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# Strengthening community food webs in the Upper Minnesota River Valley

Southwest Regional Sustainable
Development Partnership

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**January 2023 | By: Tara Maireid Conway, Research Assistant**

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**Project Overview**
This project, Strengthening Community Food Webs, is a collaboration between Land Stewardship Project and the University of Minnesota's Southwest Regional Sustainable Development Partnerships, with assistance from Noelle Harden (UMN Extension) and Ken Meter (Crossroads Research Center). The primary intent of this project was to support resilient, regenerative community food systems by 1) convening a new, diverse set of food system stakeholders and 2) using community asset mapping and social network analysis to identify local resources and strengthen connections between producers, consumers, buyers, and institutions in the Upper Minnesota River Valley. This project understands robust community connections to be foundational to a thriving regional food system.

We thank everyone who participated for taking the time and care to share your experiences in the local food system. There would be no project and no local food system without you.

**Methods**
This project relied on two primary methods: community asset mapping and social network analysis (SNA). Both of these methods built on Land Stewardship Project's prior listening sessions, which addressed some distinct questions such as, "What do we want or need to support local foods?" and "What might our ideal food system future look like?" Community asset mapping and social network analysis complement these sorts of questions by focusing on the abundance already within a community, rather than what is lacking. Visioning questions from the listening sessions can tell us where we want to go, but we need to use methods like community asset mapping and SNA to understand where we currently are in order to get at that desired future. In concert, these three methods provide a snapshot of the current food system, a "map" forward, and a meaningful basis of comparison to gauge the result of efforts that aim to advance food system resiliency.

*Community asset mapping*
Community asset mapping is a collaborative process used to unite, mobilize, and connect community members through identifying and highlighting the abundance within a geographical area. The process can help a community identify surprising assets, deepen connections (or make new ones), and serve as a launching point for organizing to address community needs. Resulting maps can be converted into resources such as a formal database to share community assets more broadly, if desired. Asset mapping is as much about building community through the method of map construction as it is about the resulting data. To-date, we have conducted two community asset mapping sessions in Montevideo and Appleton, where we built maps based on prompts to identify: 1) natural resources, 2) farms, 3) food aggregators, wholesalers, distributors, 4) food system institutions (non-profit and government), 5) restaurants, 6) grocery stores and food retailers, 7) waste recyclers, and 8) any untapped, potential, or underused resources in the community.

*Social network analysis*
While asset mapping reveals physical, spatially-located assets, social network analysis illuminates some less tangible assets you cannot see on a map, such as relationships, support structures, knowledge transfer, and economic supply chain relationships. Additionally, SNA can help us see which relationships enable the access and mobilization of assets and where there might be gaps or bottlenecks in connectivity. In tandem, the two methods paint a much fuller picture of regional food system assets. For instance, while an asset map might highlight an

apple orchard, SNA can show us where the knowledge of growing, grafting, and processing apples comes from; what human labor tends to the orchard; and who is buying and eating the apples.
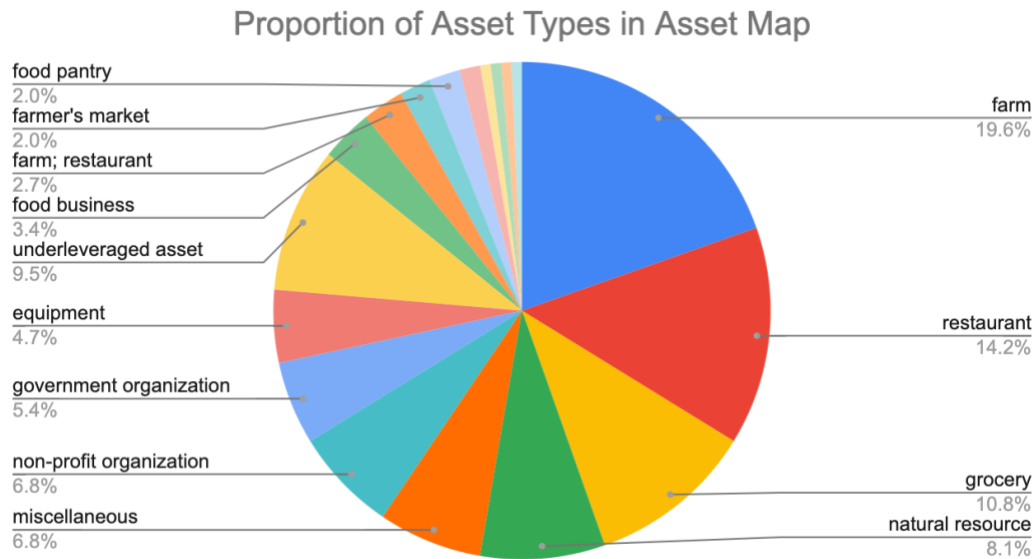
We conducted a SNA survey from November 7 through December 21, 2022. The digital survey was designed in Qualtrics and distributed through Land Stewardship Project's mailing list, with phone call follow-up for some community members. Survey questions were primarily open-ended, asking respondents to list up to five of their most important relationships across four core areas of inquiry: 1) economic connections, 2) collaborative connections, 3) informational connections, and 4) ecological connections. Additionally, respondents were asked to describe any desired connection to an existing person/business/institution or a theoretical entity they wished existed. This approach to social network analysis is referred to as a connected ego-network analysis. While a whole network analysis requires participation of an entire network of individuals, in this case the entire Upper Minnesota River valley, connected ego-network analysis highlights individual connections, local leaders, and patterns of connectivity from a subset of the whole network.

**Results**
*Community asset mapping*
Across the two asset mapping sessions, community members identified 179 total assets and 150 assets were included in the final map. Twenty-nine assets had to be omitted due to not having strict geographic coordinates, primarily because they were desired assets that do not currently exist, were mobile (e.g. thunderstorms, birds, food trucks), or the research team was unable to find a physical location for a given asset. Roughly 27 community members participated in the asset mapping sessions, in total. The final map is currently under construction by the University of Minnesota's Community GIS Lab (see Fig. 1 for preview). Map print outs will be displayed in businesses in core commerce areas throughout the Upper Minnesota River Valley, where they will welcome additions and modifications. The online version of the map will be shared with community members once available. Farm, restaurant, grocery, and natural resource were the most commonly mapped asset type (Fig. 2). The "miscellaneous" category encompasses a few assets that were unique, ranging from "storytellers" at Pioneer Public Broadcasting (PBS) to the meat-processing program at Ridgewater College.

Figure 2. Asset types in final Community Asset Map



Proportion of Asset Types in Asset Map

food pantry 2.0%
farmer's market 2.0%
farm; restaurant 2.7%
food business 3.4%
underleveraged asset 9.5%
equipment 4.7%
government organization 5.4%
non-profit organization 6.8%
miscellaneous 6.8%

farm 19.6%
restaurant 14.2%
grocery 10.8%
natural resource 8.1%

Before and after the asset maps were constructed, there were robust discussions that proved to be as meaningful as the map data collected. Some noteworthy areas of discussion included:

- How to improve intergenerational knowledge transfer regarding growing, processing, and cooking fresh, local foods and how to use underutilized spaces such as community kitchens and libraries to achieve those ends
- More inclusion of local government agencies, such as individuals in the EDA office, in conversations regarding local foods initiatives
- Integrating the EDA's efforts to map local empty buildings and promoting local food businesses
- Need for intentional food system coordination through a position such as a Regional Food Systems Coordinator, which would have bandwidth to pursue suggestions brought up in the community asset mapping sessions
- Inciting more collaboration with the University of Minnesota's Food Science program and more generally, the ways in which innovation might raise the profile of local food businesses.
- What larger food processors in the region, such as Just Food and PURIS, means for our local food system
- The role of storytelling in supporting our regional food system

*Social network analysis*
The social network analysis survey was taken by 47 people. Only 43 of those respondents had sufficiently completed the survey to provide data that could be used in a social network analysis. Survey responses and the social network analysis that follows describes patterns of connectivity based on a subset of Land Stewardship Project's regional base, as Land Stewardship Project's mailing list was the core basis of survey distribution. This is to say that SNA results do not represent the relationships of the entire region but rather those who participated in the survey. Survey demographics were as follows:

## Age of Survey Respondents
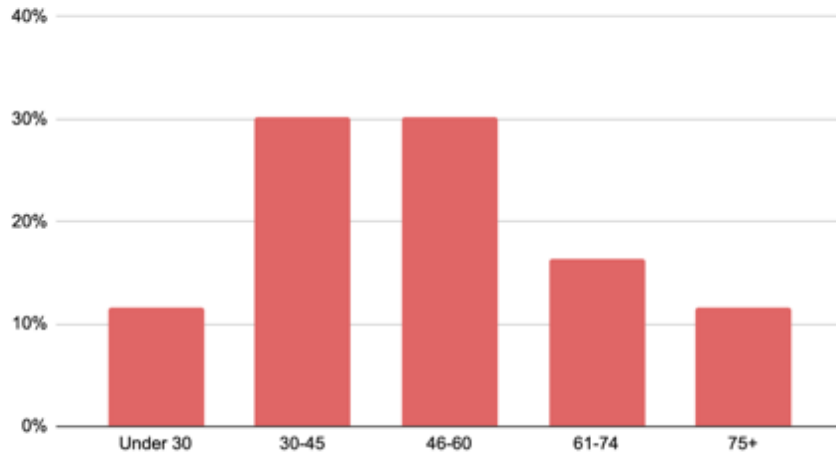


## Length of time lived in region by survey respondents
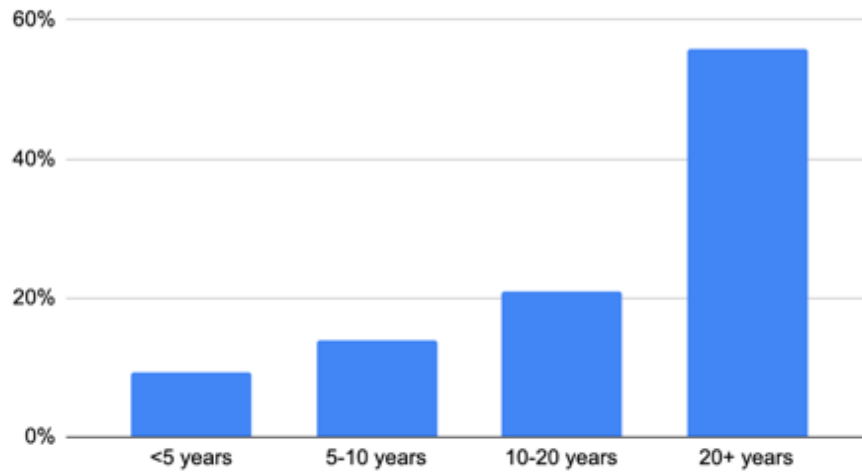


## Gender of survey respondents

Social network maps were constructed in Kumu. Some important SNA metrics that Kumu provides include:
1. Degree (connectors/hubs): count of number of connections an element has
2. Closeness (sensors/spreaders): the distance each element is from all other elements. High closeness indicates high visibility to what is happening in a network and capacity to spread information quickly.
3. Betweenness (brokers/bottlenecks): how many times an element lies on the shortest path between two other elements. Indicates capacity to act as a bridge but is also a double-edged sword of broker and bottleneck.
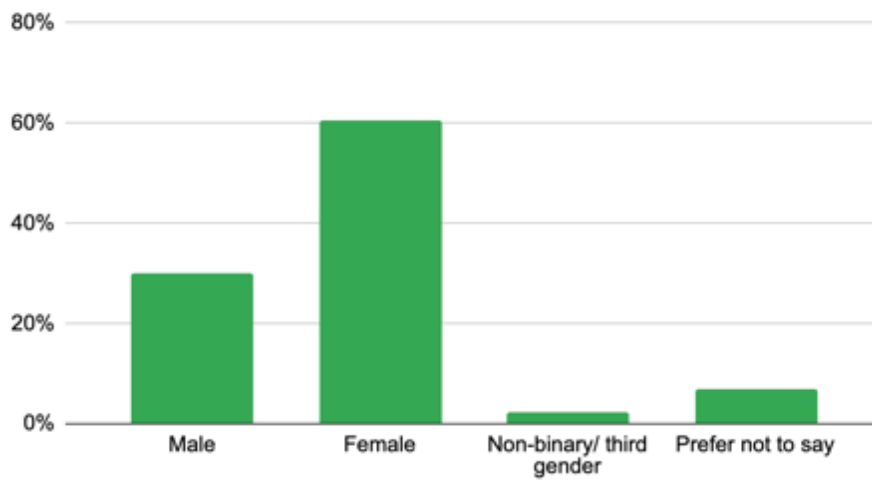4. Reach (deepest network reach): portion of network within two steps of an element.

Additionally, Kumu provides some whole network measures:
1. Total number of elements
2. Total number of connections
3. Density: Measure of the number of actual connections relative to number of potential connections, with 1 being the highest possible density and 0 being the lowest.
4. Diameter: Shortest path between the two elements that are farthest apart
5. Degree: Average number of connections across all elements
6. Path length: Average number of steps it takes to get from one element to another.

Elements are the nodes of connectivity. In the case of our survey an element could be an individual, farm, organization, business, or ecological entity. This turned out to be the most difficult part of data analysis. People in the region wear many hats-- they are an individual person with their own relationships, but they may also be a farmer, hunter, gardener, educator, business owner, and government or non-profit employee. When a person with many food system roles lists their important relationships, it is hard to determine if that relationship is their farm, business, or individual relationship. I did my best to maintain consistency; for instance many farmers listed individuals rather than farms or institutions for their collaborative relationships, in which case I defaulted to individuals as the basic element for collaborative farmer relationships when possible. I present results below in the following manner: first I include the top five most commonly cited connection from the survey results, followed by the top five elements in terms of degree, closeness, betweenness, and reach based on social network analysis.

Figure 2. Whole network map, elements sized by betweenness
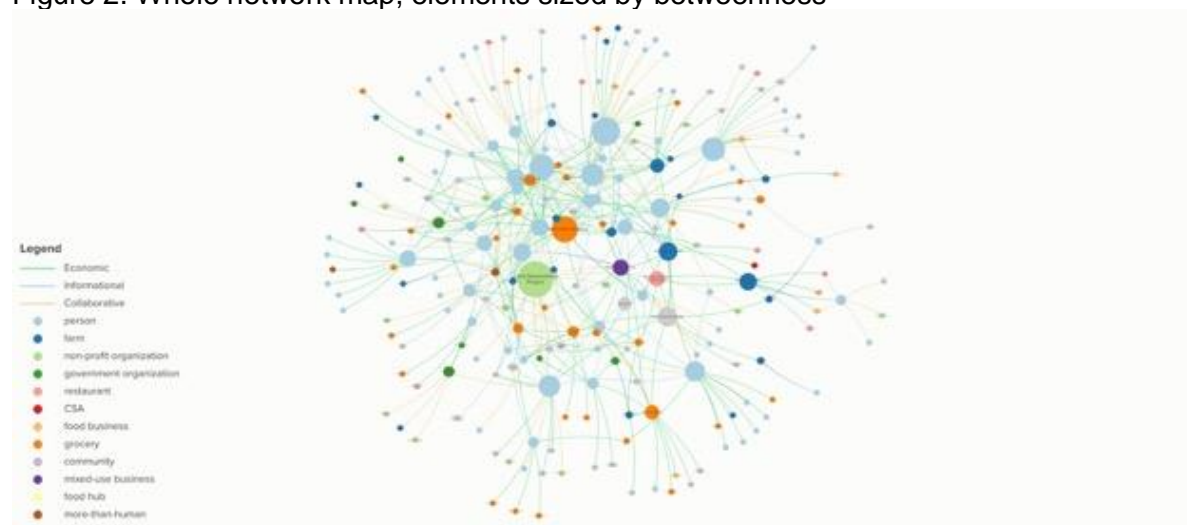
SNA results were as follows:

*Whole-network (not including ecological relationships)*
233 elements, 445 connections, .02 density, diameter: 8, degree: 3.82, path length: 3.79

|   | Survey | Social Network Analysis | | | |
|---|---|---|---|---|---|
|   | Most cited connections | Degree (connectors/ hubs) | Closeness (sensors/ spreaders) | Betweenness (brokers/ bottlenecks) | Reach (deepest network reach) |
| 1 | Friends | LSP employee 1 | LSP employee 2 | Land Stewardship Project | LSP employee 2 |
| 2 | Land Stewardship Project | Farmer 1 | LSP employee 1 | LSP employee 2 | Walmart |
| 3 | Walmart (Montevideo) | LSP employee 2 | Land Stewardship Project | Farmer 1 | Land Stewardship Project |
| 4 | Direct to consumer | Land Stewardship Project | Farmer 1 | Walmart | LSP employee 1 |
| 5 | Pomme de Terre food co-op | Gardener 1 | Walmart (Montevideo) | LSP employee 1 | Friends |

- Land Stewardship Project (LSP), LSP employees, and Walmart emerged as important elements in the SNA of the whole network
- Walmart had the deepest reach, meaning it had the largest portion of the network within two degrees of connection. Walmart also had a high betweenness score, which means it has the capacity to serve as both a bridge between relatively disconnected parts of the network and a bottleneck for the broader system. This is noteworthy because this map encompassed all relationships (economic, informational, collaborative) and even though Walmart is only mentioned in the economic category, it managed to emerge as a key player in the whole network of relationships.
- Land Stewardship Project (LSP) and LSP's employees were other major sources of connectivity amongst the network. This is unsuprising, since LSP distributed this survey through its own network.

*Collaborative*
102 elements, 106 connections, .02 density, diameter: n/a, degree: 2.08, path length: n/a*

|   | Survey | Social Network Analysis | | | |
|---|---|---|---|---|---|
|   | Most cited connections | Degree (connectors/ hubs) | Closeness (sensors/ spreaders) | Betweenness (brokers/ bottlenecks) | Reach (deepest network reach) |
| 1 | Land Stewardship Project | Land Stewardship Project | Land Stewardship Project | Land Stewardship Project | Farmer 4 |
| 2 | LSP employee 2 | Farmer 1 | LSP employee 2 | LSP employee 2 | Land Stewardship project |
| 3 | Farmer 3 | Food business owner 1 | Food business owner 1 | Gardener 1 | LSP employee 2 |
| 4 | Friends | LSP employee 2 | Farmer 4 | Farmer 4 | Food business owner 1 |
| 5 | Food business owner 1 | LSP employee 1 | LSP employee 1 | Farmer 1 | Farmer 3 |

*n/a diameter and path length metrics are due to unconnected elements of network

- The collaborative network was the least connected network, with a number of discrete clusters of collaboration
- LSP was a core center of collaboration for organizations and institutions in the region
- There were a number of other sub-networks of collaborations comprised of mostly individual farmers, gardeners, foragers, and hunters (as opposed to the organizational collaboration above)
- The top five most commonly shared resources in collaborative relationships were: ideas, information, equipment, values, and food

*Economic*

145 elements, 221 connections, .02 density, diameter: 9, degree: 3.05, path length: 4.26

| | Survey | Social Network Analysis | | | |
|---|---|---|---|---|---|
| | Most cited connections | Degree (connectors/ hubs) | Closeness (sensors/ spreaders) | Betweenness (brokers/ bottlenecks) | Reach (deepest network reach) |
| 1 | Walmart | Walmart | Walmart | Walmart | Walmart |
| 2 | Direct to consumer | Toad Hill | Direct to consumer | Direct to consumer | Direct to consumer |
| 3 | Friends | Carl's Bakery | Toad Hill | Kalliroe Orchard | Farmer 6 |
| 4 | Family | Farmer 1 | Farmer 1 | Farmer 1 | Toad Hill |
| 5 | Almich's Market | Gardener 1 | Gardener 2 | Toad Hill Farm | Kalliroe Orchard |

- Walmart and direct to consumer (or CSA from the consumer's perspective) emerged as the foundation of economic activity in the regional food system. They make an interesting duo, as one very large/centralized and one small/decentralized model for a food economy.
- Almich's Market, Toad Hill Farm, Carl's Bakery, and Kalliroe Orchard appeared as other significant economic actors in the region
- Friends and family also emerged as some top sources that people exchanged food with, indicating a significant informal food economy

*Ecological*

71 elements, 95 connections, .04 density, diameter: 9, degree: 2.68, path length: 3.9

| | Survey | Social Network Analysis | | | |
|---|---|---|---|---|---|
| | Most cited connections | Degree (connectors/ hubs) | Closeness (sensors/ spreaders) | Betweenness (brokers/ bottlenecks) | Reach (deepest network reach) |
| 1 | Pollinators | Pollinators | Pollinators | Pollinators | Pollinators |
| 2 | Soil | Soil | Soil | Soil | Prairie |
| 3 | Soil microbial communities | Soil microbial communities | Prairie | Soil microbial communities | Soil |
| 4 | Aquifer | Prairie | Soil microbial communities | Prairie | Soil microbial communities |
| 5 | Prairie | Aquifer | Aquifer | Butterflies | Aquifer |

- Although only 18 of the 43 survey respondents answered the ecological connections question, they indicated 95 connections

- Responses to the ecological connection question were robust and often poetic, making it difficult to distill answers to neatly defined SNA elements
- Pollinators, soil, soil microbial communities, prairie, and aquifers stood out as foundational ecological elements that connect the regional food system
- The ecological network is far more connected than what is displayed here, as

*Informational*
62 elements, 89 connections, density: .05, diameter: 9, degree: 2.87, path length: 4.12

|  | Survey | Social Network Analysis | | | |
|---|---|---|---|---|---|
|  | Most cited connections | Degree (connectors/ hubs) | Closeness (sensors/ spreaders) | Betweenness (brokers/ bottlenecks) | Reach (deepest network reach) |
| 1 | Land Stewardship Project | LSP employee 1 | MN Grown | Facebook | Farmer 6 |
| 2 | Facebook | Farmer 3 | Farmer 3 | Farmer 7 | Gardener 3 |
| 3 | MN Grown | LSP employee 2 | Land Stewardship Project | Land Stewardship Project | Farmer 3 |
| 4 | Farmer 3 | Land Stewardship Project | Facebook | Friends | LSP employee 1 |
| 5 | Word of mouth | MN Grown | LSP employee 3 | Farmer 3 | Facebook |

- Informational connections were comprised of a mix of individuals and online resources, such as MN Grown or Facebook
- Land Stewardship Project, Facebook, and some local farmer-leaders were identified as critical sources of information
- Facebook was the major broker/bottleneck, meaning that is served as a double-edged sword of connecting generally disconnected elements while also potentially being a bottleneck of information for the community

The informational network was the densest network (.05), indicating the highest degree of connectivity, while the economic, collaborative, and whole networks were less than half as connected (.02). Land Stewardship project emerged as a major source of network connectivity, which is unsurprising given that it was the organization administering the surveys. Farmer 3, Farmer 1, LSP employee 1, LSP employee 2, and Walmart were some other consistent sources of network connection. Interestingly, when ecological connections were included in the whole-network analysis, pollinators consistently entered the top 5 important connections, indicating that pollinators are one of the strongest links in the regional food system. Ecological connections were excluded from the whole-network analysis above because people listed so many ecological relationships (more than the recommended 5), that it distorted the social network analysis.

*Desired*
While the previous connection types allowed for five responses, desired connection was one, open-ended question. Thus, there was not enough data to construct a social network analysis. However, the top responses were as follows:

| Desired Connection | Percent of responses |
|---|---|
| Local grain mill | 15% |
| Local food coop | 10% |
| Local food businesses | 8% |
| Local meat processor | 8% |
| Local vegetables | 8% |
| Easier connections between local producers and local businesses and institutions | 8% |

- Out of the 40 responses for desired connections, the most common desired connection mentioned by survey respondents was **a local grain mill/processor.**

## Discussion

- Only 35.3% of the assets mentioned in the mapping sessions were noted in the social network analysis. This number drops to 31.4% if we exclude natural resources, as there was a high level of agreement amongst the community asset mapping and social network analysis regarding natural resources. **Maps resulting from community asset mapping are only one part of the regional food system story and are strengthened through interpretation using other methods like SNA.**
- Although EDA offices were a common theme in the two asset mapping sessions, there was relatively little representation of collaboration or relationships with EDAs in the SNA. **EDA offices should be a target area for increased collaborations**
- A local grain mill/processor was the most desired connection, while asset mapping highlighted some underutilized milling equipment. **A local grain mill/processor should be a target area for strengthening the regional food system, first by scoping potential pre-existing or underused infrastructure.**
- The Montevideo Walmart was (perhaps unsurprisingly) the most significant economic bottleneck for the region at a value of 0.23 (on a scale from 0 to 1). This can serve as a benchmark from which to gauge improvement of economic resiliency going forward.
- The most important sources of food system information in the community (that weren't Facebook or MN Grown) tended to be long-standing community members. This connects with discussions in the asset mapping session regarding intergenerational knowledge sharing. **Relationships should be promoted between individuals that hold a lot of the local food system knowledge and younger/newer generations of residents, especially those emerging as leaders.**
- The collaboration network was the least connected network, with a few discrete clusters of collaboration. **Collaboration or cross-pollination should be promoted amongst the disconnected clusters of collaborators.**
- Findings here barely scratched the surface of the role of ecological relationships in supporting (and grounding) the regional food system. **Future studies should more intentionally investigate the role of local ecologies in promoting the health, well-being, and permanence of residents in the regional food system.**

Figure 1. Snapshot of community asset mapping (final map will be much nicer!)