Agricultural GIS Mapping Data

NEEDS ASSESSMENT

State of Connecticut | Winter 2020





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Photos taken by Mark Goetz were of Connecticut farms and produce

DEFINITIONS, ACRONYMS & ABBREVIATIONS

- CGISC Connecticut Geospatial Information System Council CFBA – Connecticut Farm Bureau Association COG – Council of Governments CTRC&D – Connecticut Resource Conservation and Development DCP – Department of Consumer Protection DEEP –Department of Energy and Environmental Protection DESPP – Department of Emergency Services and Public Protection DMV – Department of Motor Vehicles DoAG – Department of Agriculture DOL – Department of Labor
- DOT Department of Transportation DPH – Department of Public Health HIFLD - Homeland Infrastructure Foundation-Level Data NAIP - National Agriculture Imagery Program NOFA - Northeast Organic Farming Association NRCS – Natural Resources Conservation Services OPM – Office of Policy and Management USDA – United States Department of Agriculture WMS – Web Mapping Service

Geographic Information Systems (GIS). "A geographic information system (GIS) is a framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of information into visualizations using maps and 3D scenes. With this unique capability, GIS reveals deeper insights into data, such as patterns, relationships, and situations—helping users make smarter decisions."¹

Computer Aided Design (CAD). "A computer aided design (CAD) is a technology for design and technical documentation, which replaces manual drafting with an automated process. This widely used software program can help you draft construction documentation, explore design idea, visualize concepts through photorealistic renderings, and simulate how a design performs in the real world"²

Agriculture. "Except as otherwise specifically defined, the words "agriculture" and "farming" shall include cultivation of the soil, dairying, forestry, raising or harvesting any agricultural or horticultural commodity, including the raising, shearing, feeding, caring for, training and management of livestock, including horses, bees, poultry, fur-bearing animals and wildlife, and the raising or harvesting of oysters, clams, mussels, other molluscan shellfish or fish; the operation, management, conservation, improvement or maintenance of a farm and its buildings, tools and equipment, or salvaging timber or cleared land of brush or other debris left by a storm, as an incident to such farming operations; the production or harvesting of maple syrup or maple sugar, or any agricultural commodity, including lumber, as an incident to ordinary farming operations or the harvesting of mushrooms, the hatching of poultry, or the construction, operation or maintenance of ditches, canals, reservoirs or waterways used exclusively for farming purposes; handling, planting, drying, packing, packaging, processing, freezing, grading, storing or delivering to storage or to market, or to a carrier for transportation to market, or for direct sale any agricultural or horticultural commodity as an incident to ordinary farming operations, or, in the case of fruits and vegetables, as an incident to the preparation of such fruits or vegetables for market or for direct sale."³

¹ https://www.esri.com/en-us/what-is-gis/overview

² https://www.autodesk.com/solutions/cad-software

³ Connecticut General Statutes, Sec. 1-1 (q)



EXECUTIVE SUMMARY

The Agricultural Mapping Data Needs Assessment was initiated by the Connecticut Resource Conservation & Development, which requires agricultural GIS data to support decision making, marketing, and outreach. The purpose of the Assessment was to determine current data availability and provide a series of recommendations to improve GIS data for the agriculture industry. Different federal, state, regional, and municipal organizations rely on agricultural GIS data as their ability to access and share authoritative, maintained data is vital to their success.

Unfortunately, GIS in Connecticut, especially agricultural data, is dispersed across many agencies and organizations, impeding its' usability. With decentralized data, the initial task of the Agricultural Mapping Data Needs Assessment was to conduct a robust data inventory. The inventory included agricultural specific GIS data along with other GIS datasets that support agriculture activity.

In addition to the data inventory, extensive outreach was conducted with agriculture stakeholders. The outreach guided the assessment and was key in creating the recommendations that will improve agricultural GIS in the State. Through online surveys, and in-person meetings, stakeholders identified numerous needs that were summarized into the following categories:

- Establish Statewide Basemap Datasets
- Identify Authoritative Agricultural Datasets
- Prioritize Datasets
 - ° Existing GIS Data
 - ° New GIS Data
- Improve Data Sharing

Drawing from the stakeholder outreach initiative, shortand long-term recommendations were generated to provide the framework to meet the needs of the agriculture industry. The focus was to document existing authoritative datasets, provide methods to produce desired data, improve collaboration between agencies, efficiently share data between stakeholders and the public, and provide avenues to establish a state GIS authority.

GIS is vital for the oversight, growth and increased efficiency of the agriculture industry in Connecticut. The following document will elaborate on the current state of agricultural GIS and provide recommendations on ways it can be improved.



1 | INTRODUCTION

The agriculture industry in Connecticut spans the entire state, from Long Island Sound to all three state borders. It involves the cultivation of crops, dairying, forestry, horticulture, husbandry, apiary, shellfishing, plus the processing and transport of the results of these activities. Agriculture and conservation practices are a vital component for Connecticut's economic growth, with \$3.3 billion to \$4 billion in sales being contributed to the state's economy annually¹. The rise of agritourism has also contributed to Connecticut's \$14 billion tourism industry, which supports livable communities for residents and businesses within the state's 169 cities and towns. Databases and GIS mapping products are essential tools to aid in government oversight and regulation of the agriculture industry.

This project was initiated by the Connecticut Resource Conservation & Development (CTRC&D). CTRC&D cultivates partnership-driven solutions for a diverse and resilient Connecticut by enhancing the state's agriculture, natural resources, and economy. In supporting this mission and its partners, CTRC&D utilizes agricultural GIS data to support decision making, marketing, and outreach. This Agricultural Mapping Data Needs Assessment was commissioned to enhance agricultural GIS data in Connecticut by achieving the following objectives:

• Inventory existing agricultural GIS data.

- Document data gaps and data redundancy between agencies.
- Document barriers and provide recommendations to improve collaboration.
- Provide recommendations to establish well maintained authoritative datasets.
- Provide recommendations to improve data sharing between stakeholders and the public.
- Assess the need for a statewide GIS authority to develop and maintain essential statewide datasets.

2 | METHODOLOGY

This needs assessment was conducted using a systematic approach to capture the current state of agricultural GIS data in Connecticut. This included an overall assessment of how GIS is organized in the state, a robust data inventory, and an outreach effort to solicit feedback from stakeholders. The assessment can be summarized by the following steps:

- Document the current organization and management of GIS in Connecticut.
- Research GIS structure in neighboring states.
- Inventory and review existing agricultural GIS data at the federal, state, and municipal level.
- Stakeholder outreach:
 - ° Data developers and policy makers
 - Data users
- Summarize needs and provide recommendations.

¹ https://ctrcd.org



3 | AGRICULTURE IN CONNECTICUT

The agriculture, forestry, fishing and hunting industries primarily engage in growing crops, raising animals, harvesting timber, and harvesting fish and other animals from a farm, ranch, or their natural habitats.

The establishments in this sector are often described as farms, ranches, dairies, greenhouses, nurseries, orchards, or hatcheries. A farm may consist of a single tract of land or numerous tracts which may be held under different tenures. For example, one tract may be owned by the farm operator and another rented. It may be operated by the operator alone or with the assistance of members of the household or hired employees, or it may be operated by a partnership, corporation, or other type of organization. When a landowner has one or more tenants, renters, croppers, or managers, the land operated by each is considered a farm.

The sector distinguishes two basic activities: agricultural production and agricultural support activities. Agricul-

tural production includes establishments that perform the complete farm or ranch operation, such as farm owner-operators and tenant farm operators. Agricultural support activities include establishments that perform one or more activities associated with farm operation, such as soil preparation, planting, harvesting, and management, on a contract or fee basis.

There are additional establishments that primarily engage in agricultural research and establishments primarily engaged in administering programs for regulating and conserving land, mineral, wildlife, and forest use.

In Connecticut, management and oversight of agriculture, including GIS data, is dispersed across multiple agencies at the federal, state, regional, and municipal level.

4 | GIS IN CONNECTICUT

The State of Connecticut lacks a dedicated and authoritative GIS department to produce, maintain, house, and distribute geospatial datasets. Connecticut's Department of Energy and Environmental Protection (CT DEEP), Department of Agriculture (CT DoAG), Department of Transportation (CT DOT), and Department of Emergency Services and Public Protection (CT DESPP), all produce statewide GIS datasets, but have limited personnel to maintain and distribute the data. In addition, the lack of coordination and standards, limit usability of datasets across agencies. With the lack of a centralized data repository, the Connecticut Environmental Conditions Online (CT ECO), part of the University of Connecticut (UConn), has acted as a pseudo GIS clearinghouse for the state, providing access to many state datasets.

In Connecticut, the burden of producing GIS data, including funding its costs, is left to individual state agencies, Council of Governments (COGs), or municipalities. The datasets produced often do not accommodate the needs nor requirements for use beyond their producers. Thus, multiple copies of the same data are produced with varying attribution and accuracy. Without set standards, overlapping data from multiple sources often do not align, making it difficult for data users to identify the most up to date and accurate datasets. The lack of a centralized agency also leaves organizations scrambling to secure funding and competing with one another to produce similar datasets. The framework for an authoritative GIS department at the state level has been attempted on several occasions during recent history.

4.1 CONNECTICUT GEOSPATIAL INFORMATION SYSTEM COUNCIL

In 2005, Section 84 of Public Act 05-3 created the 21 member Connecticut Geospatial Information System Council (CGISC) " to coordinate a uniform geospatial information system capacity for municipalities, regional planning agencies, the state and others as needed, which shall include provision for creation, maintenance and dissemination of geographic information or imagery and promote a forum in which geospatial information may be centralized and distributed"².

In 2007, the CGISC oversaw a business plan for "Funding Connecticut's Statewide GIS Program" conducted by Applied Geographics. This report, funded by the

2 Applied Geographics, Inc. (2007). Business Plan for: Funding Connecticut's Statewide GIS Program. Manchester, CT.

Strategies from "Funding Connecticut's Statewide GIS Program"

Goals:

- Organize GIS efforts across state and local government agencies.
- Develop a core set of data layers that are kept up to date and made broadly accessible in a state managed data repository.
- Communicate and educate potential users and decision makers about the benefits and capabilities achieved by GIS investments.

Tasks to Achieve Goals:

- Establish a GIS Coordination Unit that would report to the State Chief Information Officer (CIO). This would be a staffed unit that coordinates GIS activities, organizes a GIS outreach program and manages statewide data, including development of a statewide data repository.
- Develop four statewide layers
 - ° Orthophotos
 - ° Parcels
 - ° Street centerlines
 - ° Address points
- Educate and build relationships between key politicians and executives that have initiatives that can benefit from GIS.

Federal Geographic Data Committee, reviewed the current use of GIS in Connecticut and made recommendations to establish a statewide GIS organization.

The estimated costs for the first three years of implementation for the report's recommendations were \$4.6 million, \$3.1 million, and \$1.9 million, respectively. While this report detailed how this unit would be established and how much it could benefit the state, nothing was ever implemented.

In 2013, The Geospatial Information Systems Council was eliminated, and the Office of Policy and Management (OPM) was tasked with constituting its successor department³.

4.2 CONNECTICUT GIS USER TO USER NETWORK

In 2001, the Connecticut GIS Network, a voluntary association of individuals and organizations that use GIS-based technologies and data, was created to enhance collaboration and cooperation between GIS professionals in Connecticut. The Network is currently managed by an 18-member Steering Committee consisting of representatives from state government, regional planning organizations, municipal government, public utilities, nonprofit non-governmental organizations, academia, and private businesses⁴. While this organization is not legislatively recognized, it works to establish standards and coordinate statewide initiatives vital to the success of GIS in Connecticut.

5 | GIS IN NEIGHBORING STATES

While Connecticut lacks a centralized GIS agency, many neighboring states have implemented GIS agencies that can be used as examples for Connecticut to follow. The following will describe the surrounding states' GIS infrastructure as well as specific agricultural data they produce.

Massachusetts The state of Massachusetts has developed a "one-stop-shop" for delivering geospatial data pertaining to their state through MassGIS (Bureau of Geographic Information). "MassGIS maintains a comprehensive, statewide database of spatial informa-

³ https://www.ct.gov/gis/site/default.asp

⁴ https://ctgis.uconn.edu

tion for mapping and analysis supporting emergency response, environmental planning and management, transportation planning, economic development, and transparency in state government operations." Their website contains interactive mapping tools and applications as well as a comprehensive data clearinghouse.

Statewide layers include a community boundaries layer, a 2016 land cover/land use layer, and a cache of orthoimagery datasets.

Although there is no agriculture specific category, there are datasets considered important within the agriculture community such as locations of farmers markets, shellfish sustainability areas, and Natural Resources Conservation Service (NRCS) certified soils data⁵.

Rhode Island The Rhode Island Geographic Information System (RIGIS) consists of both government and private organizations that manage and utilize a comprehensive collection of geospatial data. Their mission is to "monitor, coordinate, and provide leadership for activities relating to the use of GIS technology within Rhode Island, to support initiatives that implement or use GIS technology, and to provide easy access to an extensive database of geospatial data for the state". Beyond providing an open data portal, RIGIS also publishes documentation and data standards as well as actively promoting investment in GIS staff and technology within private businesses, local and state government, institutions, colleges and universities.

Statewide layers include land use/land cover, soils, subaqueous soils, bedrock geology, contours, census data and sea level rise.

Although there is no agriculture specific category within the open data portal, there are datasets considered important within the agriculture community such as an invasive plant inventory, forest habitat, shellfish harvesting areas and an environmental inventory layer⁶.

Vermont The Vermont Center for Geographic Information (VCGI) is a division of the State of Vermont's Agency of Digital Services and is responsible for the "coordination, procurement, processing, storage, and distribution of free and public digital Vermont GIS data". VCGI also works to initiate and oversee statewide spatial data programs such as the Vermont parcels program, imagery program, and lidar program. Their website hosts an open geodata portal for the public to access statewide geospatial datasets.

Statewide layers include parcel and zoning data, protected lands, land cover, and orthoimagery.

VCGI's open data portal also contains an agriculture specific category which contains farm data by county as well as NRCS certified soil data⁷.

New Hampshire The New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) is a collaborative effort between the University of New Hampshire and the NH Office of Strategic Initiatives. NH GRANIT's main objective is to create, maintain, and provide access to geographic data for state, regional, and local decision makers. Their website provides online map services as well as tools to search for downloadable data layers.

Statewide layers include impervious surfaces, land use, public roadways, and a cache of orthoimagery.

NH GRANIT's database contains an agriculture and farming specific category that includes a pesticide polygon layer. Other datasets considered important to the agriculture community include data on shellfish waters, a timber clear-cut inventory and a toxic release inventory⁸.

New York New York State Geographic Information Systems (NYS GIS) Clearinghouse is overseen by the New York State Geospatial Advisory Council. The council "coordinates, promotes and facilitates the development, effective use, and sharing of geographic information". The NYS GIS Clearinghouse website also hosts established standards as well as procedures for submitting standards to the council.

Statewide layers include a statewide parcel dataset, street and address datasets, an elevation dataset and orthoimagery datasets.

The NYS GIS Clearinghouse contains an extensive inventory of data produced throughout the state, including agriculture specific data produced by the New York State Department of Agriculture and Markets. These datasets include agricultural districts and boundaries as well as New York State fairgrounds. Also available through the Clearinghouse, the New York Department of Environmental Conservation has datasets important

⁵ https://www.mass.gov/orgs/massgis-bureau-of-geographic-information

⁶ http://www.rigis.org/

⁷ http://geodata.vermont.gov/

⁸ http://www.granit.unh.edu/



within the agriculture community such as water quality classifications, public fishing grounds, well locations and state forests⁹.

New Jersey The New Jersey Department of Environmental Protection's Bureau of Geographic Information Systems (BGIS) provides an open data portal as well as mapping applications for users to view and download data. BGIS sets mapping and digital data standards as well as GPS data collection standards. Their main objectives are to provide technical support, development, maintenance and accessibility to geospatial data in order to improve environmental management decisions.

Statewide layers include land use, impervious surfaces, historic properties, soils, and a parcel dataset.

Although there is no agriculture specific category within the open data portal, there are datasets considered important within the agriculture community such as prime fishing grounds, drought regions, freshwater mussel habitats and shellfish monitoring stations¹⁰.

Iowa While not in the northeast, Iowa was included to assess how a more agricultural state provides GIS data. In Iowa, the Office of the Chief Information Officer supports the Iowa Geodata open data portal. The open

data portal hosts data contributed from multiple governmental agencies throughout the state as well as supporting statewide geospatial initiatives.

Statewide basemap layers include land cover, soils, groundwater vulnerability, census data and aerial imagery.

lowa Geodata contains a specific category on farming related datasets and includes many more layers then other surrounding states, such as feeding operations, manure applications, environmental facilities, and drainage wells¹¹.

In comparison to neighboring states, Connecticut lacks the GIS infrastructure to adequately support state initiatives and the agriculture community. The review of these surrounding states provided examples of actionable items for mediating the current needs for agricultural GIS in Connecticut.

6 | DATA INVENTORY

Through independent research and stakeholder outreach, a robust data inventory was completed. The inventory included agency data at the federal, state, regional and municipal level. This section will review high priority datasets. Additional state datasets can be found in Appendix A.

⁹ https://gis.ny.gov/gisdata/

¹⁰ https://gisdata-njdep.opendata.arcgis.com/

¹¹ https://geodata.iowa.gov/

6.1 FEDERAL DATASETS

6.1.1 US Department of Agriculture

The United States Department of Agriculture (USDA) completes a nationwide census of agriculture every five years. The census captures land use, operator characteristics, production practices, income and expenditures.

Census of Agriculture

The census is available at https://www.nass.usda. gov/AgCensus/. It includes the full report, as well as tables and query tools to filter the data. From the census, county level GIS data that contains information on the number of farms and farm types, may be viewed and downloaded. Expanding on the data collected from the Census of Agriculture, the USDA also conducts the Census of Aquaculture and the Census of Horticulture Specialties. The Census of Aquaculture includes information regarding volume and methods, surface water acres and sources, sales, aquaculture distributed for restoration, conservation, and enhancement or recreation. The Census of Horticultural Specialties details production and sales data for floriculture, nursery, and other specialty crops in the United States¹².

Agricultural Conservation Easement Program

The USDA provides financial assistance for purchasing Agricultural Land Easements that protect agricultural lands. These easements prevent the conversion of productive working lands to non-agricultural uses. Easements can be viewed on their publicly available web application at http://nrcs.maps.arcgis.com/apps/webappviewer/index.html?id=60cb4564f7b4461ca9a-61fa224c066ba.

Aerial Imagery

The USDA runs the National Agriculture Imagery Program (NAIP) which acquires aerial imagery during the growing season. The data can be downloaded through the USDA NRCS Geospatial Data Gateway at https:// datagateway.nrcs.usda.gov/. In Connecticut, this data is also available through CT ECO. Prior to 2016, the imagery was 1-meter resolution but recently the imagery was improved to 0.6-meter resolution. This data differs from most imagery collected in Connecticut as it is flown during leaf-on conditions, making it valuable to assess farm locations and crop health.

Soil Survey

The Natural Resources Conservation Services (NRCS)

12 https://www.nass.usda.gov/AgCensus/

was established within the USDA in response to "the wastage of soil and moisture resources on farm, grazing and forest lands" The NRCS provides several services to farmers, ranchers and forest services including financial assistance, technical assistance, and incentives to preserve lands through easements¹³.

The NRCS conducts soil surveys which can be used for farming and other wider area planning. The soil survey can be accessed through direct download at https://nrcs.app.box.com/v/soils

6.1.2 Homeland Infrastructure Foundation-Level (HIFLD)

Homeland Infrastructure Foundation-Level Data (HIFLD) was established in 2002 to address improvements in national geospatial information across multiple levels of government. HIFLD provides data through an Open Data Portal as well as a Secure Data Portal. The Open Data Portal provides foundation-level geospatial critical infrastructure data within the public domain. The Secure Data Portal hosts "For Official Use Only" and licensed critical infrastructure. Access is available to any user with Homeland Security Information Network (HSIN) credentials¹⁴.

In the HIFLD inventory, agriculture data is available through the Open Data Portal and the Secure Data portal.

HIFLD Open Data Portal

- Poultry slaughtering and processing facilities
- State fairgrounds

HIFLD Secure Data Portal

- Animal production and aquaculture Animal aquaculture facilities; beef cattle ranches and farms; cattle feedlots; dairy cattle farms; hog and pig farms; poultry and egg farms
- Crop production Fruit and tree nut farms; greenhouse nursery and floriculture production facilities; oilseed and grain farms; other crop farms; vegetable and melon farms
- Fishing hunting and trapping-Hunting; trapping and game propagation facilities
- Forestry and logging Logging operations
- Support activities for agriculture and forestry

¹³ https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/about/history/

¹⁴ https://gii.dhs.gov/hifld/

6.2 STATE DATASETS

In 2018, the State of Connecticut submitted a State Data Plan pursuant to Public Act 18-175¹⁵. A link to the plan can be found at https://portal.ct.gov/-/media/CT-Data/Connecticut-State-Data-Plan-Final-pdf. pdf?la=en .

Part of this plan directed executive branch agencies to annually conduct an inventory of high value data, including pertinent metadata such as data descriptions, data owners, data stewards¹⁶ and more. The inventory was conducted for GIS and non-GIS datasets and can be found in the State's Open Data Portal at https://data.ct.gov/. It is important to note that the Open Data Portal does not provide access to the datasets but rather provides information on what datasets exist. The following will discuss data included in the Open Data Portal as well as datasets that were not documented.



6.2.1 Connecticut Department of Agriculture (CT DoAG)

The GIS inventory from CT DoAG consisted of only Bureau of Aquaculture data. This included:

- Aquaculture Licensing Database
- Shellfish Beds Division Geodatabase
- Shellfish Master Classification

After engaging with stakeholders, we received feedback that the department also has a "Preserved Farmland" dataset that is used internally. Preserved farms have easements restricting development rights held by the State of Connecticut or other entities.

There were numerous non-GIS datasets contained in the state data inventory. While these datasets are currently not in GIS format, many have a spatial element, such as an address that could be mapped.

The following non-GIS datasets were discovered on the Connecticut Open Data Portal from the DoAG. More information on these datasets can be found in Appendix A.

Bureau of Agriculture Development & Resource Conservation - Farm Link, the Connecticut Grown Store, apple marketing board assessments, viability/



transition grants, organic cost share and the farmers' market nutrition program

Commissioners Office - eLicense database and animal population control.

Bureau of Regulatory Services - Poultry and livestock import permits, dog bite reports and dog license listings, farmers market inspection reports and complaint database, Generally Accepted Accounting Practices (GAAP) reporting database, disease testing information i.e., tuberculosis, brucellosis, ring, swine rabies, equine infectious anemia, Connecticut feed manufacturing facility list, retail outlets for animal feed, dairy producers inspection evaluations and warning/prohibitory order letters, milk examiners inspection evaluations, bulk milk tanker inspections and dairy retail store inspections.

Shellfish Growing Areas - Aquaculture water quality database, Paralytic Shellfish Poisoning (PSP) and Male-Specific Bacteriophage (MSB) database and shellfish landings.

Shellfish Laboratory – Fisher Scientific[™] orders, media, dish detergent, agar weight loss, two analyst comparison count and duplicate samples.

Dairy Laboratory Evaluation Officer – current dairy laboratory and proficiency intra state.

Administrative/Fiscal – Long Island Sound (LIS) shellfish beds lease, LIS shellfish bed franchises, kelp initiative license, and Branford initiative license.

¹⁵ https://cga.ct.gov/2018/act/pa/pdf/2018PA-00175-R00HB-05517-PA.pdf

¹⁶ The data steward is the individual who is responsible for maintaining and updating the datasets.

CT DoAG also promotes Connecticut Grown information to consumers. Available at https://portal.ct.gov/ DOAG/Marketing/Marketing/Find-a-Farmer , it lists

agricultural fairs, agritourism events, apple growers, Christmas tree growers, Community Supported Agriculture (CSA) listings, dairy products, farm stands, farmers' markets, forest products, garden centers, honey producers, hydroponic growers, sugarhouses, meat producers, organic farms, pick your own, poultry and egg producers, roses, specialty food products, and vineyards and wineries.

These listings contain contact information, hours of operations and descriptions for consumers. It also provides addresses which could be used to incorporate this data into a GIS format. Ideally, the data would be incorporated into a publicly available web application that would allow users to find the closest Connecticut Grown location. This recommendation will be further developed in Section 8.3.

6.2.2 Connecticut Department of Energy & Environmental Protection (CT DEEP)

CT DEEP maintains numerous GIS datasets that include natural resources, administration, and other basemap layers. The data is available at https://www.ct.gov/ deep/cwp/view.asp?q=322898 for download and as Web map services through CT ECO.

CT DEEP has datasets for the following business function/areas: coastal habitat, endangered species and habitats, elevation contours, surface elevation, bathymetry, Long Island Sound bathymetry, terrain datasets, coastal resource management, Sea Level Affecting Marshes Model (SLAMM), flooding and inundation, natural resource management, recycling and composting, utility infrastructure and pipelines, Connecticut place names, geology, soils, hydrography and waterbodies, watersheds and drainage basins, outdoor recreation, statewide trails, open space, DEEP property, 2010 parcels, topo maps, topo map index, orthoimagery, and political boundaries. More information on these datasets can be found in Appendix A.

Those datasets pertinent to agriculture include:

- Forestry
 - ° DEEP forest blocks
 - ° Forest boundary layer
 - ° Forest legacy program
- Fisheries
 - ° Fisheries management areas

- ° Shellfish
- ° Boat launches
- ° Coastal access points
- Farming

0

- Soil survey geographic database
- ~ Contains farmland soils layer
- ° NRCS web soil survey link to NRCS website
- ^o Agriculture use license management
- Basemap
 - DEEP property
 - ° 2010 parcels¹⁷
 - ° Protected open space
 - ° Elevation
 - ° Orthoimagery

CT DEEP also had the following non-GIS agricultural data documented in the Open Data Portal:

- Marine fisheries monitoring and assessment
- Track marine events
- Track and manage coastal public access sites
- Wildlife Division bird survey, wildlife management areas for public, vegetation, pheasant tagging, New England Cottontail, Crop damage datasets, digital photos
- Forestry Division forest plots, fire weather forecast, Public Act 490

6.2.3 Connecticut Department of Transportation (CT DOT)

While CT DOT did not have any specific agricultural GIS data in the Open Data Portal, the following datasets could be used for land management and basemap purposes.

- Air quality
- Scenic Land Strips
- Town and county boundaries
- Right of Way Surveys

6.3 REGIONAL DATASETS

Through the stakeholder outreach process, data sources from regional, municipal, and non-profit organizations were discovered.

Councils of Governments (COGs) produce a variety of GIS datasets. Two COGs, Naugatuck Valley and

¹⁷ These parcels were used to define protected open space parcel boundaries for the POSM project. Data is not current or complete.

Northwest Hills have specific agricultural GIS viewers. The Northwest Hills web viewer's datasets provide location, contact information, and links to websites. This web viewer was established using ArcGIS Online and can be used as a model for other CT DoAG datasets.

The Naugatuck Valley web viewer's datasets were aggregated from a variety of data sources and are updated annually. Several of the layers come from the CT DoAG's Connecticut Grown website that was mentioned previously in Section 6.2.1. NVCOG was able to take the existing data and transform it into an intuitive web-application that can be used as a statewide tem-



Regional Agricultural GIS Datasets

Northwest Hills Councils of Governments

- Farms
- Farmers markets
- Click here for the Webviewer

Naugatuck Valley Councils of Governments

- Farmers markets
- Pick-Your-Own farms
- Winery/Vineyards
- CSAs
- Agritourism
- Click here for the Webviewer

plate. This recommendation will be further developed in Section 8.3.

Most COGs produce or inventory basemap GIS data. While these datasets are not agriculture specific, they provide value to agriculture by providing base data that assists in the overall protection of farmland, the zoning that decides how land can be developed, and the conservation of farming through open space easements. These datasets include:

- Parcels
- Land Use
- Zoning

6.4 MUNICIPAL DATASETS

Municipalities are often the source of parcel level information. This information is typically provided by the town assessor in a GIS format by the town itself or pushed up to a COG for GIS implementation. Parcel data attributes include ownership, assessed value, zoning, and land use information. This information, while not agriculture specific, provides vital knowledge for farmland preservation and future town development.

Municipalities that rely more heavily on agriculture have additional agricultural specific data such as:

- Prime, important and locally important farmland soils
- Cropland or agriculture land versus forest land
- GPS points for farmland preservation

6.5 OTHER AGENCIES

Connecticut Farmland Trust: Connecticut Farmland Trust has a GIS web viewer consisting of the farmlands it currently protects. This dataset contains farm name, description, acreage, location and links to farm websites. The data can be viewed at http://ctfarmland.org/site/ protected-farms/.

7 | STAKEHOLDER OUTREACH

To assess existing conditions and current needs of the agriculture community, this assessment solicited feedback from key stakeholders. Outreach assisted in the development of the data inventory and discussion of current needs. Stakeholders were divided into two groups. Data producers and policy makers, and data users.

The data producers and policy makers included federal,



state, regional, municipal and non-profit agencies that develop GIS data or policy that impacts GIS in the state. The data users included farmers, agriculture and shellfish commissions, appraisers, realtors and other individuals who specialize in agriculture in Connecticut but do not develop GIS data. A full description of all stakeholders that were included can be found in Appendix B.

Prior to stakeholder meetings, a web-based survey was distributed to both groups. The surveys were designed to solicit feedback from stakeholders to discuss their current obstacles using agricultural GIS data in the state. To focus on the specific needs of each stakeholder group, two surveys were developed. Survey responses were then used to drive the in-person meetings which further discussed the needs of the agriculture community in Connecticut.

7.1 DATA DEVELOPERS & POLICY MAKERS

A meeting with data developers and policy makers was held on October 28th, 2019, from 10:00am- 12:00pm, at the UConn Extension Office in Haddam, Connecticut. Minutes from the meeting can be found in Appendix C.

Prior to the meeting, 33 stakeholders responded to the survey, representing COGs, consultants, UConn, municipalities, the agriculture industry, CT DoAG, inland wetlands commissions, conservation districts, land trusts, American Farmland Trust, and the Northeast Organic Farming Association (NOFA). 20 of the 33 participants were from CT DoAG, a municipality, or a COG (see Figure 1). The survey and results can be found in Appendix D.

7.2 DATA USERS

A stakeholder meeting was held on Monday, December 9th, 2019 from 3:00-4:30pm at the UConn Extension Office in Haddam for all potential users of GIS data. The goal was to discuss what data they access, obstacles experienced and input on potential mapping products users would like to see developed. Minutes from the meeting can be found in Appendix E.

The web-based survey was sent out to users on November 26, 2019 and 44 individuals responded. The survey participants represented a wide variety of agencies, organizations, and occupations associated with agriculture in Connecticut. The most responses (27%) came from farmers (see Figure 2). Many of the farmers are members of the Connecticut Farm Bureau Association (CFBA). The CFBA strives to increase income and improve quality of life for Connecticut farmers through market promotion, education, and legislative advoccy¹⁸. The survey and results can be found in Appendix F.

¹⁸ https://www.cfba.org/





8 | CURRENT NEEDS

When asked about the major obstacles data developers and policy makers experience when working with agricultural GIS data, the most common responses were the lack of data, lack of consistent aerial imagery, finding authoritative datasets, and sharing datasets (see Figure 3). The data user community had similar responses, citing lack of data as the biggest obstacle when dealing with agricultural GIS data (see Figure 4, next page).

Through the survey responses and stakeholder meetings, data needs can be summarized into the following categories:

- Establish Statewide Basemap Datasets
- Identify Authoritative Agricultural Datasets
- Prioritize Datasets
 - ° Existing GIS Data
 - ° New GIS Data
- Improve Data Sharing

8.1 ESTABLISH STATEWIDE BASEMAP DATASETS

When discussing data needs with stakeholders, the lack of consistent statewide data was a common theme. In 2007, the business plan titled "Funding Connecticut's Statewide GIS Program" had three strategic goals which still have not been addressed:

- Organize GIS efforts across state and local government agencies.
- Develop a core set of data layers that are kept up to date and made broadly accessible in a state managed data repository.
- Communicate and educate potential users and decision makers about the benefits and capabilities achieved by GIS Investments

Stakeholders cited key basemap data essential for a variety of agriculture related tasks. Stakeholders independently generated the same list of desired datasets that were included in the 2007 business plan. They include:

- Parcels
- Aerial Imagery
- Address Points
- Street Centerlines

8.1.1 Parcels

Currently, parcels are developed and maintained by municipalities or COGs. These datasets are often developed and shared independently, requiring users to contact individual municipalities or COGs directly. While some municipalities and COGs provide parcel data through interactive web viewers, rural communities often lack the capabilities to do so.

In 2018, Public Act No 18-175, stated that towns submit a "digital parcel file" to their corresponding COGs annually. These datasets are to include pertinent assessor information along with the parcel boundaries. Figure 4: Obstacles for Data Users



updated statewide parcel dataset, the act was unfunded and there are still several obstacles that remain.

1) The failure to uniformly use the Cadastral and Parcel Data Standards adopted by the CT Geospatial Information Systems Council. These standards were created to "establish common data elements and framework that will allow municipal cadastral datasets as defined by the Production Level Cadastral Standard to be merged and collated into a single statewide GIS dataset". Without all municipalities adhering to the same attribution, datasets cannot be easily merged. Currently, COGs lack funding to support migrating municipal data to the state standard.

2) The lack of an accurate, authoritative, town boundary dataset prevents the merging of parcel datasets. Currently, the boundaries are established by each municipality or COG resulting in data overlap or gaps between datasets. The state needs to have an authoritative boundary dataset that each municipality can adhere to. This would ensure parcel datasets fit together throughout the state.

8.1.2 Aerial Imagery

The State of Connecticut acquired aerial imagery in 2012, 2016, and 2019. These datasets have all been acquired at different resolutions and funded through

different sources. In 2016, the COGs collaborated to acquire statewide imagery and LiDAR data through the Regional Performance Incentive Program (RPIP) grant. In 2019 the state, spearheaded by OPM, worked with Massachusetts and USGS to acquire imagery for both states. Funding for the Connecticut imagery was provided by CT DEEP, CT DOT, CT DESPP, and NRCS.

To date, there is no imagery program to create standards and a regular imagery acquisition cycle. With the uncertainty of updated imagery, COGs and municipalities became responsible which increases costs and creates numerous datasets across the state.

8.1.3 Address Points

There is a lack of a regularly updated, easily accessible, standardized statewide address dataset. While most towns have addresses in their parcel datasets, the lack of standardized fields make the merging of datasets difficult.

However, the Department of Emergency Services and Public Protection (CT DESPP), does produce and maintain the most robust address point layer in Connecticut. This layer is based on parcel centroids and points are adjusted to building footprints when the correct building on the parcel can be definitively determined. The data lacks a clear update schedule as points are updated when towns provide CT DESPP with address changes or when a new address is discovered through a phone service. While this dataset is publicly available, CT DESPP lacks the infrastructure to provide the data in an efficient manner. Interested parties must reach out to CT DESPP directly and data is shared on a request by request basis. CT DESPP is currently working with CT OPM to make the data easily accessible.

8.1.4 Street Centerlines

CT DESPP also produces a CT 911 street centerline dataset which contains address ranges of each street segment. This dataset is shared quarterly with COGs through mailed DVDs. There are also street centerlines available through CT DEEP, CT DOT, and from aerial imagery collected by COGs and municipalities. The lack of an authoritative dataset creates uncertainty for users and the datasets also vary in geography and attribution, thus working with multiple datasets is difficult.

Recommendations: As evident by the establishment of the Connecticut Geospatial Information System Council in 2005, the "Funding Connecticut's Statewide GIS" business report from 2007, ongoing

Figure 5: Cost estimates from "Funding Connecticut's Statewide GIS Program" (2007)

State of Connecticut SSDI Construction		FY'08		FY'09		FY'10	
Coordinate and organize GIS Efforts							
 Staff Salary and Benefits 							
GIS Coordinator (Position Exists)	\$	-	\$	-	\$	-	
GIS Outreach Coordinator	\$	164,300	\$	172,515	\$	181,141	
Technical Manager/DBA	\$	108,500	\$	113,925	\$	119,621	
GIS Analyst (1 Currently exists)	\$	93,000	\$	97,650	\$	102,533	
2. Create State GIS Clearinghouse	\$	385,000	\$	75,000	\$	125,000	
Total	\$	750,800	\$	459,090	\$	528,295	
Framework Data Layers							
1. Statewide Orthophoto Program	\$	1,871,000	\$	450,000	\$	-	
2. Statewide Parcel Program	\$	850,000	\$	850,000	\$	250,000	
3. Statewide Centerline Program	\$	875,000	\$	475,000	\$	250,000	
4. Statewide Address Point Program	\$	250,000	\$	775,000	\$	775,000	
Total	\$	3,846,000	\$	2,550,000	\$	1,275,000	
Communicate and Educate			1				
1. Identify Initiatives and Build Champion Relationship	\$	20,000	\$	-	\$	-	
2. Develop Communications and Outreach Program	\$	55,000	\$	35,000	\$	25,000	
3. Develop Educational Materials	\$	35,000	\$	35,000	\$	35,000	
Total	\$	110,000	\$	70,000	\$	60,000	

efforts from the Connecticut GIS Network and discussions with agriculture stakeholders, there is a clear need for authoritative statewide data. Particularly for agriculture, missing statewide data impacts the ability to assess farmland through aerial imagery, the ability to preserve and acquire farmland through parcel information, the ability to report zoning classifications of agricultural parcels to ensure agriculture remains a vibrant land use, the marketing of agritourism, and the ability to efficiently move products and equipment on Connecticut's roadways. The following recommendations will help establish these datasets.

Long-Term: The formal creation of a well-funded, staffed GIS department, similar to neighboring states, would allow for the creation, maintenance, and dispersion of essential statewide datasets. The business plan from 2007 provided a detailed outline for the establishment of a Connecticut GIS Clearinghouse as well as approaches and cost estimates for the creation of the four main state datasets; imagery, parcels, address points and street centerlines (see Figure 5).

While the previous assessment provided a good framework, it is over 10 years old and outdated. Some of the IT infrastructure it recommended is obsolete or was not implemented. Significant changes in the GIS industry over the last 12 years, such as the development of Arc-GIS Online, were not included in the report.

The 2007 business plan should be updated with new cost estimates and implementation strategies based on current technology and costs. This assessment would

benefit from broad stakeholder outreach to ensure the GIS community in Connecticut has their concerns addressed. When the updated needs assessment is completed, the final report should be used to implement the proposed changes through the legislature. While cumbersome, this process would ensure the funding and staffing needed to properly develop these datasets.

Short-Term: The creation of a state GIS program has been the goal of the Connecticut GIS community for decades. Even if the needs assessment can be updated and legislation passed, it will take years for the department to get started and years after that to produce viable datasets.

In the meantime, Connecticut GIS stakeholders can continue to collaborate with the goal of creating datasets that can be integrated across municipal and COG boundaries. The Connecticut GIS Network has a Standards subcommittee which works with GIS users across industries to establish standards for different datasets. This group should focus on updating the cadastral standard and establish standards for addresses. These standards will need to be published, in a variety of formats, including geodatabase schema, on an easily accessible platform, such as the GIS Network website (www.ctgis. uconn.edu) to ensure usability among GIS professionals. CT DESPP should be an instrumental partner in developing address standards and should also work on establishing a regular update schedule and methodology for towns to provide updated data.

Parcel datasets should also continue to be shared through web applications. For smaller communities, web applications should be developed to provide easy access to the data. Often these rural municipalities have significant agricultural properties making access to their parcel information critical. The development of regional GIS applications, that combine parcels from multiple municipalities, would limit the number of sites users would have to visit to obtain parcel information.

For aerial imagery, the Connecticut GIS Network also has a Data Advocacy and Acquisition subcommittee. This subcommittee was created during the acquisition of the 2016 flight and worked in an advisory role to OPM for the 2019 flight. Until aerial imagery can be secured through a statewide GIS program, the Data Advocacy and Acquisition subcommittee will continue working with members and state departments to search for funding, establish flight standards, and identify means to distribute the final products. Finally, an authoritative street centerline dataset will only be compiled through collaboration between state agencies. CT DOT is currently working to establish an Enterprise GIS system and will be using their Linear Reference System (LRS) as their authoritative street centerline dataset. This dataset will need to be maintained and made readily available to users. Currently, CT DOT does not provide an easily accessible way to obtain road data. However, they are in the process of migrating to an Enterprise GIS system, which would enhance their data sharing capabilities, making acquiring roadway information easier in the future. It is recommended that other agencies adopt the LRS as their centerline network or modify their current datasets so they can work with the LRS.

8.2 IDENTIFY AUTHORITATIVE AGRICULTURAL DATASETS

According to data producers and policy makers, agriculture GIS data is being obtained from several different agencies. The most accessed data sources are: CT DoAG from which 24% of participants access their data; 16% obtain CT DEEP data; 15% obtain NRCS data; and 13% access GIS data from UConn (see Figure 6).

79% of the data user survey participants are using agricultural mapping products primarily from the USDA NRCS – Soil Web Survey, CT Shellfish Atlas, CT ECO, and data from municipalities (see Figure 7)

As noted previously, Connecticut lacks a central repository for GIS data. Even with regards to agricultural specific GIS data, the survey responders indicate no





clear repository. This has resulted in confusion for GIS users, duplicate datasets, and organizations scrambling to maintain data.

Recommendations

Long-Term: After the establishment of a state GIS program, an agriculture subsection should be incorporated into the GIS clearinghouse. The business plan for a Statewide GIS recommended the creation of a GIS Coordination Unit that would develop statewide datasets for inclusion in the clearinghouse. This assessment reaffirms the need for a GIS Coordination Unit to work with different stakeholders to retrieve and publish their data. The Coordination Unit would parse through data and establish which datasets are authoritative. The data inventory collected in this assessment requested metadata, including data stewards and updated methodology from pertinent organizations. This inventory and metadata will be essential in the creation of the final clearinghouse to find the most up-to-date dataset and remove potential duplicates. This process will be discussed further in Section 8.3.

Short-Term: As previously stated, the establishment of a state GIS Clearinghouse will take several years to accomplish. In the meantime, other avenues to improve access to agriculture GIS data should be explored. Several state agencies, including CT DEEP and the Bureau of Aquaculture, currently partner with UConn to make their mapping data available to stakeholders through different interactive map viewers and informational web pages. This coordination between agencies could be used as a template for other agriculture datasets.

The Aquaculture Mapping Atlas was developed by UConn's Center for Land use Education and Research (CLEAR) for the Connecticut Sea Grant Program, in collaboration with the Bureau of Aquaculture. It is available at http://cteco.uconn.edu/projects/aquaculture/ index.htm

The Aquaculture Mapping Atlas contains datasets provided by the Bureau of Aquaculture in an easy to use viewer and includes robust data documentation. Datasets are provided through ArcGIS Online. UConn accesses the services shared by the bureau and loads them into an intuitive web application. Sharing through this methodology ensures that the data in the viewer is the most up to date version

This methodology could be replicated to produce an Agriculture Mapping Atlas. This would require organizations to utilize ArcGIS Online to share their data through groups that share data with invited members. For example, UConn could establish a group and invite stakeholders from different agencies. Group members would access to view shared datasets and the ability to share their own datasets with UConn. UConn would digest the data and implement a similar viewer.

While easier to accomplish, this method would still require funding, staffing and infrastructure to ensure UConn could effectively host the data. The creation of the Aquaculture Mapping Atlas was an iterative process that has been ongoing for over 10 years. The development was partially supplemented by a \$50,000 grant and through matched staff time from state employees. Additional small grants were necessary for custom tool development and software licenses. An Agriculture Mapping Atlas would likely require more funds, staff time, and infrastructure than the Aquaculture Atlas had, as establishment would encompass a broader coalition of data.

Identifying Authoritative Datasets

To implement either the long term recommendation of sharing agriculture data through a state GIS clearinghouse, or the short term solution of replicating UConn's role as a pseudo clearinghouse, the agriculture community must agree on which agencies will generate the authoritative datasets.

A component of this needs assessment was outreach to stakeholders to collect all agriculture GIS data and potential GIS data in the state. Stakeholders were asked to fill out an Agency GIS Data Input Sheet, created for the Connecticut Data Portal. The input sheet includes data stewards and other pertinent metadata. Moving forward, this form should be filled out by all agencies providing GIS data and included in the CT Data Portal. This would ensure data is catalogued and data stewards are assigned for contact and maintenance.

As discussed in Section 6, there are numerous agriculture GIS data sources in Connecticut. While the inventory was a good first step, additional work is required to establish authoritative datasets. The establishment of a working group to convene regularly and continue the discussion of authoritative datasets is highly recommended. The working group could commence with members from the data producers and policy makers stakeholder meeting and expand to others identified in the future. As the regulatory agency in the state, CT DoAG should organize and lead the discussion. Unfortunately, CT DoAG currently lacks the staff to coordinate such an effort and it is therefore recommended that the department invest in a GIS Analyst position. This position would be a point person for coordination within the department as well as a source for other organizations to contact and share data with. The lack of a dedicated GIS professional in CT DoAG has resulted in the decentralized datasets currently available.

8.3 DATA PRIORITIZATION

As authoritative datasets become identified, they must be prioritized, which will ensure highly utilized datasets are easily accessible, and updated regularly. In addition to prioritizing existing datasets, there is a need to prioritize desired datasets as well.

Existing GIS Data: Agricultural GIS data that is currently being produced, discussed in Section 6, needs to be clearly documented and prioritized. The first step is making users and other producers aware of what datasets are available which will be further discussed in the following recommendations.

New GIS Data: In both stakeholder surveys, the lack of data was a major obstacle in utilizing agriculture GIS. For those agencies producing GIS data, staffing is the most common obstacle that prevents additional data development. Other hurdles include funding and IT support. Agencies that are not producing their own agriculture GIS data cite staffing, technical experience, and IT support as the barriers to GIS data development (see Figure 8).

Stakeholders listed the following datasets currently unavailable that should be developed for Connecticut:

Farm Information:

- Farms by production, or farm activity, including:
 - ° Livestock
 - ° Active versus fallow fields
 - ° Protected versus unprotected status
- Location of farm stands, farmers markets and community gardens
 - ° GPS location of farm stand
 - Attribution (hours of operation/produce available etc.)
- Public Act 490 Properties¹⁹

Farmland Management:

- Conservation and Forest Management Plan for preserved farms.
- Comprehensive soil dataset (including locally important farmland soils layer for each town and soil erodibility potential)

¹⁹ Public Act 490 allows farms, forests, or open space land to be assessed at its use value as opposed to its fair market value.



- Location of known groundwater well data results
- Nutrient reduction best practices
- Subtidal maps
- Mapping of sapropel²⁰ deposits
- Land cover and up-to-date land use change
- Prime soils
- Access to USDA's common Land Unit GIS Maps

Farmland Support:

- Road networks suitable for truck and equipment routing
- Location of agriculture infrastructure

Farmland Preservation:

- Comprehensive data on protected lands, including land protected by conservation and preserved farmland
- Priority farmland for preservation
- Historic farms

Recommendations:

Existing GIS Data: This section will focus on the most utilized datasets by stakeholders. Specifically, it will focus on agricultural datasets as basemap data (parcels, imagery, address points, street centerlines were addressed in Section 8.1). Currently they highest priority datasets are:

- Aquaculture Data
- Shellfish beds

- Shellfish master classification
- NRCS Soil Survey
- Preserved Farmlands

For best use, priority datasets need to be maintained, well documented, and readily available. The aquaculture data has met all those criteria and should be used as an example for other agencies to follow. The aquaculture datasets are documented in the CT Open Data Portal which provides information on the datasets including the data steward. The aquaculture data is also readily available through the Aquaculture Mapping Atlas. By sharing the data through an intuitive web application, the data is available to both GIS professionals and other users who may not be GIS savvy. This assessment recommends the aquaculture Mapping Atlas.

The NRCS Soil Survey is developed by the USDA who also developed additional layers for CT DEEP. These datasets include the Soil Survey Geographic database as well as Farmland Soils which was interpreted from the Soil Survey Geographic database. Currently, there are several ways to obtain the data; through the NRCS Geospatial Data Portal, as a geodatabase through CT DEEP site, or as a web service through CT ECO. Collaboration between CT DEEP and NRCS should continue to ensure this highly utilized datasets is maintained. Data stewards at both CT DEEP and NRCS should be identified and made available through the Open Data Portal.

Two preserved farmlands datasets are maintained by

²⁰ Putrefied marine deposits that may contain Vibrio bacteria.

the CT DoAG and Connecticut Farmland Trust. In the data producer stakeholder meeting, both agencies discussed the datasets and expressed concerns about overlapping data. This assessment recommends that the two agencies develop an update schedule in which the two agencies would share their data. As previously mentioned in Section 8.3, the development of a working group is necessary to document and develop authoritative datasets, including deciphering between duplicate datasets. There must also be coordination with USDA as these datasets may also overlap with the easements provided through the USDA's Agricultural Conservation Easement Program mentioned in Section 6.1.1.

CT DoAG completed the Data Input Sheet for their "Preserved Farm" layer. This data is available in Appendix A and will be shared with the CT Open Data Portal. The documentation will allow users to contact the data steward directly and get information on the update schedule. However, the "Preserved Farmland" dataset is currently only being shared internally. The bureau does not utilize ArcGIS Online but should move to this online framework to share the data. By sharing through ArcGIS Online, the data could be incorporated in a mapping atlas similar to the Aquaculture Mapping Atlas hosted by UConn.

NewGIS Data: The ability to produce additional datasets will depend on the coordination between organizations and increased GIS capabilities at CT DoAG. As recommended in Section 8.2 a GIS Analyst at CT DoAG would drastically increase the probability of the following datasets being developed.

Locations of Farms

The most requested GIS dataset by both data producers and data users was a dataset that contained all farms in the state categorized by farm activity. The Northwest Hills COG maintains a regional dataset containing farm locations but lacks metadata necessary to categorize by farm activity.

Currently, there are several non-GIS datasets that contain information that could be used to develop a farms GIS dataset. In the Connecticut Open Data portal, non-GIS datasets include inspection reports and CT DoAG licenses that contain farm information.

Public Act 490 Properties

Another dataset requested by users was a listing of PA-490 properties. PA-490 allows farms, forests, or open space land to be assessed at its use value as opposed to its fair market value. The information is available from each municipal assessor and could be collected when parcel data is aggregated for the COGs.

Location of Farm Stands, Farmers Markets & Community Gardens

The location of farm stands, farmers markets and community gardens, as well as attribution was another dataset requested. As mentioned in Section 6.2.1, CT DoAG currently lists Connecticut Grown information for Consumers on their website, https://portal.ct.gov/DOAG/ Marketing/Marketing/Find-a-Farmer .

Much of the information available on the Connecticut Grown website can be incorporated into an interactive web application. For example, using information from several publicly accessible sites, NVCOG developed geospatial data using the addresses listed. The viewer contains pertinent information such as goods sold, hours of operation, and links. Their viewer is described in more detail in Section 6.3, and is available at: https://nvcog. maps.arcgis.com/apps/webappviewer/index.html?id=e3f569eedc5c4c83871ffc1332c559d3.

Using this web application as a template, CT DoAG could create a similar application. Unfortunately, only the Bureau of Aquaculture utilizes ArcGIS online in CT DoAG at this time. Other bureaus would need to utilize ArcGIS Online capabilities or coordinate with other agencies (such as UConn) to act as a centralized repository. While it is feasible for each COG to present the data similarly to NVCOG, this assessment recommends one statewide application.

Datasets for Farmland Management

Several other datasets were requested that pertain to farmland management. Inspection reports are currently available in the non-GIS inventory from the Connecticut Data Portal. Providing this information in a non-public web application using the addresses associated with the inspection is recommended by this assessment. If the data was available through ArcGIS Online or ArcGIS Portal, inspectors could develop applications through the Collector for ArcGIS²¹ or Survey 123²² for ArcGIS to complete inspections and share the data immediately in ArcGIS Online.

Data user stakeholders also requested mapping of sapropel deposits, as it poses a risk to shellfish populations in the state. More information on sapropel can be found in Appendix G.

22 Form-centric data gathering app.

²¹ A mobile data collection app.

Datasets for Farmland Support

Data user stakeholders requested datasets that would support farm infrastructure and farm sales. This includes the locations of farm equipment suppliers as well as those of distributers that would be interested in surplus farm produce. Users stated that they often have extra produce and a database of where they could potentially sell this produce would be very beneficial. To develop these datasets, CT DoAG would need to coordinate with the business community to get location and contact information. A producer's site, similar to the Connecticut Grown website with agritourism locations for consumers, could be developed. Businesses that sell farm equipment or buy produce could provide their information to CT DoAG which would then distribute it through an online application.

Privacy Concerns: Individuals in both the data developers and policy managers, and data user stakeholder groups expressed privacy concerns with publishing farm locations. When asked if participants had concerns with agricultural information being included in a publicly accessible map, 79% said no, and 21% said yes. Public information concerns included the following:

- Agroterrorism
- Agriculture is often misunderstood and sometimes a negatively targeted industry.
- Livestock farms are targets for animal rights organizations.
- General privacy issues
- Developers could target farms to develop existing farmland

If a statewide farm dataset was developed, it should not be made publicly available. Through different security measures available through ArcGIS Online or ArcGIS Portal, access to the dataset can be restricted to credentialed users, such as federal, state or municipal employees. If an Agriculture Atlas is developed similar to the Aquaculture Mapping Atlas, detailed farm locations would not be included. Farm locations could be aggregated to a coarser resolution, similar to the USDA census data which provides detailed farm locations at the county level, before display on a public viewer. With more detailed information, the farm location could be aggregated to municipalities or census tracts.

8.4 DATA SHARING

Throughout this assessment, currently available agricul-

ture GIS datasets as well as datasets that need to be developed were documented. This assessment also discussed the methodology to share this data with the appropriate community. Currently, the top platforms agencies use to share data include email, ArcGIS Online or ArcGIS Server (see Figure 9).

Agencies experience obstacles when sharing data with agriculture stakeholders that include funding, infrastructure, and the consumer's technical ability. Other reasons included technical expertise and IT support (see Figure 10, page 24).

Recommendations: Data sharing has been discussed throughout this assessment. To summarize, data should be shared from a centralized repository when applicable. Ideally, a state GIS program would establish a statewide GIS Clearinghouse. Until the state develops the infrastructure necessary for a complete repository, agencies such as the CT DoAG or UConn could serve as pseudo repositories.

Data should be shared through intuitive web applications that reduce the need for GIS expertise. This would support the largest user community. Data should also be available via download to allow further analysis from GIS experts.

Finally, privacy concerns are critical to consider when sharing farming data. Sensitive datasets, such as farm locations, should not be distributed publicly without restraints. However, these datasets are important for state





management of agriculture and should be available to permitted parties. This can be done through ArcGIS Online or ArcGIS Portal's use of restrictive user access.

9 | IMPLEMENTATION

Section 8 provided short and long term strategies to address the current needs of the agriculture community. The implementation of these recommendations is key to mitigating the obstacles facing data developers and end users, and efficiently improve the use of agricultural GIS. The following provides a timeline for implementation.

0 – 6 Months

- Form a working group comprised of state, regional, and municipal stakeholders to discuss authoritative datasets. As the regulatory agency in the state, CT DoAG should organize and lead the discussion. Unfortunately, CT DoAG currently lacks the staff to coordinate such an effort and it is therefore recommended that the department invest in a GIS Analyst position. This position could serve as the point person to lead the working group and discuss topics such as:
 - Maintenance of priority datasets discussed in Section 8.3.
 - Maintenance, including designating data stewards, for existing datasets not included in this assessment.
 - Assigning data stewards to create desired datasets discussed in Section 8.3.

- Establish ArcGIS Online accounts for additional bureaus in the CT DoAG. Currently, only the Bureau of Aquaculture utilizes ArcGIS Online. This effectively acts as a barrier between bureaus as they are in different locations that do not share GIS infrastructure. Implementing ArcGIS Online would enable sharing as well as the development of web applications.
- The Connecticut GIS Network though the Standards Committee should begin updating the Cadastral and Parcel standards as well as develop standards for address points. The Data Acquisition and Advisory Committee should begin discussion of another aerial flight for 2022.
- The Connecticut GIS Network should organize a working group to discuss updating the 2007 Business Plan "Funding a Statewide GIS in CT". This would layout the structure for a state GIS program.
- Advanced functionality should be developed in the Aquaculture Mapping Atlas. Currently underway are workflows that provide outreach to users when shellfish beds are closed.

6 - 12 Months

• Begin developing web applications for data that can be easily integrated. Once CT DoAG bureaus have established ArcGIS Online accounts, and data has been prioritized through the working group, web applications can be created. The agritourism information on the Connecticut Grown website should be the first data converted into a web application. Data developers could use the web application developed by NVCOG as an example.

- Begin developing desired datasets. Through the working group, current data gaps addressed in this assessment should be prioritized. Once authoritative agencies have been assigned through the working group, data can be developed.
- Standards developed through the Connecticut GIS Network should be published on the Connecticut GIS Network website and distributed through Network meetings. These standards will enable users across the state to develop basemap data that can be integrated between organizations while a state GIS program is being developed.
- The working group should finalize the update to the business plan for developing a state GIS program.

12 - 24 Months

- Once datasets have been developed and prioritized, stakeholders should begin the development of an Agriculture Mapping Atlas. The Atlas could be developed through CT DoAG, or as recommended, through UConn following the template from the Aquaculture Mapping Atlas. The data prioritization working group should designate datasets as sensitive or non-sensitive and only publicly share the non-sensitive data.
- Sensitive datasets should be shared between authorized users through ArcGIS Online or ArcGIS Portal. This could be administered by CT DoAG or a cooperating agency such as UConn.
- The Connecticut GIS Network should use the updated business plan with the state legislatures to formally create a state GIS program through legislation.

24 Months +

- The Agriculture Mapping Atlas should become publicly available. Updates would continue through ArcGIS Online.
- Sensitive data should be shared with authorized users to enhance oversight and management of agriculture.
- The state should establish an authoritative GIS program which develops and maintains statewide basemap data.
- Specialized web applications should continue to be developed as needs arise.

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Stakeholders

Connecticut Department of Agriculture Connecticut Department of Energy & **Environmental Protection** Connecticut Office of Policy & Management Connecticut Resources Conservation & Development The University of Connecticut Connecticut Environmental Conditions Online Center for Land Use Education & Research **Connecticut Sea Grant** Connecticut Farm Bureau Connecticut Council on Soil & Water **Connecticut Farmland Trust** The Northeast Organic Farming Association of Connecticut Working Lands Alliance The United States Department of Agriculture The Natural Resources Conservation Service American Farmland Trust Connecticut Conservation Districts Council of Governments Hartford Food System City Seed The Lebanon Agriculture Commission



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