

Nevada County

2018 Crop & Livestock Report

Inside:
SPECIAL REPORT
on Economic Multiplier
Effects and Ecosystem
Services



**Department of
Agriculture,
Weights & Measures**



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About Nevada County

History

Nevada County was established in April 1851. The county was named after the mining town of Nevada City, a name derived from the term "Sierra Nevada." The word nevada is Spanish for "snowy" or "snowy-covered."¹

Mission Statement

Nevada County's Department of Agriculture is dedicated to sustaining a healthy agricultural industry, while protecting the environment, the agricultural workforce and the community. The mission of the Nevada County Department of Weights & Measures is to provide fair compensation and equity in the marketplace and to ensure that the interest of the buyer and seller are protected through education, inspection and enforcement.

Statistics

POPULATION
98,904²

DENSITY
101 per square mile

TOTAL AREA
974 sq. mi. (623,360 acres)²

LAND AREA
958 sq. mi. (613,120 acres)²

HIGHEST/LOWEST ELEVATION
9,152 feet/280 feet

FARMLANDS
8,078 acres³

GRAZING LAND
133,508 acres³

URBAN AND BUILT-UP LAND
17,609 acres³

TOTAL CROPLAND
4,816 acres⁴

NUMBER OF FARM OPERATIONS
377⁴

¹ "Nevada County History," US Gen Web Project, retrieved June 7, 2019.

² California Department of Finance, City/County Population Estimates as of January 1, 2019.

³ California Department of Conservation, Farmland Mapping & Monitoring Program, 2016.

⁴ USDA National Agricultural Statistics Service, 2017 Census of Agriculture.

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Karen Ross, Secretary
*California Department
of Food and Agriculture*



**The Honorable
Board of Supervisors
of Nevada County**

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Commissioner's Letter

I am pleased to present the 2018 County of Nevada Annual Crop and Livestock Report. This report is prepared pursuant to Section 2279 of the California Food and Agriculture Code, which requires every county to report agriculture's annual value.

In 2018, the gross value of agricultural commodities in Nevada County was \$25,609,200. This represents an overall increase of 7.3% from 2017. Noteworthy gains occurred in Fruit & Nut Crops (24.2%), Timber Products (20.6%), and Nursery & Flower Products (14.5%). After three years of declines, our livestock industry, which is the county's highest valued commodity, experienced a 3.7% gain.

This year we include a **Special Report** that helps fulfill our Section 2279 mandate on an unprecedented level. Part One of the Special Report quantifies multiplier effects of production. It shows how agricultural businesses, suppliers, and their employees spent an estimated \$7.7 million in the county economy. When combined with the farm production value, this brought agriculture's total 2018 economic contribution to \$33,356,991.

Part Two explores ecosystem services. It describes scenic beauty, wildlife habitat, wildfire protection and more than a dozen other non-market services that agricultural lands provide to society. It also assigns an initial, rough estimate of the dollar value to these services: \$420.0 million to \$1.203 billion per year. Validating and refining this estimate would require significant further research.

Combined, the **Special Report's** two parts paint the fullest picture yet of agriculture's economic contributions to Nevada County.

I would like to thank the many producers, industry representatives, businesses, and other public agencies who cooperated in supplying the data necessary to produce this report. Without their assistance, this crop report would not be possible. I would also like to thank the members of my staff for their contributions. Thank you!

Respectfully Submitted,

Chris de Nijs
Agricultural Commissioner and Sealer of Weights & Measures

Gross Production Value Summary

Commodity	Year	Value	Year	Value
Vegetable Crops	2018	\$1,869,800	2017	\$1,964,200
Nursery & Flower Products	2018	\$603,300	2017	\$531,400
Fruits & Nuts	2018	\$2,663,100	2017	\$2,143,500
Timber Products	2018	\$5,254,100	2017	\$4,356,300
Pasture & Rangeland	2018	\$3,700,000	2017	\$3,700,000
Livestock & Poultry	2018	\$11,100,800	2017	\$10,706,700
Apiary, Eggs, & Wool Products	2018	\$418,100	2017	\$460,400
Grand Total	2018	\$25,609,200	2017	\$23,862,400

The amounts in this report represent estimated gross values, regardless of utilization. No attempt is made to reflect net income to the producer or cost of production. Values represent rounded estimates based on data collected from producers, experts and literature.

Because of rounding, numbers may not compute exactly in all tables throughout this report.

Special Report: Key Findings

\$33.3 million

Nevada County Agriculture's total contribution to the local economy



Vegetable, Fruit, and Nut Crops

VEGETABLE CROPS			
Crop	Year	Harvested Acres	Value
Vegetables	2018	88	\$1,869,800
	2017	87	\$1,964,200

Vegetables include bean, beet, broccoli, cabbage, carrot, cauliflower, celery, corn, cucumber, eggplant, garlic, herbs, kale, kohlrabi, leafy greens, lettuce, melon, onion, pea, pepper, potato, parsnip, pumpkin, radish, squash, tomato, tomatillo and turnip

FRUITS & NUTS			
Crop	Year	Harvested Acres	Value
Other Fruits & Nuts (Wine grapes below)	2018	40	\$248,100
	2017	39	\$186,100

Fruits and nuts include apple, apricot, blackberry, blueberry, boysenberry, cherry, chestnut, fig, nectarine, olive, peach, pear, persimmon, plum, pluot, pomegranate, prune, raspberry, and strawberry. Wine grapes are calculated separately.

WINE GRAPE CROPS					
Crop	Year	Harvested Acres	Tons Per Acre	Total Tonnage	Value
Red Wine Grapes	2018	320	4.38	1399	\$1,797,300
	2017	320	3.60	1182	\$1,519,300
White Wine Grapes	2018	96	4.95	477	\$617,700
	2017	96	3.52	338	\$438,100
Total Wine Grapes	2018	416	9.33	1,876	\$2,415,000
	2017	416	7.12	1,520	\$1,957,400

Red wine grape varieties include Barbera, Bastardo, Cabernet Franc, Cabernet Sauvignon, Carignane, Carmine, Cinsault, Corvina, Dolcetto, Graciano, Grenache, Lagrein, Malbec, Merlot, Montepulciano, Mourvedre, Petite Sirah, Petite Verdot, Primitivo, Refosco, Sangiovese, Syrah, Tempranillo, Teroldego, Tinta Cao, Tinta Negra Mole, Touriga Nacional and Zinfandel.

White wine grape varieties include Chardonnay, Chenin Blanc, Falanghina, Fiano, Flora, Forastera, Marsanne, Melon de Bourgogne, Muscat Orange, Peverella, Pinot Gris, Pinot Grigio, Rkatsiteli, Roussanne, Sauvignon Blanc, Semillon, Tocai Friulano, Vespaiola, and Viognier.

Nursery, Timber and Field Crops

NURSERY PRODUCTS				
Crop	Year	Production Acres	Number of Trees	Value
Nursery	2018	4	—	\$309,700
	2017	5	—	\$255,000
Cut Flowers	2018	8	—	\$192,300
	2017	8	—	\$170,300
Christmas Trees	2018	40	2100	\$101,300
	2017	42	2200	\$106,100
Total Nursery	2018	52	—	\$603,300
	2017	55	—	\$531,400

TIMBER				
Crop	Year	Production in MBF	Price Per MBF	Value
Timber	2018	19,772	\$266.00	\$5,254,100
	2017	23,158	\$188.11	\$4,356,300

PASTURE & RANGELAND					
Crop	Year	Amount	Unit	Price Per Unit	Value
Pasture	2018	10,000	Acre	\$180	\$1,800,000
	2017	10,000	Acre	\$180	\$1,800,000
Rangeland	2018	95,000	Acre	\$20	\$1,900,000
	2017	95,000	Acre	\$20	\$1,900,000
Total Pasture & Rangeland	2018	105,000	Acre	—	\$3,700,000
	2017	105,000	Acre	—	\$3,700,000

Livestock, Poultry, and Livestock Products

Commodity	Year	Head ¹	Live Weight	Unit	Price Per Unit	Value
Steers & Heifers (As of January 1, 2018)	2018	4,100	43,900	lb	\$140	\$6,146,000
	2017	4,100	45,100	lb	\$116	\$5,231,600
Cows & Calf	2018	2,200	28,100	lb	\$138	\$3,877,800
	2017	2,900	32,130	lb	\$139	\$4,466,100
Sheep & Lambs	2018	1,500	—	ea	\$140	\$210,000
	2017	1,110	—	ea	\$160	\$176,000
Miscellaneous (Hogs, goats, chickens)	2018	—	—	—	—	\$253,000
	2017	—	—	—	—	\$291,200
Specialty Livestock (Modified 2017 reported amount)	2018	219	66,929	lb	—	\$614,000
	2017	215	74,095	lb	—	\$541,800
Total Livestock	2018	—	—	—	—	\$11,100,800
	2017	—	—	—	—	\$10,706,700

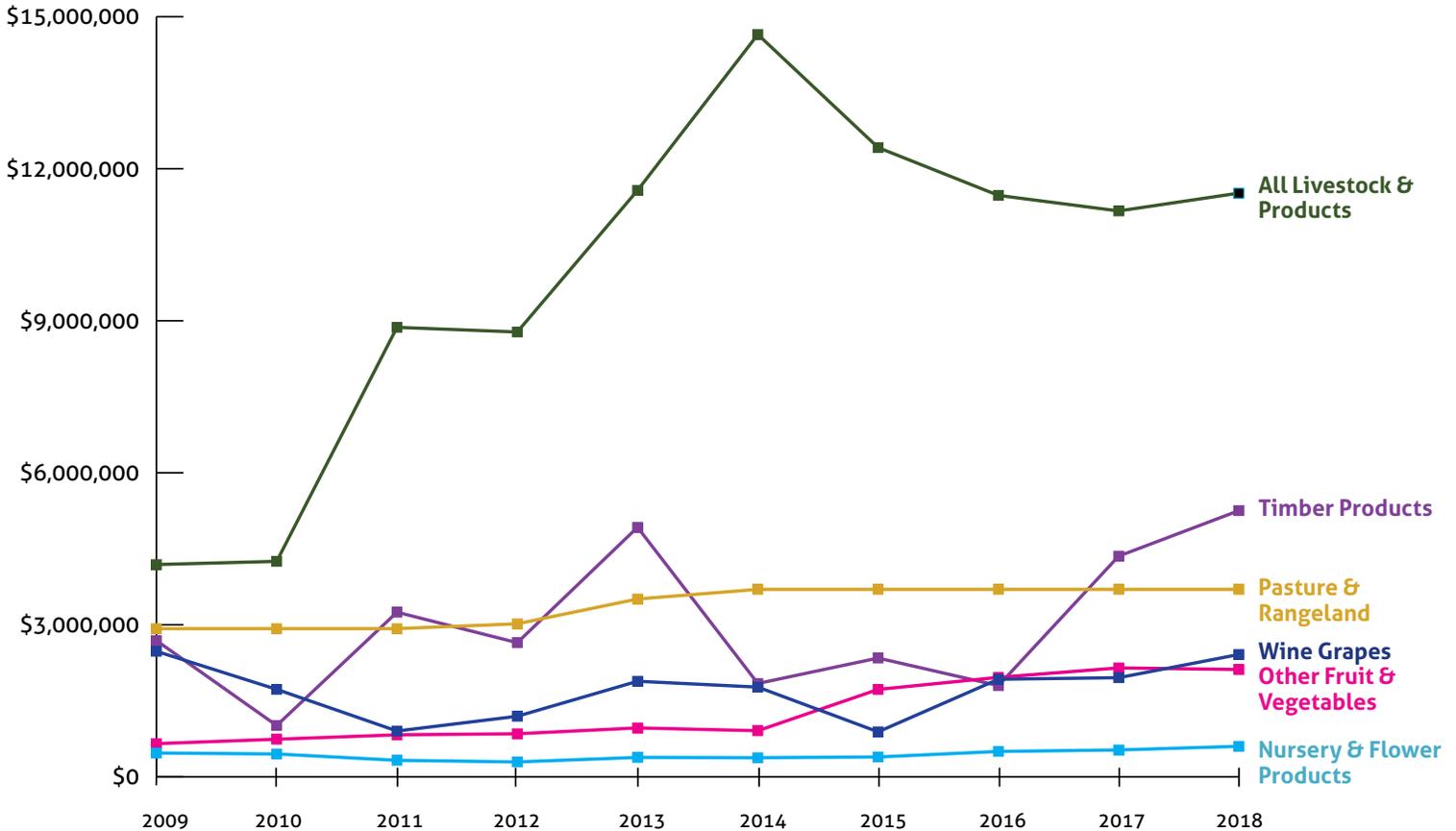
Apiary, Eggs and Wool Products

Commodity	Year	Amount	Unit	Price Per Unit	Value
Apiary (Includes in-county pollination, nucs, & hives.)	2018	2,225	—	—	\$208,800
	2017	2,326	—	—	\$218,200
Honey	2018	25,677	lbs	\$4	\$100,700
	2017	28,320	lbs	\$5	\$129,700
Wool Products (Includes fine & industry-grade wool.)	2018	1,400	lbs	\$5	\$6,300
	2017	1,300	lbs	\$6	\$7,500
Eggs	2018	18,941	doz	\$5.40	\$102,300
	2017	20,224	doz	\$5.19	\$105,000
Total Apiary, Eggs, & Wool Products	2018	—	—	—	\$418,100
	2017	—	—	—	\$460,400

Agricultural Income: 10-Year Comparison

Year	All Livestock & Products*	Pasture & Rangeland	Nursery & Flower Products	Wine Grapes	Other Fruit & Vegetables	Timber Products	Total Value
2009	\$4,189,300	\$2,925,000	\$471,000	\$2,477,500	\$656,000	\$2,689,000	\$13,407,800
2010	\$4,252,600	\$2,925,000	\$452,000	\$1,727,000	\$743,200	\$1,014,200	\$11,114,000
2011	\$8,870,000	\$2,925,000	\$327,000	\$905,200	\$829,900	\$3,249,000	\$17,106,100
2012	\$8,778,300	\$3,020,000	\$294,800	\$1,196,200	\$851,000	\$2,647,700	\$16,788,000
2013	\$11,573,200	\$3,510,000	\$383,900	\$1,886,900	\$966,400	\$4,924,900	\$23,245,300
2014	\$14,649,300	\$3,700,000	\$378,500	\$1,771,400	\$911,300	\$1,843,100	\$23,253,100
2015	\$12,417,100	\$3,700,000	\$392,500	\$888,900	\$1,725,700	\$2,344,600	\$21,468,800
2016	\$11,473,800	\$3,700,000	\$502,200	\$1,926,800	\$1,964,300	\$1,800,800	\$21,367,900
2017	\$11,167,100	\$3,700,000	\$531,400	\$1,957,400	\$2,150,300	\$4,356,300	\$23,862,500
2018	\$11,518,900	\$3,700,000	\$603,300	\$2,415,000	\$2,117,900	\$5,254,100	\$25,609,200

*Includes all livestock, poultry, apiary, wool & egg products.



Special Report

A Deeper Look at the Economic Contributions of Nevada County Agriculture

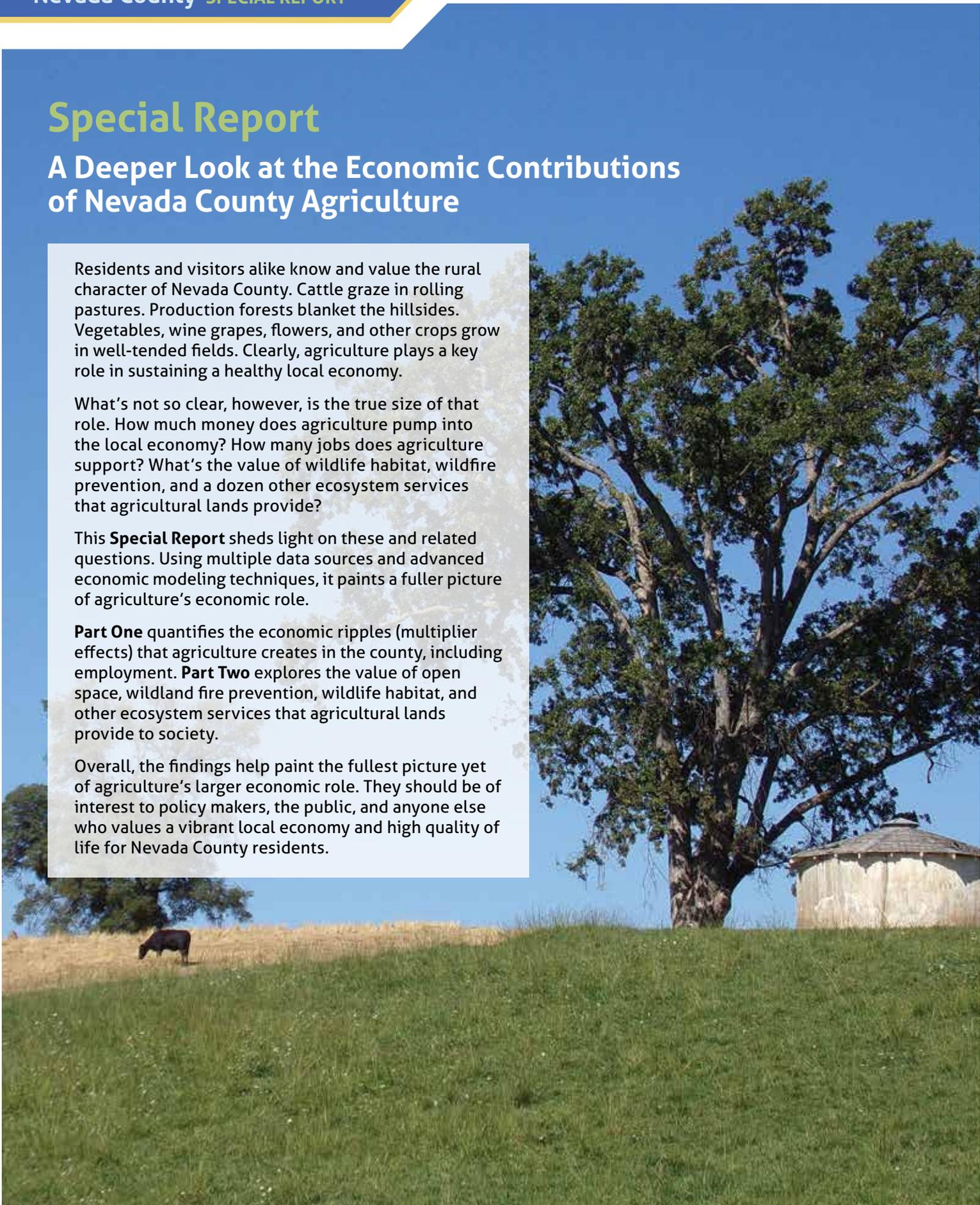
Residents and visitors alike know and value the rural character of Nevada County. Cattle graze in rolling pastures. Production forests blanket the hillsides. Vegetables, wine grapes, flowers, and other crops grow in well-tended fields. Clearly, agriculture plays a key role in sustaining a healthy local economy.

What's not so clear, however, is the true size of that role. How much money does agriculture pump into the local economy? How many jobs does agriculture support? What's the value of wildlife habitat, wildfire prevention, and a dozen other ecosystem services that agricultural lands provide?

This **Special Report** sheds light on these and related questions. Using multiple data sources and advanced economic modeling techniques, it paints a fuller picture of agriculture's economic role.

Part One quantifies the economic ripples (multiplier effects) that agriculture creates in the county, including employment. **Part Two** explores the value of open space, wildland fire prevention, wildlife habitat, and other ecosystem services that agricultural lands provide to society.

Overall, the findings help paint the fullest picture yet of agriculture's larger economic role. They should be of interest to policy makers, the public, and anyone else who values a vibrant local economy and high quality of life for Nevada County residents.



SPECIAL REPORT - Part One

ECONOMIC MULTIPLIER EFFECTS of Production & Employment

INTRODUCTION

When it comes to economic analysis, it's important to examine the fullest possible range of economic contributions. This section does that by focusing not just on *direct* economic effects such as farm production and employment, but also on *multiplier effects*. *Multiplier effects* are ripples through the economy. These ripples include inter-industry business-to-business supplier purchases, as well as consumption spending by employees of agricultural businesses and their suppliers. The **Multiplier Effects** section starting on page 11 explains this further.

It is appropriate to calculate *multiplier effects* when analyzing what economists call a *basic industry*. A *basic industry* is one that sells most of its products beyond the local area and thus brings outside money into local communities. Agriculture easily qualifies as a basic industry in Nevada County. Therefore, this report includes *multiplier effects* when describing agriculture's total economic contribution.

The analysis only examines agriculture's economic contributions. To understand agriculture's full economic impact, one would also need to assess agricultural-related costs to society, for example subsidies and net impacts on water and other natural resources. While important, these impacts lie beyond the scope of this study.

Calculations draw from local and national data sources. The local sources include industry experts and the Annual Crop & Livestock Report produced by the Nevada County Department of Agriculture. The main national data source is IMPLAN, a widely used economic modeling program (see www.implan.com). IMPLAN uses econometric modeling to convert data from the U.S. Department of Agriculture, U.S. Department of Labor, and several other federal government sources into local values for every U.S. county and zip code, across 536 industry sectors. The analysis used multipliers from the 2017 IMPLAN dataset, the most recent one available.



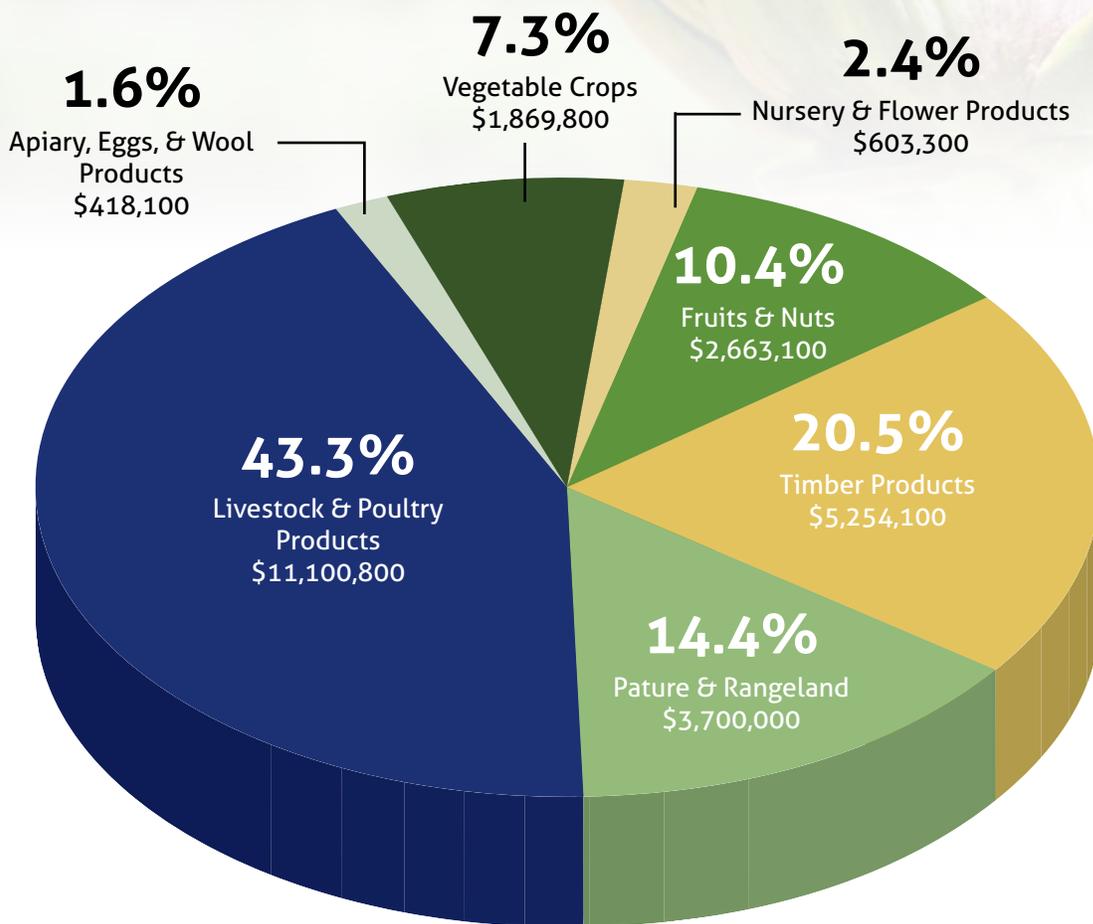
DIRECT EFFECTS of Nevada County Farm Production

The figure below provides a graphical summary of production data presented on page 3. At \$11.1 million, Livestock and Poultry was the single largest production category by dollar value in 2018, comprising 43.3% of the county total. Cattle dominated this category at \$10.0 million.

Timber Products, at \$5.3 million, represented the second largest category (20.5% of total production). Next was Pasture and Rangeland at \$3.7 million and 14.4% of total direct production value.

The combined, total dollar value for all products rose \$12.2 million over the previous decade, from \$13.4 million in 2009 to \$25.6 million in 2018. Inflation totaled 19.5% during this period, averaging just under 2% per year. Thus, agricultural production grew an impressive 71.5% even after adjusting for inflation.

For perspective, agriculture directly pumped \$492,485 dollars per week into the county economy during 2018, or \$70,162 per day and \$2,923 per hour.



Distribution of 2018 Nevada County Farm Production

MULTIPLIER EFFECTS of Nevada County Farm Production

This section quantifies the economic ripples that farm production creates in the local economy. These ripples take two forms: *indirect effects* and *induced effects*.

INDIRECT EFFECTS

Indirect effects consist of business-to-business supplier purchases. For example, when a farmer or rancher buys fertilizer, pesticides, seed, insurance, banking services, farm equipment, and other inputs, the grower creates *indirect effects*.

IMPLAN provides distinct indirect effects Output multipliers for every farm production sector in Nevada County and for every county nationwide. Local multipliers change every year, depending on where producers buy their inputs and how much they buy.

For example, the most recent IMPLAN data show that "Fruit farming" in Nevada County had an indirect effects multiplier of 0.2216. This means that each dollar's worth of fruit production, mostly wine grapes, generated an extra 22 cents in supplier purchases within Nevada County.

The analysis only captures supplier purchases that occur within Nevada County, i.e. ones that circulate agriculture money locally. Quantifying supplier purchases outside the county would be an expensive, complex effort that lies well beyond the scope of the report.



INDUCED EFFECTS

The second multiplier effect type, *induced effects*, consists of consumption spending by employees of agricultural businesses and of their suppliers. Employees pay for groceries, housing, healthcare, leisure activities, and other things for their households. All this spending creates ripples in the local economy.

For example, the most recent IMPLAN data show that "Commercial logging" in Nevada County had an induced effects multiplier of 0.4091. This means that each dollar's worth of timber production generated an extra 41 cents in consumer spending within Nevada County. As with *indirect effects*, the analysis only captures local expenditures.

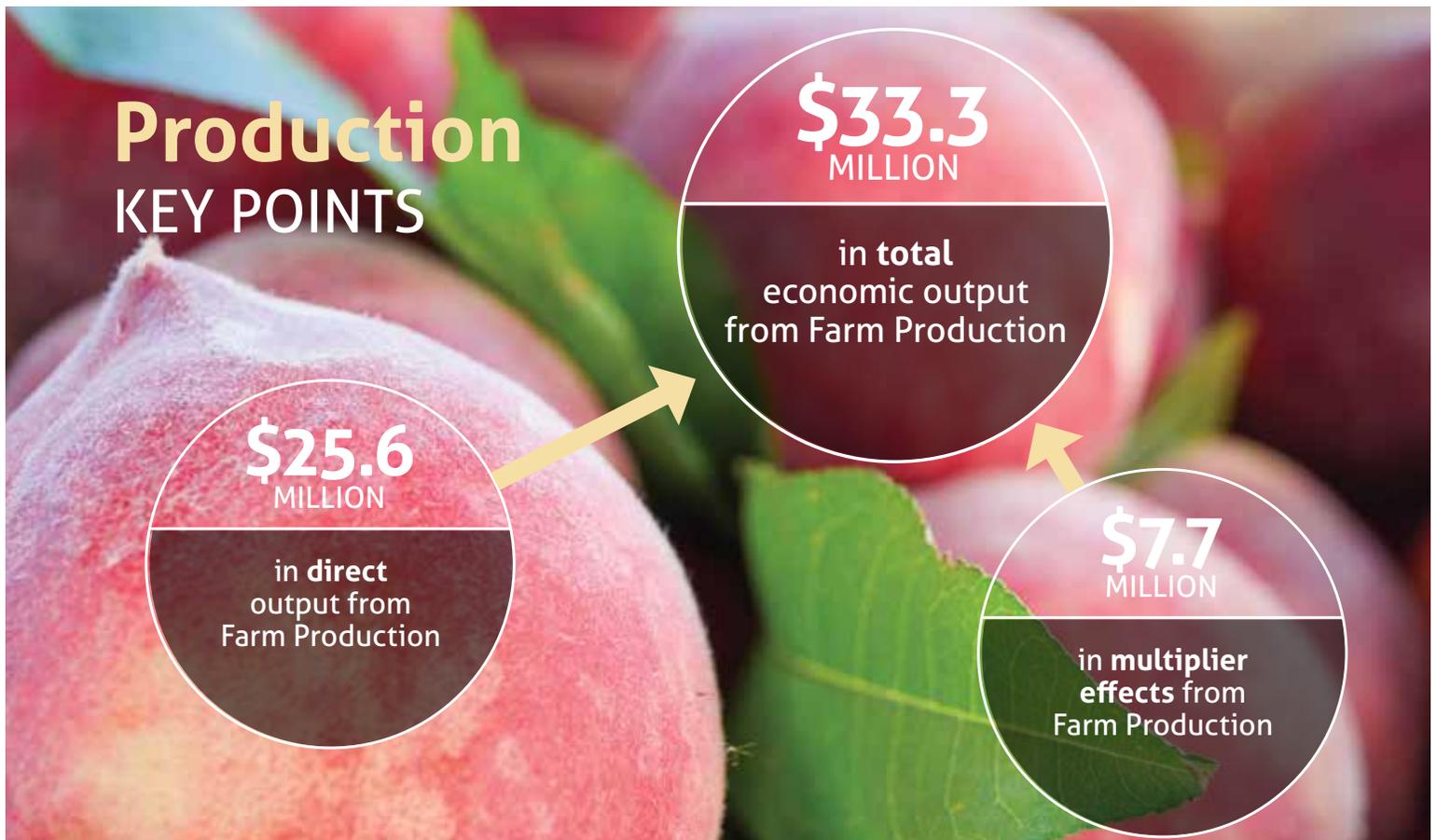


TOTAL MULTIPLIER EFFECTS

The previous three sections have provided pieces to a puzzle. This section brings them together to form a more complete picture. The table below combines agriculture's *direct*, *indirect*, and *induced* economic effects within the county, across major production categories. The numbers use IMPLAN multipliers for each category, weighted by specific commodities.

Economic Effects of Nevada County Farm Production

FARM PRODUCTION	Direct Value	Multiplier Effects		Total Value
		Indirect	Induced	
Vegetable Crops	\$1,869,800	\$388,574	\$55,133	\$2,313,506
Nursery & Flower Products	\$603,300	\$91,956	\$21,697	\$716,952
Fruits & Nuts	\$2,663,100	\$667,303	\$158,310	\$3,488,713
Timber	\$5,254,100	\$238,256	\$2,149,233	\$7,641,589
Pasture & Rangeland	\$3,700,000	\$669,021	\$365,543	\$4,734,564
Livestock & Poultry	\$11,100,800	\$2,735,755	\$187,847	\$14,024,402
Apiary, Eggs, & Wool Products	\$418,100	\$17,981	\$1,183	\$437,264
TOTALS	\$25,609,200	\$4,808,845	\$2,938,945	\$33,356,991



EMPLOYMENT EFFECTS of Nevada County Farm Production

Agriculture contributes to the local economy not just through production and its multiplier effects, but also by employment. This section estimates direct employment in farming and ranching, as well as the number of jobs attributable to multiplier effects.

DIRECT EMPLOYMENT

How many people work in agricultural production? Based on the most recent IMPLAN data, agricultural production directly employed an estimated 891 people in Nevada County. The figure encompasses a wide range of private sector, production-related jobs, across all the major production categories. It does not include agricultural workers in public agencies and academic institutions. Nor does it reflect workers who might not appear in surveys as formal employees, for example, family members and seasonal workers.

For perspective, agriculture's 891 direct jobs represented 1.6% of the county's total employment.

MULTIPLIER EFFECTS OF EMPLOYMENT

Just as every IMPLAN production sector has a unique output multiplier reflecting where employees of agricultural businesses and their suppliers spend their money, so too does each sector also have its own unique employment multiplier.

IMPLAN's "Commercial logging" sector, for example, captures Nevada County timber production. It had an employment multiplier of 0.1774 for *indirect* effects and 0.4506 for *induced* effects. This means that every million dollars in timber product output supported the equivalent of 62.8% of a job (0.4506 plus 0.1774).

Perhaps due to Nevada County's rural character, most employment multipliers are low. Agricultural businesses, suppliers, and their employees spend much of their money outside the county. As a result, the total employment from multiplier effects was just 8 jobs. Adding this to the direct employment brought total employment to 898.



SPECIAL REPORT - Part Two

Ecosystem Services from Agricultural Lands

Nevada County agricultural lands produce more than the items people can easily buy or sell. Local farmers and ranchers also provide open space, wildlife habitat, carbon storage, and many other benefits to society, including protection from wildfires. Often called ecosystem services, these benefits have significant value but are poorly understood and rarely counted.

This section helps raise awareness about the topic. It explores three questions:

- What types of ecosystem services occur on Nevada County agricultural lands?
- How can we best quantify the dollar value of these ecosystem services?
- What is an initial estimated range of their annual value in Nevada County?

Why Is This Important?

Hundreds of articles, perhaps thousands, have described the importance of ecosystem services. For example:

“Ecosystem services’ is the term given to the goods and services provided by natural and modified ecosystems that benefit, sustain and support the well-being of people. They include production of food and medicines, regulation of climate and disease, provision of productive soils and clean water, and landscape opportunities for recreation and spiritual benefits.

These services come from ecosystems made up of a combination of soil, animals, plants, water and air. Obviously, the variety of these elements will differ across ecosystems, from undisturbed natural areas (such as tropical forests, or Australia’s northern savanna) to highly modified agricultural landscapes. But all functional ecosystems include these essential components, which can be seen as the ‘natural capital’ or underlying assets that give rise to a ‘flow’ of ecosystem services.

One major challenge we face, however, is that ecosystem services often go unrecognized in economic markets, government policies and land management practices. This is because most of these services are difficult to see and measure, and so their contribution to economic and social well-being is rarely considered when management decisions are made. Some good progress is now being made in these necessary assessments and ways of ‘accounting in’ natural capital.”¹

California Agriculture: Leading Again

California agriculture already leads the nation and world in several categories. It comes as little surprise, then, that California agriculture has also assumed a leadership role in documenting and valuing ecosystem services.

In 2011, the California Department of Food and Agriculture (CDFA) established the Office of Environmental Farming and Innovation (OEFI). Its vision is “to be a trusted and valued resource for scientific analysis and support to stakeholders and state agencies in the development and implementation of economically viable agricultural practices that optimize environmental and public health.”

To accomplish that vision, OEFI has a mission “to serve California by supporting agricultural production and incentivizing practices resulting in a net benefit for the environment through innovation, efficient management and science.” For details, please see www.cdca.ca.gov/oefi/.

One of OEFI’s most exciting contributions lies with ecosystem services. OEFI has defined different types of ecosystem services that California’s agricultural lands provide (see page 15). It has also launched a project to document, recognize, and incentivize them.

¹ Stratton, A., and L. Pearson, “Importance of ‘ecosystem services’ for sustainable development.” *ECOS Magazine*, page 28, June-July 2008.

Ecosystem Services that California Agricultural Lands Provide

Source: California Department of Food and Agriculture. See <http://www.cdfa.ca.gov/oefi/ecosystemservices>

Wildlife Habitats



Providing food, water, shelter and space to support resident and transient wildlife, especially through riparian areas and perennial vegetation.

Food Production



Nourishing a growing global population with nutrients and energy, the primary product of agricultural production.

Fuel Production



Meeting energy needs by producing plant-based biofuels, and through mechanized production of renewables such as wind, solar, hydro, and geothermal.

Soil Structure, Formation and Fertility



Sustaining healthy soils, the foundation of all life, by managing them in ways that not only support plant growth, but also reduce erosion, prevent landslides, suppress pathogens, sequester carbon, and purify water.

Water Cycling



Maintaining or improving soil moisture and water storage, while minimizing runoff, through cover crops, tillage, residue management, and dozens of related practices.

Pest Control



Controlling pests and weeds through many management practices that support their natural enemies, such as raptors, beneficial insects, and other wildlife.

Pollination Services



Supporting agricultural production and healthy ecosystems by providing nesting habitat and floral resources for wild pollinators such as bees, bats, and birds.

Nutrient Cycling



Managing plant nutrients and soil amendments in ways that help store, transform, and cycle important nutrients in the soil, such as carbon, nitrogen, and phosphorus.

Fiber Production



Clothing people by producing cotton, wool, and other fibers that can be processed into thread, yarn and cloth.

Recreation and Cultural



Improving quality of life by providing places for wildlife viewing, nature walks, outdoor recreation, entertainment, and educational experiences.

Biodiversity Conservation



Promoting ecosystem productivity, beauty, pest control, and other benefits by managing on-farm streams, trees, shrubs, wetlands, and cropped areas in ways that support diverse plants and animals.

Atmospheric Gas & Climate Regulation



Reducing greenhouse gas levels through practices that make farm operations more energy efficient, and by building capacity to store carbon.

Water Quality



Improving and protecting water quality through vegetative buffers, stream bank protection, prescribed grazing, grassed waterways, and dozens of other management practices.

Wildfire Protection*



Crops, orchards, grasslands, and other agricultural areas can help protect people and property from wildfires.

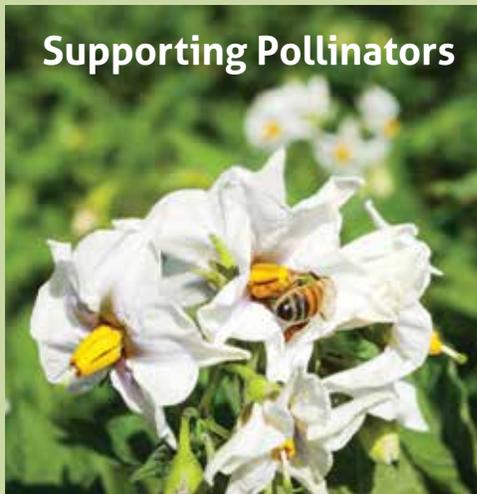
**This new category, Wildfire Protection, does not occur on CDFA's original list.*



Douglas wildfire

Reducing Wildfire Risk

Many wild and cultivated plants depend on pollinators that agricultural lands support.



Supporting Pollinators



Promoting Carbon Sequestration

California's Agricultural Lands Deliver Multiple Benefits

Agricultural areas reduce fuel load and facilitate firefighting efforts. Even well managed timber stands can lower fire risk compared to native forests.



Fostering Community

Farmlands foster a sense of community, as well as physical and emotional benefits.



Production forests provide many ecosystem services, including water purification and production, wildlife habitat, erosion control, and carbon sequestration.

The Local Opportunity and Benefit

What does this mean for Nevada County agriculture? The main implication is that while no one can predict the future, ecosystem services likely represent a growing financial opportunity for local producers.

Many Nevada County producers already participate in various state and federal programs that pay for ecosystem services. The Williamson Act and U.S. Farm bill programs are especially popular. Current trends suggest the number and types of opportunities will increase in coming years.

For example, new private sector markets have emerged for water, biodiversity, and greenhouse gases. Others are in development. In fact, some experts believe that market-based ecosystem services could become a major economic driver for rural America.

Assigning Dollar Values to Ecosystem Services

Economists have tried with varying success to assign monetary values to benefits from ecosystem services. They use a variety of methodologies such as Travel Cost Method, Hedonistic Pricing, Replacement Cost Method, and Contingent Valuation.

This raises an important question: **what is the annual dollar value of ecosystem services provided by Nevada County agricultural lands?**

Answering this question could require primary data collection taking several years and costing hundreds of thousands of dollars. Fortunately, economists have developed a cost-effective approach that takes full advantage of existing research. Called the Benefit Transfer Methodology, the approach estimates economic values by transferring existing benefit estimates from studies already completed for another location.

For example, researchers recently used the Benefit Transfer Methodology to estimate the value of ecosystem services in three California counties. The philanthropic foundations that commissioned these expensive pilot studies hoped the results would prove useful for other counties, too.

The table below summarizes relevant results from those three studies. It shows inflation-adjusted, average dollar value per acre for ecosystem services provided by four specific land use types that are relevant to Nevada County agriculture.

Annual Average Value of Select Ecosystem Services in Three California Counties

Land Cover Type	Santa Cruz County ¹		Santa Clara County ²		Sonoma County ³	
	Low	High	Low	High	Low	High
Grassland	\$4,299	\$9,160	\$3,686	\$7,873	\$2,505	\$11,124
Pasture	\$546	\$11,709	\$1,132	\$11,158	\$535	\$8,643
Cultivated	\$136	\$2,819	\$136	\$2,819	\$136	\$2,819
Evergreen Forest	\$3,638	\$9,637	\$3,699	\$9,622	\$3,072	\$7,379

¹ Inflation-adjusted averages calculated from Table 7 (pp. 27-30) in R. Schmidt *et al.*, 2014, Nature's Value in Santa Cruz County. Earth Economics, Tacoma, WA & the Resource Conservation District of Santa Cruz County, Capitola, CA.

² Inflation-adjusted averages calculated from Table 7 (pp. 30-33) in D. Batker *et al.*, 2014. Nature's Value in Santa Clara County. Earth Economics, Tacoma, WA & the Santa Clara Valley Open Space Authority, San Jose, CA.

³ Inflation-adjusted averages calculated from Table 8 (pp. 33-37) in R. Schmidt *et al.*, 2015, Nature's Value in Sonoma County. Earth Economics, Tacoma, WA & Sonoma County Agricultural Preservation and Open Space District, Santa Rosa, CA.

Using sample values from these three California counties, we can create initial estimates for Nevada County. The table below combines all three counties' values into combined averages. Then it multiplies them by the number of Nevada County acres of each land cover type, pulled from the 2018 Crop and Livestock Report. The value of ecosystem services provided by Nevada County agricultural lands is estimated to be \$419,982,019 to \$1,203,961,869 per year.

Initial Estimated Value of Ecosystem Services Provided by Nevada County Agricultural Lands

Agricultural Land Cover Type	# of Acres	Value Per Acre (\$)		Total Value (\$)	
		LOW	HIGH	LOW	HIGH
Rangeland [Grassland]	95,000	\$3,497	\$9,385	\$332,175,317	\$891,615,036
Pasture	10,000	\$738	\$10,503	\$7,376,600	\$105,034,729
Crops [Cultivated]	597	\$136	\$2,819	\$81,120	\$1,682,894
Timber [Evergreen forest]	23,158	\$3,470	\$8,879	\$80,348,982	\$205,629,210
TOTALS	128,755			\$419,982,019	\$1,203,961,869

Two caveats are in order. First, this back of the envelope estimate is for illustrative purposes only. The range gives some indication of magnitude but is by no means definitive. Getting robust numbers would require a full study using the Benefit Transfer Methodology.

Second, it is safe to assume that values for rural Nevada County would be lower than for the three sample counties mentioned earlier. The sample counties each have larger populations than Nevada County, which increases their aggregate demand for various ecosystem services.



Conclusion to the Special Report

This special report has broken new ground in fulfilling the mandate from Section 2279 of the California Food and Agriculture Code to quantify agriculture's annual value.

- **Part One** explored multiplier effects. For 2018, agriculture contributed \$25,609,200 in direct economic output, plus \$7,747,791 in multiplier effects (indirect and induced), for a total of \$33,356,991.
- **Part Two examined ecosystem services.** Nevada County agricultural lands provide valuable goods and services to society that do not currently have market prices but are likely worth hundreds of millions of dollars per year – perhaps \$420.0 million to \$1.203 billion annually.

The main overall finding is that agriculture plays a larger economic role in Nevada County than one might expect – and certainly a bigger role than what annual commodity production values would suggest.

Agriculture is an important pillar of the Nevada County economy and represents a vital link to both the county's cultural past and competitive future. Although this Special Report has presented many facts and figures, it has barely begun to fill key information gaps about agriculture's role. The process of developing this report has raised several additional questions that lie beyond the scope of this report but may warrant future research (see list below). In the meantime, the findings herein provide the clearest picture yet of Nevada County agriculture's important economic role.



Additional Questions

■ Adding Value to Agricultural Products

Most of Nevada County's raw agricultural products leave the county for processing. What new policies, programs, and other initiatives could expand locally sourced, value-added food processing within Nevada County?

■ Ecosystem Services

This report has taken an initial look at ecosystem services and produced a rough estimated value. What is a more robust estimate of the annual dollar value of wildlife habitat, scenic beauty, carbon sequestration, and many other ecosystem services that Nevada County's agricultural lands provide to society?

■ Economic Resilience

Economic diversification tends to reduce risk of major economic shocks. How economically diversified is Nevada County agriculture? How is the diversification level trending over time? What promising pathways exist for diversifying and strengthening agriculture?

■ Cannabis and Hemp

What economic opportunities and risks do commercial cannabis and industrial hemp production pose for Nevada County agriculture?

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