DEVELOPING MONTANA'S DIRECT FARM MARKETS AND SUPPLY CHAINS: MAPPING THEIR PROGRESS AND SETTING A NEW COURSE
FY 2010

The opportunities for Montana's farmers, ranchers and small food entrepreneurs to produce and market food for local and regional markets are severely limited by a lack of in-state food supply chain infrastructure. Montana's sparse population and vast distances exacerbate the challenges, particularly those related to distribution and access to marketing channels. Even where local and regional food supply chain infrastructure exists, it tends to be poorly connected, resulting in market inefficiencies, and logistical as well as cost barriers. Over the last 20 years a number of statewide, collaborative efforts as well as individual community-based ones have focused on developing Montana's capacity to meet more of its citizens' food needs. These efforts have resulted in development of several vital components needed for functioning local and regional food markets and passage of five needed state legislative policies, guided to success by core project partner Grow Montana.

The FSMIP project came about to better understand the value and implications of the food supply chain components that have been added over the past 10 to 20 years. No one had a real sense of what the changes meant or if those changes were being used to their best advantage, or even where the new components are located and how they are connected. The main deliverable of the project was an interactive online map which shows the names and locations of different types of food businesses, including producers, processors, institutional and retail food service, grocers, food pantries, and food distributors across Montana. The map shows which food product types a business sells or buys, and which businesses are buying or selling local food. By overlaying these map layers in different combinations, users can see general location trends in the infrastructure. The project was successful in enlisting numerous stakeholders across the state and creating formal and informal networks to consider the next steps in developing a cohesive state food system.

FINAL REPORT

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Developing Montana's Direct Farm Markets and Supply Chains: Mapping their Progress, Setting a New Course

The need for this project

The opportunities for Montana's farmers, ranchers and small food entrepreneurs to produce and market food for local and regional markets are severely limited by a lack of in-state food supply chain infrastructure. Montana's sparse population and vast distances exacerbate the challenges, particularly those related to distribution and access to marketing channels. Even where local and regional food supply chain infrastructure exists, it tends to be poorly connected, resulting in market inefficiencies, and logistical as well as cost barriers.

Montana's agricultural economy, beginning in the 1950s, has been based largely on the export of bulk, raw commodities, principally wheat and beef cattle. The vibrant local food economy and the infrastructure that supported it prior to the end of WWII were largely lost as the infrastructure for relatively cheap, bulk commodity shipping by rail to overseas markets was further developed.

The results of this shift from community-based food systems to commodity export have been dramatic and costly. In 1910 farmers and ranchers earned on average $.60 of each dollar consumers spent on food. By 2007, the value of Montana's grain farmers' share plummeted to an average of $.07 for every food dollar. In addition, over 30% of Montana citizens face food insecurity, where they do not have adequate access to safe, nutritious and culturally appropriate food.[1]

In 2006 Montana ranked second in the nation for the number of acres in agricultural production.[2] Yet, according to the U.S. Census Bureau (2007), during this same time period, Montana ranked 39th in the nation for median household income.[3] "In 2003, eight of the ten poorest counties in the nation (based on wages and salaries) were in Montana, all of them agricultural."[4]

Creating new opportunities

In response to the challenges described above, over the last 20 years a number of statewide, collaborative efforts as well as individual community-based ones have focused on developing Montana's capacity to meet more of its citizens' food needs.

These efforts have resulted in development of several vital components needed for functioning local and regional food markets, including more farmers with the capacity to produce for regional and local markets; growers' cooperatives and alliances that facilitate marketing of local food; a micro-processing facility and agricultural innovation center; a cooperative development

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[1] Montana Department of Agriculture. 2007. Video: Montana's Food System in Change. View at http://growmontana.ncat.org/

[2] McLeay and Barron (2006). As cited in Babcock, J. (2008). *Redeveloping a Montana Food Processing Industry: The Role of Food Innovation Centers.*

[3] U.S. Census Bureau (2007). Retrieved on January 27, 2010 from http://www.census.gov/statab/ranks/rank33.html

[4] Western, S. (2005). As cited in Babcock, J. (2008). Redeveloping a Montana Food Processing Industry: The Role of Food Innovation Centers.

center; several significant institutional food buyers committed to local food procurement, and two public university academic programs with a focus on sustainable food and agriculture systems and community-based action research. Changes also include passage of five needed state legislative policies, guided to success by core project partner Grow Montana.

This project came about in response to both the needs described above, but also to the positive changes that have occurred more recently. The various organizations, coalitions and individuals responsible for the progress made in development of the state's community-based food system infrastructure felt a need to better understand the value and implications of the food supply chain components that have been added over the past 10 to 20 years. No one had a real sense of what the change meant or if those changes were being used to their best advantage, or even where the new components are located and what they are connected to. This lack of a system-wide picture of the changes that have occurred has made it difficult to know what the most important pieces still missing are.

The birth of this project

Thus was born the idea behind this project. The interested parties said, let's GIS map the current infrastructure that is serving or could serve the growing markets for locally and regionally produced food, with a specific look at the direct market-infrastructure. By placing each piece of the puzzle on an interactive, online map, interested stakeholders would be able to see what services and products are available where, where the gaps are, and where might new investment make the biggest difference in supply chain functioning and efficiency.

In the process of carrying out this project, the partners would engage a broad spectrum of stakeholders needed for compiling and analyzing the current state of our direct farm markets and the supply chains that support them. It would result in a new set of local and statewide priorities for increasing the connections among the state's direct market supply chain infrastructure components and for developing missing components. By the end of the project, the engaged stakeholders would be prepared to support the priorities coming out of this project.

Project partners and objectives

The original project partners included representatives of two different programs within Montana State University; the state's food policy coalition called "Grow Montana"; the Montana Farmers Union; the state's largest, grassroots sustainable agriculture organization, called AERO; a regional economic development organization that houses the state's only food innovation and cooperative development center—Lake County Community Development Corporation; and the Montana Department of Agriculture.

These initial project partners and stakeholders developed the following objectives, which describe the project, its rationale and anticipated outcomes, in clear terms:

1. Assess why and how Montana's growing number of direct market and supply chain components are—and are not—efficiently functioning as value chains from field to plate;
2. Identify opportunities and strategies for linking poorly connected direct farm market value chain components, and identify and prioritize the value chain gaps that remain;

3. Develop strategies to address Montana's direct market and supply chain priority needs identified by this project, and strengthen needed stakeholder engagement through the process of data compilation, analysis and education, and
4. Share broadly the information and analysis developed by the project.

Project work plan

The plan of work and the objectives were modified during the course of the project, which will be explained below. The original plan was to 1) GIS map the state's direct farm market supply chain infrastructure, drawing on existing databases generated predominantly by local and statewide nonprofit sustainable agriculture and food system organizations, some of which were project partners.

This focus on direct market value chains was intended to be a first phase of a multi-phase project that would ultimately look beyond direct markets to include more complex market supply chains.

The resulting interactive GIS map would have the capability of showing different categories of the value chain components and of food products in a layering of the data. For example, by selecting the category of local poultry producers and overlaying that with area poultry processors, and the institutional purchasers of the local chicken meat, a community or region would be able to identify gaps in infrastructure needed for the direct market poultry supply chain to function more efficiently. They'd be able to see distances where proximity is needed, and to see existing resources that might not be currently utilized that could be connected in the chain.

The next step in the work plan was to 2) take the online mapping tool out to stakeholder and community groups for them to use for analysis of their community's or region's food system infrastructure needs and opportunities. The idea was that this sort of visual mapping tool would make infrastructure gaps and connections obvious, enabling collective analysis of needs and prioritization of investment to fill those needs.

In the final two steps, the project partners would 3) compile the analysis and recommendations from all the community stakeholder meetings and develop broad strategies for meeting the identified needs, and 4) publicize and pursue those strategies.

Two things happened fairly early in the project to alter the just-described project's scope of work:
1. The state USDA-NRCS administrator offered to donate the services of its state GIS specialist to the project. Note that none of the original project partners had much knowledge of or experience with GIS data bases or mapping. So the project welcomed the addition of the USDA-NRCS to the partnership.

2. The NRCS GIS specialist sought and received permission from the Montana Department of Health to access its licensed food facilities data base.

Suddenly, the project had expert GIS help and a data base of every licensed food business in the state. (The only type of food business not licensed, and therefore not in the data base, is agricultural producers.)

The impact of these two things was to change this project's initial focus on the state's direct market value chain components to *all* food-related components, but with a focus on those engaged in local commerce. In practical terms, the partners went from expecting to create and code a GIS data base of several hundred records, to one containing many thousands of records.

As a result of this greater ambition, the project added another partner, the Montana State Library's Geographic Information Clearinghouse, which the project contracted with to host the data base, to convert the Department of Health's Excel data base to GIS, to set up and manage the data coding process that the partners would undertake, and create the online mapping tool and create maps.

What didn't change in the project's original scope of work was the plan to take the completed GIS mapping tool out to communities for food system stakeholders to use for the purpose of collectively analyzing the community's food system infrastructure and helping identify needs, opportunities and priorities for action and investment. These meetings did occur, with results to be described later in this report.

Contributions of partners, cooperators and volunteers

All project partners served on the project steering committee. In addition, each partner's more specific role is described below.

The **Montana Department of Agriculture** provided project administration, oversight, reporting and some of the project outreach and publicity. The department also assisted with data collection and coding, and contributed its knowledge of many local and regional food businesses that are included in the GIS data base, and brought to bear its relationships with stakeholders across the state.

Grow Montana, the state's food and ag policy coalition, provided coordination of the partners and assisted with project outreach and publicity. Grow Montana assisted with data collection and coding, and also organized six of the seven community meetings where the mapping tool was show-cased, tested by stakeholders, and where stakeholder feedback was solicited. Grow Montana recorded the comments, suggestions and analysis generated by the stakeholders at the community meetings.

Montana State University's role shifted significantly early on, as they were going to lead the GIS data base and mapping work. Because the state's USDA-NRCS and the Montana State Library's Geographic Information Clearinghouse came on as new partners with superior capacity to do the GIS work and the latter to host the mapping site, MSU stepped back from its central GIS role.

Montana State University's Department of Health and Human Development and its interdisciplinary degree program, Sustainable Food and Bioenergy Systems, participated in steering the project, participating in decisions on project scope and implementation. MSU also provided student assistance with data collection and coding, and helped host and participated in the community meeting held in Bozeman.

AERO (**Alternative Energy Resources Organization)**, with its extensive stakeholder networks and its *Abundant Montana* local foods directory and data base, engaged key community leaders, farmers, ranchers and other nonprofits and businesses, as well as public agencies throughout the state, in providing key data bases, especially ag producer data bases needed to make the GIS mapping more complete. Since farmers and ranchers are not licensed by the state, their data is more difficult to collect.

AERO also coordinated and managed volunteer efforts to code the data gathered by the project, as well has helped MSU solicit volunteers from among MSU Extension agents scattered across the state who are familiar with the food and ag enterprises in their communities. AERO also solicited data-coding volunteers from among county health officers involved in licensing food businesses, which makes them well qualified to code food facilities data according to business and product type.

Lake County Community Development Corporation (LCCDC), in particular its Agriculture, Food & Cooperative Development Program, identified data sources in western Montana and gathered data bases, hosted and facilitated a project workshop at a larger western Montana conference, hosted one of the seven community meetings show-casing the mapping tool, and contributed to project outreach and publicity.

Montana Farmers Union solicited from among its members and other statewide farm organizations food business entity data, especially on farmers and ranchers serving local and regional markets. MFU also hosted and recruited participants for the first community meeting at which the project partners received early feedback on the interactive map and on the process we used for the discussion. We modified the process subsequent to that meeting.

Montana State Library's Geographic Information Center became a partner beginning in January 2011, to take over the technical GIS data and mapping activities from MSU and Montana NRCS, including hosting the map. This turned out to be a great relationship with excellent results. The Geographic Information Center is the central clearinghouse for all Montana GIS data. The Center did all the technical GIS database work, set up ways for partners and volunteers to code records according to type of business, food products grown, sold or purchased, and whether the business is engaged in local commerce.

The Center also generated static maps using a variety of ways to display the data, and printed them in large size for interactive use at the community meetings. (Note: map hosting moved to the Department of Agriculture upon completion of the grant phase of the project.)

The **Montana office, USDA-Natural Resources Conservation Service** joined the project as a result of interest from the state NRCS GIS specialist. The GIS technical capacity and resources available through the NRCS exceeded that of MSU, the partner originally proposed to perform the GIS data work. The NRCS was able to access the Montana Department of Health's data base of the state's licensed food facilities. The NRCS performed the initial categorizing and organizing of the data base.

As NRCS' other demands on the GIS specialist's time grew, and the tasks of this project grew more complex, the NRCS reduced its time on the project and transitioned the GIS work to the State Library's GIS Center.

All partners helped with and participated in the seven community meetings held around the state; all helped with data coding; all solicited volunteers from around the state to code records of businesses in their local communities and counties. These volunteers included university students, food business owners, farmers and ranchers, grassroots members of the partnering organizations, extension agents and others familiar with the food supply chain in their communities. Two MSU work-study students and a Department of Agriculture student intern also helped with the data and the community meetings.

The cooperators listed in the original grant proposal, as well as other stakeholders that became interested during the course of the project contributed data bases of local food businesses, actively participated in the community meetings and helped identify people and organizations that needed to be included in each meeting.

The original cooperators are:

- **University of Montana**, Environmental Studies Program, Sustainable Food and Agriculture Emphasis
- **Montana Food System Council (folded in 2011)**
- **Farms for Families**
- **Montana Food Bank Network**
- **Community Food and Agriculture Coalition**
- **Western Sustainability Exchange**

Project results and conclusions

This project delivered, as promised, an interactive, geographic database and mapping tool displaying food system infrastructure information that can be layered to graphically depict the existing Montana food value chain components. The interactive mapping tool does not, however—as we came to discover—visually reveal the relationships among the value chain components, their service areas, or the economic or demographic factors that influence them. These are not things that can be depicted by simple symbols on a map. The project did produce some static maps that allow for many more ways to display data, including relational data. The online tool lacks that capacity.

This project changed substantially when the partners decided to integrate the Department of Health database of licensed food businesses into the project, in addition to simply mapping food businesses we knew to be engaged in local commerce. The reason the partners decided to go ahead and include entities that may not be participating in local food chains is to show market potential, meaning how many of which types of businesses are out there and could potentially become a market for or source of local foods in the future.

Our original objectives were based on plans to use existing data bases of food businesses involved in direct market supply chains in order to see and analyze the adequacy of the infrastructure comprising those supply chains. By limiting the project initially to a focus on

direct market infrastructure, we knew we'd be dealing with a manageable amount of fairly available data in the neighborhood of 1,000 records; that it would be relatively apparent what type of business each of those entities is, and all the businesses would be involved in local commerce.

Instead, by including the Department of Health data base, we ended up with nearly 10,000 total records, which turned the project into one dominated by a manual process of sorting through this large database and identifying which of these businesses were buying and selling locally, and even more so of simply identifying what types of food related businesses they are. The project needed several extensions of its timeline as result.

Project Results

To see and explore the interactive online map that is the most concrete result of this project, click on Montana's Food Infrastructure. What you'll see first is a data layer displaying food retailers that buy and sell locally produced food. For instructions on how to manipulate the map and its many data layers, go to *Appendix 1* on page 14.

The mapping tool shows the names and locations of different types of food businesses, including, for example, producers, processors, institutional and retail food service, grocers, food pantries, and food distributors, across Montana. In addition, the map can show which food product types a business sells or buys, and which businesses are buying or selling local food. By overlaying these map layers in different combinations, users can see general location trends in the infrastructure.

For a printed list of all the data categories and subcategories available as map layers, see *Appendix 2* on page 16.

In addition, the project:

1. Has enabled stakeholders in this large state to see where different types of local food production and marketing activity is happening, and has found a purpose in unifying Montana stakeholder organizations that are conducting local food system development.

2. Engaged 116 diverse stakeholders in thinking critically about and discussing with their neighbors a whole range of aspects of their area's food system and the information and research they need for making decisions to support a food system that can better serve the needs of their communities, the economy and area food businesses.

Participation in these community meetings was by invitation in order to assure a rich diversity of stakeholders, with a focus on individuals and organizations that have an interest in local food economies. The participants ranged from: institutional dining services staff, to county planners, farmers and ranchers, tribal extension agents, Montana food processors, food bank staff, university faculty and staff, FoodCorps/Americorps members, ag organization staff and members, a variety of local and regional economic development organizations, funders, county commissioners, NRCS staff, representatives of local food initiatives, and more.

3. Generated excitement among MSU and UM faculty about the number of research topics the map layers suggest, and how the maps can be used as a basis for student research projects. According to one participant, "The project provides seemingly endless opportunities for students to explore current food system infrastructure, consider opportunities to work with a variety of stakeholders that are listed on the maps, and to develop research questions and projects that involve using or improving the map." The connections this project made with university faculty and students engaged in the subjects of sustainable food and agriculture is an exciting project result, that promises to generate future results.

4. Achieved respectably-complete geo-mapping of food entities in the region of the state with the greatest concentration of food businesses both generally, and of businesses involved in local food commerce, specifically. This region is the US Highway 93 corridor up and down western Montana's major valleys of the Bitterroot, Mission and Flathead, where 25 percent of all the licensed food businesses in Montana are located.

5. Achieved less complete geo-mapping in other parts of the state, but succeeded in mapping a high percentage of the food establishments known to be involved in local food supply chains in nearly all the state's 56 counties.

6. Attracted the attention of a variety of people in Montana, as well as in other states not directly engaged in the project but interested in the type of food infrastructure data we collected, how we mapped it, and how we've used the maps. For instance, the nine-county Opportunity Link, which serves the interests of economically disadvantaged communities in north central Montana (including two American Indian reservations), has been developing a map of the area's assets, and used our FSMIP project map and data, and added data from their region to it.

Another example is from a call that the folks at ArcGIS received from the Mississippi Department of Agriculture, asking how to contact our project to learn more about its purpose and how we conducted it. We subsequently talked with both the Mississippi Ag Department and Fred Shore from NASS, who shared with us the geo-coded data set for farmers markets nationally as an example of how NASS goes about structuring its GIS data.

7. Generated many ideas from among project participants and stakeholders at the community meetings for additional purposes the interactive online map could serve, ways to refine the data so it could tell its users more, and many suggestions for additional data layers. We also heard ideas for easier ways to geo-code the data when it comes to updating the map. The project partners will consider implementing some of the ideas in a future project phase.

For example, community meeting participants told the project leaders they want the ability to select a defined geographic area of the map and see a list of contacts of the producers and buyers in that area. They also recommended making the tool interactive so that food businesses could use it to post and exchange relevant information, or update their information as it changes seasonally. At multiple meetings including Great Falls, Missoula, and Ronan, stakeholders indicated a desire to use the data to show relationships between the businesses on the map, such as selecting a grocery store and being able to see all of the producers it buys from, or by showing a radius around a producer indicating the range in which that producers sells their products.

8. Engaged 31 volunteers to assist with coding the database, all of whom helped out in order to learn more about their communities' role in local food commerce. Fourteen of the volunteers were Extension agents, a great connection to have developed in a state where commodity production for export dominates agricultural production.

What didn't result: This project did not result in a new set of local and statewide priorities for increasing the connections among the state's direct market supply chain infrastructure components, or for developing missing components. These were to be project deliverables. While the project did engage stakeholders ready to support further actions to develop direct market and other supply chain infrastructure, the mapping tool did not produce visual patterns that made seeing the opportunities, needs and gaps readily apparent.

Conclusions and Lessons Learned

Montana has more local food system infrastructure capacity than most participants anticipated, particularly food manufacturing infrastructure, though the project revealed that much of that is not available for commercial use outside of the businesses that own it and use it to make their own products.

The spatial relationships depicted by the maps do not illuminate economic relationships, scale or distribution and supply radii of the businesses, which are key to deeper analysis of infrastructure needs and opportunities.

As one project partner summarized, "The maps don't provide the nice visual that would allow the project participants to immediately be able to spot problems with Montana's food system, to see the obvious gaps, justify action in developing additional food processing infrastructure or distribution centers, etc."

Developing the maps was a mammoth task, bigger than any of us probably imagined, and that what we have is immediately valuable in some ways. But, it has become clear that using the maps and working with them will take time and commitment from interested parties.

Food system stakeholders at almost all of the community meetings want the maps to serve a marketing function—the producers and retailers especially. Currently, the maps display the name of each business, the type of business it is, and whether that business is participating in local commerce, but it does not include contact information, or lists of like businesses or like products. The project was designed for analyzing where infrastructure can improve local and regional market efficiency, not to source or market products, though features could be added to give it functions to aid in marketing.

Currently, the maps are most useful for displaying the location, distribution and density of many different types of food business, including those businesses engaged in local food commerce. The interactive mapping tool is also useful as a food system community organizing tool and a source of research ideas and data. The GIS maps as they currently exist will be able to answer many research questions.

One of the bigger shortcomings of the project is the fact that – to date – there is no method in place for updating the data. Originally, when we gained access to the Department of Health's food establishment license data base, the department promised to give the project live access to its data base to retrieve automatic updates. That access never materialized, and it may not have been useful anyway given the disorganized state of that data base. The establishment data is entered by 50-some individual county sanitarians, resulting in a lack of consistency in data expression and categorization.

GIS technology advances occurred during the course of this project that were difficult to take advantage of because we had already created a platform for gathering data bases, converting the Excel data into geo-data, and coding it. If we were to start the project today, we would use tools with GIS capacity built in, avoiding some of the more laborious and time-consuming aspects of this project.

County or regional organizations may need to take on some ongoing responsibility for completing, maintaining, and updating the information within their geographic areas if the maps are to evolve. More people and organizations working relatively locally—at a more manageable scale, may be a solution to keeping the data current.

Otherwise, this map is a picture in time, which can have value in a historical comparison in the future, but much of this data is, or will be soon out of date. Mapping a fluid data set like food system infrastructure must include a way for the data to reflect the dynamism of the economy that it represents.

But even with static and incomplete data, the maps do well at fostering curiosity and prompting questions, and they are a visually engaging way to bring all kinds of citizens into the food system conversation. This tool can be used as a prompt for individuals, organizations and communities to facilitate food system conversations that can lead to effective action.

In summary, it is apparent that this project has become a potential springboard for moving beyond the purpose of analysis to integrating features and functions that stakeholders have identified as useful to their communities and their businesses. Creating a process for map users to add data they want to see on the maps would be useful for expanded future benefits.

Future benefits and future research

The project's academic partners have had conversations with students who are looking for information that can be answered by the maps, once they get some practice using them. And, if the information doesn't provide the answers, then research the students are doing could potentially add to the maps.

Using the project's existing GIS data, the project can create more static maps, ones able to show how production is matching up to processing infrastructure, and how well production for direct markets matches up to demand as indicated by population density. Static maps may also be able to show the ways that Montana is not capturing its own production potential and its own processing potential.

An obvious next phase of work would be to use the data to populate MarketMaker. Montana is not yet a participant in MarketMaker and this project offers an excellent starting point in terms of both the quantity of GIS data we have and the partnerships and other engaged stakeholders this project created. The large data base of licensed food establishments came from the Department of Health, and as such it is illegal to turn it into anything that could be used as a mailing list. Therefore, before we could populate MarketMaker with the current GIS data, we'd need to develop a process for businesses in our data base to opt-in to MarketMaker.

In terms of Montana's food self-reliance as a state, an expanded project with a marketing function could help us see what initiatives, in which food system sectors, would increase that self-reliance.

This project offers opportunities for using the mapping tool to generate media stories and publicity about Montana's local food markets and supply chains. It offers the capacity to answer a wealth of research questions. Those especially interested in using the mapping tool for these purposes are the UM School of Journalism, MSU's Sustainable Food and Bioenergy Systems major, the UM Environmental Studies Program–Sustainable Food and Agriculture Emphasis, and other food system researchers like Ken Meter of Crossroads Resource Center out of St. Paul, Minn.

This project offers a spring-board for expanding community and statewide discussions begun at the community meetings on questions of the scale of production, e.g., do we want farms to scale up or have many small growers marketing at local food hubs?

Because the maps don't actually show value chains, only establishments, the relationship between the establishments is not evident. There is interest among the stakeholders in future efforts to map actual value chains by, for example, mapping the Good Food Store and all its local suppliers. The idea is to create maps that do display relationships among the value chain components.

The project partners are interested in creating static maps that can show things like population densities, gross value of product or gross acres of product, soil types or other agronomic data, which when turned into pdf files can be layered in different combinations. There is also interest in using the data in Excel files to chart and graph other kinds of data that is complementary to the spatial data. The MarketMaker platform could accommodate many of these ideas.

Evaluation Process

The evaluation process utilized the engagement and input of the stakeholders that participated in the project. Each community meeting ended with an evaluation in the form of questions posed by the facilitator and a group discussion by the participants. These evaluative discussions were recorded, assembled and summarized by project partners, and are rich in ideas warranting further examination.

In addition, the project partners (steering committee) also addressed evaluative questions, both via steering committee meetings and email. With so much engagement and input from the

stakeholder interests from around the state, we got the kind and quality of feedback that the project partners and other food system stakeholders need to improve on the project results to-date and further explore and pursue the ideas and recommendations coming out of this project.

Project beneficiaries

Food entrepreneurs can identify markets, such as the businesses that buy local foods (both specific businesses as well as densities of types of business). Processors, retailers and consumers can identify sources of local food.

Community developers can make statewide or community-scale observations about infrastructure (e.g., highest densities are along US Hwy 93, lowest are in eastern Montana, or the closest processors to Great Falls are X, Y, Z). The maps can also be used to identify densities of different types of producers or infrastructure (e.g., most of the vegetable producers are located near large cities, or many of the meat processors in the state are Hutterite Colonies that only process their own animals). This information could also inform policy makers and fundraisers for community food projects, as well as inform food access and food security interests.

Food producers, buyers, processors, distributors, and the professionals that work with them can use the maps to identify potential business partners and customers and suppliers.

Engaging broader groups of Montanans with the maps can help spur conversations and action-groups around food system development, and help guide the emphasis of their work.

Media outlets can use the maps can help them tell the Montana food system story. The maps can provide a door to communicating with citizens not currently engaged in food systems.

Entrepreneurs and economic developers can identify food businesses that are not participating in local commerce and target their outreach and/or education to increase local food commerce.

Faculty and students from institutions of higher education can use the maps in food system and socio-economic research projects. Teachers and students in middle and high school, and in farm to school programs can also use the online maps for learning and connecting.

POTENTIAL FUTURE USES OF	BENEFICIARIES
Make food entity contact information visible and have the ability to generate exportable data based on user selected criteria.	Food producers, buyers, processors, distributors, and the professionals that work with them could more easily use the maps to identify potential business partners and get in touch with them (or help those they work with get in touch).
Have the map data show relationships between the entities (such as all of the local producers a retailer buys from, or the distribution area of a producer)	Food producers and buyers could identify potential business partners. Food buyers could market this information to attract more consumers. A food system entrepreneur focused on a food hub or aggregation would especially benefit from this.

Have the map data reflect issues of scale, such as the volumes of local food a retailer buys/sells, or volumes a producer markets locally.	Prospective agricultural entrepreneurs (farmer, rancher, value-added food, distributor, food hub aggregator) could conduct a market versus production analysis of an area, or an economic development organization could compare the amount of revenue captured by local marketing versus the amount of revenue captured by export marketing.
Overlay food infrastructure data with demographic, land use, and soil-type data.	Prospective producers could look at food infrastructure within the context of other types of social, economic, and environmental data to help them locate fertile land, help entrepreneurs to locate markets, and help food access professionals identify priority areas, or help community developers identify where to conserve farmland.

Several products of this project are appended below.

APPENDIX 1: Instructions for viewing Montana's Food Infrastructure Map

APPENDIX 2: Montana Food Infrastructure Data Categories and Subcategories

APPENDIX 3: Sources of project data and number of records from each

APPENDIX 4: Static maps—experimenting with ways to display GIS data

APPENDIX 5: Outreach and publicity materials

APPENDIX 6: Locations and dates of the seven community meetings

Thanks to the supportive FSMIP staff, and for the opportunity to undertake this project. It's been a great learning and organizing experience, which we hope to follow with much more!

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APPENDIX 1: Instructions for viewing Montana's Food Infrastructure Map

To go to the map, click on:
http://www.arcgis.com/home/webmap/viewer.html?webmap=31b923c4cf944774ade671347aa06f79

Or to find it using your browser, go to www.arcgis.com/home/. In the top-right search field of the home page, enter the term: **"Montana Food Infrastructure."** Click on the title of the search result of the same name when it appears. Click **"Open"** and select **"ArcGIS.com Map Viewer."**

Using the map controls:

1: You will see a **"Details"** button in the upper left screen. This opens and closes the window pane that has the map data viewing controls. Make sure this button is selected.

2: The map-viewing controls are directly below the "Details" button. To see the viewable categories in the map **contents**, click the middle button under **"Details."** Click on the words, **"MT Food Infrastructure"** next to the check-box to see the list of data categories. Click the right-hand button under "Details" to see the map legend.

3: The first check-box in the contents under "Montana Food Infrastructure," called **"Establishment_Location_Status,"** should **not** be checked. It shows all the establishments in the database according to how we determined their location, and it just clutters up the map.

4: You will see six remaining check-boxes under "Contents", each one representing a general category of food businesses or facilities. (Unclick any boxes that are already checked before you start selecting the categories you want to display). Check the box next to the main category or categories you want to view. Then click on the category label next to the check box to see the subcategories available under each main category. Uncheck all the subcategories except the ones you want to see simultaneously. (Checking more than two or three categories or subcategories at one time results in a cluttered map.) You can now choose any combination of food business categories and subcategories you'd like to see the spatial relationships between. \

Understanding the map symbols:

1: For the key to map symbols, click on the right-hand box under "Details" to display the legend.

2: You may single-click on any symbol on the map to see the actual business it represents. If there is more than one symbol in a single location, when you click on that location the window header that pops up will say, for example,
"(1 of 2)" and have an arrow for paging through the other symbols that are layered underneath. This allows you to see the different businesses that are in close proximity to one another, or to see the variety of products or functions a single business has. For example, if a farm produces multiple products, such as cattle and vegetables, there will be two "pages" for that farm.

Note: Any map symbol with a circle around it indicates a business that is engaged in local commerce. Also note that last on the list of general categories under the map contents is a category called, "Local Commerce Status." Clicking this category and the subcategory, "Buys or Sells Local Food," will create a display of all entities known to engage in local commerce regardless of business or product type.

Tip: Where map symbols are all clumped together and difficult to distinguish, zoom in for greater detail and separation. Zoom out to see patterns across a region or the whole state. For instance, the concentration of symbols along US Highway 93 in the western part of the state illustrates the fact that 25 percent of all licensed food businesses in Montana are along that corridor.

Technical note: There are some records we were not able to get specific locations for, and thus, are placed on the map according to zip code and won't appear in their precise location.

If you need assistance navigating these maps, or see errors or omissions, please contact
Nancy Matheson: (406) 444-0131, nmatheson@mt.gov.

APPENDIX 2: Montana Food Infrastructure Data Categories and Subcategories

Producer (farm/ranch)

- Produce
- Vegetables
- Fruit
- Tree Fruit
- Dairy
- Eggs
- Poultry (chickens, turkeys, ducks)
- Livestock
- Cattle
- Hogs
- Sheep/Lambs
- Other (Bison, Goats, etc)
- Fish/aquaculture
- Nursery (bedding plants for transplanting)
- Cereal grains
- Oilseeds
- Pulses
- Apiary/Honey
- Feedlot

Food Manufacturer

- Flour miller
- Oilseed processor
- Pulse processor
- Sugar processor
- Co-packer (custom processing of others' products)
- Produce processor (fruit and vegetables, preserves, salsa)
- Dairy processor (milk, butter, cheese, yogurt, ice cream)
- Grade A dairy products
- Grade B dairy products
- Poultry (exempt slaughter/processor)
- Meat processor
    - Custom exempt
    - State inspected
    - Federally inspected
    - Slaughter
    - Packing/processing
    - Red meat
    - Poultry

- Confectionery/Syrup/Jam
- Bakery
- Beer/Wine
- Fruit juice
- Other
- Other (snacks, supplements, etc.)

Wholesale Food Distributor (markets that do not sell at retail)

- Broker
- Transporter/Freight hauler

Retail Food Distributor

- Farmers Market
- CSA
- Farm Stands/U-Pick
- Grocer
    - Montana independent or chain
    - National/regional supermarket chain
- Convenience Store

Food Service

- Restaurant, hotel, B&B, guest ranch
- Institutional cafeteria/food service
    - School K-12
    - College/university
    - Early childhood care/educ.
    - Retirement/nursing home
    - Hospital
    - Prison/jail
- Caterer
- Bar

Charitable Outlet (food pantry/bank)

Non-Food

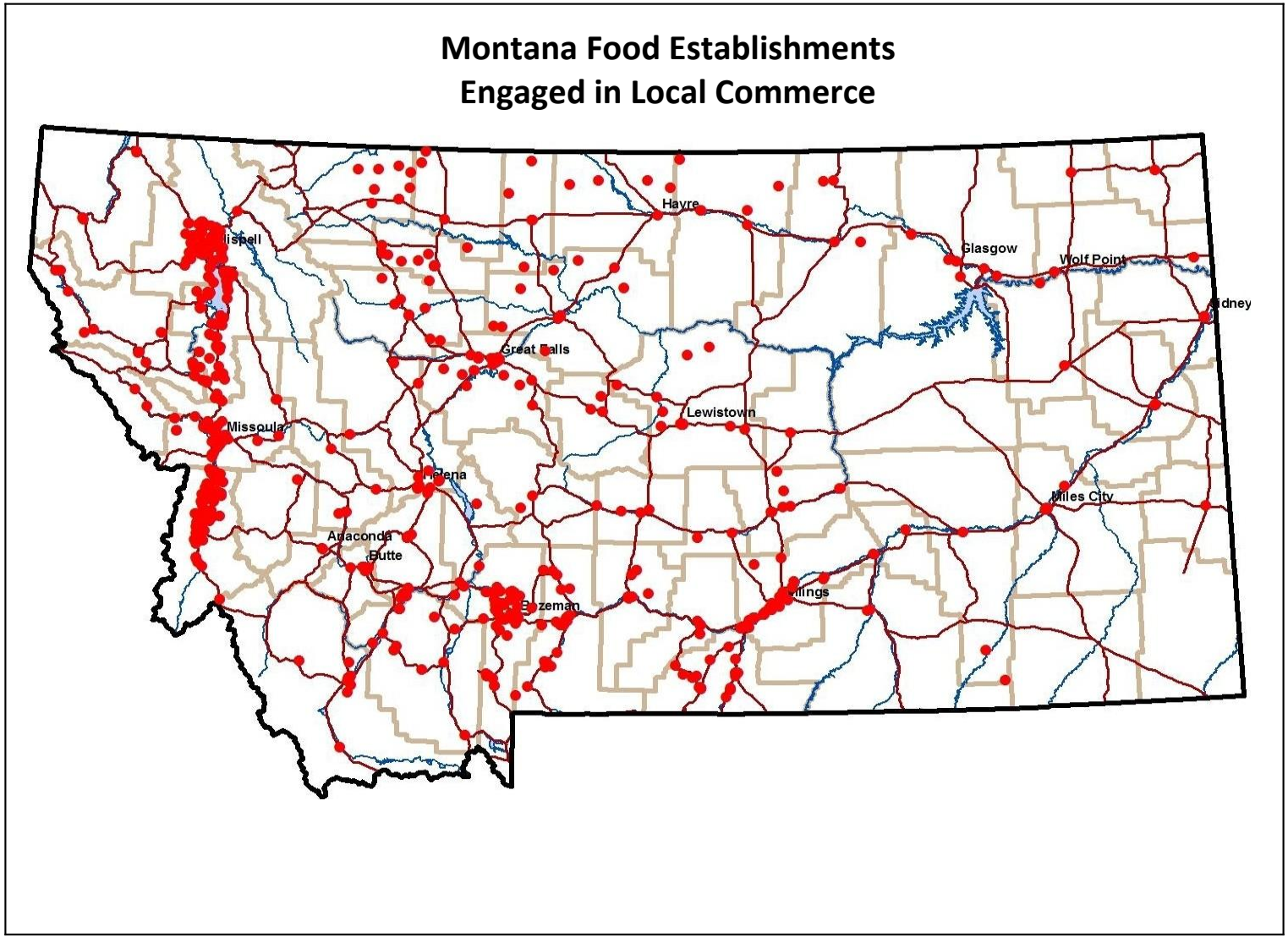
Flowers

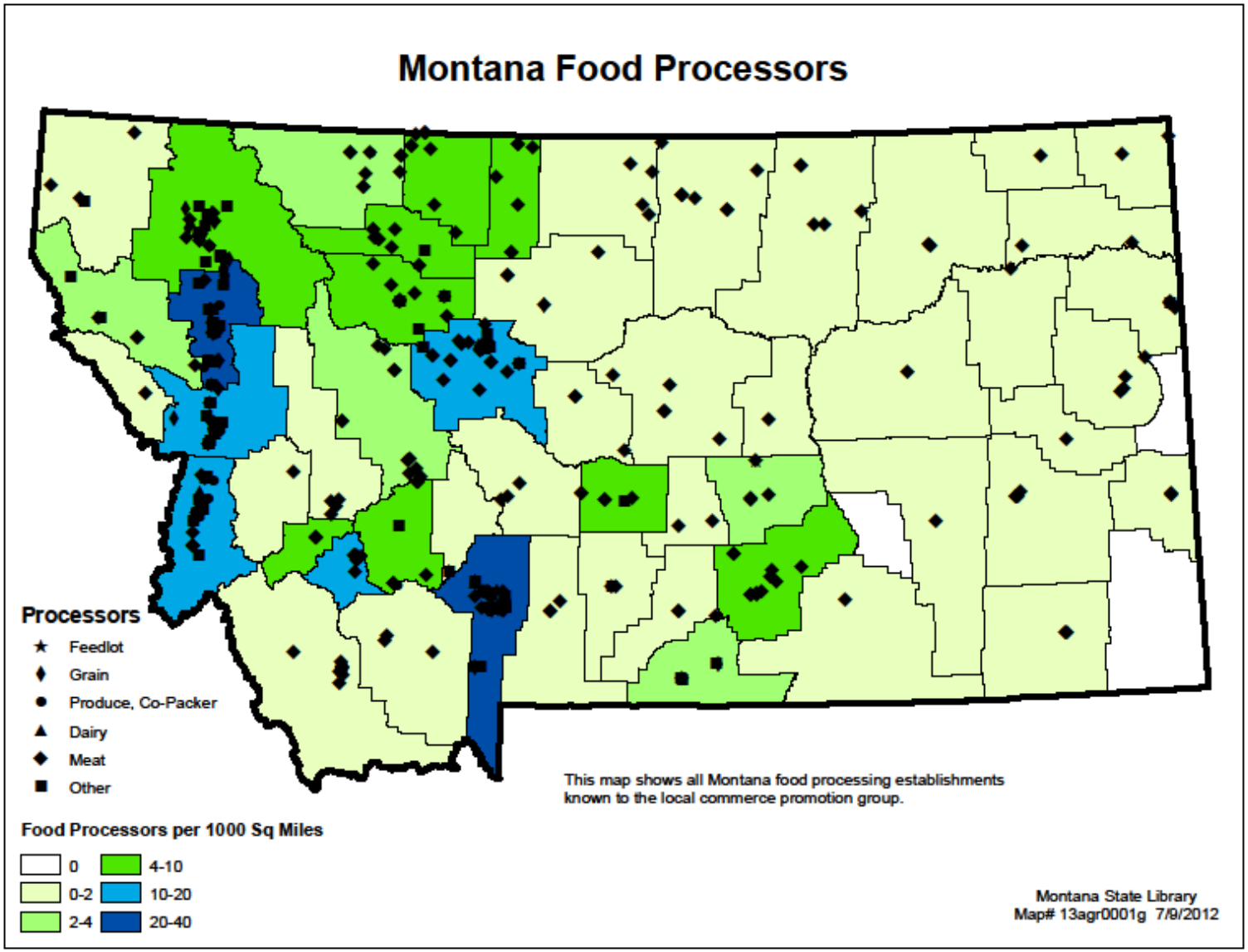
APPENDIX 3: Sources of project data and number of records from each

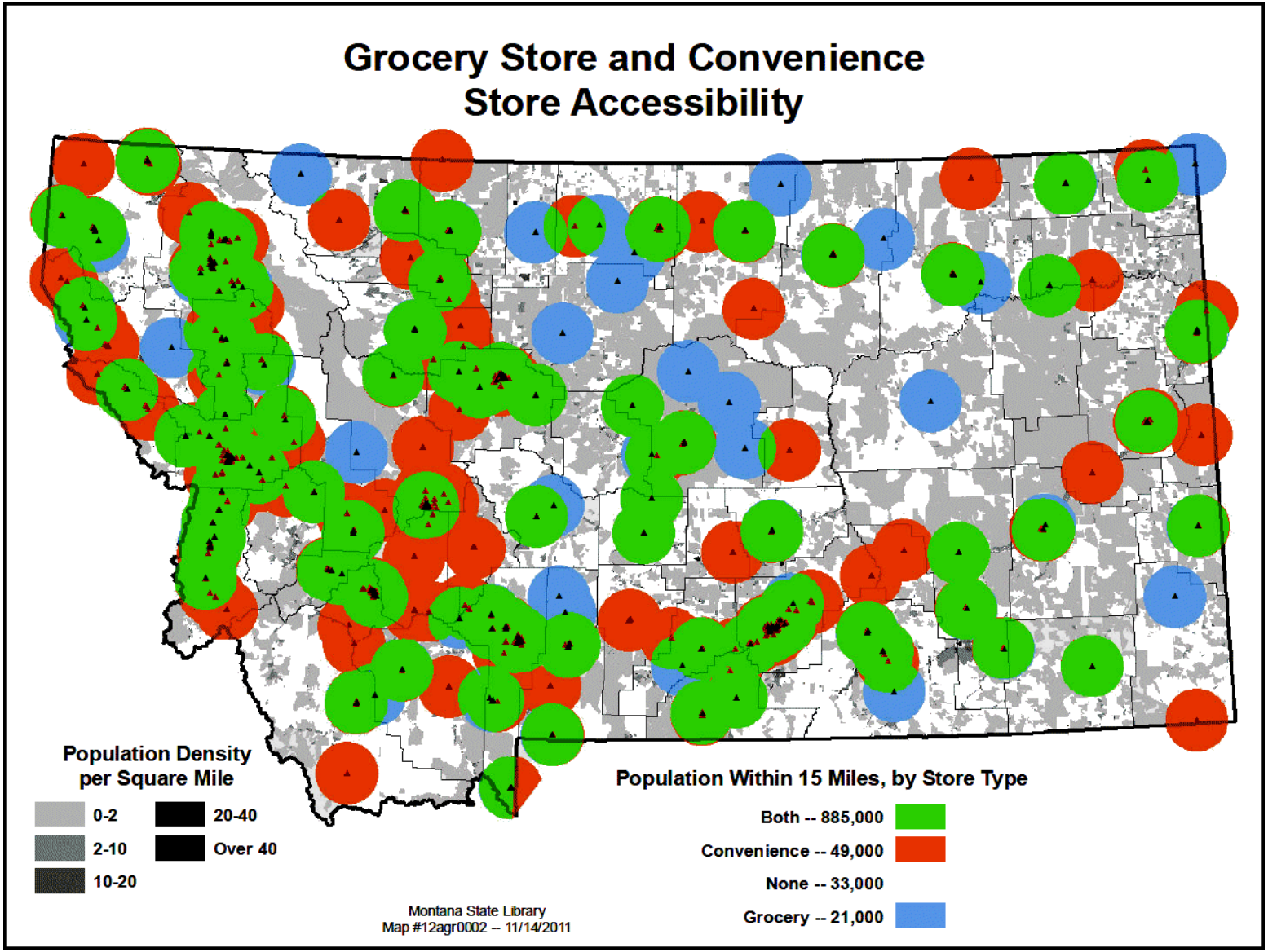
- Abundant Montana local foods directory (68)
- AERO (116)
- Western Sustainability Exchange partners
- MSU Dining Services and Food Fair vendors (71)
- UM Farm to College vendors (60)
- Yellowstone Valley Food Buying Club vendors
- Good Earth Market vendors
- Hutterite Colony directory (44)
- Bozeman Food Co-op vendors (65)
- Five Valleys Food System Project (80)
- Montana school food survey (58)
- Montana structures data base (558 schools, 53 hospitals, 15 nursing homes)
- USDA National Organic Program (180)
- Independent grocers from Cherry Growers Grocer Survey (112)
- Montana Poultry Growers Co-op (36)
- Western Montana Growers Co-op (33)
- MSU NAPA (Nutrition and Physical Activity) project (1272 geo-coded)
- FarmDirect WIC (94)
- School gardens (46)
- Grocery stores (225)
- Community gardens (14)
- Montana Food Bank Network (111)
- MT Department of Livestock (247)
- MT Department of Health Food Licenses (9385)
- 9,460 total records after deleting duplicates

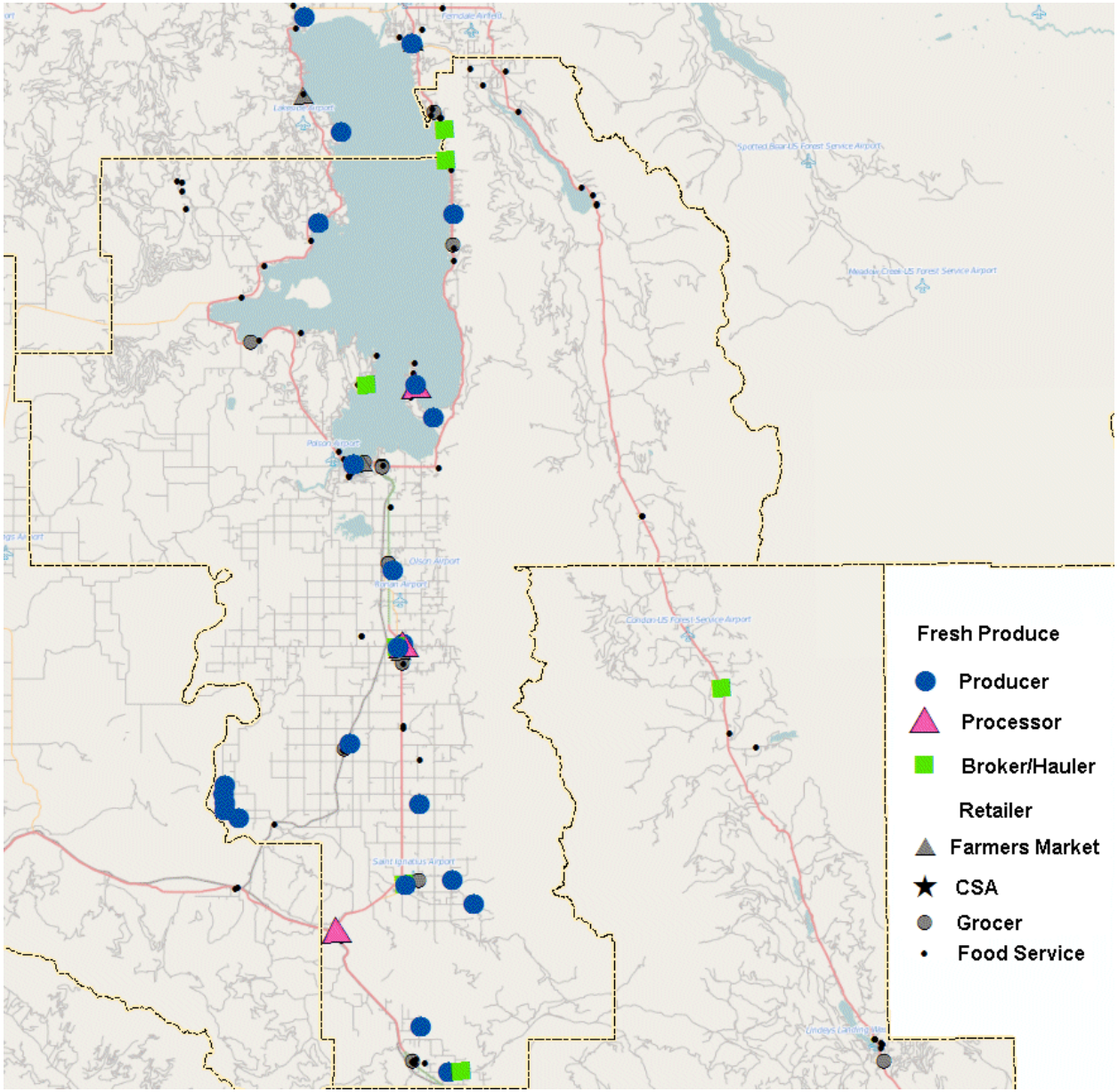
Significant amounts of additional data were provided and/or coded by 31 county-based volunteers.

APPENDIX 4: Static maps—experimenting with different ways to display GIS data




Montana Food Processors
Processors
Feedlot
Grain
Produce, Co-Packer
Dairy
Meat
Other
This map shows all Montana food processing establishments known to the local commerce promotion group.
Food Processors per 1000 Sq Miles
0
0-2
2-4
4-10
10-20
20-40
Montana State Library
Map# 13agr0001g 7/9/2012


Grocery Store and Convenience Store Accessibility
Population Density per Square Mile
0-2
2-10
10-20
20-40
Over 40
Population Within 15 Miles, by Store Type
Both -- 885,000
Convenience -- 49,000
None -- 33,000
Grocery -- 21,000
Montana State Library
Map #12agr0002 -- 11/14/2011


Fresh Produce
Producer
Processor
Broker/Hauler
Retailer
Farmers Market
CSA
Grocer
Food Service

APPENDIX 5: Outreach and publicity materials

Web pages:

Montana Department of Agriculture: (we're working on spiffing up this web page)
(http://agr.mt.gov/agr/Programs/Development/FADC/FoodInfrastructureMap.html

AERO web site (partner): http://www.aeromt.org/montana-food-system-mapping-project/
See also attached PowerPoint presentation used at the community meetings.

Ravalli Republic: Mapping Montana's Food

Story at: http://www.ravallirepublic.com/business/article_00e4d0ce-8c01-11e2-89bf-0019bb2963f4.html

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From: Grossenbacher, Jennifer jenniferg@montana.edu
To: cxextn@sympa.montana.edu
Subject: help needed for MDOA food mapping project

Greetings MSU Extension Agents,

In partnership with Nancy Matheson of the Montana Dept. of Agriculture and Kevin Moore of AERO, we are asking agents from all counties to assist with the DOA's food system mapping project.

AERO has partnered with Montana DOA to create an interactive database and map that shows market information relating to local food (including producers, processors, retailers and other food distributors and outlets). These interactive maps can help to understand and prioritize the gaps in regional and statewide food value chains, and to identify the opportunities for filling those gaps.

We need your help adding more businesses to the map for your county. By taking the time to identify the food businesses in your area that are missing from the map, you will be helping to increase the visibility of the farms, processors, retailers, and food services that are buying and selling Montana food **in your region**.

I have attached additional information from the DOA on this project. Feel free to also check out the website at: http://www.aeromt.org/montana-food-system-mapping-project/.

Your county's information needs to be added by *May 10th* so please contact me immediately for additional information on how you can help your county.

Thank you for your time!

Jenny

Jenny Grossenbacher | ***Montana State University Extension*** | *Sustainable Housing & Pollution Prevention Coordinator | 406-994-4292*
|jenniferg@montana.edu|*www.mtp2.org*

300 RIVER DRIVE NORTH

February 8, 2011

To: Montana Agricultural Organizations
From: Alan Merrill, MFU President
Subject: Help us locate your food business

I am writing to invite your members to participate in an exciting and beneficial research project being spear-headed by the MT Department of Agriculture, which is funded by a grant from USDA's Federal-State Marketing Improvement Program.

As you know, Montana's farmers, ranchers and small food entrepreneur opportunities to produce and market food for local and regional markets is often limited by the lack of in-state food supply chain infrastructure. Identifying where the gaps and opportunities lie for Montana to meet more of its citizens' food needs is a motivating goal of this project.

The Department (along with a number of other public and private Montana partners including MFU) is working to develop Montana's direct farm markets and supply chains. To that end, this project will compile and spatially map the supply chain components serving direct farm markets in the state. Examples include Montana food products and production sites, in-state processors of and outlets for Montana-produced food such as grocery stores, farmers markets, restaurants, schools, universities and the transportation and distribution infrastructure that links them.

Once mapped and analyzed, the resulting information will identify those food infrastructure components needed to further stimulate and develop local and regional food systems and value-added agriculture, with a specific focus on increasing direct and value-added processing and marketing opportunities for Montana producers and producer groups.

We are asking that you share the outline of this project with your members and invite those who are already involved in direct marketing of their agricultural products to opt-in and let us map their location and product(s). Specifically we are looking for the physical locations of direct marketed production, processing, distribution and sales outlets of Montana food products. GIS coordinates (latitude and longitude) are ideal, but township, range and section will work, as will a physical address, though the latter takes more effort to convert and thus is least desirable. The resulting maps will ultimately assist in developing the infrastructure currently missing but necessary for Montana to produce more of the food for Montana markets. Identifying and prioritizing development of key food supply chain components will foster new and expanded local and regional markets and new and expanded uses of our state's agricultural products.

Please share this request with your members. Attached is a sample news article for use in your organization's next newsletter or to share with your e-mail list. Thanks for your help in getting the word out about this very useful research project.

Sandy Courtnage, Communications Director
Montana Farmers Union
PO Box 2447
Great Falls, MT 59403
406-452-6406
www.montanafarmersunion.com

For almost 100 years MFU has worked for strong family farms & farmer cooperatives, has presented the organization's policies to lawmakers & has provided education for all ages. If you're not a member, please join!

APPENDIX 6: Locations and dates of the seven community meetings

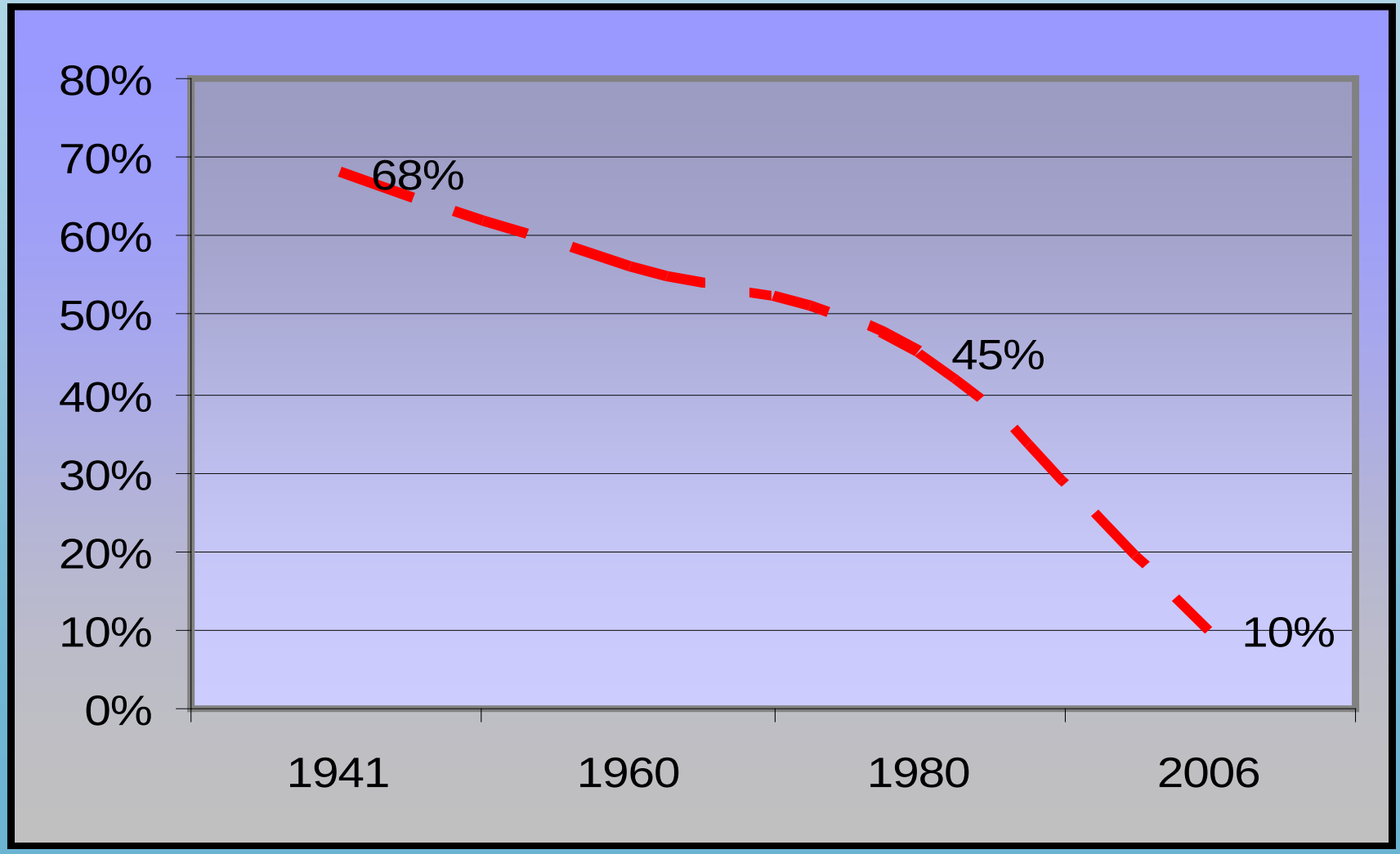
1. One community meeting in Arlee, December 4, 2011, Heart View Center, 50 participants

   Six community meetings in Summer 2012, by invitation 66 participants
2. Great Falls, July 11, MFU Conference Room
3. Ronan, July 18, MMFEC Conference Room
4. Hamilton, July 24, Bitterroot Public Library
5. Missoula, August 2, Missoula County Extension Office
6. Bozeman, August 15, Bozeman Public Library
7. Kalispell, August 29, Flathead Valley Community College

Montana Food Value Chain Infrastructure Mapping Project

Administered by

Montana produced 70% of its own food through the 1940s.

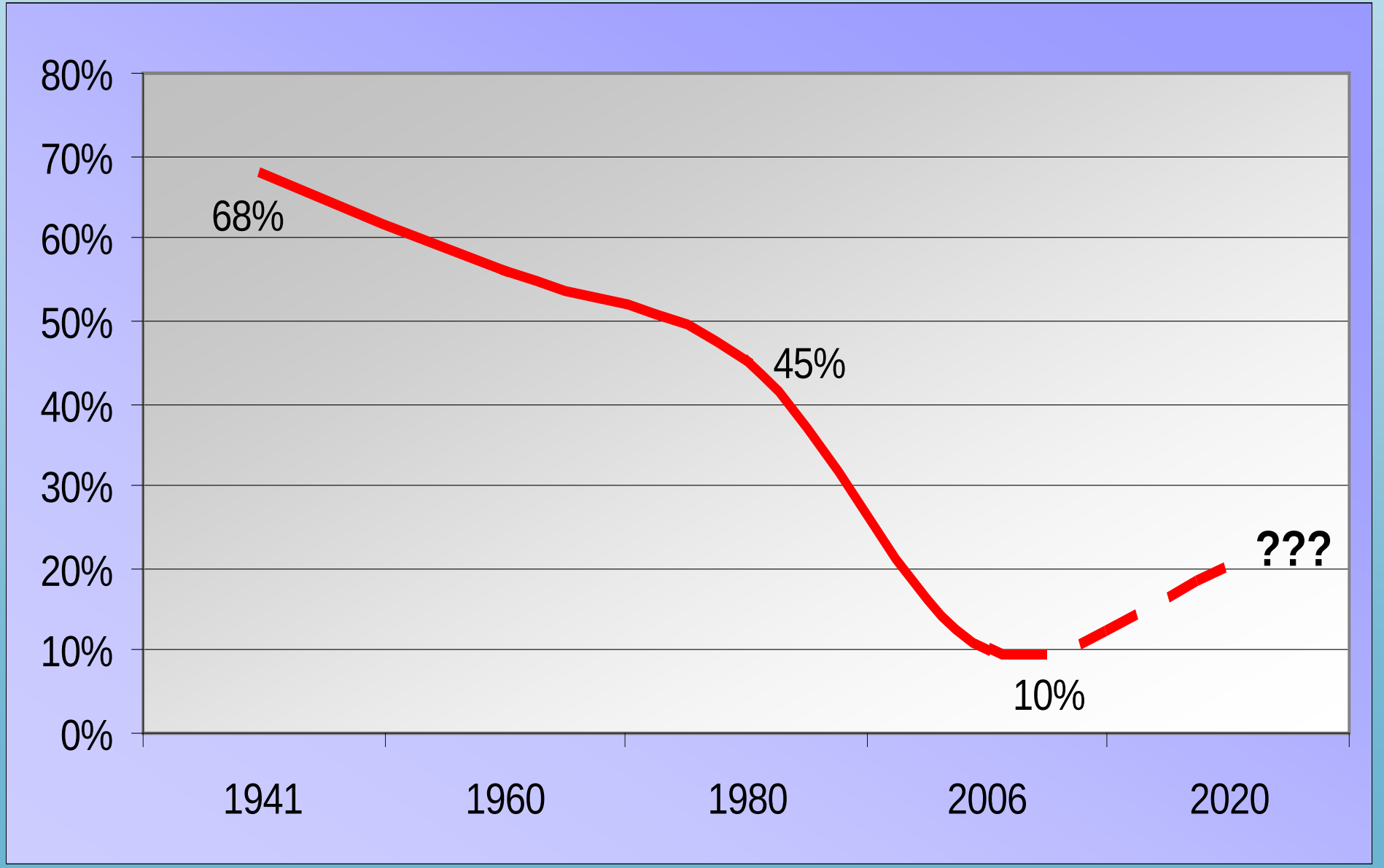


What did Montana lose?

- meat processing
- cheese making
- vegetable preservation
- fruit and vegetable production

Source: Journal of Nutrition Education, 1989

Where are we now?



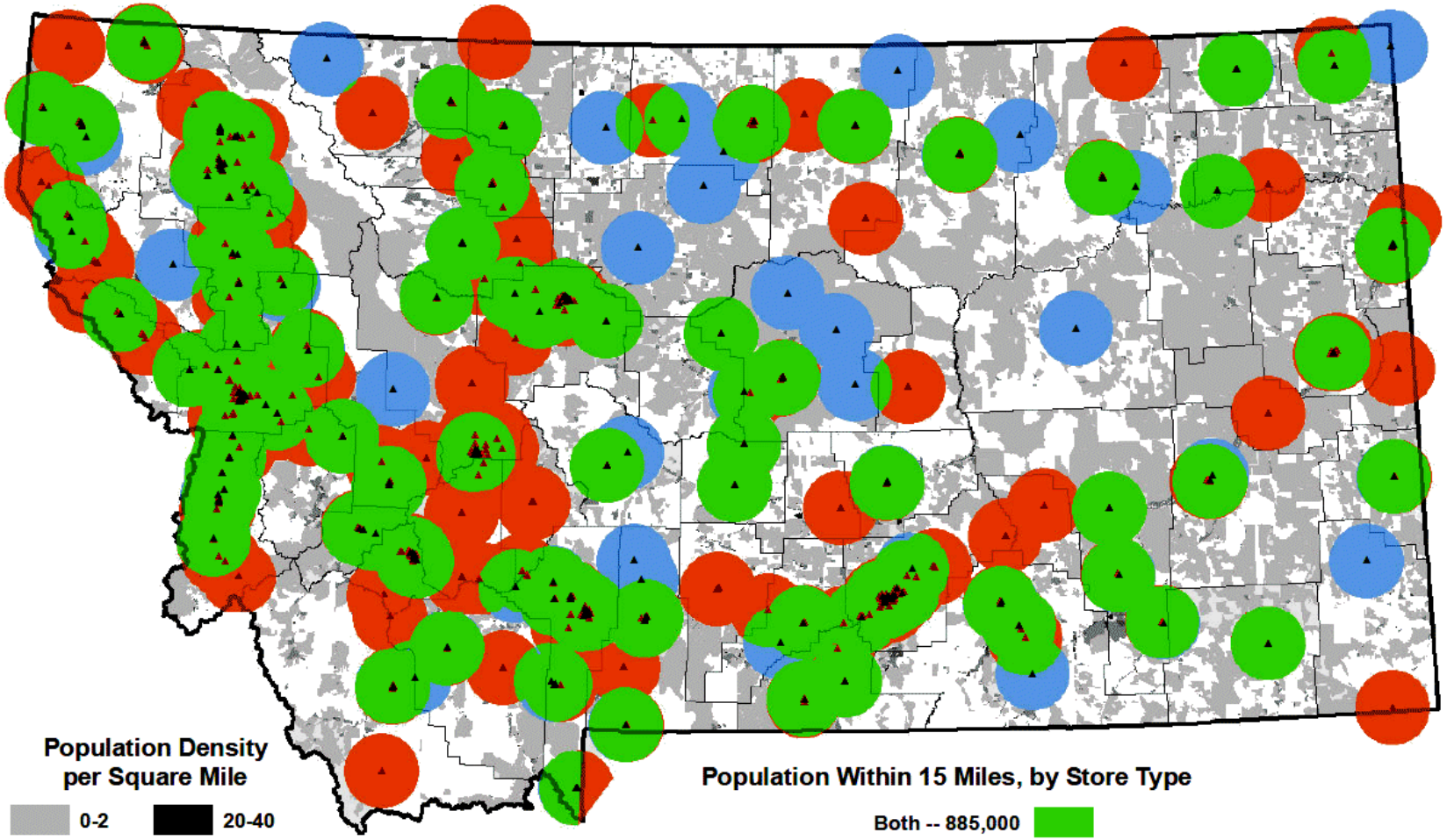
Montana Food Manufacturing Establishments 1954-2007


Montana RANGE
ALL-NATURAL
NO ADDED HORMONES
RAISED WITHOUT ANTIBIOTICS
• Natural* Tender Piedmontese Beef
• Vegetarian Fed - No animal by-products
• Raised without the use of antibiotics
• Raised without added growth hormones
• Source verified by Montana Range Brand to working family ranches
CERTIFIED PIEDMONTESE BEEF
by Montana Range Brand
All Natural* Piedmontese Beef
KEEP FROZEN
PIONEER
POTATOES from the MONTANA TERRITORY
FLOUR
REDNECK
FOODSERVICE
BONELESS HAM

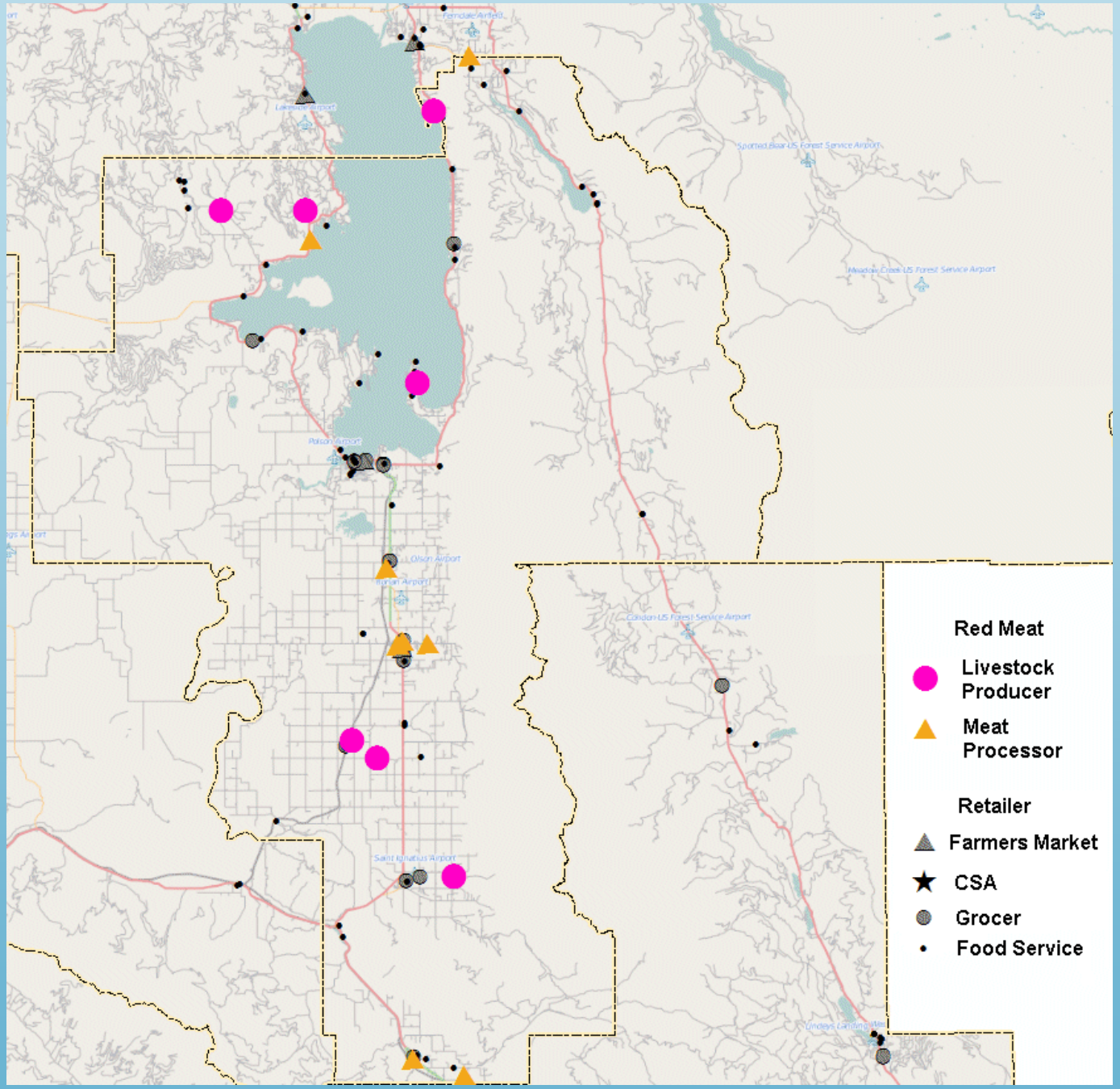
Data Sources

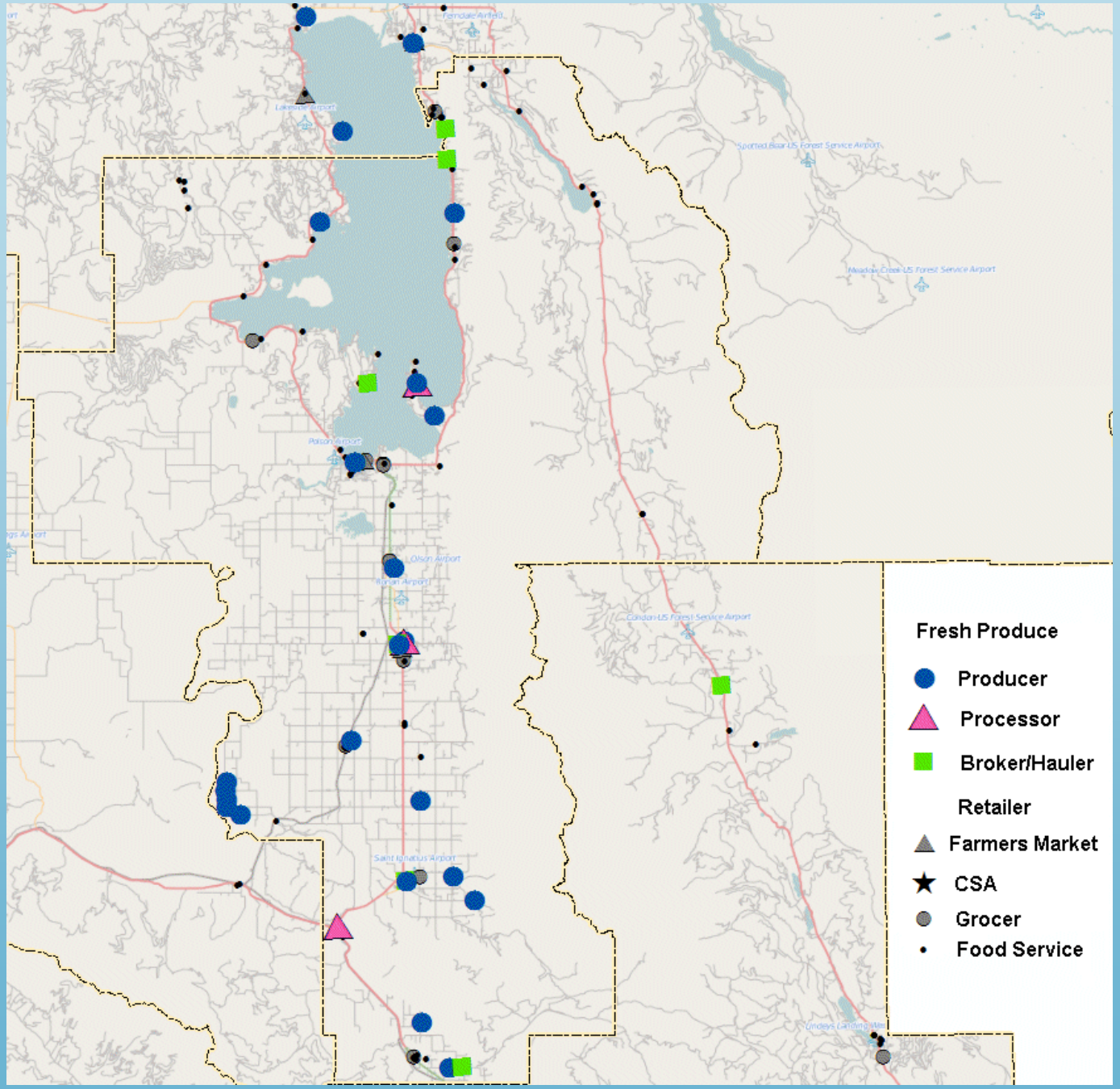
- Abundant Montana (68)
- AERO (116)
- Community Supported Agriculture (24)
- USDA National Organic Program Producers (180)
- Cherry Growers Grocer Survey (112)
- Montana Poultry Growers (36)
- Western Montana Growers Coop (33)
- MSU NAPA project (1272)
- DPHHS Food Licenses (9385)
- 10348 Total records
- 9460 Records after one pass search for duplicates

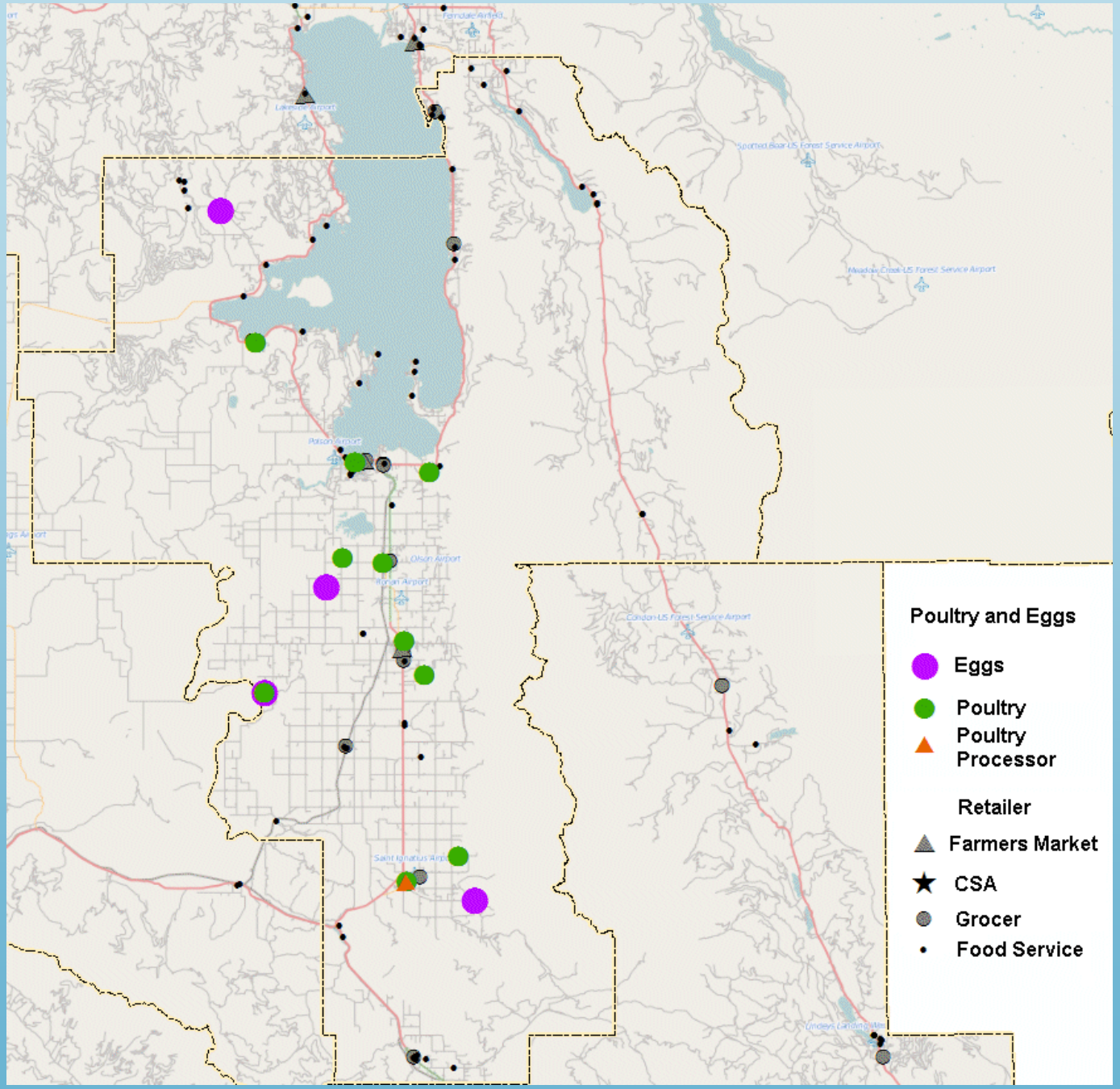
Grocery Store and Convenience Store Accessibility



Montana State Library
Map #12agr0002 -- 11/14/2011


Red Meat
Livestock Producer
Meat Processor
Retailer
Farmers Market
CSA
Grocer
Food Service


Fresh Produce
Producer
Processor
Broker/Hauler
Retailer
Farmers Market
CSA
Grocer
Food Service


Poultry and Eggs
Eggs
Poultry
Poultry Processor
Retailer
Farmers Market
CSA
Grocer
Food Service