

**Attachment One**

**Upper Carson River Watershed GIS Framework**

## Upper Carson River Watershed GIS Framework with Base Data Layers

Organizing and archiving the large amount of data collected during the Upper Carson Stream Corridor Condition Assessment was accomplished using GIS technology. The GIS framework, as it is termed in this project, provides a dynamic, automated data storage resource. The database is available to the assessment team to aid in analysis and available to the watershed group to understand the results of the assessment. Most importantly, the intent of the GIS framework is to provide a lasting product that can be used as the stepping stone for the next set of projects.

The GIS Framework has evolved through the watershed assessment project, and hopefully will continue to evolve as stakeholders continue with their projects. A number of GIS data layers were compiled during the preliminary assessment phase of this project. Data was compiled from outside sources and developed as products of the preliminary assessment surveys. A number of layers were cataloged, but key datasets included:

- Alpine County parcel data- Completed in June for the Alpine County Planning Department this layer describes ownership across the entire County. This dataset is linked to the Alpine County Assessor records.
- Federal and State owned lands- Ownership of USFS, BLM, BIA, CA State Parks, and CA Fish and Game. Provided by the USFS.
- Orthophotos- Black and white aerial photos covering the entire study area.
- Hydrologic Network- A detailed network of streams and rivers based on the USGS 7.5 minute maps. Data was collected from the USGS and enhanced by adding stream order, USGS reach codes, and verifying names. Reach codes developed by the assessment team were integrated into the GIS. Where necessary, the spatial complexity of the GIS feature was enhanced to better align with the photos and artificial flows paths created through lakes and wetlands. This process will continue throughout the project.
- Named Locations – The Geographic Names database from the USGS identifying known locations on USGS maps. This includes recreation areas, mines, etc.
- Historic Wildfires – Perimeters of wildfires from the past fifty years.
- Infrared Composite Satellite Image – A Color Infrared satellite image of the entire watershed, with bright red demonstrating riparian vegetation.

GIS was used to capture and catalog preliminary assessment data. A GPS was available in the field for the preliminary survey, but not used since most site visits were not specific to a couple of meters (the scale of the aerial photos was easily sufficient to map the preliminary survey points). Instead, locations were mapped in the GIS using aerial photos. The team collected a variety of characteristics about each site on the preliminary survey and entered this information into a database. This database information is linked back to the Assessment Points layer. The assessment team classified the study area into reaches based on the information they collected in the field and this information is also in the GIS.

The base layers and survey data products were used in creating a number of maps for the project. A large study area map was created for the team and the Watershed Group. A small atlas of the study was created for use in the field assessment, the Watershed Group was provided a copy of this as well.

The in-depth assessment provided more data into the GIS. GPS was used to collect spatial locations and then a number of attributes and photos were collected at each location.

- In-Depth study transects – Using GPS, cross sections were collected at the in-depth study sites. Measurements collected by the field teams, resulting graphs, and photos along each cross section were associated to the spatial features. Transects include geomorphic measurements and vegetation measurements.
- Historical photo locations – Historical photos within the watershed were provided by the Alpine County Museum. The in-depth assessment attempted to recreate some of these historic photos and provide a comparison. Locations of these historic photos were collected with GPS.
- Assessment Points- Locations along the study area where the watershed group or assessment team conducted either a preliminary assessment or an in-depth assessment. These points are tied back to digital photographs of those locations.

All data in the GIS Framework is in ESRI ArcGIS compatible format. A complete project CD will be compiled for distribution to the individual stakeholders. Metadata consistent with the FGDC metadata standard is compiled and available with the datasets.

### **Using the GIS and related data**

The most effective way to retrieve the information gathered during the watershed assessment is to use the ArcView GIS software to display and query the data. The spatial index of information helps group information into an intuitive format. However, there may be times that GIS tools are unavailable or one would need to access information for other purposes. Below is a description of the data structure and associated files.

The project CD should accompany this report or the larger watershed assessment document. If you need or would like to obtain a copy of the disk, please contact the Alpine County Planning Department at (530)-694-1078. They will be able to provide you a copy or put you in touch with someone who can.

The CD contains two directories at the root level. They are:

- GIS
- Web

The GIS directory obviously contains all of the GIS datasets. These datasets are readily accessible through the GIS application. Additionally, the ArcMap project files are also in this directory.

The Web directory contains all of the non-GIS specific data. This includes charts, graphs, text, webpages and photographs. It is important to maintain the directory structure under the web directory to keep the HTML pages intact. HTML pages in this directory should function normally and allow you to view the necessary information.

### **GIS structure**

Under the GIS directory, the structure is as similar to the Alpine County GIS directory structure as possible. This will make update by the County easy and consistent. The structure is as follows:

- Images – Elevation, shaded relief, and satellite imagery datasets.

- Hydro – Hydrologic datasets. This includes the GIS data (in personal geodatabase format) for the streams, reaches, and study areas. The assessment points (preliminary and in-depth) and study transects are also within this geodatabase. The advantage to this GIS format is its use of a single file for storage, allowing users to move the dataset with ease.
- Ortho – Digital Orthophotos for the project area. It includes only the orthophotos for the study area as the entire County photo dataset would not fit on a single DVD
- Owner – Landownership and management layers
- Quads – the USGS 7.5 minute 24K quads for all of Alpine County
- Resource – Other resource related layers, such as fire history
- Trans – The County highways and roads layer

## Web Structure

Under the web directory, the structure is organized by the assessment phase. The directories are:

- Bridges
- Historical
- Indepth
- Preliminary

The structure is self-explanatory, if you are interested in data collected about bridges, go to the bridges directory. For someone unfamiliar with the project, it may seem difficult to determine in what directory your desired information resides. However, you can get an understanding of the level of effort behind the data without having to read the report.

Within the Bridges, Indepth, and Preliminary directories, the structure is defined by the location of the data. For example, in the Bridges directory the structure is:

- Centerflat
- Crystalspgs
- Hope
- Markleeville

indicating the location of the bridge the data describes. In many cases the directory names must be shortened and without spaces to be usable across multiple operating systems.

Within each of the location directories is a series of web page files (.htm) and a photos directory. The web pages display groups of photos that share a common location or theme within that directory.

The photos follow two different naming conventions, depending upon the camera that took the photos. One camera allowed for the naming of the picture files, an example would be reference\_meadow1.jpg. The majority of photos are named with a date format, for example P9240001.jpg. This indicates this is photo 1 taken on September 24. In this manner, many of the photos have dates associated with them.

The historical directory does not contain location names, it simply lists a histphotos directory, a retakephoto directory and .htm files. In each of the directories are the photos, either historical or current, but they are best viewed with the web pages so that historic and the current photos can be compared.

## File Formats

Within the GIS directory, all data is in some type of GIS file format, such as shapefiles, personal geodatabases, geo-tiffs, or grids. In the web directory, files are in commonly used file formats. Pictures are all in JPEG format, easily imported into word processing or presentation documents. HTML pages are

compatible with any standard web browser. Text, charts, and graphs are in Adobe pdf format for both limiting file size and ensuring source data is not changed.

## Running the GIS application

The GIS application is designed to run from the CD with minimal effort. All the web pages and links should work without any changes. The GIS file will work after the data locations are remapped and a WATERGIS variable is declared.

When you first open the GIS ArcMap project file, little red “!” will appear next to the layer names in the Table of Contents. It indicates that it cannot find the data. Simply right click on the layer name and go to Data>Set Data Source. A navigation box will appear allowing you to locate the data in the GIS directory structure. Once you have remapped the data layers, you may wish to save the project on your hard drive to keep from having to perform this operation in the future.

To view the document linkages in the GIS correctly, you will need to create a variable on your system called WATERGIS. To do this, navigate from the Start Button>Control Panel>System. Click on the right hand tab (Advanced). There will be a button on that page called Environment Variables. You will want to create a new user variable, click on the “New” button. Fill out the box like the example below:



Where the variable value (in this case D:\) is the letter of your DVD drive. Click OK, close all the windows and start the GIS application. The hyperlinks will work.

## Complete directory structure

Below is a complete directory structure of the web directory

- Web\bridges
- Web\historical
- Web\indepth
- Web\preliminary
- Web\bridges\centerflat
- Web\bridges\crystalspgs
- Web\bridges\hope
- Web\bridges\markleeville
- Web\bridges\centerflat\photos
- Web\bridges\crystalspgs\photos
- Web\bridges\hope\photos
- Web\bridges\markleeville\photos
- Web\historical\histphotos
- Web\historical\retakephoto
- Web\indepth\charity

Web\indepth\eastforklwr  
Web\indepth\eastforkupr  
Web\indepth\grover  
Web\indepth\lwrfaith  
Web\indepth\lwrhope  
Web\indepth\marklee  
Web\indepth\redlkreek  
Web\indepth\uprfaith  
Web\indepth\uprhope  
Web\indepth\charity\photos  
Web\indepth\eastforklwr\photos  
Web\indepth\eastforkupr\photos  
Web\indepth\grover\photos  
Web\indepth\lwrfaith\photos  
Web\indepth\lwrhope\photos  
Web\indepth\marklee\photos  
Web\indepth\redlkreek\photos  
Web\indepth\uprfaith\photos  
Web\indepth\uprhope\photos  
Web\preliminary\bridgehope  
Web\preliminary\centerflat  
Web\preliminary\diamondvly  
Web\preliminary\dutchvly  
Web\preliminary\eastforkberm  
Web\preliminary\eastforkresrt  
Web\preliminary\eastforkslide  
Web\preliminary\eastforkwcrd  
Web\preliminary\faith  
Web\preliminary\grover  
Web\preliminary\indianres  
Web\preliminary\lwrhope  
Web\preliminary\lwrwolf  
Web\preliminary\lwrwoodfords  
Web\preliminary\markbridge  
Web\preliminary\markleecrk  
Web\preliminary\markvillage  
Web\preliminary\midhope  
Web\preliminary\paynesville  
Web\preliminary\redlkcrk  
Web\preliminary\uprhope  
Web\preliminary\uprwolf  
Web\preliminary\woodfords  
Web\preliminary\bridgehope\photos  
Web\preliminary\centerflat\photos  
Web\preliminary\diamondvly\photos  
Web\preliminary\dutchvly\photos  
Web\preliminary\eastforkberm\photos  
Web\preliminary\eastforkresrt\photos  
Web\preliminary\eastforkslide\photos  
Web\preliminary\eastforkwcrd\photos  
Web\preliminary\faith\photos  
Web\preliminary\grover\photos

Web\preliminary\indianres\photos  
Web\preliminary\lwrhope\photos  
Web\preliminary\lwrwolf\photos  
Web\preliminary\lwrwoodfords\photos  
Web\preliminary\markbridge\photos  
Web\preliminary\markleecrk\photos  
Web\preliminary\markvillage\photos  
Web\preliminary\midhope\photos  
Web\preliminary\paynesville\photos  
Web\preliminary\redlkrk\photos  
Web\preliminary\uprhope\photos  
Web\preliminary\uprwolf\photos  
Web\preliminary\woodfords\photos

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