Olympia Farmland Analysis

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Introduction

The goal of this work is to provide current estimates of agricultural land present within Olympia city boundaries and within Olympia's Urban Growth Area (UGA). Previous estimates of agricultural lands in these areas have been lacking, making it difficult to track changes over time. This analysis aims to provide a baseline of agricultural land area that can be used for future monitoring, as well as to provide information about characteristics of agricultural land

Methods

Potential vs. Active Agriculture

Definitions of agricultural land can often vary, leading to difficulties in comparisons across different analyses. For the purposes of clarity and for a more comprehensive view of agricultural land in this analysis, we broke agricultural land into two categories: "potential" agricultural land and "active" agricultural land.

Active agricultural land referred to all agricultural land under active cultivation or grazing and was defined broadly. Active agriculture included, but wasn't limited to, production of mixed vegetables, berries, hops, hay and other forage production, Christmas tree farms, actively grazed pastures, and nurseries. The few excluded categories were shellfish beds and turfgrass. These two categories are included in the WSDA Agricultural Land Use layer, which was used in this study, but were excluded in this analysis. Forestry was not considered as agriculture.

Potential agricultural land was defined as land that could be brought under cultivation by meeting certain criteria, but is currently inactive.

Data sources

The first step of this analysis was to locate and utilize data on agricultural land and its extent. Numerous agricultural land estimates, varying in scope and precision, already exist at county and state levels.

These resources were considered for inclusion in this analysis. Each is listed below, along with their strengths and weaknesses.

WSDA Agricultural Land Use Layer

The WSDA's Agricultural Land Use Layer is currently the most extensive and detailed state-wide agricultural GIS layer available. Data for this layer is provided through a combination of satellite data analysis and WSDA ground surveys.

WSDA surveys were the sole source of information in the 2019 WSDA Agricultural Land Use layer considered in this analysis.

The WSDA Agricultural Land Use Layer takes a unique approach in how it measures farmland by outlining only the area of agricultural land identified in surveys. This contrasts to other surveys, which often classify the entire parcel as either agricultural or non-agricultural. Due to the heterogeneous nature of farmland on parcels, which are often partially developed or forested, this approach allows for a more precise estimate of farmland especially as it pertains to agricultural land.

This layer was the largest contributor to our survey work of any existing data resource. The main gap in this layer is small-scale livestock owners, which are smaller in scope than WSDA surveys capture, but which are one of the more common types of agriculture in Thurston County.

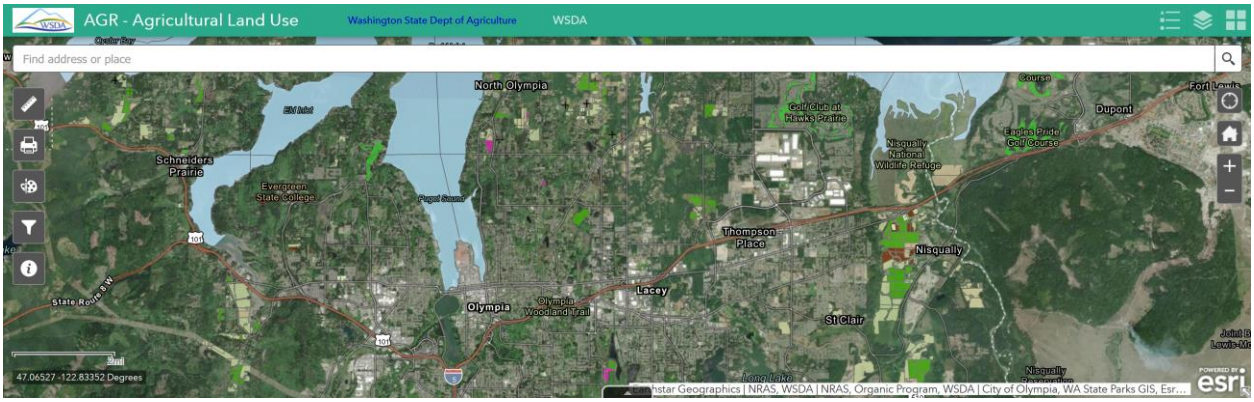

Figure 1. Screenshot of WSDA Agricultural Land Use Layer web map.

Current Use Agriculture

Parcels in Thurston County may be enrolled in the Current Use Agriculture program if they are used for commercial agriculture and meet particularly criteria, dependent on the parcel size. Since not all agriculture is enrolled in this program, this data source was used to supplement overall results and was not considered to be an exhaustive definition of all agricultural land.

2020 SSCFLT Farm Map

A county-wide farm map is published annually by the South of the Sound Community Farmland Trust (SSCFLT) to connect local farmers to customers. This map includes many small-scale operations that often go missed by larger-scale farmland analyses, but that are active in direct marketing approaches, such as CSAs. The farmland map was reviewed for any farm entries that had not yet been identified by other sources.

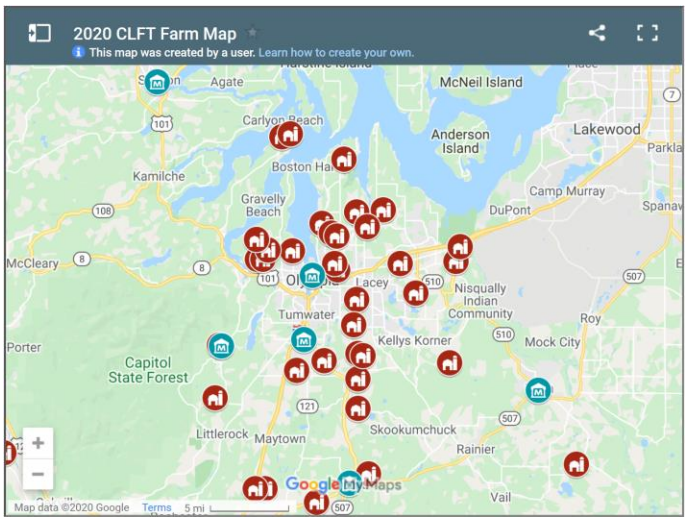

Figure 2. Google Map version of 2020 CFLT Farm Map showing Thurston County entries.

Organic INTEGRITY Database

The USDA maintains a nationwide database of all certified organic operations. While this analysis was inclusive of operations regardless of management, this database often catches smaller operations often left out of larger-scale agricultural survey efforts. Entries of agricultural operations in Thurston County were reviewed to find entries located within Olympia and its UGA. No new agricultural operations were found that had not yet been located in other sources.

Figure 3. Screenshot of USDA Integrity Database.

American Farmland Trust "Farms Under Threat" Data

A data layer of agricultural lands was recently released from the American Farmland Trust, as part of their *Farms Under Threat: State of the States* report. A copy of this data was obtained.

The technical specifications of this dataset recommend against using their layer for finer-scale analysis, at scales smaller than 100 to 200 acres, due to the resolution of the NLCD (National Land Cover Database) data that was used to develop the Farms Under Threat dataset (Freedgood et al. 2020).

Since the scale of tracts of urban and surburban farmland is well below the range of 100-200 acres, this dataset was not chosen to feed into the Olympia Farmland Analysis.

Data Sources	Source	Scale	Use in Analysis
WSDA Agricultural Land Use Layer	WSDA	Statewide	Used
Current Use Agriculture	Thurston GeoData	Countywide	Used
SSCFLT Land Trust Farm Map	SSCFLT	Countywide (present for multiple counties)	Used
Organic INTEGRITY Database	USDA	Nationwide	Provided no new data
Farms Under Threat Data	American Farmland Trust	Nationwide	Not used

Aerial Imagery Analysis

These existing data resources combined to provide a fuller picture of agricultural land in Olympia and its UGA. However, there were two clear gaps that remained. Small-scale livestock owners were generally not included in existing data resources, along with potential agricultural land. Both of these represent a significant portion of agricultural land in Thurston County.

To fill in these gaps, sources of aerial and satellite imagery were reviewed to capture the full breadth of agricultural land present in Olympia and its UGA. This data was combined with existing data resources to develop a master GIS layer of agricultural land in Olympia and its UGA.

NAIP (National Agricultural Imagery Program) from the USDA and ESRI Basemap Imagery were used in ArcGIS Pro to outline agricultural areas. Where needed, additional context was provided by Google Earth and Google Street View imagery (Table 1).

Table 1. Data sources used in Aerial Imagery Analysis.

Sources
NAIP Imagery (USDA)
ESRI Basemap Imagery
Google Earth/Google Maps Imagery
Google Street View

Potential Agriculture Criteria

A number of criteria were applied to ensure that the potential agricultural areas marked out in the aerial imagery analysis represented viable farmland, and not simply open space.

Areas were included that met the following criteria:

- Contiguous tract of land 1 acre or larger, on land with the same owner OR land is adjacent to an actively cultivated tract of farmland
- Open land, clear of trees and native woody brush*, pavement, or other development
  *areas with a small number of scattered trees were allowed, as were open areas with common types of clearable, invasive brush species (i.e. scotch broom, Himalayan blackberry)

Areas were excluded that had the following characteristics:

- Steep slopes
- Wetlands*
- Areas within a 30 ft buffer of streams or bodies of water
- Former gravel pits or sites that have characteristics that clearly preclude agricultural use, such as stony ground or lack of topsoil
- Parks and areas that are currently used for sports or other outdoor recreational activities
- Paved areas, roads, and driveways (with the exception of small driveways bisecting large fields)
- Portions of land clearly devoted to landscaping, backyard space, or common space
- Open areas currently under development, where roads and other residential or commercial infrastructure is already in place and waiting to be built
  *Thurston Geodata wetland layer used; all wetlands from this layer were excluded, with the exception of wetlands classified as farmed (e.g. PEMf wetlands)

Tracts of land present in the Olympia city zoning districts shown in Table 2 were also excluded, as agricultural use is not allowed in them.

Table 2. Olympia City Zoning Districts Excluding Agricultural Use

Zoning Category Code	Zoning Category Name
RM24	Residential Multifamily 24 Units Per Acre
RMH	High Rise Multifamily
RMU	Resident Mixed Use
UR	Urban Residential
UW	Urban Waterfront
UW-H	Urban Waterfront Historic
DB	Downtown Business
AS	Auto Services
I	Industrial
LI-C	Light Industrial Commercial

Active Agriculture Criteria

The criteria for active agriculture focused on clearly visible signs of agriculture. These included, but were not limited to the following characteristics:

- Presence of barns, cross-fencing, or other livestock infrastructure
- Presence of livestock traffic tracks in pastures
- Presence of row crops, greenhouses, orchards
- Presence of hay bales and mow lines
- Visible livestock from Google Street imagery

No active agriculture was found in the Olympia city zones that exclude agricultural activity.

Master Agricultural Layers

From this combination of existing data sources and the results of the aerial imagery analysis, two 'master' layers of agricultural land were generated, one for active agriculture and another for potential agriculture. (Figure 4). These two layers fed into the analysis, the results of which are detailed in the Results & Discussion section.

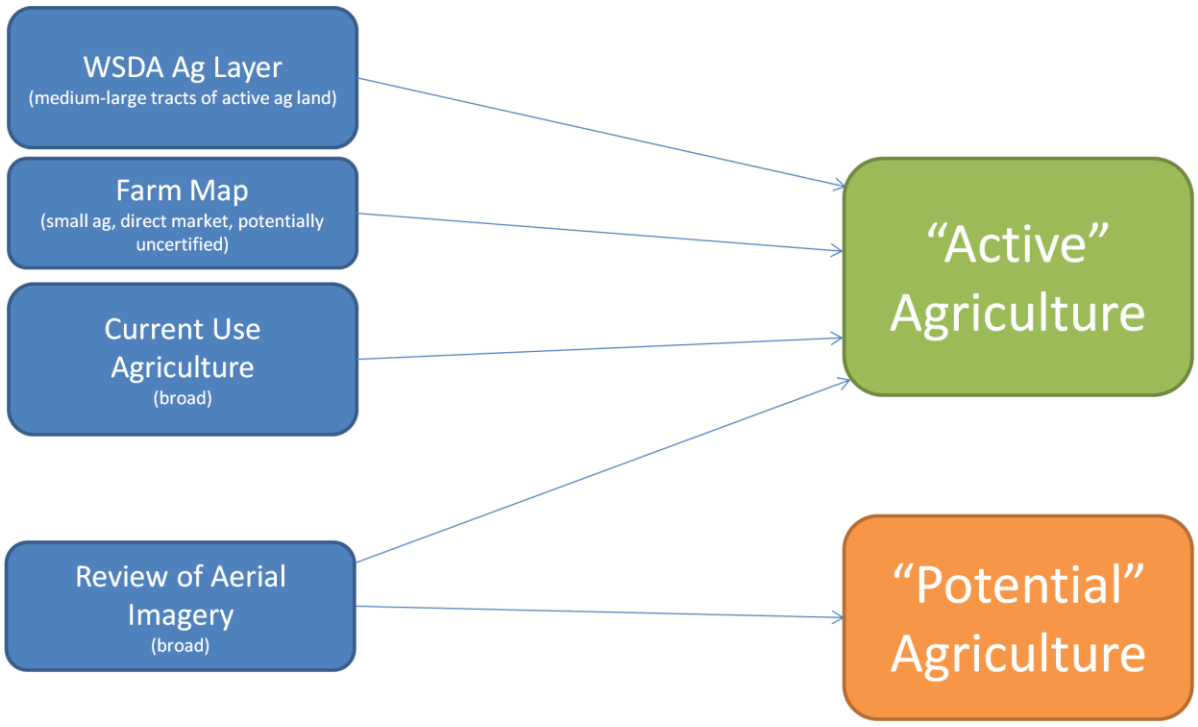

Figure 4. Final breakdown of data sources for master agricultural layers.

Agricultural Land Characteristics

Ownership

In order to better understand patterns of agricultural land ownership across our surveyed area, agricultural land was classified as being public, private, or non-profit-owned land.

Public land was considered to be any land owned by a government entity (i.e. City of Olympia, Thurston County, school districts, etc.).

Remaining parcels were sorted into land owned by individuals – classified as privately owned land - and land owned by business entities or organizations. Business entities and organizations were checked against the Business Search available from the Washington Secretary of State's website to determine whether they had for-profit or non-profit status.

Where organizations or business entities were organized or incorporated in other states, their status was checked against their respective states' business searches. This allowed final classification of remaining parcels into 'private' and 'non-profit'.

Land Values

Another question, relevant to questions of farmland affordability, was asked about the value of agricultural land.

This is a particularly difficult question to answer since in most cases, less than half of a parcel may be agricultural land. In western Washington, particularly in urban and surburban areas, agricultural land is often present with a heterogeneous landscape where forests, hills, houses, and other developed areas may make up the rest of a parcel.

If the full value of a parcel were attributed to an agricultural area that made up only a small portion of the parcel's total area, this would result in a gross overestimate of the cost of agricultural land.

To avoid this problem, the two following questions were asked and analyzed in ways that minimized this problem.

1. How much is farmland per acre on a per acre basis?
2. How much does a parcel of predominantly agricultural land cost?

Land values were obtained from a parcel layer from Thurston Geodata, which provided assessor values for each parcel, broken down into land value, building value, and total value (land value + building value).

Method #1: Agricultural Land Only

To provide an answer to the first question, a modified approach was taken. The total value of a parcel was divided by its acreage, then multiplied by the acreage of agricultural land present on the parcel to derive a value for just the agricultural portion.

For instance, a 10-acre parcel worth $500,000 would be considered to be worth $50,000 per acre. If 5-acres of agricultural land were present on this parcel, the total value of agricultural land would be considered to be worth $250,000 (at the same rate of $50,000/acre), as shown in Figure 5.

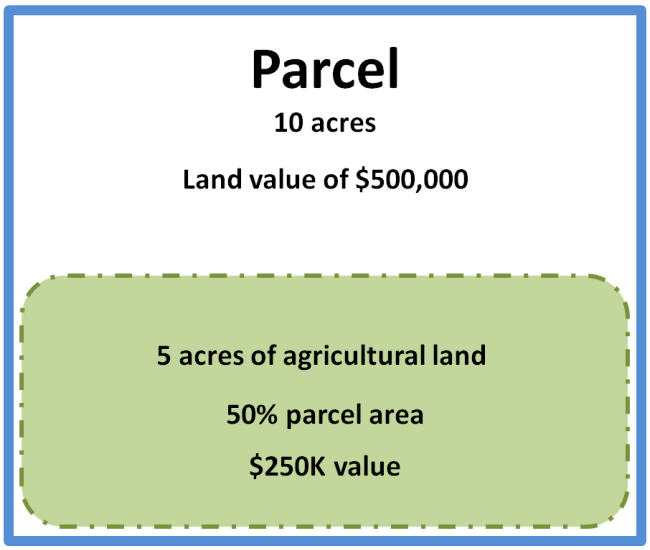

Figure 5. Example of how value is derived in Method #1.

There is one assumption of this approach which could introduce a significant amount of error, and that is that all areas of a parcel are worth the same amount. No data exists for parcels that allow us to consider within-parcel value differences.

However, it's assumed that the differences from within-parcel differences in value are likely smaller than attributing the full value of a parcel to a parcel with <50% of its area as agricultural land.

Method #2: Total value of parcels ≥50% agricultural land

This method attempts to answer the second question; namely, what is the value of a parcel of land that is mostly agricultural land? For a beginning farmer looking to acquire a piece of land that is predominantly agricultural land, this is a particularly relevant question.

All parcels with ≥50% agricultural land were pulled into a subgroup, and the total value of these parcels was considered along with the entire area of the parcels.

For example, a 10 acre parcel with a land value of $500,000 and 80% agricultural land would be considered as a whole, with a value of $500,000, as shown in Figure 6.

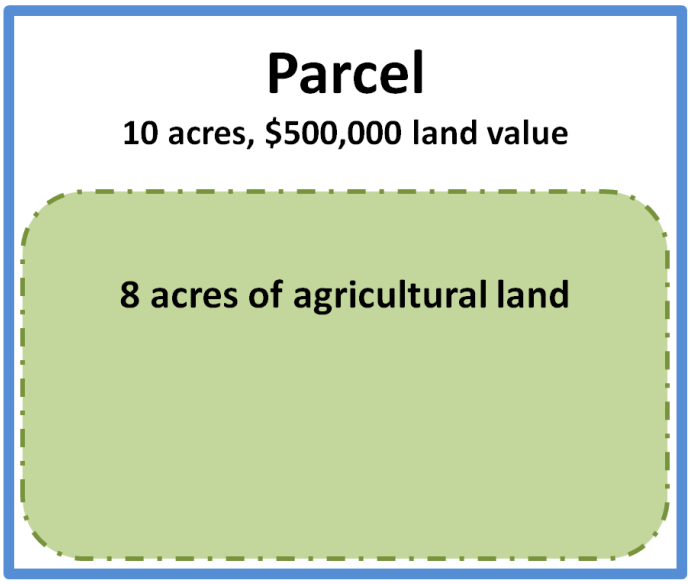

Figure 6. Example of how land value is derived in Method #1. The parcel is considered as a whole, as an agricultural parcel worth $500,000 at $50,000 per acre.

NRCS Land Classifications

To determine the quality of the agricultural land, we drew on NRCS Soil Survey data available for Thurston County. NRCS's "Farmland Classification" metric provides a rating for a soil's suitability for agricultural production. By overlaying the agricultural land boundaries from our survey with this survey data, we were able to generate numbers for the suitability of agricultural land in both Olympia and its UGA.

Analysis

Data collection and data analysis were all conducted in ArcGIS Pro (2.6.2 & 2.6.3). The analysis was structured in the form of a model in ArcGIS Pro's ModelBuilder.

If desired, the same analysis could be expanded to answer additional questions, or used for data collected from new survey locations.

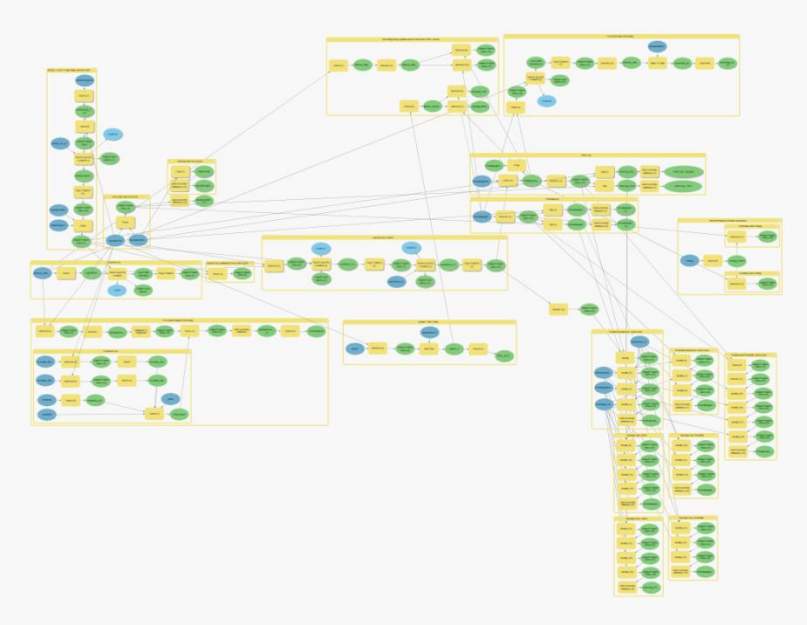

Figure 7. Screenshot of main ArcGIS Pro model used to process and analyze survey results.

Results & Discussion

Land Totals

Olympia and its UGA were both very similar in their total amount of agriculture land, differing by less than 8 acres. Altogether, both areas had nearly 450 acres of agricultural land (0.7 square miles), over half of which is in active production (Table 3).

Table 3. Agricultural Land Totals by Type in Olympia and Olympia's UGA.

	Active Agriculture	Potential Agriculture	Total Agriculture
Olympia	151.9 acres	69.1 acres	221 acres
Olympia UGA	123.3 acres	105.3 acres	228.6 acres
Olympia + Olympia UGA	275.2 acres	174.4 acres	449.6 acres

Proportionally, agricultural land in Olympia was more utilized, with a higher percentage in active agricultural as compared to its UGA (Figures 8 & 9).

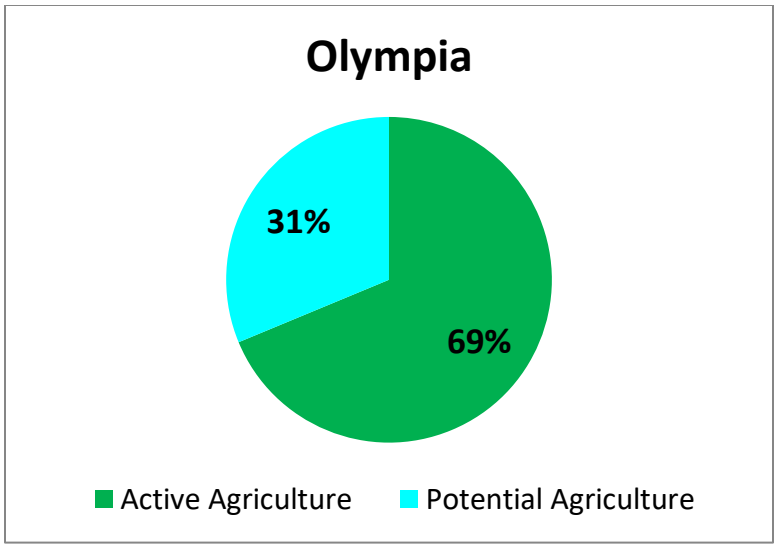

Figure 8. Active versus Potential Land in Olympia.

Agricultural land in the UGA was closer to an even split (Figure 9).

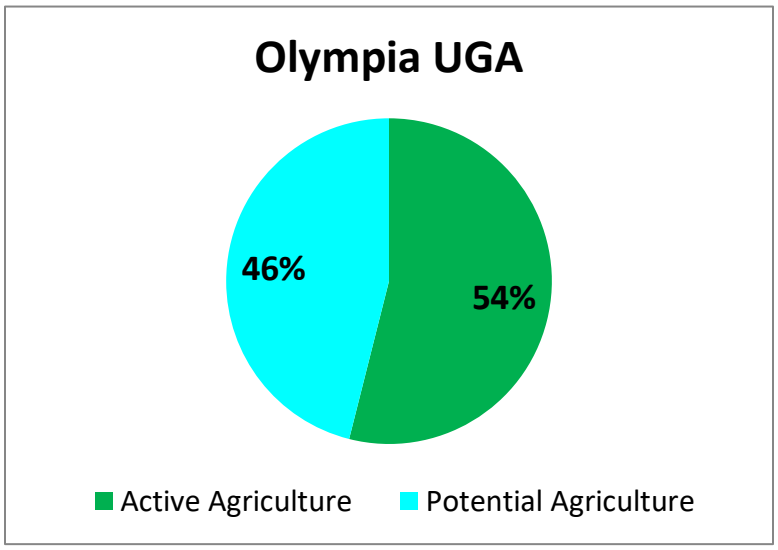

Figure 9. Active versus Potential land in Olympia's UGA.

Percent of Total Area

Since the size of the city of Olympia is much larger than its UGA, the agricultural acreages of both Olympia and its UGA were divided by the respective total area for each. Although both Olympia and its UGA have roughly similar levels of overall farmland, the smaller area of its UGA result in a higher

proportion of its land being dedicated agriculture (Figures 10 & 11). This makes sense in light of the less developed nature of Urban Growth Areas.

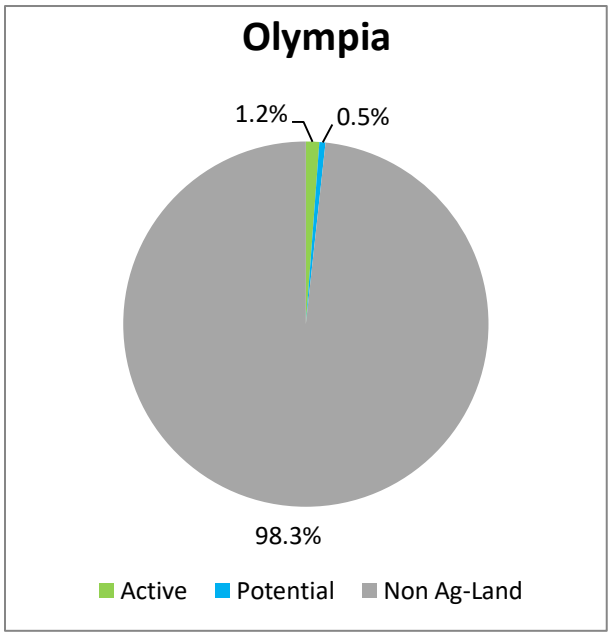

Figure 10. Breakdown of agricultural land expressed as a percentage of Olympia's entire area.

However, the UGA was still less than 6% agricultural land (Figure 11). This indicates that UGAs have limited agricultural resources, and that these could be targeted for preservation as growth continues in the remaining 94% of the UGA.

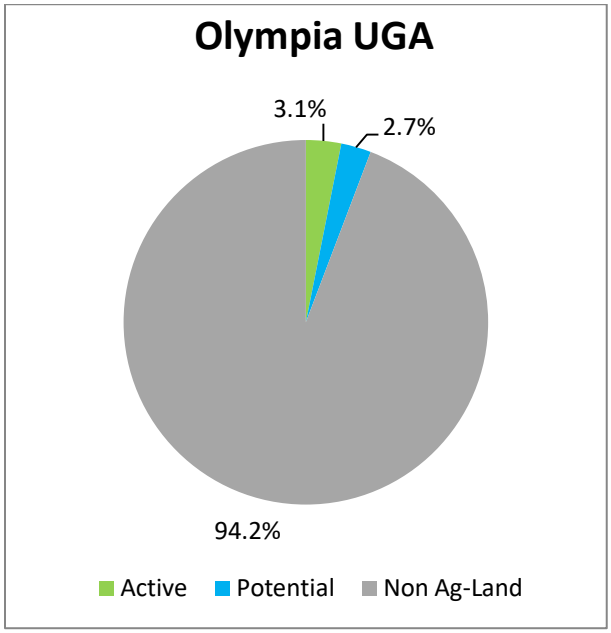

Figure 11. Breakdown of agricultural land expressed as a percentage of Olympia UGA's entire area.

Land Ownership

Sufficient information was available to classify the vast majority (99.6%) of agricultural land as either owned by private entities, public entities, or non-profits. In both Olympia and its UGA, privately held agricultural land was by far the most common ownership classification. Publicly held land was most common in Olympia's UGA, where it made up roughly 19% of all agricultural land (Table 4, Figure 13).

Non-profit land was found in roughly equal amounts in Olympia and Olympia's UGA, but it formed the second most common ownership category Olympia, ahead of publicly held land (Table 4, Figure 12).

Table 4. Agricultural land split by ownership category

	Olympia	Olympia UGA	Both
Private	205.3 acres	171.7 acres	383.2 acres
Public	1.8 acres	44.3 acres	46.1 acres
Non-profit	11.9 acres	12.4 acres	24.3 acres
Unknown	1.9 acres		1.9 acres

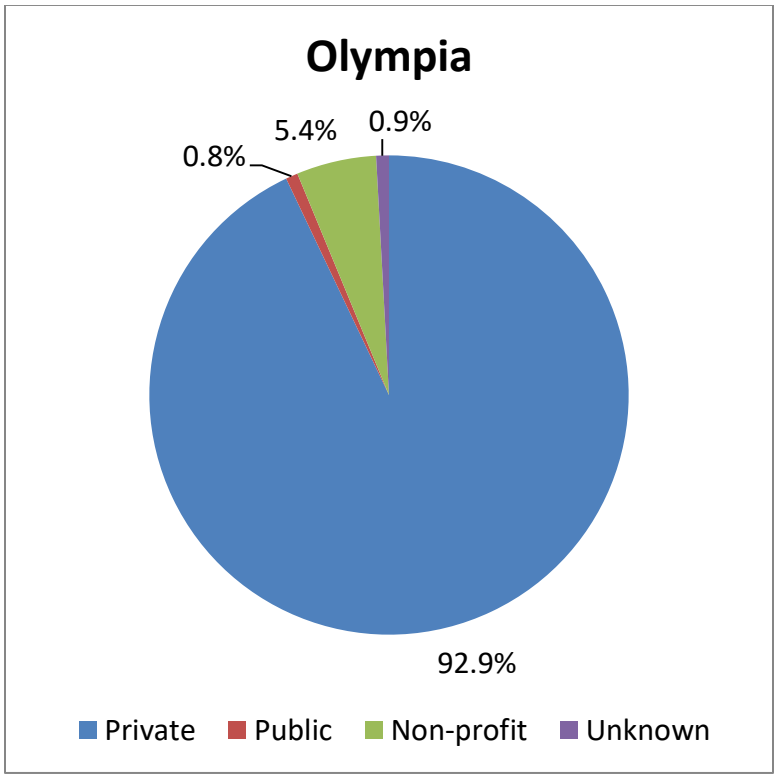

Figure 12. Breakdown of agricultural land by ownership category in Olympia.

Non-profits held an equal amount (5.4%) of farmland in both Olympia and its UGA (Figures 12 & 13).

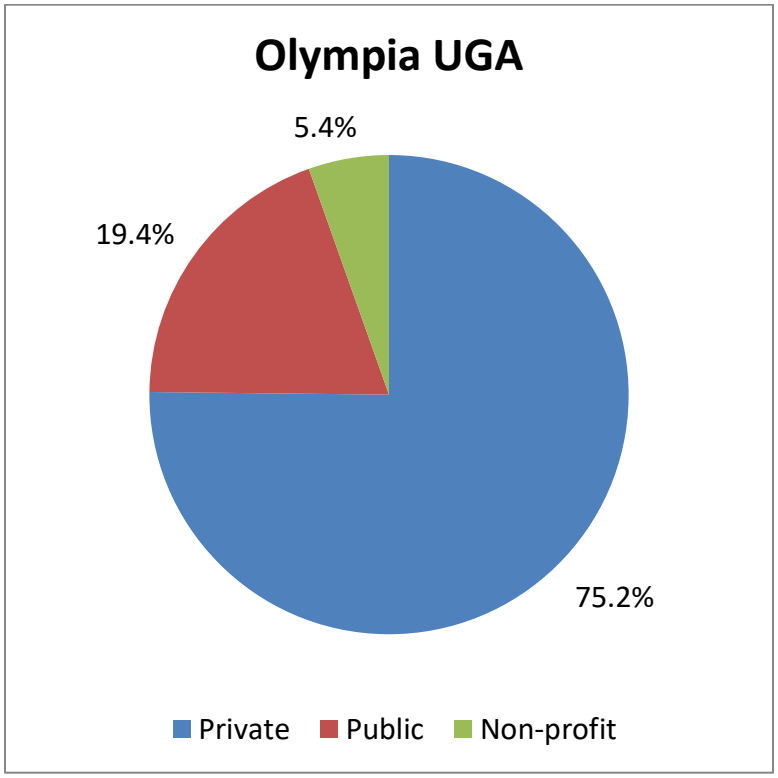

Figure 13. Breakdown of agricultural land by ownership category in Olympia's UGA.

Land Values

An initial screening of parcels was conducted to determine the relative proportion of agricultural land present. Prior to the analysis, it was already known that agricultural land formed a partial portion of most parcels.

This screening confirmed that most parcels have only a minority of their area as agricultural land. The most common percentage was 0-10%, although some of this may be due to narrow overlap of agricultural areas across parcel lines. Even if such parcels were excluded, however, there was a clear trend towards parcels with <50% of their total area in agricultural land (Figure 14).

Method #1: Agricultural Land Only

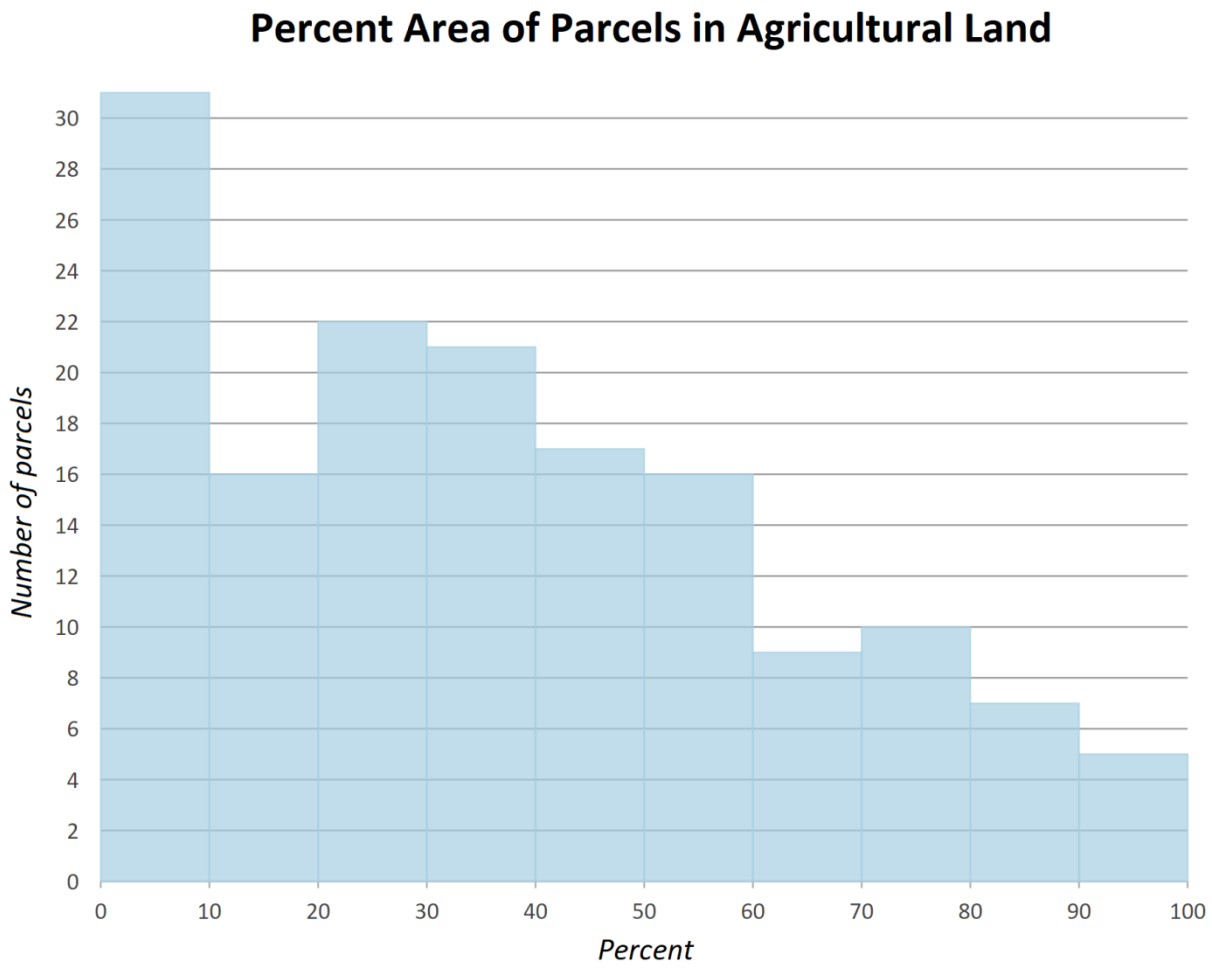

Figure 14. Number of Parcels by Percentage of Total Area in Agricultural Land (Active or Potential).

Land values were then calculated for just the agricultural portions of these parcels and a total average was obtained for the land value on a per-acre basis (Table 5).

Table 5. Mean land value for agricultural areas, according to Method #1.

Land value	$46,019 per acre

Building values were excluded here, as it did not make sense to allocate the value of buildings – which most frequently included houses and shops – to the agricultural areas of the land, which excluded these areas.

Method #2: Total value of parcels ≥50% agricultural land

In the second method, only parcels that had 50% or more agricultural land were considered. In this case, the total value of the parcel was considered as a whole. This method provides a more realistic look at the costs associated with a parcel that's clearly agricultural in nature.

The average parcel size and values are provided below in Table 6, and the breakdown of costs on a per acre basis are shown in Table 7. Overall costs are higher, compared to land values measured by Method #1.

Table 6. Mean area and value breakdown of parcels that were majority agricultural land.

Mean parcel size	5.67 acres
Mean land value of parcel	$321,338
Mean building value of parcel	$92,458
Mean total value of parcel	$413,796

Table 7. Value of parcels that were majority agricultural land on a per acre basis.

Land value per acre	$56,785
Building value per acre	$16,339
Total value per acre	$73,123

Zoning Breakdown

The majority of agricultural land was found in residential zones, with a plurality (40%) of the acreage found within the Residential 4-8 zone.

Table 8 Breakdown of agricultural land by zoning categories.

Zone Name	Acres
Residential 4-8	181.1
Single-Family Residential (Chambers Basin)	44
Mixed Residential 7-13	38.4

Residential 1 Unit Per 5 Acre	38.2
Residential Multifamily 18	29.7
Single Family Residential 4	29.6
High Density Corridor 4	28.5
Mixed Residential 10-18 Units	18.1
Medical Service	10.5
Residential Low Impact 2-4	7.8
Two Family Residential 6-12	6.5
Residential Low Impact	5.7
Commercial Oriented Shopping Center	4.8
Light Industrial	1.9
General Commercial	1.6
Professional Office/Residential	1.4
Residential 6-12	1.3
High Density Corridor 3	0.6

NRCS Farmland Classification

The breakdown of agricultural land by Farmland Classification found that the majority of farmland fell under a prime farmland classification, either with or without qualifications. Prime farmland is the highest rated classification, and this indicates the high quality of farmland identified in this survey. Only 0.7 acres was found to be not prime farmland (Table 9).

It is noteworthy that the largest category was “Prime farmland if irrigated”. Access to water for irrigation will be of key importance for agricultural land in this category, depending on the type of agriculture.

Table 9. Breakdown of agricultural land by NRCS Farmland Classification.

Farmland Classification	Acres
Prime farmland if irrigated	142.2
All areas are prime farmland	124
Prime farmland if drained	101.5
Farmland of statewide importance	81.3
Not prime farmland	0.7

Conclusion

This survey work established baseline estimates of agricultural land for Olympia and its UGA that can be used to monitor levels of agricultural land across future years. The spatial GIS-centric approach taken here allowed us to not only generate area estimates of agricultural farmland, but also to look at attributes of those areas that are relevant to agricultural suitability and preservation, such as land values, ownership, zoning, and farmland quality. For most parcels with agricultural land present on them, less than 50% of the area was found to be in agricultural land. The spatial approach here accommodates that fact, drawing on existing agricultural data resources and an intense aerial imagery analysis that allowed a degree of precision finer than the parcel-scale.

The analysis and protocol here can be extended to additional areas, such as if Olympia or its UGA are expanded. It could also be repeated at a future date to provide comparisons across time. Additionally, the data here can be easily broken down into greater detail if needed, especially if agricultural land meeting certain criteria is of interest (e.g. to determine values of agricultural land in Olympia's UGA classified as prime farmland).

References

Freedgood, J., et al. "Farms under threat: The state of the states." *American Farmland Trust* (2020).