



Chaffee County and Planning Collaborative GIS Assessment

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Executive Overview

Geospatial data is becoming more and more ubiquitous, and it is important for organizations and governments to organize, standardize, and cooperate in the implementation and application of geospatial capabilities. Hence, a holistic approach for handling all geospatial data, technology, and processes is recommended. It starts with a review of the entire geospatial process throughout the organization, exploring new technologies and processes, and learning how others are using their geospatial infrastructure.

Argis completed an assessment of the current state of GIS for Chaffee County and the planning collaborative members, which include the Towns of Buena Vista, Poncha Springs, and the City of Salida. This assessment allowed Argis to review who is doing GIS work, what type of work they are doing, and what data they have and maintain.

The review produced a variety of results, but the overall concerns of the condition and current use of GIS were similar from organization to organization. The key general themes are as follows:

- Team members are positive and excited about GIS and are looking for ways to improve their organizations through GIS.
- Team members did not know how to find the data they need.
- Team members felt undertrained and unable to effectively use and gain all the value from the GIS tools they have available.
- Team members felt they did not have effective access to data and did not know how to share their own data to make it easy for others to access.

There were a few cases of more advanced GIS usage and methods throughout the organizations. These cases still had the overarching themes listed above where the challenges of sharing data and data access would persist.

Argis proposes that the organizations focus their efforts on two primary directions. The first is team training. Almost every single person wanted some form of training and felt that their knowledge of GIS and GIS technologies could be improved, and this would help them overall. The second is building a GIS infrastructure that is shareable and accessible through effective use of modern cloud technologies.

By tackling these two areas, the planning collaborative will gain an organization skilled in creating, maintaining, and publishing GIS data, and an infrastructure that can visualize and share that data to those that need it, whether in the public or within the various municipalities.

Current State

A Geographic Information System (GIS) is a computer system that analyzes and displays geographically referenced information, or data that is attached to a unique location on the earth. The strength of GIS is its ability to create distinct map layers for different types of information, and then to combine those layers in any way desired or needed. Each layer consists of geographic, or spatial, data linked to descriptive tabular information. In combining layers, GIS uses known earth coordinates (like latitude and longitude) to make sure each layer lines up correctly with the others.

Many routine operations of government are tied to a location and rely on the use of geographic information to accomplish goals. For example, a municipality might want to know how suitable different

areas of the town are for development. GIS can be used to generate maps showing where various conditions exist: prime agricultural land, surface water, high flood frequency, and highly erodible land. Planners can then use this information to make decisions about zoning designations and building permits.

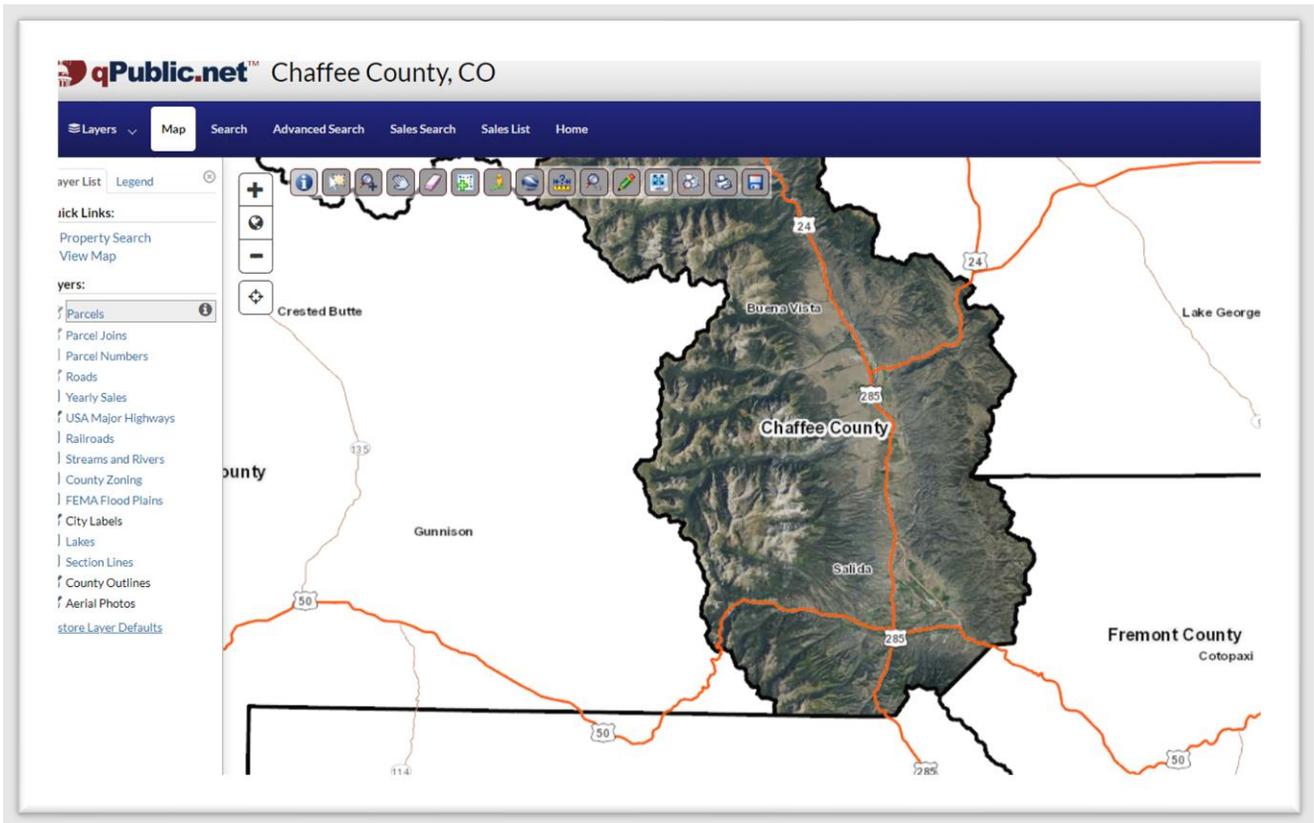
Through a series of interviews, we were able to gather information about the current state of GIS throughout the county and municipalities of Chaffee and break it down into three categories: GIS backlog, GIS pain points, and GIS goals.

There is a unanimous need for GIS throughout the various organizations but a lack of access and expertise to the necessary tools, limiting the execution of GIS tasks such as creating, viewing, managing, and sharing necessary data. Most groups are currently using minimum GIS to address immediate and internal needs and have a strong desire to create data that can be easily shared at various levels within their organization, throughout the county, as well as providing needed information to the public.

Chaffee County

<https://www.chaffeecounty.org/>

Most of the GIS efforts and data currently in use at the County are generated and maintained by the County Assessor's office. The [Chaffee County map](#) is interactive and accessible to the public on the County website. Departments throughout the County have a need for additional GIS resources beyond the online map and layers available to support projects such as redistricting, planning, and development.



Chaffee County GIS Professionals

There are several County employees with GIS experience, but they are spread throughout several departments, and communication is limited:

- Office of Emergency Management - Rich Atkins, 9 years of GIS experience
- Planning Department - Christie Barton, 3-5 years of GIS experience
- Assessor's Office - Dean Russell, 10+ years of GIS. Provides most of the GIS data used throughout the County and municipalities.
- County IT group – Years of GIS experience unknown. Handles on-the-fly map requests: transportation routes, etc.

GIS Backlog

1. Data – Several GIS data initiatives are needed through the county.
 - Chaffee County Evacuation Plans
 - Mapping Hazard Mitigation Plan
 - Situational Awareness Procedures for damage assessment
 - Debris Management
 - 911 CAD system for first responders
 - Map of Emergency Help Spots located throughout the County
 - Comprehensive Plan implementation
 - Capital Improvements Plan
 - Infrastructure study
2. Access and Management – Additional backlog to visualize and access data and then update it as required.
 - Wildlife habitat and slope
 - Transportation Plan to Multi-modal Transportation Plan
 - Subdivisions, boundaries, deeds, covenants, and associated documents
 - Cell phone towers
 - Solar farm locations
 - Infrastructure/planning and development
 - Storm water systems
3. Cloud GIS – There are existing needs for cloud GIS for internal/external sharing and visibility.
 - Chaffee habitats
 - Focused development to sustain wildlife

GIS Pain Points:

GIS pain points for the County are focused on data, access to data, and resources with time and the expertise sufficient to deliver GIS needs.

1. The data available are:
 - Disseminated and difficult to access
 - The data available is often in many different formats, some of which I do not have the proper software to open.

- The data available is in various places on a network that I do not have access to.
- Receiving layers associated with my municipality is expensive. I provide the data to the county and get charged to receive it back.
- Inaccurate or incomplete
 - The GIS layers available are limited and are not relevant to my department.
 - The GIS layers provided for my department or municipality are often not the most current, or the data is inaccurate.
- Naming conventions not intuitive
 - The internal data layers available for my municipality are not given intuitive names and I have a hard time finding what I need.
- Hard to edit
 - The data layers provided are not enabled for editing (updating or modifying) by anyone other than the creator of the data layer.
- Not coordinated and connected with surrounding and unincorporated areas
 - Some municipalities share utilities that are maintained by a neighboring municipality. Therefore, they might have data that I need but I do not know what they have.
- Difficult to use for analysis
 - The data layers provided are difficult to query for analysis such as extracting the amount of planning and development to document change over the years.
- Need a viewing platform that does not require an expensive GIS license
 - I do not have access to mapping software, but I still need to access maps on my desktop and tablet for field work.
 - I would like to provide maps that are accessible to the public, who will likely not have access to proprietary mapping software.
- Static data
 - The PDF and online maps need to be more interactive to be useful.
 - PDF maps are provided but they have too many layers and I cannot turn them off. I need to be able to see what is displayed underneath that might be more relevant to a specific project or data-gathering effort.

2. Resources

- Insufficient GIS backup
 - GIS would make our jobs more efficient, but there is no one to do the GIS work except me for my department or team.
 - I am overwhelmed with GIS data requests and maintenance for the county departments and various municipalities.
- Delayed data request fulfillment
 - There is a wait for GIS data deliverables.
- No access
 - Groups within the County do not have access to active directory servers and firewalls separate various departments.

- No access
 - The only publicly available online map is the assessor map.
 - I do not know what data is available.
 - I must send an email requesting data and refer to the email string for locations and links.
 - The online maps created for the Envision Chaffee County are not available on their website.

GIS Goals

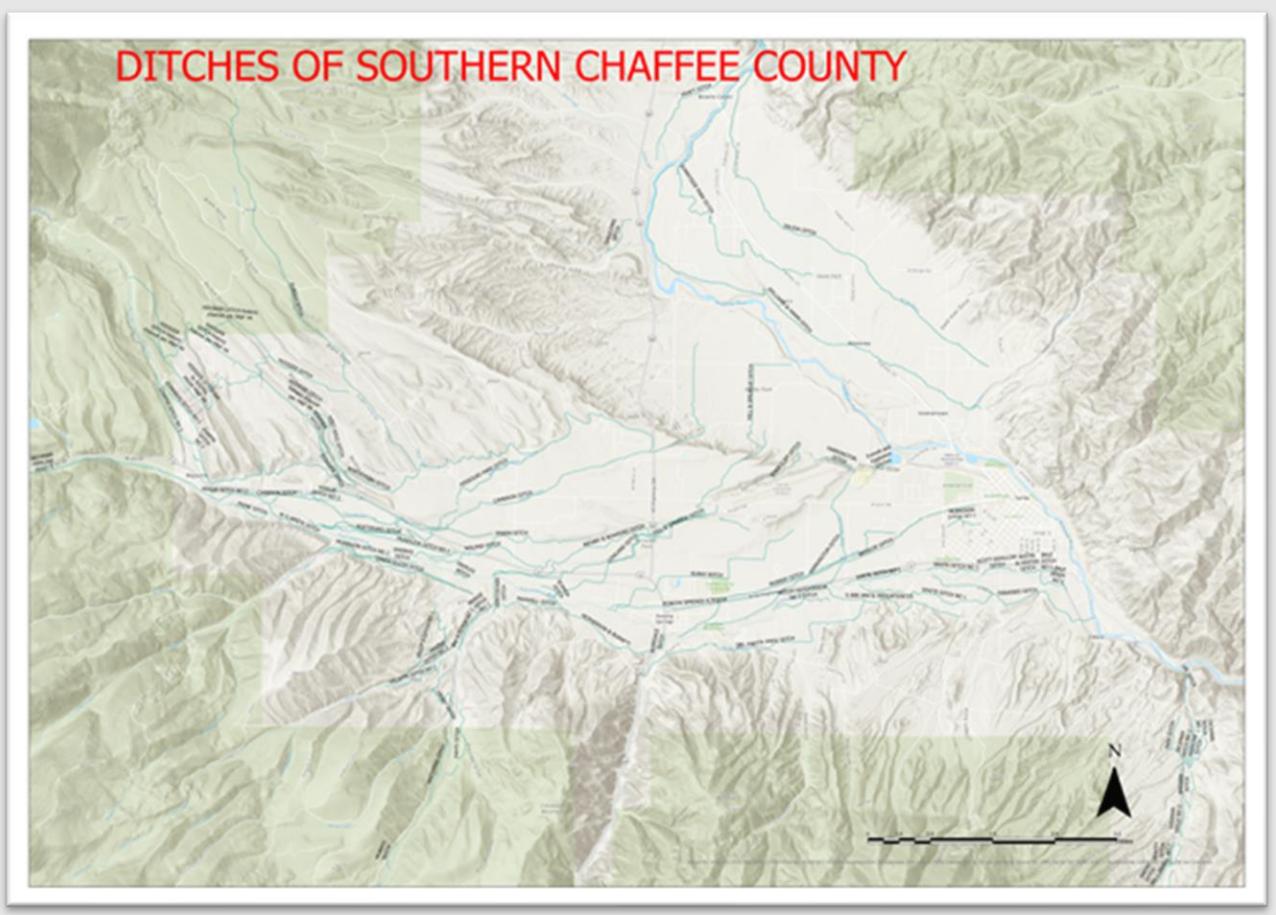
The County team is enthusiastic about GIS and excited to have a more robust system in place with better access to use it in day-to-day activities. Primary needs revolve around access to the data, tools, the ability to visualize data, as well as training to use those tools and data.

1. Enterprise GIS
 - To better interface with the community
 - Better use of GIS technology
 - To link data throughout the organizations and make it easily accessible in one place
2. Data
 - Create building footprints
 - Create publicly available online maps
3. Trainings
 - ArcGIS Pro
 - ArcGIS Online
 - Advanced subjects:
 - Editing workflows
 - ArcGIS Online administration
 - Data publishing workflows

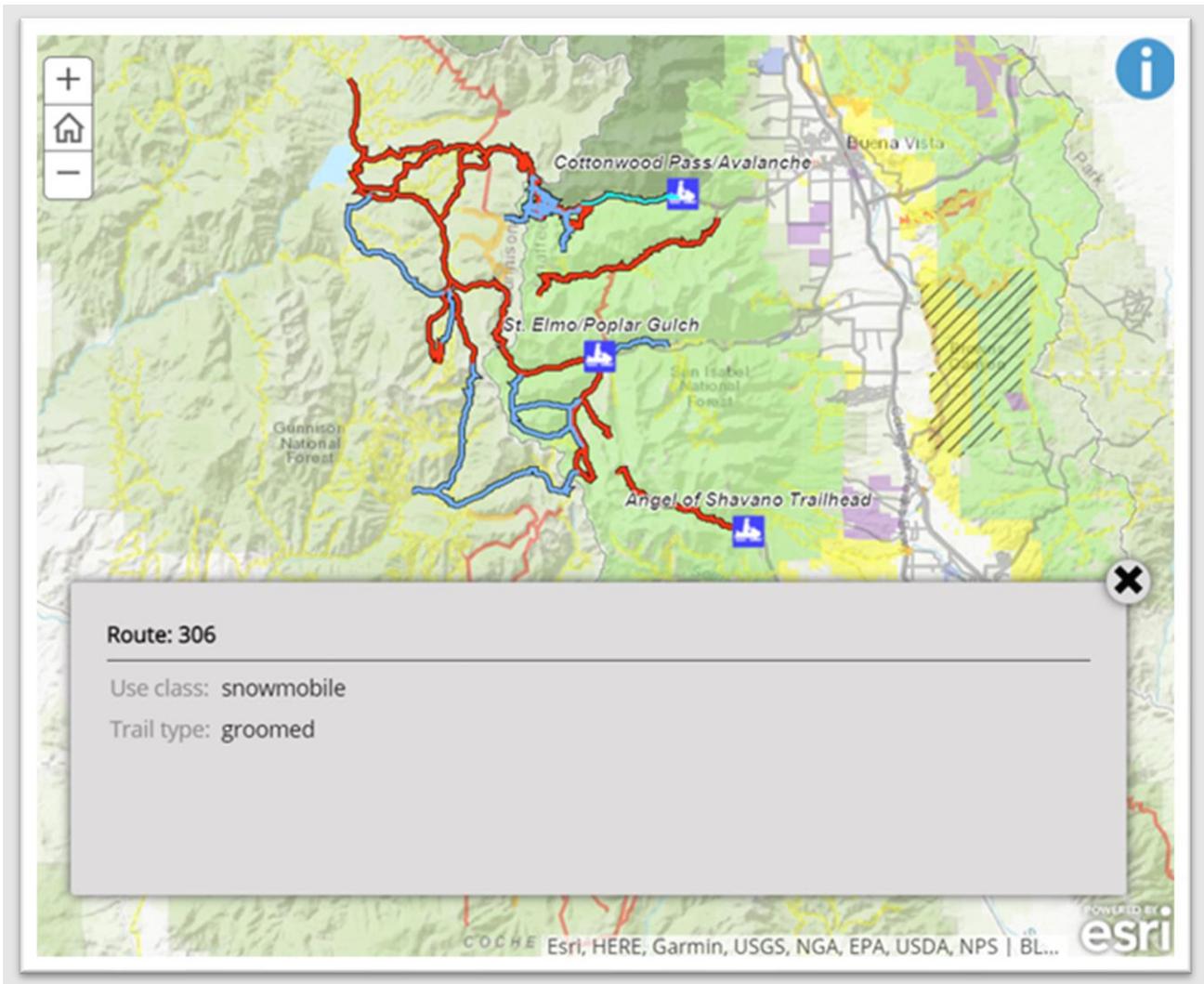
Buena Vista

<https://buenavistacolorado.org/>

Buena Vista owns and manages their own GIS data and tools. The focus of this team is primarily on parcel and utility data management. Data and analysis for the Town are primarily used internally and provided through static maps with no option to pan or zoom to locations of interest.



USDA recreational maps are also available at buenvistacolorado.org/map. The coverage area includes the entire county, rather than just the Town of Buena Vista, as a user searching the Town's website might expect. Users can pan, zoom, and (as shown below) select individual trails for additional information on the USDA map.



GIS Professionals

The Town has one primary GIS professional. He focuses efforts on data management and coalition. Primarily skilled in esri's ArcGIS Desktop software, most GIS work is completed using a desktop computer with analysis performed at the desktop level as well.

GIS Backlog

Buena Vista is primarily focused on data creation through the digitization of paper maps. This makes data accessible throughout different departments within the organization. They hope to move data to a cloud and make it accessible outside of their organization to the county, neighboring municipalities and the public.

1. Digitizing paper maps and stop adding to the paper pile
2. Move to cloud GIS environment
3. Generate interactive GIS data for internal and external users

GIS Pain Points

Buena Vista's pain points include a need for data access and visualization of that data. Additionally, there is a need for training on the tools required for managing the data once they have it.

1. Data

- I need current data to do more accurate and efficient analysis such as
 - identifying patterns and trends
 - new and current development
- Paper maps
 - We have only paper maps to use as points of reference in the office and in the field.
 - I have no way of digitizing paper maps.
- No topography data
 - We have different building regulations based on various elevation levels. The topography maps available only show elevation at every 40 feet, it would be helpful to have data for every 10 feet.
- Assessor data
 - The data available for the Town is outdated, often wrong, and/or missing information.
- No historical information for infrastructure
- Aerial imagery
 - Aerial imagery available is 10m resolution.
 - Aerial imagery provided is outdated.
- Receiving layers associated with my municipality is expensive.
 - I provide the data to be updated and get charged to receive it back to me.

2. Resources

- There are minimal staff with GIS skills to keep up with our needs.
- We do not have the data that we need.
- Searching for third-party data available online takes a lot of time.
- Asset management software is needed to improve and speed up field collection for efficiently managing infrastructure and utilities.

3. Field Capability Needs

- Tablets and GPS equipment would be useful for field workers to update and track resources in the field.
- Public works teams require access to maps for field collection in areas that have no internet access.

4. Quality Assurance

- ☒ The necessary data to manage Town assets is not available.
 - I use what I can find online and cannot verify the accuracy.
 - We need accurate and current data for light poles, sewer system, building footprints, subdivision plots, and special event maps.

GIS Goals

Buena Vista's goals align with the others throughout this report: they require access to current and accurate GIS data, training, and visualization. Their goals also extend to providing public access to GIS information, and they would like tools to give better service to their constituents while relieving pressure on staff.

1. Data

- Public maps: online property information and historical records
- Accessing historical maintenance data on infrastructure
- Mapping for special events, current street closures, construction, housing counts, etc.
- Accurate topography data (every 10 ft.)
- Not adding to the paper-map pile
- Interactive PDF zoning map online

2. Training

- ArcGIS Pro
- ArcGIS Online
- Advanced subjects:
 - Field tools
 - Editing workflows
 - ArcGIS Online administration
 - Publishing workflows

3. Resources

- An asset management system for locating utilities and breaks
- Cloud environment
- Access to data in the field
- Capital support for GIS

Poncha Springs

<http://ponchaspringscolorado.us/>

Last year, Poncha Springs worked with North Line GIS, a local GIS services company, to help digitize and organize data layers that were previously only available in paper format. North Line scanned and digitized all the paper maps and made them available online. Currently, Poncha's maps are only available for internal use and provide no mapping resources to the public.

GIS Professionals

Poncha has one GIS professional on staff solely responsible for managing the Town GIS data. It is a part-time effort and will remain so for the foreseeable future.

GIS Backlog

Poncha is perpetually in data verification and creation phase, focusing on validity, accuracy, and completeness.

1. Verify water infrastructure

2. Data accuracy
3. Adding new infrastructure

GIS Pain Points

The pain points revolve around the limitations on time to dedicate to GIS work. The knowledge is limited and therefore is in danger of being lost when that resource leaves or retires.

1. Resources

- We have a need for access to shared data from neighboring municipalities.
 - The data necessary is not publicly available for ease of access or sharing.
 - I do not have the necessary applications to open and use data when it is shared.
 - It is difficult to share data with the applications that I have available to me.
- Data and resources available for the town are not easily accessible or in a common location.
- GIS knowledge is not documented. When the person who created the processes and workflows leaves, the institutional knowledge goes with them.

GIS Goals

The Town of Poncha Springs is looking for ways to make data more accessible and accurate while minimizing the effort to make this happen. Additionally, they could use training to learn more about what they can do with the tools available to them and better understand what GIS features and functions would be of benefit.

1. Data

- Real-time data updates
- A designated GIS resource such as a GIS technician or GIS analyst available to help implement and alleviate the GIS needs and backlog.
- Reduce redundancies
- Establish an online GIS platform

2. Training

- ArcGIS Pro
- ArcGIS Online
- Advanced subjects:
 - Editing workflows
 - Field operations
 - ArcGIS Online administration

Salida

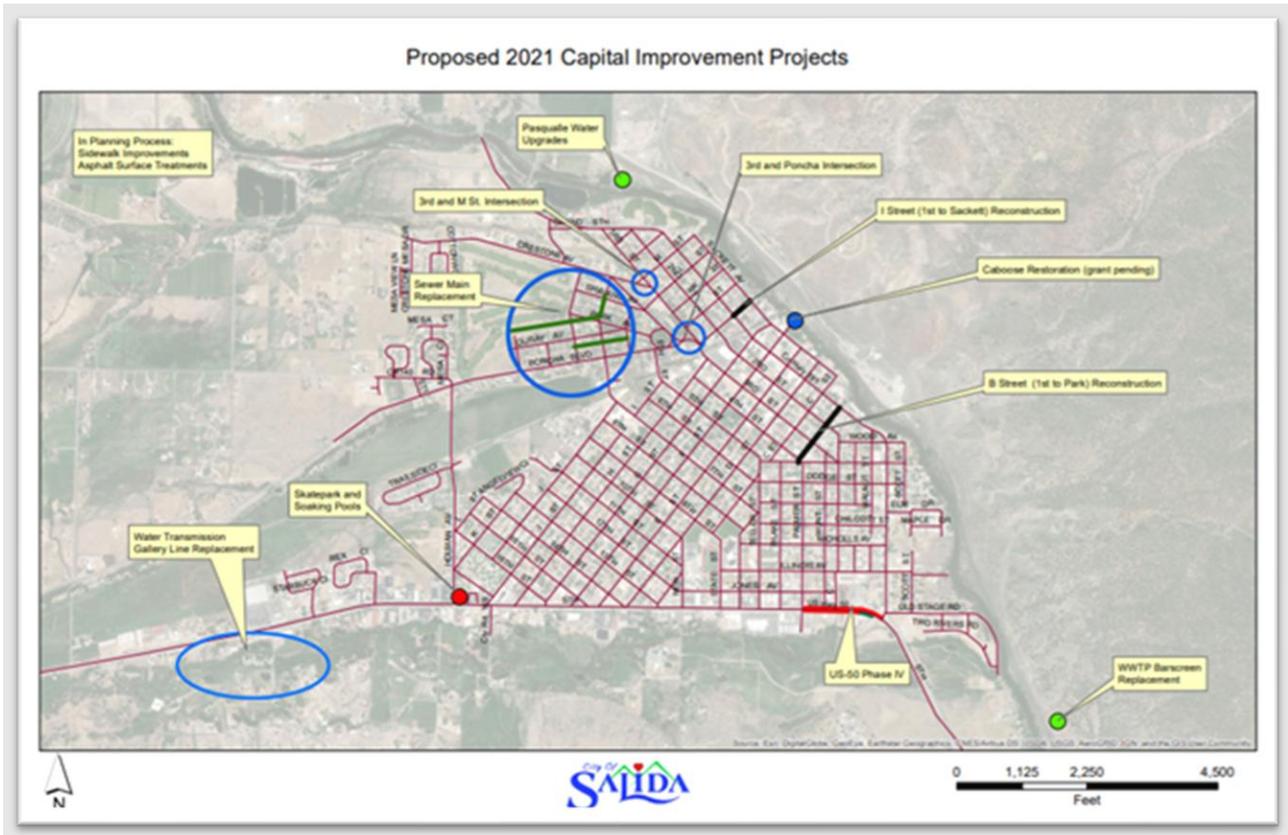
<https://cityofsalida.com/>

The City of Salida is an active leader in GIS and has collected a large amount of data for their city. They have similar challenges as the other municipalities when it comes to data acquisition, visualization, and training. Salida provides limited availability for public maps, such as third-party [historical maps](#) detailing

Salida from 1883 to 1914. All maps are published in static PDF format, providing no dynamic layers for viewers to turn on or off for better visibility.



Sanborn Fire Insurance Map



GIS Professionals

Salida has a team that supports GIS, including one part-time GIS technician who manages and develops the data on a day-to-day basis.

GIS Backlog

Salida would like to primarily focus on data organization and make sure that more than one or two people understand the data and how to use it. They would like to make their data available to other departments and on their website for public consumption.

1. Data

- City website updates are difficult (see GIS Pain Points below), and therefore no maps are currently available on the city website.
- The planning department does not have access to the resources required to implement planning and parcel data set updates.
- Access is needed to regularly updated base maps to use beneath city data layers.

2. Resources

- The GIS workflows currently in use are not documented. It is all institutional knowledge. The City is at risk of losing information when employees with GIS expertise retire or leave.
- No inventory of agency data is available.

GIS Pain Points

One of Salida's primary pain points is tracking down third-party GIS data that could benefit the City.

1. Data

- As much as we try, there is still outdated and missing city data sets.

2. Resources

- The website was created by a contracting company for the City to be able to add PDF maps. But uploading the links to those maps is proving difficult and departments are not able to complete the data uploads.
- There are many third-party GIS companies providing data relevant to the City. Inventorying third-party GIS data is time consuming.

GIS Goals

Salida's GIS goals focus on data, training, accessibility, and visualization.

1. Data

- Share data city-wide
- Automate updates
- Public access for planning
- Public amenities maps: public parking, recreation, pedestrian access, trails/scenic walks
- Create and update infrastructure layers
- Incorporate GIS throughout the City (OpenGov for financial reporting)

- Integrate a bigger asset management system that will keep up with future growth
2. Training
 - ArcGIS Pro
 - ArcGIS Online
 - Advanced subjects:
 - Esri 3D
 - Esri Scene
 - Editing workflows
 3. Resources
 - Framework improvements
 - Coordinating City and County goals

Organizational GIS Infrastructure

Esri provides a popular suite of GIS tools for creating, managing, and sharing data. The following Esri licenses are purchased and administered directly by each organization:

Chaffee County	
Noxious Weeds	ArcGIS Online GIS Professional Basic Term License
	ArcGIS Tracker for ArcGIS Online Term License
Office of Emergency Management	ArcGIS Desktop Advanced One Year Timeout for Personal Use License
Assessor's Office	ArcGIS Desktop Advanced Concurrent Use Perpetual License
	ArcGIS Publisher for Desktop Concurrent Use Perpetual License
	ArcGIS Desktop Basic Single Use Perpetual License
	ArcGIS Desktop Basic Single Use Perpetual License.
	ArcGIS Desktop Basic Single Use Perpetual License.
Town of Buena Vista	
Planners Office	ArcGIS Desktop Basic Single Use Perpetual License.
	ArcGIS Desktop Basic Single Use Perpetual License.
Salida	
Public Works Dept.	ArcGIS Desktop Basic Concurrent Use Perpetual License
	ArcGIS Desktop Basic Concurrent Use Perpetual License
	ArcGIS Desktop Basic Single Use Perpetual License.
	ArcGIS Online Viewer (Formerly Named User Level 1) Term License
Administration Office	ArcGIS Desktop Basic Concurrent Use Perpetual License
	ArcGIS Desktop Basic Single Use Perpetual License.
	ArcGIS Desktop Basic Single Use Perpetual License.
Poncha Springs	

Managers Office	ArcGIS Online Creator (Formerly Level 2 Named User) Term License
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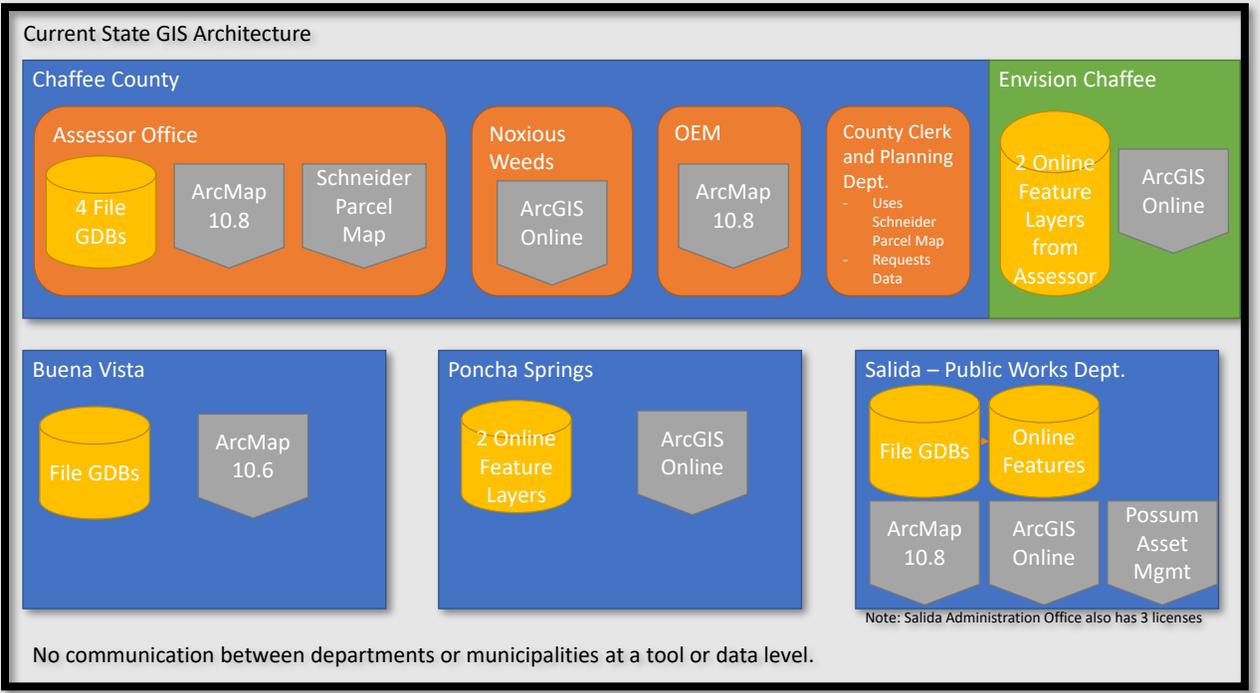
Throughout **the County** not all users have access to the network where most GIS data lives and clearing the firewall is problematic. This creates difficulty sharing data and delegating GIS responsibility. County email is not synced across devices (computer, tablet, phone, etc.) making it challenging to access data across various devices in the office and out in the field. Thus, data is shared through personal email or OneDrive.

In addition to Esri products, the Office of Emergency Management has implemented [MARPLOT](#), part of the CAMEO software suite; [WebEOC](#), for emergency management; Google Maps, for addresses; and free online GIS applications to complete GIS tasks.

Buena Vista uses an ArcGIS 10.8 single use license, with no access to ArcGIS Online, but they would benefit greatly from utilizing cloud infrastructure.

Poncha Springs uses Google Drive to access data across platforms and ArcGIS Online to reference digitized paper maps. Trimble Geospatial Positioning Systems (GPS) are used by the Public Works crew to acquire data in the field to update infrastructure and utility maps.

The **City of Salida** is using the latest version of ArcGIS Desktop and ArcGIS Online to manage and share GIS data throughout the City.



The figure above is a representation of the current GIS architecture within the County and municipalities. The diagram’s symbols are defined as the following:

- Blue boxes are each a distinct municipality.

- The green box is the sub-organization, Envision Chaffee.
- Orange boxes are departments within the County.
- Yellow cylinders are the data structures. Mostly these are file geodatabases or groupings of shapefiles in folders.
- Gray arrows name specific GIS applications that are in use by various personnel.

GIS Workflows & Commonalities

The County Assessor provides most of the GIS data used throughout the County and municipalities. They maintain three or four file geodatabases categorized by administrative, parcels, subdivisions, transportation, hydro, etc. These geodatabases can be accessed through the Assessor website, www.chaffeecounty.org. In addition, the Assessor's office generates and maintains the web maps for the Envision Chaffee County community project, <https://envisionchaffeecounty.org/>.

The maps generated from the county are beautiful but the data available for independent GIS use is too dispersed to be useful. The layer naming convention is not intuitive, making it hard to find things. Data requests are filled months after they are requested and after they are needed. Web GIS access is limited and updating or creating new layers is difficult.

Third-party data sources for GIS information are used in addition to county data provided. These publicly available layers include www.arcgis.com, neighboring county maps found online, Esri Living Atlas, Forest Service and BLM layers for Colorado, public layers from ArcGIS Online, Esri dashboards, and census data.

Buena Vista

The Town of Buena Vista has three geodatabases, but the data is not current or detailed enough to do efficient analysis, such as tracking current or historic development. The Town does not have the ability to generate or maintain their own data. The process to update the data they have is expensive and time consuming. Therefore, it is difficult to maintain or edit for accuracy. New data is provided in paper map format rather than a digital version. This contributes to the backlog of paper maps to be digitized for use in the field or sharing with the public online.

Poncha Springs

Poncha Springs utilizes GIS data that they create as well as county data shared through email links. Paper maps used for reference in most GIS projects were digitized in 2020 by North Line GIS, a third-party GIS company, and are now accessible online in PDF format. The data now needs to be verified for accuracy and new infrastructure added as it happens. There is an urgent need to share infrastructure and utility data with neighboring municipalities.

Salida

The City of Salida's data is dispersed based on type (infrastructure, utilities, etc.) among several geodatabases stored either locally on a desktop or in a city-wide shared GIS folder. Many of the City maps are accessible through ArcGIS Online, but only to internal users. They currently have no publicly accessible data but would like to be able to share what they have with other city departments and the

public. Salida tries to utilize local data made available by local GIS companies but does not have the resources to inventory and catalog all the third-party data available.

GIS Data Dictionary

The Data Dictionary details the various data sources available from each municipality. There were approximately 1,215 layers identified between the County and four municipalities. Please refer to the [Data Dictionary](#) Excel spreadsheet for detailed information about each layer. The contact information for the GIS representative for each organization is as follows:

- Chaffee County: Dean Russell
drussell@chaffeecounty.org
- Town of Buena Vista: Doug Tart
dtart@buenavistaco.gov
- Town of Poncha Springs: Brian Berger
manager@ponchasprings.us
- City of Salida: David Lady
david.lady@cityofsalida.com
- Colorado Department of Public Health and Environment
[CDPHE Open Data](#)
Devon Williford
devon.williford@state.co.us

Future State

Chaffee County and the municipalities contained therein have an excited group of personnel passionate about making GIS better for their organizations. Each organization has worked to get a basic GIS established and have built core data to help achieve their organizational goals at varying levels. This planned future state goal is to achieve a GIS architecture that allows for easy data sharing, both between departments and organizations and with the public in the future.

To achieve this goal, two primary activities need to occur. First, provide training for those involved so they can make the most of the modern tools that GIS technology, specifically Esri, have to offer. Second, make data available, accessible, and easy to find is key.

Training will not only empower each department and individual to better contribute to the overall data fabric of the County, but also educate others on the possibilities that come with a robust, integrated GIS solution. This will bring about ideas and focus direction for the future.

The efficiency of available data will free up time and resources. Move data to a shareable platform, and train people to use those platforms. This shareable platform will open opportunities, not only for data available among the municipalities, but also for the public and advanced workflow applications such as:

- Field Data Operations
- Integrated Asset Management
- Integrated Emergency Response Plans

This list can be expanded for all spatial needs of the area. Once the data is available and established, the collaboration can turn to advancing workflows for data creation, data maintenance, general portal administration, and specific work functions. The data will be available, and tools exist for advanced analytics and workflow, creating value throughout the region.

Finally, a key to succeeding in this overhaul of the GIS organization is establishing a GIS oversight group within the County and municipalities. Initially, this group will share changes in the data dictionary that occur in their respective organizations. However, as the tasks laid out in this plan start moving forward, this committee will help roll out each of these goals, updating them as time and requirements change the direction of the organizations. Setting up a 30-minute GIS standup every other week is recommended. The standup would cover what was accomplished this period with GIS, any data changes (assign an owner to the data dictionary to be updated accordingly) and identify any data needs. The effort will pay off in the long run with more efficiency and the freeing up of resources.

GIS Infrastructure/Tools

Argis recommends that each organization continue to hold their own license agreement with Esri. In discussions with Esri, it was determined that this would keep each organization within good license agreement and allow them to cooperate through Esri's ArcGIS Online cloud platform. The following section details a basic license structure and example costs to give a ballpark estimate on future costs for Esri licensing for the County and all municipalities.

In discussions of this infrastructure with Esri, they have shared several options for each organization. Chaffee County could possibly benefit from an Esri Enterprise Agreement (EA). Each municipality does not show a license count need large enough to worry about an EA but will have some licenses increase

so that more people in their organization will have access to the ArcGIS Online implementation for their organization.

Your Esri representative is Bryn Brum (bbrum@esri.com). Argis is happy to help your organizations get quotes for the final and accurate license counts. What is included here is estimation only, for the purpose of guiding towards a future state identified in this document.

Chaffee County

The County already has 5 ArcMap licenses and some ArcGIS Online licensing. Assuming the Assessor team is using all three ArcMap licenses, the County could benefit from a 6th ArcMap license with the current staff. Because of this growing need there are options within the County for future state licensing.

The first option is simply buying additional licenses and paying yearly maintenance. If the licenses are increasing by one, and ArcGIS Online users are purchased to share among personnel for the County, this would cost approximately \$22,900, which includes current maintenance costs. Most of the new price is for a new ArcMap Advanced license at \$14K. Maintenance in the future would be approximately \$15,000 per year. As Argis did not get a chance to interview all of the Assessor staff we were not able to determine if 5 licenses are truly in active use or not. If not, this price could reduce, however it is expected that the County will be investing in ArcGIS Online users to increase the ability to share and visualize data around the County.

A second option is to upgrade to an Esri Enterprise Agreement (EA). Overall, this would be more expensive, but this option offers major benefits for future growth. Esri can provide more details, but in general, an EA agreement would allow the County to have essentially unlimited Esri licensing. Desktop licenses would be available for everyone that needs them, along with online licenses for the entire organization, including commissioners and other primary decision-makers. The price per year for an EA would be \$27,500.00. Esri is willing to stage this over a three-year period, charging approximately \$9,350 the first year, \$18,500 the second year, and \$27,500.00 the third year.

This is a decision for the County to weigh carefully. The price point of the EA is significant enough that this investment would need to be considered in this years and future budgets, offsetting against expected growth and need. If the organization grows enough to need two or three more desktop users, then it will be valuable to consider the EA. If expected growth could occur in the next 1 to 2 years, Esri's offer could be unbelievably valuable, providing additional licensing to allow the County to invest in setup and advancement of the GIS system over the next two years.

Buena Vista

Buena Vista has been moving towards developing a system of record within their organization. It is expected that Buena Vista will require additional Viewer licenses for ArcGIS Online. This will happen with the addition of publishing the data to ArcGIS Online so it can be shared both publicly and securely with groups such as the Utility team. The Esri Viewer licenses can be upgraded to Field User licenses once editing in the field starts to become important. These licenses are expected to cost approximately \$1,200/year.

Poncha Springs

Currently, we do not see any need to change the licensing in Poncha Springs. As better security is needed, and if the GIS team wanted to share secure data among the organization, then buying ArcGIS Online viewer licenses could benefit the Town.

Salida

Salida has a strong base of usable data, so we are recommending growth in ArcGIS Online Viewer licenses, possibly upgrading to Field User licenses as the need for field data updates grows. To purchase these licenses, the expected cost is approximately \$1,200/year.

While Salida has 6 desktop licenses, it is not expected that they will need to elevate to an EA until they invest in GIS for the full utility team. The pricing would be like what is estimated in the County section. If Salida is considering this, Argis can work with Esri to find accurate pricing and include the same type of deals afforded the County.

To reiterate, these prices are estimations only. We would need to work together with Esri to obtain accurate and documented quotes.

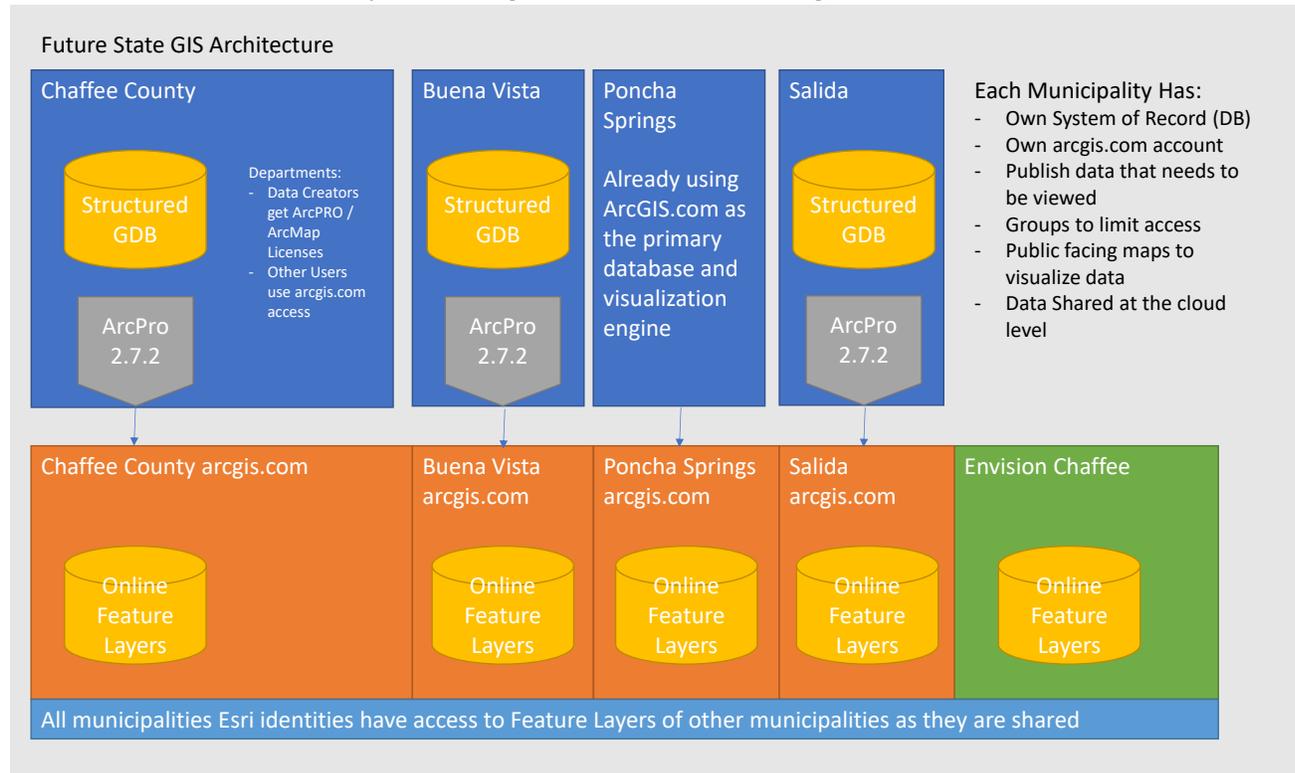
GIS Proposed Architecture

Argis proposes that each organization hold their own system of record. This means that the data the organization is tasked with owning, updating, and maintaining will be in the system of record, or database. Each organization will then publish this data to be shared among specific groups with set privileges for access after publishing. In this initial architecture, published or online data will be considered read only, except for Poncha Springs, which will be fully online in this initial architecture. This means that changes or updates to the data will be completed on the system of record held by each organization and republished as an overwrite of the existing published data.

Each organization will have its own discrete ArcGIS Online organization. Creating groups and adding the Esri user will allow the data to be viewed and shared among all organizations of Chaffee County. This will meet the needs of visible, shared data that can easily be found and used throughout the County.

Additionally, this modernizes the current infrastructure by moving the organization to ArcGIS Professional with the capability of publishing to ArcGIS Online. This is the new best practice standard for

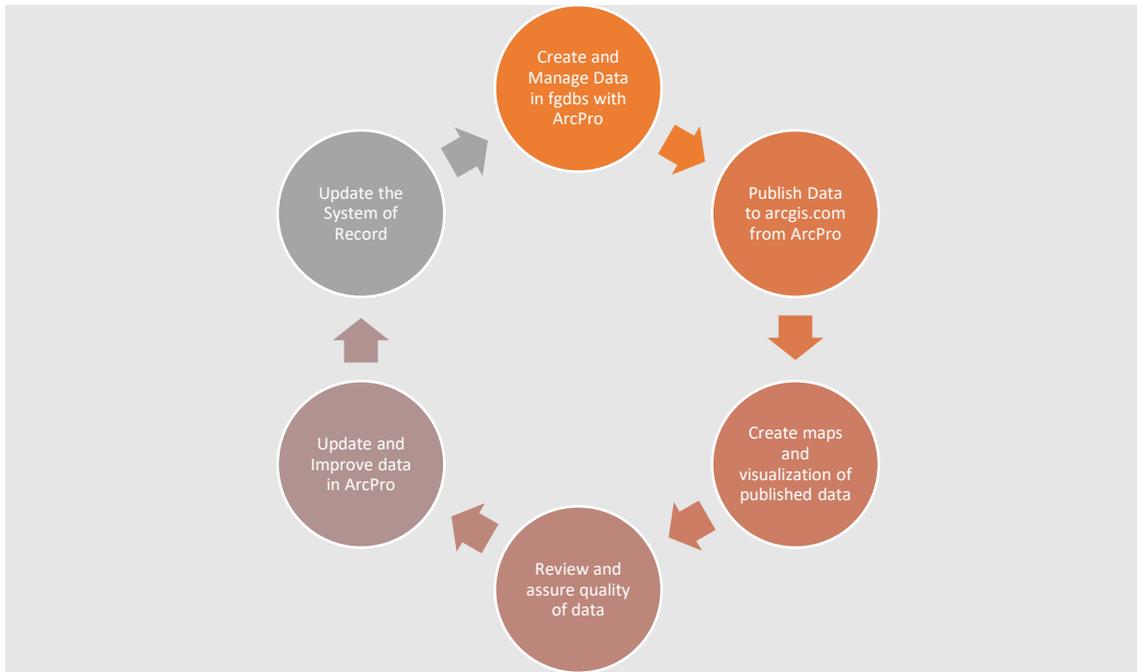
Esri and will create the stability for training and resources for the organizations.



The figure above describes the future state for the municipalities within the county. The details are designed as follows:

- Blue boxes define each municipality. The integrated architecture of starting to drive data from local hard drives to ArcGIS Online means the specific departments are not listed. The concept is that each department has created a workflow to publish, and therefore share, their respective data sources.
- Orange boxes define the online portion of the infrastructure. The goal is for each organization and department to push data up into a cloud environment that can then be either shared publicly with citizens and other organizations, or through Esri identities for secured sharing between other organizations with Chaffee County.
- Yellow cylinders are data stores. The yellow cylinders within the blue boxes are the local data stores. These will be File Geodatabases (fgdbs) that store the core information and where data is updated and cleaned. The cylinders within the orange boxes are the online data stores. These will be where the data is primarily read-only and used for visualization and sharing as the future state is implemented.
- The green box is the Envision Chaffee online presence which is another location within the Chaffee County ArcGIS Online account and the data is published from either Chaffee County or the partner organizations, such as Colorado State University.
- The gray arrow boxes represent the software that is used to manage, edit, and publish the data. This architecture identifies the County and municipalities upgrading from ArcMap to ArcPro.

The following workflow is an example of GIS data management in the County and other organizations:



GIS Applications

The applications specifically listed within this infrastructure are identified in this section.

1. [ArcGIS Online \(arcgis.com\)](#)
Make interactive maps, features and web applications available anytime, anywhere, and to anyone. Various security levels can be set to limit access where applicable.
2. [ArcGIS Professional](#)
GIS desktop application supporting data visualization and advanced analysis. This is the modern 64-bit replacement for ArcGIS Desktop (ArcMap) that includes advanced tools for 3D data. This integrates more seamlessly with ArcGIS Online.
3. [ArcGIS Desktop](#)
Legacy GIS desktop application to support maps, perform spatial analysis, manage geographic data, and share results. This is slowly being phased out in lieu of ArcGIS Pro.

GIS Training

A need for a better understanding of Esri tools was a common request throughout the interview process. Esri provides a multitude of free online training available to customers under a current maintenance contract. The trainings listed directly below are self-paced and will provide a basic understanding of ArcGIS Online, ArcGIS Pro, and how to share data.

1. [ArcGIS Online Basics](#)
ArcGIS Online is a cloud-based geographic information system used to map data, share content, and collaborate. This course will provide a foundation for working with ArcGIS Online and the benefits of using it.
2. [Share GIS Resources through Publishing](#)

Share data over the web or publish maps to an ArcGIS Online or ArcGIS Enterprise portal to create hosted web layer items. Help people in your organization or the public work with the resources these services and items represent, share them with others and include them in apps.

3. [ArcGIS Online: Administration Basics](#)

Discover the benefits of administering your ArcGIS Online organization.

4. [Getting Started with ArcGIS Pro](#)

This course introduces the ribbon-style interface, project-based organization, key capabilities, and ArcGIS Pro terminology. Users will learn to import an ArcMap map document, create 2D and 3D features, modify symbols, use geoprocessing tools to perform analysis, create map layouts, project packages, and web layers for sharing work.

5. [Editing Basics in ArcGIS Pro](#)

ArcGIS Pro provides editing tools that allow you to update existing features or create new features. Using the editing functionality in ArcGIS Pro, change the geometry of features or the informational attributes. This course will teach the editing basics and how to use workflows in ArcGIS Pro.

6. [Managing data](#)

Hosted feature layer views provide a unique set of capabilities that allow you to meet the needs of each audience. Using views helps to simplify work, reduce unintended edits, and avoid duplicating the source data. Finally, add the views to a map to compare the different user experiences. Add and delete features to confirm views are ready for use within your organization and the community.

The following is a suggested 1 day in-person training agenda. Argis can assist in finding an instructor if none are available through Colorado Mountain College.

- Mapping GIS Data
 - Learn the best type of map to display features based on data type.
 - Learn to use symbols to differentiate among data types.
 - Understand the relationship between a layer and its source data set.
- Coordinate Systems
 - Learn basic properties and best practices for using coordinate systems.
 - Understand the difference between geographic and projected coordinate systems.
 - Learn to choose appropriate projections for an application or geodatabase.
- Managing Data
 - Best practices for organizing GIS data.
 - Learn to compile data for geodatabases.
 - Learn to document data sources using metadata.

- Attribute Data
 - Learn how tabular data are stored and queried.
 - Learn how to edit and calculate fields in tables.
- Data Analysis
 - Learn commonly used functions to perform data analysis.
- Sharing GIS
 - Learn how to share data using ArcGIS Online.
 - Develop metadata to document shared items.
 - Use ArcGIS Online to drive mobile mapping and survey applications.

GIS Local Data Stores

As the GIS committee gets established and a workflow is created to update and keep the data dictionary relevant and accurate, the committee will need to start including third party data sources that can benefit the overall organizations of the County. Argis has identified a few (listed below) that were mentioned as useful, but there are many more to be identified and added to the data dictionary.

- [Esri Living Atlas](#)
ArcGIS Living Atlas of the World is the foremost collection of geographic information from around the globe. It includes maps, apps, and data layers to support your work.

What's new

Explore items recently added to ArcGIS Living Atlas of the World, learn about GIS events, and discover ways to use content.



USA Wildfires Live Feed update

The USA Current Wildfires layer in ArcGIS Living Atlas of the World has been updated with new fields and cartography. Updated every 15 minutes using the Aggregated Live Feed Methodology, this layer now includes calculated fields for days since an incident record was created and modified, new symbology to differentiate prescribed fires, and more.



Broadband availability and adoption

ArcGIS Living Atlas of the World now includes a broadband availability layer for United States neighborhoods and outlying areas. This layer summarizes the Federal Communication Commission (FCC) Form 477 data by transmission technology used and speeds offered at Census Block and larger areas.



Precipitation layers in Living Atlas

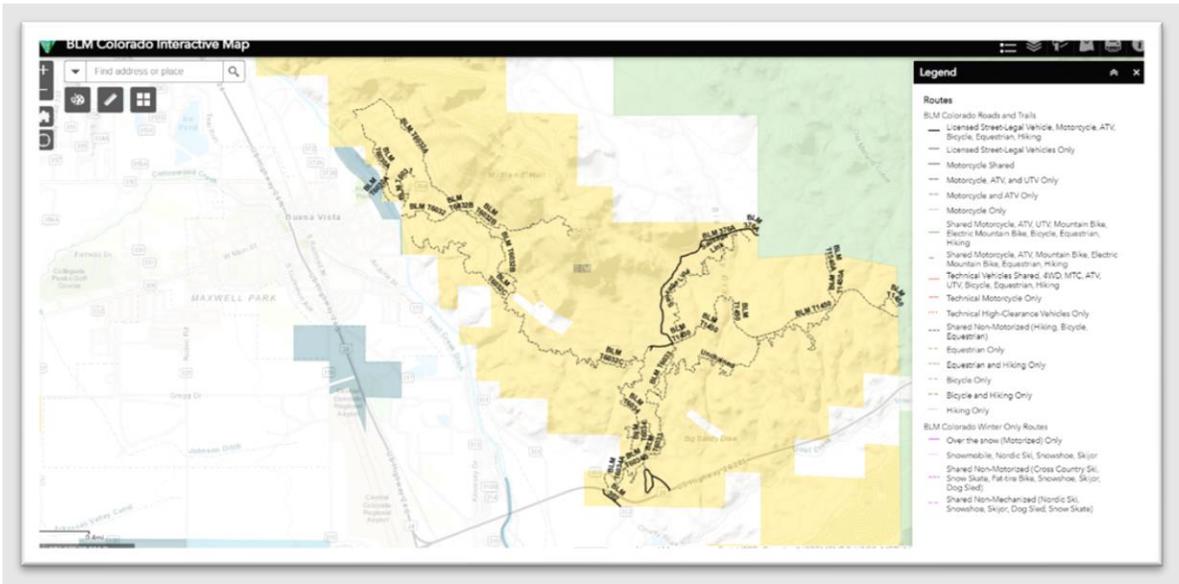
ArcGIS Living Atlas of the World includes precipitation layers that can support a wide range of environmental analysis and mapping projects. With the addition of two new layers, IMERG and WorldClim 2.1, you can display a time series of monthly precipitation rasters from June 2000 to the present and view mean monthly and total annual precipitation from 1970-2000.

- [CO-Treeview](#)
A web and mobile mapping application for Urban & Community Tree Inventory and Data Management in Colorado.



- [BLM Colorado Interactive Map](#)

The Bureau of Land Management (BLM) Colorado offers a variety of GIS data sets as web services that can be consumed and viewed within web mapping applications. This interactive map shows the statewide BLM data available.



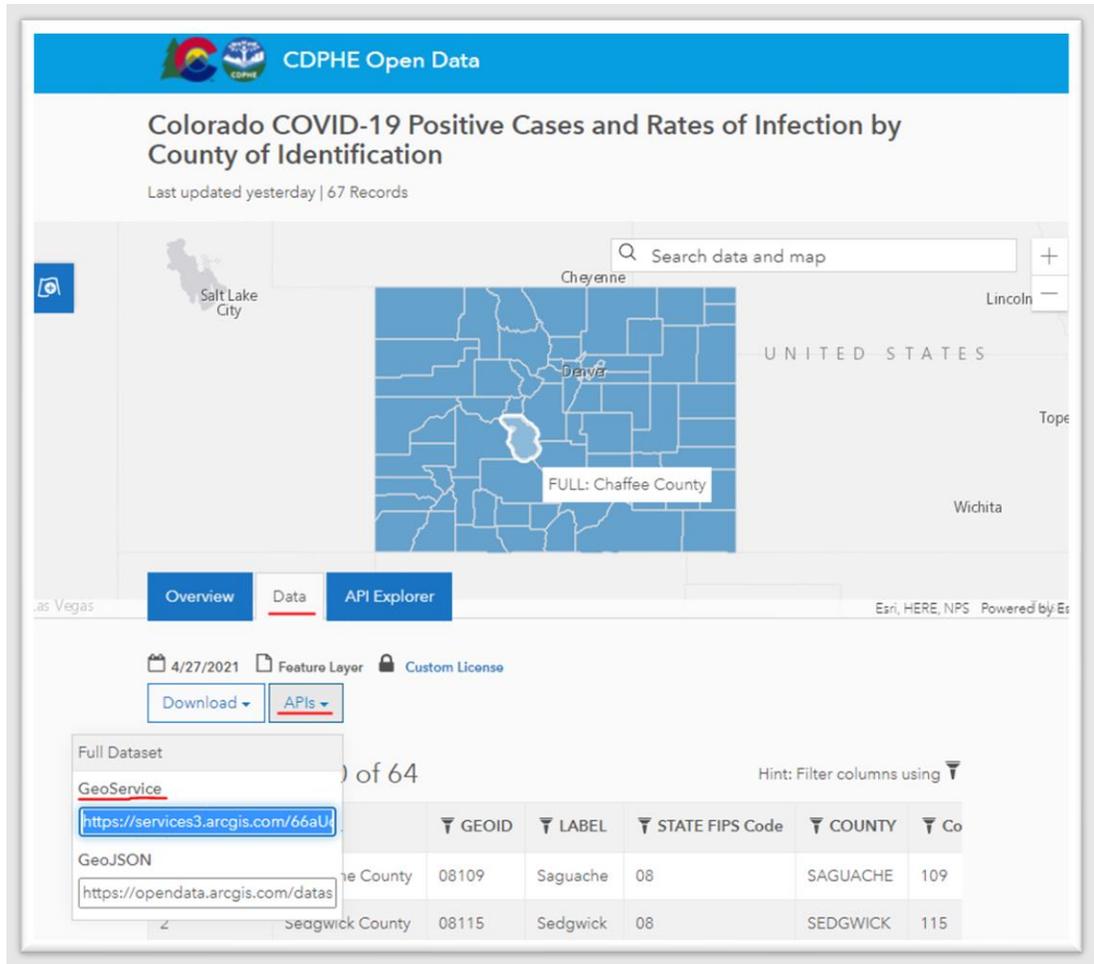
- [Colorado Public Health and Environment Open Data](#)

The NEW Colorado Department of Public Health Information Dataset (CoHID) provides improved access to state and local-level data and resources compiled by the Colorado Department of Public Health and Environment (CDPHE) and its partners to help understand health and related issues affecting Colorado.

Search for public health datasets that track policy changes affecting the long-term health outcomes in Chaffee County. Access dynamic layers using the GeoService link to embed in a web

map. The example below provides information on the number of positive COVID-19 cases in Colorado counties, how to embed it into ArcGIS Online (AGOL) and share it publicly.

1. Search for the [Colorado COVID-19 Positive Cases and Rates of Infection by County Identification](#) dataset on the CDPHE Open Data portal.
2. Copy the [GeoService link](#) from the *Data* tab > *API* > *GeoServices*. This will provide dynamic updates as changes are reported by the CDPHE.



3. Log into your organization's ArcGIS Online account and open a new web map.

Sign in to Argis Solutions, Inc. with 

ArcGIS login

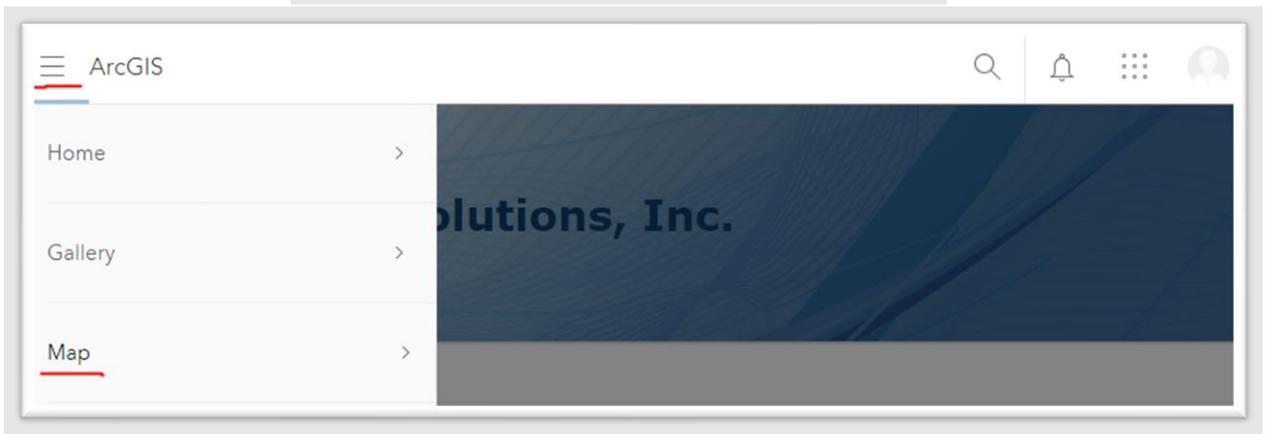
Keep me signed in

[Sign In](#)

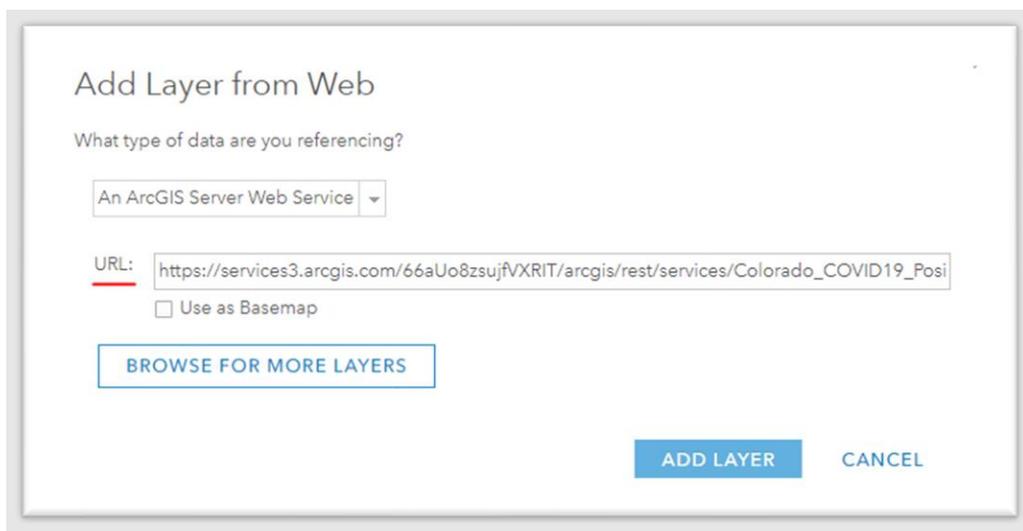
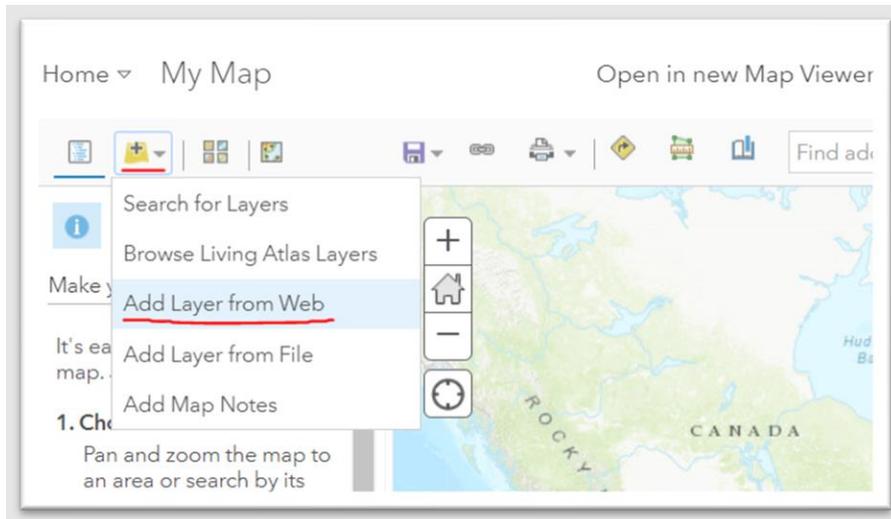
[Forgot username?](#) or [Forgot password?](#)

Not a member of this organization?
[Sign in to your account on ArcGIS Online](#)

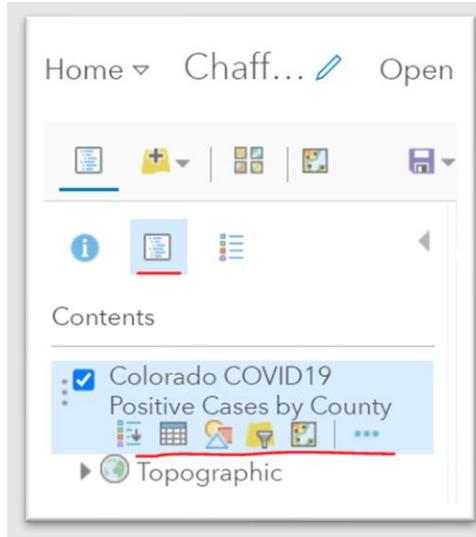
[Privacy](#)



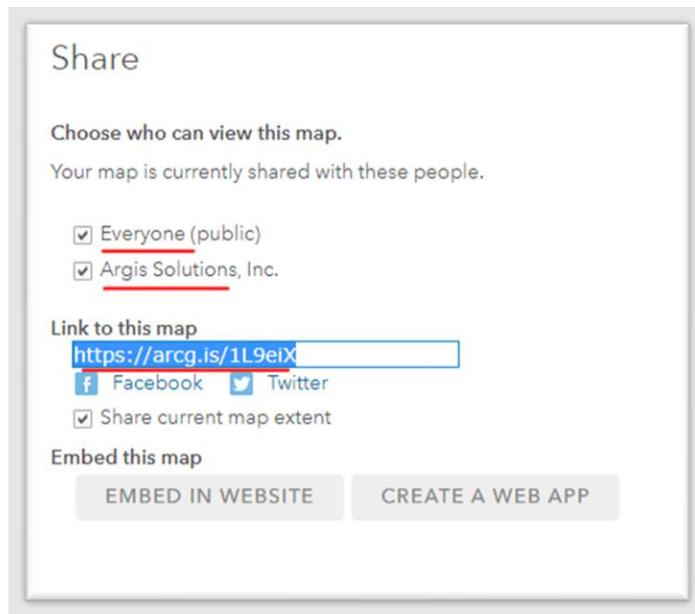
4. In the new map, add the CDPHE GeoServices data link copied in step 2 by choosing *Add Content to Map > Add Layer from Web*



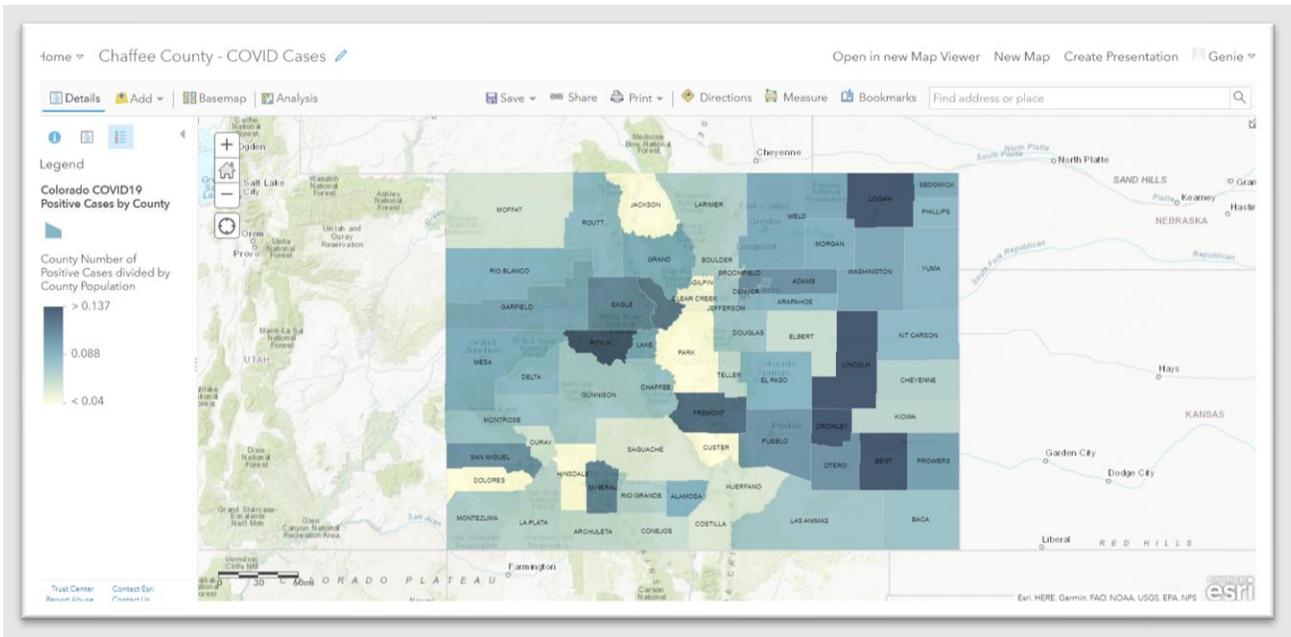
5. Personalize your map with the tools available in the *Contents* pane.



6. Save your map and choose the level of sharing. Either share within your organization or the public. Copy the link to share.



[Colorado COVID19 Positive Cases by County](https://arcg.is/1L9eiX)



This dataset is published by the Colorado Department of Public Health and Environment (CDPHE) and contains the number of COVID-19 positive cases by county, county rate of infection per 100,000 persons, death data by county, statewide COVID-19 prevalence data and associated statewide COVID-19 related statistics. This data is updated around 4pm MST daily. Further information concerning case data can be found at <https://covid19.colorado.gov/data/>.

Planned Agile Implementation

Agile is a project methodology that bases delivery of effort and results in an iterative cycle, allowing the team and owners of the results to redirect as the project moves forward to make sure that the final deliverable will be what is needed, not what was thought to be needed at the beginning of the project. Read more about Agile methodology, specifically the Scrum methodology, here: [Scrum.org](https://www.scrum.org/).

Argis recommends the following steps as the project plan to move Chaffee County and the planning collaborative to a modern, shareable, and effective GIS platform.

Agile Steps:

1. Setup bi-monthly GIS Meetings with the county and municipalities
 - a. What has changed in your GIS world?
 - b. GIS Data Dictionary updates (if any)
 - c. Re-distribute Data Dictionary.
 - d. Add steps as the GIS process(es) get more complete or change.
2. Establish data dictionary and access for 3rd party data sources and providers.
 - a. Add to the initial list of 3rd party supporters.
3. Organizing Licenses and Access to arcgis.com and ArcGIS Pro
 - a. Setup Initial Free Training for ArcPro Fundamentals and arcgis.com
 - b. Setup up ArcGIS Online [user roles](#):

- i. Viewer – View GIS content. Viewers cannot create, edit, share or perform analysis on items or data.
 - ii. Editor – View and edit data shared by other ArcGIS users. Editors cannot analyze, create, or share items.
 - iii. User – Users have editor privileges and the ability to create groups and content.
 - iv. Publisher – User privileges and the ability to publish features and map tiles.
 - v. Administrator – Publisher privileges and the ability to manage organizations and users.
- 4. Go through GIS 101 Training at Colorado Mountain College or other source of training.
 - a. Work on metadata, data descriptions, projections, and known accuracy.
- 5. Determine a Publishing Workflow and official system of record.
 - a. Go through training on publishing and arcgis.com administration.
- 6. Determine what has been published and set up using the publishing process.
 - a. Start publishing data and setting appropriate rights for all users.
 - [Best practices for sharing](#)
 - b. Training on privacy levels, user [roles](#) and rights
- 7. Establish the Portal views of data.
 - a. Many choices exist for shared data visualization through web maps.
 - i. ArcGIS Hub
 - ii. Web AppBuilder/Experience Builder?
 - iii. Web map on ArcGIS Online
 - b. Training on ArcGIS Hub and open data
- 8. Establish Chaffee Collaboration Portals
 - a. Each organization has a portal on ArcGIS Online with data shared to the proper people across the county, departments, and organizations.
 - i. Internal to the organization
 - ii. Between the county municipalities
 - iii. The public
 - b. Identify specific Web applications that benefit and create future plans and projects.

Appendix A: What is GIS?

Copied from the USGS Site: [What is a geographic information system \(GIS\)? \(usgs.gov\)](http://www.usgs.gov/what-is-a-geographic-information-system-gis/)

What is a geographic information system (GIS)?

A Geographic Information System (GIS) is a computer system that analyzes and displays geographically referenced information. It uses data that is attached to a unique location.

Most of the information we have about our world contains a location reference: Where are USGS stream gages located? Where was a rock sample collected? Exactly where are all a city's fire hydrants?

If, for example, a rare plant is observed in three different places, GIS analysis might show that the plants are all on north-facing slopes that are above an elevation of 1,000 feet and get more than ten inches of rain per year. GIS maps can then display all locations in the area that have similar conditions, so researchers know where to look for more of the rare plants.

By knowing the geographic location of farms using a specific fertilizer, GIS analysis of farm locations, stream locations, elevations, and rainfall will show which streams are likely to carry that fertilizer downstream.

These are just a few examples of the many uses of GIS in earth sciences, biology, resource management, and many other fields.

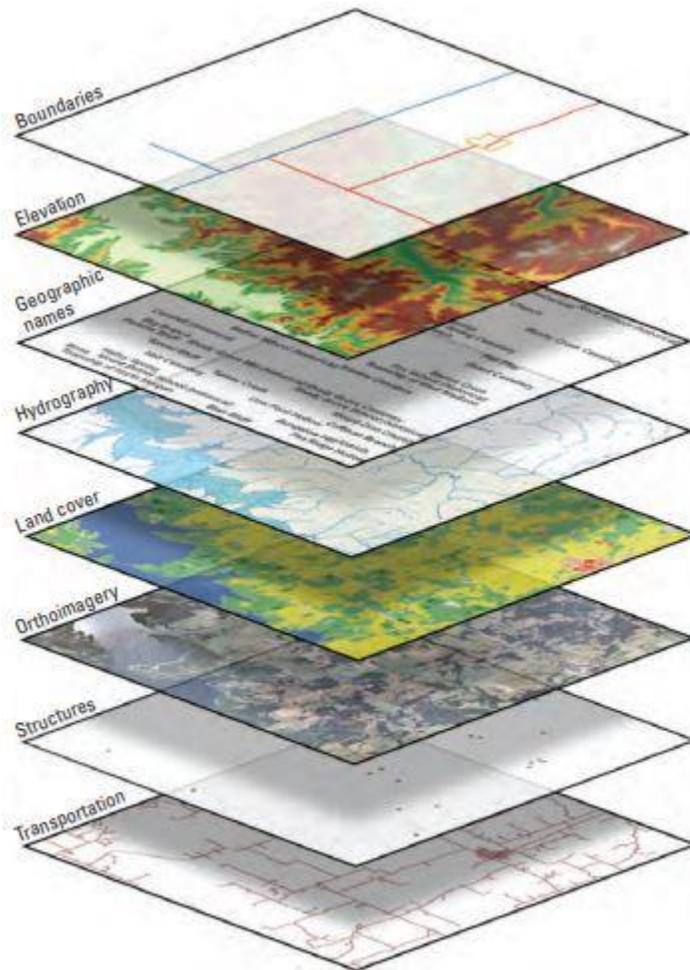


Figure 1. Eight base layers of *The National Map*.

Appendix B: Argis Solutions Rate Card

Argis Solutions, Inc. is a full-service GIS consultancy that can help the Chaffee County organizations with their GIS needs, from data collection and cleaning to complex architecture and software development. We include a rate card so your organizations can have a sense of the costs associated with various stages in moving this architecture forward.

Role	Rate
GIS Data Analysis and Data Management	\$68 / hour
Senior GIS Manager	\$110 / hour
GIS and IT Architect	\$135 / hour
GIS Developer	\$125 / hour

All of the above prices can be discounted with yearly maintenance agreements.

Argis believes that a few small projects to get the proposed architecture implemented could be very beneficial. While final pricing would require knowing the specific steps that the County and municipalities would like to implement, the following offers scoping examples:

- Setting up Web AppBuilder with configuration tools and an initial map – 10 hours
- Administering ArcGIS Online for an organization and training and confirming tools work with Esri updates – 8 hours per quarter
- Building a custom website with custom analysis tools – a large range, from 40 to 200 hours
- Building up the ArcGIS Online portal for visualization around the organization and creating links to maps for primary websites – 6 to 24 hours.

Argis hopes this helps generate ideas of future work and budget needs for the organizations. Argis is happy to discuss any specific needs and their associated costs.