AgWest FARM CREDIT

Industry Perspectives

Small Grains

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Introduction

Western small-grain producers raise wheat, barley, legumes, oilseed and grass seed crops. These crops are grown as part of agronomic, diversified cropping systems, with a majority grown in non-irrigated dryland conditions. Wheat is the most common crop in this sector. Barley is the second largest small-grain crop followed by peas and lentils. In the west, small grains are grown in large areas of every state but are concentrated in Montana, eastern Washington, northern Oregon and southern Idaho, and western Arizona.

Nationally, Montana ranks third in wheat production for 2023 behind North Dakota and Kansas. Washington ranks fourth, Idaho fifth and Oregon fifteenth. California and Arizona rank in the top half of states for wheat production. Globally, the U.S. ranks fourth in wheat production behind China, India and Russia.

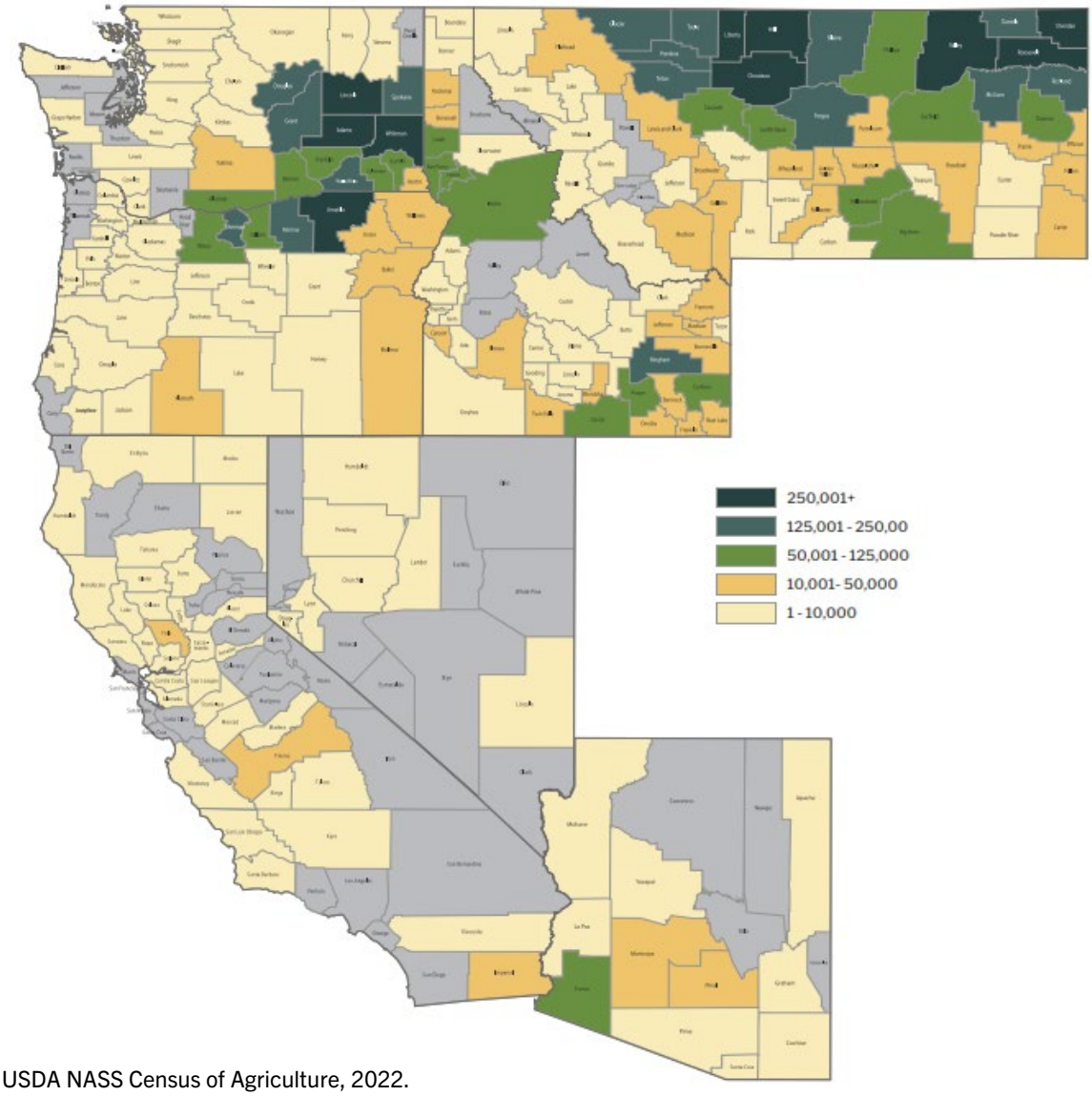
Wheat and other small grains are normally sold in bulk to high-volume grain buyers including flour mills and exporters. The majority of small grains produced in the west are exported to foreign markets. Wheat is milled into flour for a variety of bread, cake and pasta products. Barley is sold as livestock feed or to breweries. Legumes are sold to domestic and export markets for human consumption. Grass seeds are often used for turf and forage, providing essential cover and feed for livestock.

Production

Wheat

In the west, wheat is both a major agricultural commodity and the pre-eminent cash crop of the region's dryland areas.

Wheat acres by county in AgWest territory



Source: USDA NASS Census of Agriculture, 2022.

According to the USDA National Agricultural Statistics Service (NASS), total farmland of all classes of wheat in Arizona, California, Idaho, Montana, Oregon and Washington in 2023 totaled 9.84 million acres, which yielded 442 million bushels. The following table breaks down production by acres planted and production by state.

2023 wheat acres planted and production

State	Acres Planted	Wheat Production *(Millions of Bushels)*	Yield *(Bushel per Acre)*
Arizona	38,000	3.81	103
California	338,000	8.34	86
Idaho	1,170,000	89.11	86.1
Montana	5,255,000	186.70	37.2
Oregon	740,000	40.60	56
Washington	2,300,000	113.12	50.5
Total	**9,841,000**	**442.0**	**69.8**

Source: USDA NASS Quickstats.

Overall average per-acre yield for Arizona, California, Idaho, Montana, Oregon and Washington was 69.8 bushels. This is 21.2 bushels above the 48.6 U.S. average. Of these states, Arizona ranks first on average per-acre yield for all classes of wheat at 103 bushels per acre in 2023. This is due to more irrigated wheat acres relative to the other states. Montana ranked lowest at an average of 37.2 bushels per acre.

Barley

For 2023, USDA NASS data reports 1.75 million acres in Arizona, California, Idaho, Montana, Oregon and Washington were planted to barley, with 91% of those acres in Idaho and Montana. The estimated production for the region is 103 million bushels, with average yields of 85.7 bushels per harvested acre. Idaho, with more land under irrigation, led the region with output of 59 million bushels. Following Idaho was Montana with 34 million bushels and Washington with 5 million bushels. Arizona, California and Oregon each produced around 1 million bushels.

Legumes and oilseeds

Oilseeds such as canola, mustard and camelina, as well as legumes such as chickpeas (garbanzo beans), lentils and peas, are grown on 2.3 million acres across the region. Important international markets include Canada as a competitor and India as a destination for legume crops. Canola is crushed to create canola oil for food use and meal is often used as feed for livestock.

Pulses and lentils planted acres, 2023

State	Canola	Chickpeas	Lentils	Peas*	Grand total
Idaho	95,000	96,000	---	11,000	**202,000**
Montana	200,000	221,000	720,000	590,000	**1,731,000**
Washington	195,000	142,000	51,000	50,000	**438,000**
Total	490,000	459,000	771,000	651,000	**2,371,000**

Source: USDA NASS.
* Dry Edible – Green, yellow and Austrian winter peas.

Value chain

The small-grains value chain involves seed production, distribution and application of crop inputs, harvest, transportation, marketing, milling and baking.

Seed development and marketing

In the 1850s, plant breeding became a formal science when Gregor Mendel, in his study of peas, shaped modern genetics. More than 100 years later, Dr. Norman Borlaug (in concert with Washington State University wheat breeder Dr. Orville Vogel) won the Nobel Peace Prize for his work on semi-dwarf wheat. In contemporary breeding programs, private companies and universities in partnership with government agencies develop and market small-grain seed designed for specific growing regions. Variety development and selection is based on many considerations including yield potential, test weight, protein content, plant height, head date and ability to resist lodging (bending over of stems).

Seed is marketed and distributed through certified seed programs, privately owned seed companies, grain cooperatives and land grant universities.

Fertilizer and pesticides are purchased from a large network of crop input providers. These companies may also provide equipment rental, soil and tissue testing, custom application and a variety of other services to growers while distributing fertilizer and pesticides.

Producers plant fields in the spring or fall and harvest in July, August and September. Small grains are harvested using combines. Combines cut and thresh the whole plant to remove the seed from the stalk. Grain is unloaded from the combine into a grain cart or directly into a large truck. Grain carts transport grain between the combine and waiting semi-truck, allowing the combine to run longer without stopping. Trucks haul to on-farm storage (grain bins) or to grain storage facilities (elevators). Grain stored on the farm will eventually be hauled to an elevator according to the producer's marketing plan. Grain elevators are generally located at railheads or barge loading facilities.

Grain cooperatives and privately owned storage facilities play a vital role in grain handling and marketing. Grain elevators act as collection points for grain as well as marketers. Grain is marketed to domestic and international mills where it is processed into flour for a variety of bread, pasta and pastry products.

Grain destined for export is shipped from elevators via truck, rail or barge to ports in Portland, Seattle/Tacoma or Long Beach where it is loaded on ocean freighters and carried to mills across the world. Grains from several countries may be mixed according to variety, quality and price.

Industry drivers

Rainfall zones

While small grains are grown on irrigated farmland throughout the west, most small grains are grown on "dryland" farms. Annual rainfall in dryland areas ranges between 10 and 35 inches of precipitation. Variation in rainfall and timing of rain events both significantly influence crop yields.

Crop rotations

Rainfall zones dictate crop rotations. In areas with less than 14 inches of annual precipitation, winter wheat may be grown only every other year in a fallow rotation where the wheat is planted in the fall and harvested the following summer. The field is then left idle for 12 months and planted again. In areas with annual rainfall between 14 and 18 inches, crops can be grown two out of every three years. Common rotations in these areas are winter wheat, followed by a spring crop (spring wheat or barley), followed by a year of fallow. In areas with greater than 18 inches of annual precipitation, crops can be grown continually.

Markets

While exchange rates, crop quality and ocean freight rates influence the flow of wheat all over the world, world markets are important to small grain growers. The U.S. produces only about 8% of the world's wheat supply but is one of the world's largest exporters[1]. In the 2022-23 marketing year, China, Egypt, Indonesia and Turkey were the largest wheat-importing countries.

Infrastructure

Fifteen new unit-train loader facilities were built in the Pacific Northwest between 1998 and 2009. These facilities target efficiency, improved pricing and lower transportation costs through larger shipments. Most load 110 rail cars (approximately 410,000 bushels) in under nine hours. Smaller grain warehouses are consolidating, requiring producers to ship wheat by truck across longer distances. Increased trucking expense is most pronounced in Montana, where producers cannot ship via barge like their counterparts in Washington, Idaho and Oregon, all with access to Columbia and Snake River grain terminals.

Crop nutrients

Nitrogen (N), phosphorus (phosphate, P_2O_5) and potassium (potash, K_2O) are the three most common plant nutrients. Nitrogen is produced using the energy-intensive Haber-Bosch process. The high-energy requirements necessary to produce nitrogen link the price of nitrogen to energy prices. China, India, the U.S. and Russia are the four largest producers. The largest producer of phosphate is China, followed by Morocco. The U.S. is the third-largest producer with large deposits in Florida, southern Idaho and North Carolina. There are also large deposits across northern Africa and Australia. The largest potash producers are Canada, Russia, Belarus, Germany and the U.S.

[1] Source: USDA Economic Research Service, Wheat Trade Accessed Jan. 31, 2017. https://www.ers.usda.gov/topics/crops/wheat/trade.aspx

Appendix A

Best practices

Over time, AgWest Farm Credit has observed the best practices of small-grains industry leaders. These practices can be grouped into key focus areas: production practices, management of production costs, business management and risk mitigation.

Production practices

Continued volatility in commodity prices and input costs requires small-grains producers to take advantage of opportunities to sharpen their production efficiency. A variety of production practices have the potential to improve grower profitability. Among them are chemical-fallow and no-till practices, cultivation of alternative grain varieties, and potential adoption of a continuous cropping system.

Chemical-fallow/no-till

Due to moisture, erosion, cost and time-saving concerns, more growers are embracing chemical-fallow and no-till practices in preference to conventional tillage. Chem-fallow and no-till are now well accepted and have become the predominant system in certain areas of the West. Operators can efficiently farm more acres using a chem-fallow/no-till system because spraying and straw management generally requires less time than conventional tillage practices. However, eliminating tillage as a tool for weed, disease and pest control requires exacting management to avoid decreases in crop yields. During the last few years, some operations have reverted to conventional mechanical fallow or implemented advanced technology such as spot sprayers to help save on chemical expenses.

Varieties

Producers who have attended field days and carefully chosen new grain varieties that perform well in their areas are realizing output gains. Additionally, the advent of Clearfield technology[2] has helped mitigate grassy weed pressure in cereal-dependent production systems, as well as the residual chemical damage when winter wheat cultivation follows a legume crop. Increasingly, these improved varieties are being developed by private breeders and through partnerships between universities and private parties. Potential downsides are that the partnerships may charge more for their seed and restrict grain being held back for use as seed the following year. Many growers reason that increased production is worth paying the higher price for new varieties and complying with prohibitions against growing their own seed.

Continuous crop

Continuous annual cropping in dryland areas has been adopted by some growers during the past decade but is mainly used in higher-rainfall regions of the Pacific Northwest. The practice works most effectively when adequate moisture is received throughout the growing season. It also tends to have agronomic benefits on the soil. In drought conditions, however, producers who use a continuous-crop practice have experienced significantly diminished yields. Accordingly, this practice is not as viable in all areas. Continuous-cropping production risk is typically minimized with implementation of a crop-rotation strategy that incorporates various crop types, such as small grains, legumes and pulses (e.g., chickpeas, dry beans, dry peas and lentils), and oilseeds (e.g., canola, mustard and camelina). A solid risk management program that uses crop insurance programs is a key component to successful, continuous farming practices.

Crop rotations

As producers look to diversify operations to protect and increase net farm revenue, many have turned to the production of legumes, pulse crops and oilseed crops. Legumes have shown the ability to add additional nitrogen into the soil, increase following-year cereal-crop yields, provide alternative rotations, assist in insect control, and help break disease cycles. Oilseed crops have also shown many of the positive characteristics of legumes, except the ability to replenish nitrogen in the soil. These crops have shown the ability to not only breakeven, but to generate strong earnings of their own. Producers do need to consider herbicide residuals, soil profiles and local marketability of the crop.

Management of production costs

Even with increases in market prices in recent years, producers must meet the challenge of efficiently managing production costs. With volatility in input costs and output prices, it is considered a best practice to match the purchase of inputs with forward contracting or hedging of future crop prices. Expenses related to raising a crop can be minimized through careful management of production costs, which can be achieved through various techniques.

[2] Clearfield technology refers to "a novel, non-genetically modified (non-GMO) crop herbicide tolerance technology discovered by BASF researchers that provides wheat tolerance to imazamox, the active ingredient in Beyond® herbicide" (BASF).

Low-cost production

Variation in input costs, yields and price have a significant impact on an individual farm's profitability. Producers who calculate their unique operation's break-even point each year and make management decisions accordingly will typically be the most successful. Producers who demonstrate well-honed expense management skills have shown, over time, significant increases in bottom-line margins compared to those who neglect to keep a tight rein on costs. Producers also need to be flexible when making decisions from year to year. Additional investment in a growing crop can be warranted in a given year if good yield and commodity price potential exist, while in other years the additional investment will not pay for itself.

Equipment

To improve efficiency and profitability, many producers have implemented new equipment technologies, reduced the amount of equipment used in operations, or increased their farmable acreage. Global positioning systems (GPS), geographic information systems (GIS), and variable-rate, auto-boom and auto-steering technologies are important components of precision-agriculture practices. These innovations have greatly optimized the use of large farming equipment. The technology allows farmers to operate these machines day and night with little overlap that, in turn, maximizes the acreage covered by each piece of equipment. Many growers are also forming alliances with other farmers to share in the ownership costs of particularly expensive equipment.

Forward purchasing of major inputs

With the price volatility of fertilizer and other necessary inputs, many producers are opting to purchase in advance to lock in their costs of production. This is not done solely for tax deferment planning. Producers can take advantage of seasonal fluctuations in the market by acquiring fertilizer, fuel or chemicals when prices are lower, and then stockpiling for future use. Since many producers lack the storage facilities to take delivery of large amounts of inputs, some elect to pay for the product at a specified price, with an agreement to take delivery later when the product is needed. When producers lock in input prices or pre-buy without taking delivery, one risk they need to consider is the financial stability of suppliers. Producers can be considered unsecured creditors if the supplier runs into financial difficulties. Additionally, farmers in some areas are banding together in 'buying groups' to pool resources and capitalize on volume purchase discounts, thereby maximizing cost containment.

Risk mitigation

Risk mitigation best practices primarily relate to marketing strategy, usage of crop insurance and participation in government programs.

Marketing

Having a marketing strategy is critical for managing price volatility. An effective marketing plan can help producers lock in profitable margins and can have a larger effect than many farm production practices. There are many viable strategies, so it's important that a producer is active and comfortable in whatever marketing strategy is chosen and is consistent in executing the plan.

Many successful farm managers choose to use forward contracting, futures marketing, puts and calls, and hedge-to-arrive as tools to lock in a profit on their crops. Such strategies help mitigate commodity-price risk. These producers may market a significant portion of their crop before it's harvested and spread out their marketing efforts over several months. Given the complexities of this strategy, most producers consult with a commodity broker or other professional.

While contracting at the local elevator remains the most common method of marketing, it is important for producers to find additional ways to mitigate price risk, evaluate timing and improve marketing methods. Marketing plans should account for not only the price of the commodity, but also basis risk, quality premiums, discounts, time of delivery, and changing input costs.

Crop insurance

Grain producers have come to regard crop insurance as a necessity for doing business given its vital role in helping an operation through tough years and down cycles. The importance of crop insurance has only grown with the sunset of some government programs. Certain coverage options protect growers against low grain price, yield losses and revenue losses. Most common is Whole Farm Revenue Protection (WFRP), where overall farm revenue determines losses. WFRP is a safety net for all commodities grown under a farm entity. Working in tandem with underlying multi-peril coverage, WFRP provides more protection for quality losses. The premium depends upon farm diversification.

Government programs

Currently, the USDA (through the FSA and NRCS) and local Soil and Water Conservation Districts (SWCD) offer mixed multi-year payments on a variety of economic and environmental programs that pay growers to idle sensitive land, improve wildlife habitat, increase conservation measures or adapt new technology to their farming operations (see Appendix B). Growers are participating in these programs to varying extents as a means of obtaining a stable source of additional income, or to help pay for the implementation of new production practices.

Business management

Business management best practices that have the greatest impact on producer profitability include record keeping, financial management, planning, entity structure selection and income diversification.

Record keeping

The most prosperous growers are proficient in their financial management capabilities and record-keeping practices. They make financial plans and projections, and monitor their progress throughout the year. They establish an advisory board consisting of trusted stakeholders dedicated to ensuring the success of their operation, including bankers, insurance agents, field representatives, attorneys, and accountants. They share their records with their advisory board members and consistently review their progress in an effort to boost the bottom line.

Financial management

Top farm managers continually refine their financial management strategies. They position their operations to have solid working capital that will help absorb any short-term cash flow deficiencies from low prices or low yields. They structure their balance sheet and cash flow to take advantage of opportunities today and manage for risk tomorrow. Producers who have locked in historically low long-term fixed-interest rates and limited their variable- and adjustable-rate debt are managing interest rate risk for the long term, although it might have a marginally higher cost in the short-term.

Planning

Successful small-grains producers understand strategic, operational, financial and estate planning pay attractive dividends. Succession planning and ongoing communication among family members and/or other business partners regarding the long-term goals of the operation are vitally important in guiding daily operational decisions.

Entity structure selection

Small grains farming operations are increasingly moving from sole proprietorships to various entity structures. While an entity is not the right choice for all producers or situations, it has a place in limiting liability for certain ventures, may provide some tax benefits and can aid in succession planning.

Income diversification

To minimize risk, many farmers engage in some form of income diversification. This practice can take the form of planting alternative crops (such as garbanzo beans, lentils, peas, oil seeds and barley) or different varieties of wheat (such as hard red, durum, spring or winter). Additionally, rather than relying solely on the farming operation to draw a wage, many diversified producers or their spouses commonly secure off-farm employment to obtain healthcare benefits and a supplemental salary to help cover living costs.

Diversification can also occur via production practices. While not widespread, organic farming practices are common in particular locales. Generally, organic producers rely on mechanical tillage. They use alternative crop rotations both for weed control and as a source of natural fertilizer. The most successful operators employ various strategies to keep weed populations as low as those found where conventional farming practices prevail.

Other forms of diversification include energy development such as biodiesel, ethanol (corn-based and cellulosic) and wind turbines. These alternate uses for crops and land help increase the value of small grains and their byproducts. As these industries are fairly young and uncertain, thorough due diligence is needed to assess the risk and benefits of these opportunities.

Appendix B

Glossary

Acre: Equivalent to 43,560 square feet, about 9/10 the size of a football field.

Bran: The edible broken seed coats of cereal grain separated from the flour or meal by modern sifting practices or bolting (sifting flour through a cloth or a screen).

Bushel (bu.): A unit of dry volume typically used to quantify crop yields. One U.S. bushel equals 8 gallons or 2,150.42 cu. inches. A bu. of wheat weighs 60 pounds, of corn is 56 pounds, and of barley is 48 pounds.

Chemical fallow (chem fallow): The use of herbicides to prevent weed growth on unseeded land to conserve soil moisture. A crop will be planted the following season. Chemical fallow is generally used when practicing no-till in a crop/fallow rotation.

Cereal: Any grass crop yielding starchy seeds suitable for food. The most cultivated cereals are wheat, rice, rye, oats, barley, corn and sorghum.

Clearfield® technology: Technology that combines high-yielding seed with tolerance to certain herbicides in order to control grassy weeds.

Combine: A self-propelled grain harvester. In one operation it combines cutting, threshing, separation and cleaning of grain, as well as dispersing the stems, stalks or other crop residue.

Continuous crop: The growing of a single crop species on a field year after year.

Conservation tillage: A process that leaves at least 30% residue coverage on the soil. Methods include no-till, where no tillage is done, and seeds are placed directly into the previous season's crop residue.

Conventional tillage: Full-width tillage performed prior to and/or during planting that disturbs the entire soil surface leaving less than 15% residue cover after planting. Generally involves plowing or intensive (numerous) tillage trips. Weed control is accomplished with crop protection products and/or cultivation.

Cooperative: A firm that is owned by its farmer-members, is operated for their benefit, and distributes earnings on the basis of patronage.

Corn: A tall, annual cereal grass widely grown for its large, elongated ears of starchy yellow or whitish seeds used especially for human and livestock consumption. Also known as maize.

Crop rotation: Growing different crops in recurring succession on the same land. Implemented to replenish soil fertility and keep down pest populations to increase the potential for high levels of production in future years.

Cultivation: Loosening and breaking up (tilling) of the soil.

Drought: Lack or insufficiency of rain for an extended period that severely disturbs the hydrologic cycle in an area. Occurs when evaporation and transpiration – loss of water from a plant – exceeds precipitation for a considerable period.

Elevator: Storage building for grain, usually a tall frame, metal or concrete structure with a compartmented interior; also, the device for loading grain into a building.

Erosion: Detachment and movement of soil particles by wind or water.

Falling numbers: A measure of wheat quality. The falling-number test measures the effects of sprout damage indicated by the seconds it takes a falling plunger to pass through a flour and water paste. A high falling number (e.g., above 300) indicates minimal sprout damage and good quality.

Fallow: Cultivated land left unseeded to destroy weeds and conserve soil moisture. A crop will be planted the following season.

Feed grain: Any of several grains most commonly used for livestock or poultry feed, including corn, grain sorghum, oats, rye and barley.

Fertilizer: Any organic or inorganic material, either natural or synthetic, used to supply elements such as nitrogen, phosphate and potash that are essential for plant growth.

Flax: A slender annual plant of the genus Linum of the family Linaceae, with blue flowers; commonly cultivated for its fiber and seed.

Flour: The finely ground and sifted meal of any of various edible grains. Giant steel or stone rollers are used to break and grind the grain.

Forage crop: Annual or perennial crops grown primarily to provide feed for livestock. During harvesting operations, most of the aboveground portion of the plant is removed from the field and processed for later feeding.

Freight: Products and commodities transported by a commercial carrier.

Genetically modified organism (GMO): Refers to plants that have had genes implanted to improve their performance by making them resistant to certain pesticides, diseases or insects.

Geographic information systems (GIS): An information system for capturing, storing, integrating, analyzing and displaying geospatial data.

Global positioning systems (GPS): A technology that uses the position of satellites to provide precise location coordinates on the Earth's surface.

Gluten: Mixture of proteins not readily soluble in water that occurs in wheat and most other cereal grains.

Granary: On-farm storage facility.

Hay: The product of any of a variety of perennial crops, typically grasses or legumes, that can be used as feed for livestock.

Income diversification: A risk-management technique that mixes a wide variety of investments within a portfolio.

Kernel: A whole seed of a cereal or the inner, softer part of a seed, fruit stone or nut.

Legume: Plant species with seed pods that split along both sides when ripe. Some of the more common legumes are alfalfa, beans, lentils, peanuts, peas and soybeans.

Lodging: Crop flattening caused by wind, rain, hail or disease.

Nitrogen: A common plant nutrient. Nitrogen fertilizer is made primarily from natural gas; its price depends heavily on energy prices (e.g., oil).

No-tillage: Crop production system in which the soil is left undisturbed from harvest to planting. Weed control is accomplished primarily with crop protection products. Other common terms used to describe no-till include direct seeding, slot planting, zero-till, row-till and slot-till.

Pest: An animal or plant causing harm or reducing the quality and value of a harvestable crop or other resource. Weeds, termites, rats and mildew are all examples of pests.

Pesticide. A general name for agricultural chemicals that include herbicide for the control of weeds and other plants; insecticide for the control of insects; fungicide for the control of fungi; nematicide for the control of parasitic worms; and rodenticide for the control of rodents.

Phosphorus (phosphate): A common plant nutrient. Phosphorus is mined; its price depends largely on global supply and demand.

Plow: Equipment used to perform primary tillage.

Potassium (potash): A common plant nutrient. Potash is mined; its price depends largely on global supply and demand.

Soil profile: The arrangement of soil horizons or layers below the surface of the ground.

Soil test: Test to indicate the availability of nutrients present in the soil and the availability of those nutrients to crops grown there.

Spring wheat: Wheat planted in spring and harvested during the summer.

Straw: The dry stem of crops after the grain-containing head has been removed for harvest. It has little or no nutritional value, so it has been traditionally used for livestock bedding and as a means of controlling erosion.

Test weight: Refers to the average weight of a cereal as measured in pounds per bushel. An important predictor of wheat milling yield (i.e. rice and flour extraction rate).

Tillage: The process of mechanically preparing a field for planting by loosening the soil and disturbing weeds.

Weed: A plant, usually of vigorous growth, that is not valued where it tends to overgrow or choke out more desirable plants.

Winter wheat: Wheat planted in the fall but lives through the winter in a dormant stage and is harvested in the summer.

Yield: The amount of crop harvested per acre.

Appendix C

Crop types and uses

Wheat

The small grains industry produces various classes of wheat. Each is defined by the distinct end-use properties of the grain. Characteristics such as hardness, color and kernel shape – as well as the time of year the crop was planted – determine how each wheat variety is classified.

Wheat is commonly categorized according to its growing season. *Winter wheat*, which is sown in autumn and harvested in the spring or summer, normally accounts for 65 to 75%[3] of annual U.S. wheat production. *Spring wheat* is planted, as its name implies, in spring and then harvested the following summer.

In North America, wheat-growing regions differ according to rainfall amounts, temperatures, soil types and the farming traditions typical of each. For this reason, every wheat class is associated with the particular region in which it is grown. In general, wheat is produced in semi-arid regions where soil quality or water availability precludes the cultivation of other high-value crops. Ultimately, most of the world's wheat is processed into some variety of flour, and each class of wheat is recognized for its individual milling and baking characteristics.

Basic classes of wheat

Hard red winter wheat

Hard red winter wheat is grown in an area of North America that stretches from Canada to Mexico. In the United States, production of the grain is concentrated on the Great Plains from the Rocky Mountains to the Mississippi River. It ranks as the largest volume class of wheat grown in this country. Protein content averages around 13%. Hard red winter wheat is used to make breads, rolls and all-purpose flour.

Hard red spring wheat

Cultivation of hard red spring wheat – also known as *dark northern spring wheat* – is common to Montana, North Dakota, South Dakota and Minnesota. The grain's protein content averages 14%, surpassing that of all other wheat classes. Prized for its excellent milling and baking characteristics, hard red spring wheat is used to produce high-gluten bread products including hearth breads and rolls, variety breads, bagels, English muffins and thin pizza crusts. The bread-making quality of low-protein flours is enhanced when blended with hard red spring flour.

Soft red winter wheat

Soft red winter wheat is grown primarily east of the Mississippi River. This crop generally is high yielding, but low in protein, which averages around 10%. Soft red winter wheat is milled into flour for flat breads, cakes, pastries and crackers.

Durum wheat

Durum wheat is farmed primarily in northern states like North Dakota – which typically accounts for 50 to 60%[4] of total U.S. durum production – and Montana. The hardest class of wheat grown in the United States, durum's primary use is the manufacture of semolina flour for pasta products. Durum wheat's U.S. export volume is the smallest of all wheat classes.

Soft white wheat

Soft white wheat is a high-yield, low-protein crop primarily grown in the Pacific Northwest states of Oregon, Washington and Idaho. This class of wheat also is farmed, to a lesser degree, in California, Michigan, Wisconsin and New York. Flour milled from the grain is baked into cakes, crackers, cookies, pastries, quick breads, muffins and snack foods. Asia – where the flour is used to make flat breads, noodles and sponge cakes – is the world's most prodigious consumer of U.S. soft white wheat exports.

Club wheat

Club wheat is a unique subclass variety of soft white wheat. Club kernels are more rounded than those of common soft white wheat. Specifically, the heads of club wheat plants are shorter and more compact, which accounts for the more diminutive and plump shape of its kernels. Club wheat tends to be lower in protein content than the common soft white variety and is a preferred source for cake and pastry flour. Valued for its exceptional baking qualities, club wheat often commands a premium price compared to common soft white wheat.

[3] USDA NASS Quickstats.
[4] USDA NASS Quickstats.

Hard white wheat

Hard white wheat is the newest class of wheat grown in the United States. In terms of milling and baking characteristics, it is on par with hard red wheat. Hard white grain is used for yeast breads, hard rolls, bulgur, tortillas and oriental noodles. Currently, most U.S. hard white wheat production is consumed domestically. Only limited quantities are exported. The nation's crop is raised mainly in Montana and the Dakotas. However, the comparatively lucrative price it commands in stable markets has not escaped the industry's notice. Increasing numbers of agricultural producers in Oregon, Washington and Idaho are planting hard white wheat.

Barley

Barley is a key product used in the manufacturing of animal feed, food and beverages.

Basic classes of barley

Malt barley

Domestically, malt barley is farmed in six- and two-row varieties. Because the grain is a key ingredient in beer, the brewing industry constitutes a primary market for malt barley. Other processed forms and uses include pot or pearled barley for soups and dressings, flour for baby and specialty foods, malted barley for distilled spirits and other brewed beverages, malted-milk concentrates, malt flour and specialty malts for the coloring or flavoring of numerous food products. Developing the plumpness of the grain is an essential objective of the barley-malting process.

Feed barley

Feed barley is also raised in both six- and two-row varieties, and barley's nutritive value nearly equals that of corn. This class of barley is also raised as a hay crop in some areas.

Alternative crops

Small-grains growers also cultivate various alternative crops. These include peas, lentils, garbanzo beans, canola, mustard, grass seed, and, on a comparatively limited basis, flax, buckwheat, soybeans, corn and hay.

Primary alternative crops

Peas

Peas are annual legumes that grow two- to five-feet tall. Boasting a protein content of roughly 5%, green and yellow peas are canned for human consumption, and also used in soups, as food-processing ingredients, and as a component of livestock feed. Dry peas grown for food markets must meet rigid quality-control standards. Countries in Central and South America, the Caribbean, Western Europe and Southeast Asia are the world's largest markets for human consumption of pea crops. Field peas also are used as a forage crop that typically is planted with barley, oats or wheat.

An advantageous characteristic of the field pea is its ability to fix nitrogen in the soil, which distinguishes this legume as an ideal crop to rotate with cereal grains. A cool-season plant, field peas can tolerate moderate frosts. In the United States, both spring and winter varieties are readily cultivated. Often, for disease-control considerations, a crop rotation of at least four years is recommended.

Green freezer peas are raised throughout the Northwest. This pea variety is harvested early while still tender, and subsequently frozen for sale or use in consumer-prepared foods. Green freezer peas are similar to varieties raised in a typical home garden. Contract processors usually control certain production decisions – including the varieties grown and the timing of harvest – and use their own combines to harvest the crop.

Lentils

U.S. production of lentils, another variety of annual legume, is consumed primarily in domestic markets. A good protein source, the harvested product most commonly is used as an ingredient in casseroles, salads, soups and stews.

Typically, the crop is planted in the spring. Young plants are susceptible to weed competition, and herbicide damage can be a problem when heavy rains occur shortly after the application of chemicals. Also, rocks can be troublesome and even damaging to equipment during harvest, as the plant generally grows only one- to two feet tall. Lentils are widely grown as rotation crops, especially in areas that receive abundant rainfall. Like its legume cousin, the pea, lentils have a useful knack for fixing atmospheric nitrogen to soils and, consequently, boosting the nitrogen levels of the fields in which it is grown.

Garbanzo beans

Garbanzo beans – also known as chickpeas – are an annual legume mostly grown for human consumption as ingredients of salads, soups and hummus. They require a longer growing season than other legume varieties grown under dryland conditions. Garbanzo beans have garnered interest as a rotation crop and, as a highly saleable commodity, they can be

quite profitable to cultivate. However, the plants require strict disease-control management and consume more soil moisture than other crop alternatives.

Canola

Usually planted as a winter and spring rotational crop, canola is most often processed into edible oil. Low in saturated fat, canola oil is perceived as a healthy alternative to other types of oil used for cooking and processing foods. As a result, end-user demand for canola continues to expand steadily. Canola oil is also a biofuel; increasing costs of petroleum fuels broaden the market for canola.

Mustard

A spring-planted crop, mustard is used as a spice, an ingredient in sauces and as a raw material in the production of biodiesel. Yellow, oriental and brown mustards are the types most often grown in the United States. Current production of mustard is constrained by its limited demand in the marketplace.

Grass seed

With its potential for income diversification, grass produced for seed is an important alternative crop for many small grains farmers, particularly those who work lands in areas known for ample rainfall. Kentucky Bluegrass is the most common type of grass seed raised in the Northwest. However, perennial ryegrass, fescues, brome grass and other reclamation grasses also are cultivated. Many different varieties are associated with each type of grass.

Often, no seed is harvested during the year following planting. Grass seed fields remain in production for three to seven years. The annual, post-harvest burning of grass stubble is integral to successful seed production. Burning stimulates the plant for the next growing season and plays a vital role in disease prevention. Over recent years, the practice of burning grass stubble has encountered vigorous opposition in the Pacific Northwest states due to concerns about degraded air quality.

Other crops

Small grains producers grow a variety of other alternative crops – including flax, buckwheat, soybeans, corn and hay – but only on a limited basis. A relatively slight percentage of arable acreage is devoted to their production.

Appendix D

Government programs

The 2014 Farm Bill contained many changes from the previous version. Direct Payments and Countercyclical Payments were removed. The Average Crop Revenue Election (ACRE) and Supplemental Revenue Assistance Payments (SURE) programs were replaced with the Price Loss Coverage and Agricultural Risk Coverage options. The new bill also established the Dairy Margin Protection Program. The 2018 Farm Bill made few changes to the 2014 version, and the 2024 Farm Bill is still under review. The 2014 Farm Bill continued or added the following programs:

Price Loss Coverage (PLC)

The PLC program provides a price loss safety net for growers. Producers electing to use PLC are eligible to utilize supplemental coverage. PLC allows a grower to receive a payment if the "Effective" or actual price for a covered commodity is less than the reference price. The PLC program covers 85% of base acres for the covered commodity.

Agricultural Risk Coverage (ARC)

The ARC program provides a revenue loss safety net. Producers can choose either an ARC-County or ARC-Individual (whole farm) program. The ARC program uses the five-year county Olympic average as base and covers up to 85% of a farm's base acres for ARC-County (65% with ARC-Individual). There are payment maximums and adjusted gross income limits for the ARC program. The maximum payment is limited to 10% of the benchmark revenue. Growers who choose to use the ARC program are not eligible to obtain supplemental coverage.

Supplemental Coverage Option (SCO)

Supplemental coverage is available for producers not electing to use the ARC program. SCO allows growers to cover 100% of insured planted acres for 50%-86% of the yield or revenue. This program mimics existing crop insurance plans. There is a 65% premium subsidy for this program. There are no payment limits.

Crop insurance subsidies

Since subsidies were increased with enactment of the Agricultural Risk Protection Act, wheat producers have been insured at higher coverage levels. In response, many have shifted to revenue protection in lieu of traditional crop-yield insurance. Typical premium subsidies range between 37% and 68% depending on the insurance product.

Export assistance and food Aid

Export programs including the Export Credit Guarantee Program, the Market Access Program and the Foreign Market Development Program allow the United States to "help promote and facilitate purchase of U.S. wheat and wheat products in foreign markets" (USDA ERS). The Export Credit Guarantee Program underwrites financing to importers requiring credit to purchase U.S. agricultural exports, while the Market Access Program helps facilitate (and partially fund) expansion into foreign markets via increased marketing and promotions. The Foreign Market Development Program focuses on establishing long-term export markets for U.S. agricultural products.

With respect to food aid, the United States participates in a variety of programs targeted at providing agricultural exports to struggling countries. These programs include providing low-interest loans to developing countries to purchase U.S. agricultural products, as well as making donations of U.S. agricultural products.

In the past, the United States instituted direct subsidies to promote wheat exports. However, this has not been employed in recent years. The percentage of wheat exports generated by government programs has declined substantially over the last few decades, dropping from 70% of wheat exports in 1992-93 to 10% of exports in 2020-21.

Conservation Reserve Program (CRP)

Conservation Reserve Program (CRP) payments are based on a contract price to keep ground idle, typically for an initial 10 years. Actual payment per acre varies according to area. When wheat prices are strong, farmers must weigh the costs and benefits of keeping ground in CRP versus putting their fields back into production. Since its inception, this program has had a dramatic influence on the number of crop acres planted to wheat. Many CRP contracts are either up for re-enrollment or will expire within the next few years. Wheat supplies could increase significantly if large numbers of acres exit the program and go back into production.

Environmental Quality Incentives Program (EQIP)

The Environmental Quality Incentives Program is a voluntary program. It provides financial and technical assistance to producers to implement conservation practices addressing natural resource concerns and to improve soil, water, plant, animal, air and related resources on agricultural land. In addition, the program can be used to help producers comply with environmental regulations. These programs typically are awarded on a percentage-cost-share practice to cover the costs of implementation. The producer is generally responsible for paying the full cost of implementation; once the project is complete, NRCS reimburses the producer for the determined share.

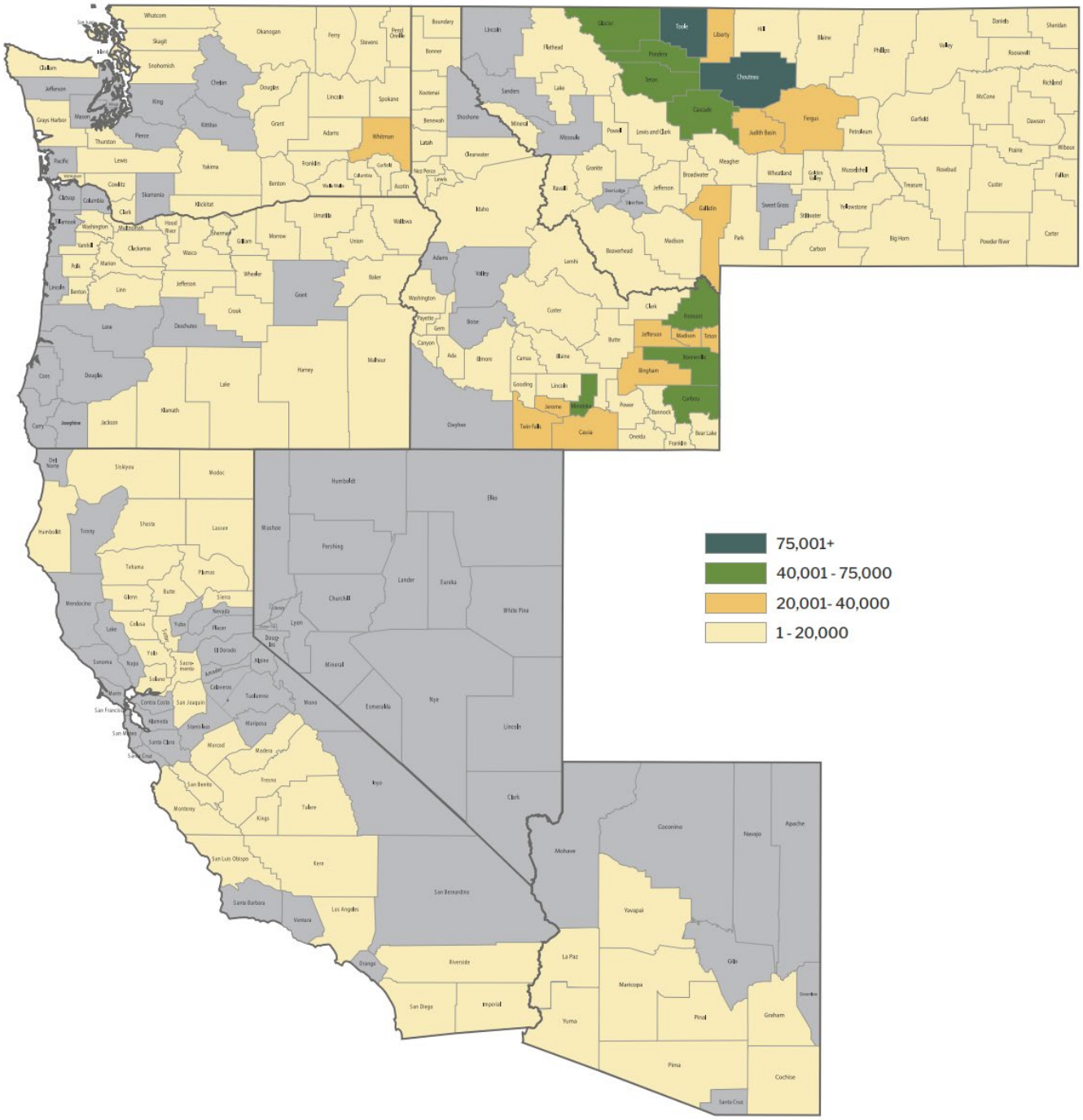
Conservation Stewardship Program (CSP)

The Conservation Stewardship Program (CSP) is intended to encourage producers to address resource concerns by installing or adopting conservation practices to the land. The program is meant to reward producers who conserve natural resources. It's expected that over time, farm-program payments will shift to more environmentally based programs that incent conservation practices rather than production-based programs.

Appendix E

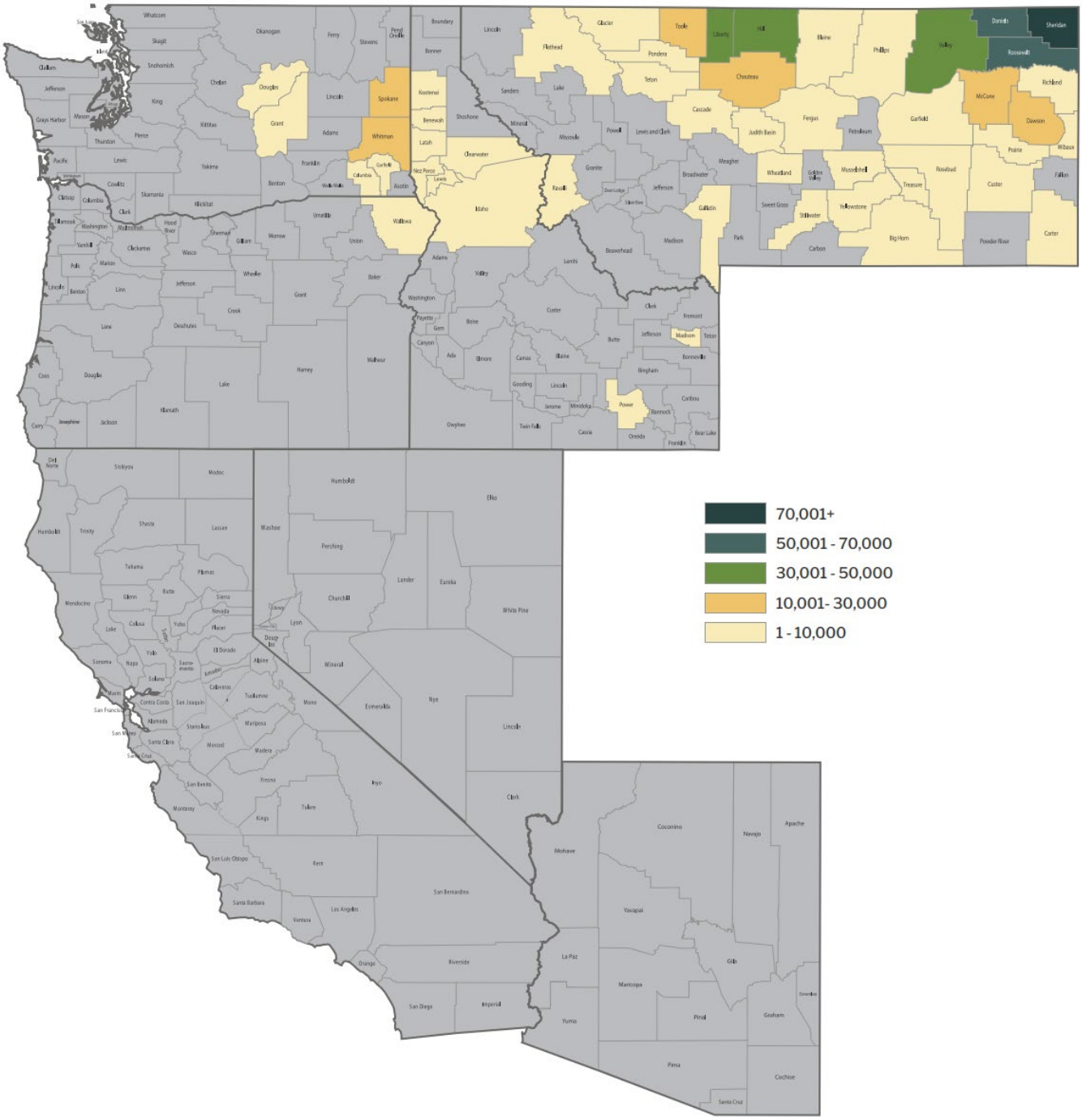
Acres by county

Barley acres by county



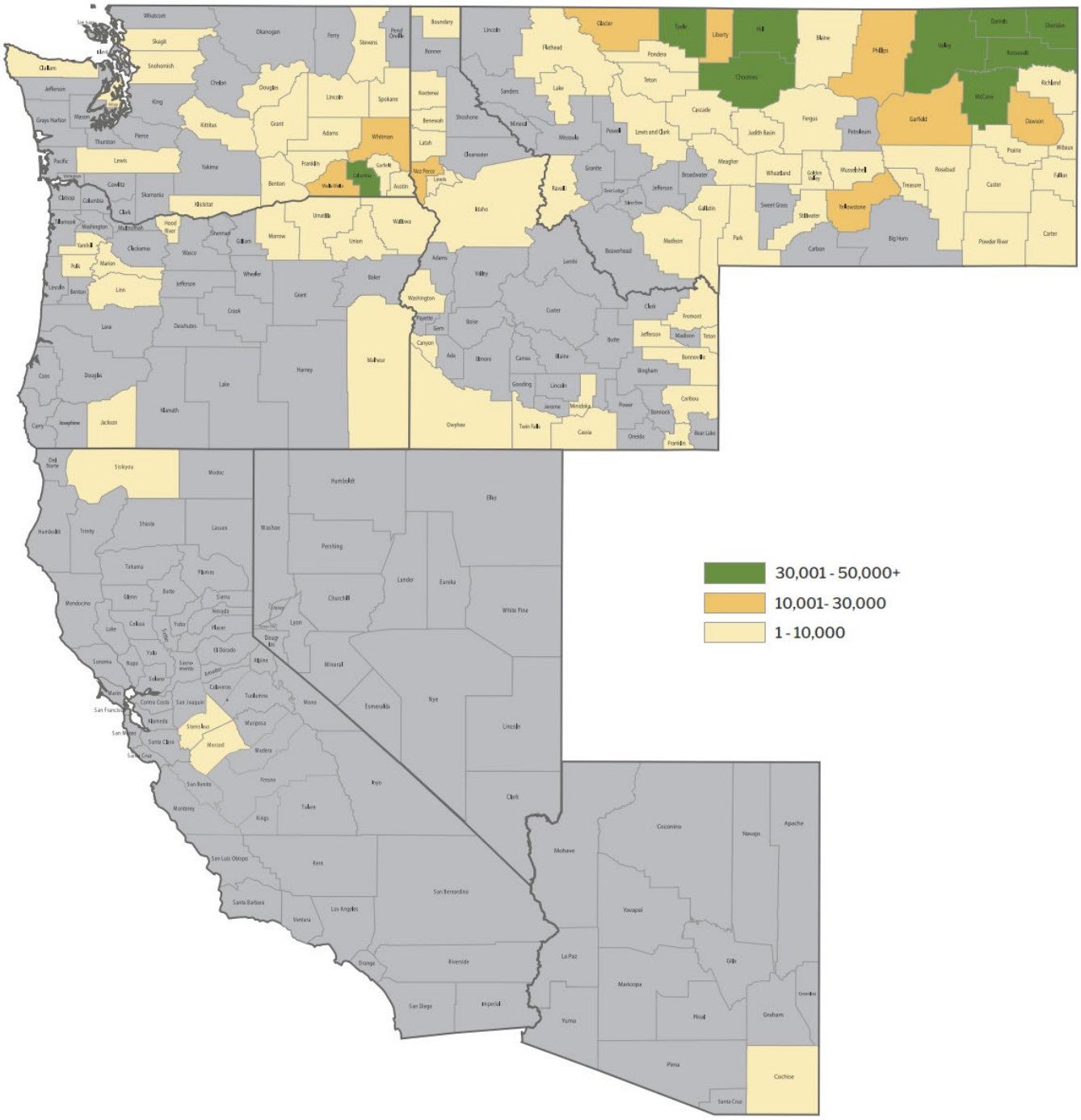
Source: USDA NASS, Census of Agriculture 2022.

Lentils acres by county



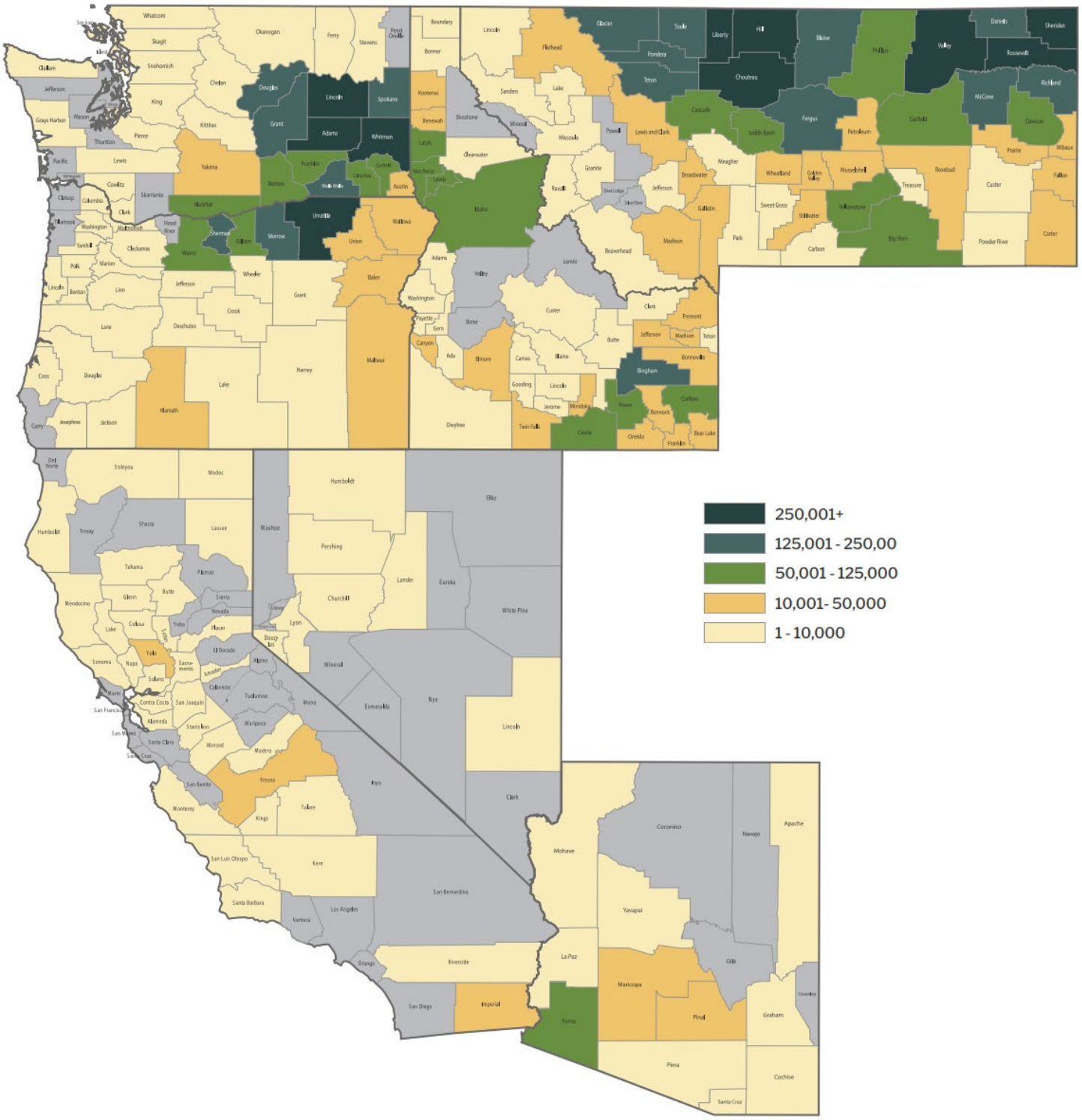
Source: USDA NASS, Census of Agriculture 2022.

Peas acres by county



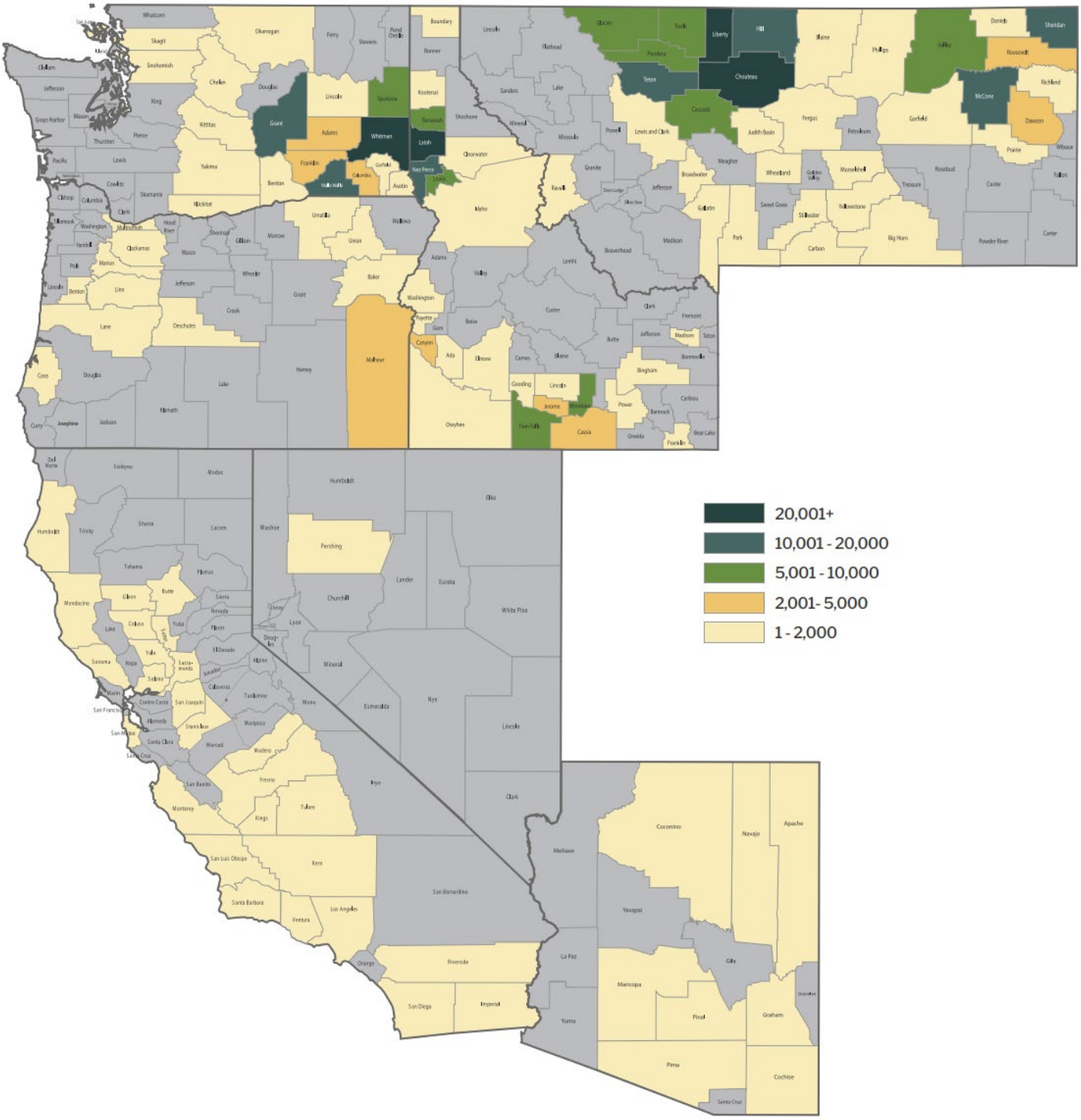
Source: USDA NASS, Census of Agriculture 2022.

Wheat acres by county



Source: USDA NASS, Census of Agriculture 2022.

Beans acres by county



Source: USDA NASS, Census of Agriculture 2022.

*Dry Edible – Black, chickpeas (large and small), dark red kidney, light red kidney, Great Northern, pink, pinto, small red, small white and other.