USDA Farm Service Agency (Montana)