Subject: Using Google Earth, Google Earth Pro, and Google Maps for FWS activities

As an FWS employee, can I use Google mapping software or applications to help me with my job?

The short answer is a "qualified yes". But it is **extremely important** that you **appropriately** use Google mapping software and understand its limitations and uses. There are many situations where Google mapping software can be a useful and productive tool to aid our work. FWS staff should understand the appropriate application and use of Google software, when it is right and when it is the wrong time to use it.

What is Google map software?

There are several Google mapping application products that you may have used or at least heard about. Many of you may already be using Google mapping software because it is easy to use and you may already be comfortable using it.

a) Google Earth (free) – This downloadable software application has to be installed on your computer to work. This software allows you to view aerial imagery, measure distances, add shapes, and add your own data. Google Earth uses a 3D model representation of the earth. It also has some imagery enhancements such as viewing temporal imagery of the same location to assess change over a period of time.

b) Google Earth Pro (purchase) - This is an upgraded software application to the Google Earth free version that has additional tools and functionality such as enhanced imagery, stronger data import/export, and additional tool availability such as providing a tool for users to measure an area's size.

c) Google Maps (free) – This is available through your internet browser window. This software is often used for navigation purposes (similar to MapQuest), has less functionality than Google Earth, and uses a 2D model representation of the earth.

d) Google Maps Application Programmer Interface (API) – This is used by web managers and developers to build and insert location-based applications into their web sites. This Google Maps API will not be addressed in this document.

Why can't I do whatever I want with Google map software?

Well, you can do what you want, but you should understand that you are **accountable** for any analytical, management, or policy decisions that are directly or indirectly derived from Google mapping software and its data products. Likewise, we should acknowledge that all FWS staff (including GIS staff) are **accountable** for maps, analyses, and decisions supported through application and use of **ANY** GIS software, including ArcGIS. When an organization or individual is **accountable**, they are responsible and have to answer for their actions that impact products, decisions, and policies.

It is important for FWS staff using Google software to understand appropriate use thresholds. Each of us should understand when it would be time to transition from Google mapping software and rely on GIS staff or other expertise, including other geospatial data sources, or alternative GIS software. We should have clear understanding of appropriate use thresholds for Google mapping software or, any GIS software we going to use.

What are the key factors I should pay attention to when deciding what I can and can't do with Google mapping software?

1) Data! Data! Data! - if you are making decisions, developing data or outputs, or creating presentations that use maps, it is important that you understand the data you are using to create your maps and the metadata (who, when, where, what, and how) associated with the data. Do you understand the imagery data source (e.g. aerial photo) you are using in Google? When was it captured, What were the camera or sensor specifications that captured the image? Often, it is not enough to say, "I viewed the imagery off Google mapping and the software described the imagery as being captured on June 7, 2004". That imagery <u>may not</u> have been captured on June 7,

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Disclaimer: This document is intended to provide guidance and direction to FWS employees who use or plan on using Google software products. It describes best practices and appropriate use of Google software. This document is not intended to serve as official policy of the US Fish and Wildlife Service. If in doubt, contact your GIS Coordinator - [*http://www.fws.gov/gis/contacts/index.html*](http://www.fws.gov/gis/contacts/index.html)

2004 and Google even says that in their documentation. Whenever you use any data with any software, it is important that the data displayed in the map is documented (i.e. has metadata), you understand who created it, when it was created, how accurate, and what that data represents - - so the user can have confidence they are using data appropriately. You need METADATA for the data you use.

2) Google Terms of Service - This is a difficult concept to get a good handle on as the Google Terms of Service seem to change rather often. A Google user **CANNOT** take any image or maps derived from Google software and use it in your presentation, or insert your exported Google map into your reports or publications. A good "rule of thumb" to follow - you **SHOULD NOT** take a Google map or product developed using Google free software and use it in an external partner meeting, insert in technical reports, or web pages. **DO NOT** use Google mapping software to develop or derive products that will be used in external or public meetings. There is more flexibility when using Google Earth Pro (purchase), but the take home message is you **CANNOT** take direct Google free mapping products and use whenever and however you want.

3) Quality of Analyses - Google Map software uses a cartographic projection that is optimal for navigation and directions, but the tradeoff is less accurate when used to measure areas and distances. Does it matter for your project? That is hard to say. How much error can you live with? If you are working with small areas of a few acres, it may not matter, but it might matter if you are working with an area of hundreds or thousands of acres. Projections and coordinate systems matter in GIS and it is always a good idea to understand how those geographic features are being represented and displayed on the landscape.

Give me examples of <u>when it is generally okay</u> to use Google free mapping software.

1) You want to find or navigate to an address or location
2) You want to calculate X and Y coordinates for a location - you should understand those coordinates meaning, their accuracy, the differences between decimal degrees, degrees minutes seconds, degrees decimal minutes, etc.
3) You want to learn about an area and better characterize this area to better understand the surrounding landscape – as an example, create a terrain or 3D perspective view of a project area for preliminary planning purposes
4) You want to create and export a map for internal reference purposes for later <u>personal</u> reference use
5) You want to visualize some GPS data you've collected to view locations on the landscape
6) You are supported by local GIS Specialists who agrees to work with your Google map products and translate and document your "preliminary" Google outputs into accepted GIS data formats such as shapefiles or file geodatabases
7) You want to query attributes from **authoritative** data sources (such as soils, wetlands, or vegetation) to improve understanding of a resource or issue. **Authoritative** data comes from reliable and trustworthy sources, and ensures accurate and current data is being used. For example, one should consider wetlands data downloaded from the US Fish and Wildlife Service wetlands clearinghouse as being authoritative data. It doesn't mean the data is perfect, but the data met certain minimum development standards relating to many criteria such as processing standards and data positional and attribute accuracy.

Give me examples of <u>when it is generally NOT okay</u> to use Google free mapping software.

1) You want to create and insert cartographic map products into publications, reports, or web pages (it may be okay with Google Earth <u>Pro</u>), even if the reports are for **INTERNAL** use only.
2) You want to capture analytical information to insert into publications, reports, or web pages and are using undocumented data, or don't understand the data
3) You don't understand the sources and appropriate uses of the data being offered through Google and want to make a decision that will impact your project's administrative record
4) You want to capture map images and insert into a presentation to be used with your <u>external partners, or the public</u>, (it may be okay with Google Earth Pro)
5) You want to use Google free mapping to make decisions that will become part of an administrative record
6) You want to use Google free mapping to develop maps, data, or analyses that may become direct evidentiary information to support a law enforcement case
7) You want to create and author data (it may be okay with Google Earth Pro)

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8) You want to "verify" a GIS analyses or map in a report using poorly documented data

When I work with contracts and agreements, is it okay to accept Google Data formats and maps?

No, it is generally not okay to accept Google data formats as deliverables from your cooperators or contractors. Google supports a KMZ/KML data format that has inherent limitations. We suggest you use the following data delivery standards and specifications template when working with contractors or collaborators: *U.S. Fish and Wildlife Service. 2012. Data Delivery Standards and Specifications Template. USFWS, Pacific Southwest Region. Sacramento, Calif. 92 pp.*

Internal FWS link to Data Delivery Standards Template:

https://fishnet.fws.doi.net/projects/GIS/GEOSPATIAL%20LIBRARY/Forms/AllItems.aspx?RootFolder=%2Fprojects%2FGIS%2FGEOSPATIAL%20LIBRARY%2FPOLICY%20AND%20STANDARDS%2FCOLLABORATION%2FIDCS%2FMASTER&InitialTabId=Ribbon%2EDocument&VisibilityContext=WSSTabPersistence

What are other options to Google Mapping software products?

There are a variety of GIS and mapping software products available to FWS staff. There are even some open source and free GIS software available not listed below. Each of these products has advantages and disadvantages when considering factors such as costs, ease of use, and GIS tool availability. If available, FWS staff should consult with a knowledgeable GIS Specialist when considering and assessing tools to support their specific GIS needs. Many full time GIS Specialists often have unique geographic perspectives of available tools, data, and their use. **Appendix A** provides a table with recommendations for selecting the right GIS tool for the right project.

1. **ArcGIS** - This high end desktop GIS software package takes time to learn and understand, but an employee can use all the geospatial data being distributed through local area FWS GIS data servers or clearinghouses. As an example, in many Region 8 offices, you can access lots of locally managed GIS data through a *DataSpace* framework – users have an ArcGIS tool that simplifies finding and accessing data. Other regions may have other tools or procedures for finding and using GIS data. ArcGIS software offers a wealth of analytical tools and modeling to support GIS work. There is a time commitment and significant learning cure to use and maintain proficiency with this software. Contact your local or regional GIS coordinator for options on learning ArcGIS 10. There are training opportunities through virtual training, local training, or through National Conservation Training Center (NCTC). Link to more info on ArcGIS: http://www.esri.com/software/arcgis/arcgis10/index.html

2. **ArcGIS Desktop Explorer** - This "Google like" desktop software application is similar to the free Google software mapping applications. A major advantage of this desktop software is that users can directly read most of the geospatial data being managed through a data server on your FWS local area network. This increases the likelihood that you would be using authoritative or best available data because there is a good chance, someone else is developing and managing local GIS data. There is a wealth of FWS and other agency supported GIS data and map services already available for your use that can be directly read with ArcGIS Desktop Explorer. The learning curve is relatively easy, similar to free Google mapping software products. This is **not** a data authoring tool and only provides simple GIS analytical tools such as measuring distance, areas, finding geographic coordinates, and creating simple maps. Link: http://www.esri.com/software/arcgis/explorer/index.html

3. **ArcGIS Explorer Online** - This is the online version of ArcGIS Desktop Explorer that runs in your internet browser window and only requires a Microsoft Silverlight plug-in. Although this online version doesn't have all the functionality of ArcGIS Desktop Explorer, a user can still add data, query data, select features, create maps, and make presentations; a user can also create an "intelligent" map that can be viewed and shared across the web in either a public or private environment. **Sensitive** data should **NOT** be shared through the map services development capacity of this application. Link: http://www.arcgis.com/explorer/

4. **ArcGIS.com and Data Basin** - These online map services can be created by anyone who establishes a free account and login with ESRI and can then share these maps with your own data to either the public or a private group. Users have the flexibility to add data and choose basic functionality available to other users. These web map services are great ways to share GIS data with users who have no GIS capacity or share maps and data with many different users through a web interface. The learning curve is relatively easy and quick, and users can create to your own web maps – no programming required. **Sensitive** data should **NOT** be shared through this application. Link ArcGIS.com: http://www.arcgis.com/home/ and Link Data Basin: http://databasin.org/

5. **Local Web Map Services or FWS Web Map Services** – Some FWS offices have the hardware and software infrastructure and technical capacity to develop and provide internal Web Map Services (WMS) using an ESRI application called ArcGIS Server. A WMS is a standard protocol for serving georeferenced maps over the intra or internet and is generated by a map server using GIS data.

Some FWS staff in some offices can quickly create custom web map applications to address specific mapping or GIS issues including your specific data of interest. A user may only need to have their internet web browser to access and use these map services; or users can view these map services inside their own software application such as Google Earth or ArcGIS software. These WMS often provide basic analytical tools to query and measure data such as distances and area. There are numerous FWS map services being distributed at the national level and each offer the advantage of sharing authoritative data through their map services. Below are links to additional information on using these FWS map services.

Critical Habitat Link - http://ecos.fws.gov/arcgis/rest/services/crithab/crithabMapper/MapServer
Landscape Conservation Cooperative Link - http://gis.fws.gov/ArcGIS/rest/services/FWS_LCC/MapServer
Joint Ventures Link - http://gis.fws.gov/ArcGIS/rest/services/FWS_Joint_Ventures/MapServer
National Wetland Inventory Link - http://www.fws.gov/wetlands/Data/Web-Map-Services.html
Wildlife Refuge System Boundary Link - http://gis.fws.gov/ArcGIS/rest/services/FWSCadastral_Internet/MapServer
FWS Regional Boundaries Link - http://gis.fws.gov/ArcGIS/rest/services/FWS_Regional_Boundaries/MapServer

6. **GeoPDF** - This is **not** an actual software application, but is a special data format that is portable and interactive. This special PDF file is a container for maps, imagery and other data. The map embedded in this special PDF (GeoPDF) is georeferenced, meaning a user can calculate coordinate locations, measure area and distance, and query attributes. Additionally, users can capture or edit data in the field with a tablet or laptop with this data file format. Users will need support from a GIS Specialist to create the GeoPDF file using specialized *TerraGo* software that was purchased by national GIS office and is freely available to staff. Creating the GeoPDF file using this software extension does require ArcGIS skills. However, in order to use a GeoPDF file, users only need a free plug-in to their free Adobe Acrobat Reader software. TerraGo software link:
https://fishnet.fws.doi.net/projects/GIS/software/terrago/default.aspx

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Appendix A. Recommended Geographic Software Applications and Appropriate Uses*

Requirement	Google Earth (free)	Google Earth Pro (purchase)	Google Map (free)	ArcGIS Desktop (purchase)	ArcGIS Explorer Desktop (free)	GeoPDF Format Files (purchase)	Other Software Choices (free or purchase)			
Display and reference digital data and/or imagery only for **DOI/FWS internal reference** purposes (3D or 2D)	X	X	X	X	X	X	X			
Find directions or navigate to a location or address.	X	X	X	X	X		X			
Query attributes from tables associated with geographic features	X	X		X	X	X	X			
Use as a tool to develop information (maps) that will be used to support authoring data with high end GIS software	X	X	X		X	X	X			
Create or author data		X		X		X	X			
Download GPS data for **internal FWS reference** and viewing. No maps or images are created and used to make internal decisions that become part of admin record or publicly used	X	X	X	X	X	X	?			
Download GPS data for creating, deriving, and inserting data or maps into **internal or external publications, reports, or web pages**		X		X			?			
Create and insert cartographic map products INTERNAL or EXTERNAL publications, reports, or web pages		X		X			?			
Conduct simple geo analyses (calculate area, distance, or geographic coordinate locations)		X		X	X	X	X			
Conduct complex geo analyses and modeling				X			X			
Create, analyze, or derive maps, data, or information that will be included in any **FWS administrative record**		X		X	X	X	X			

Other recommendations:
*There are many factors one should use when selecting which software is best for each situation. As an example, when authoritative data is available, a user has more flexibility for GIS tool selection. If in doubt or uncertain, always consult with a knowledgeable GIS person.
When querying, analyzing, or mapping information from any software product, staff are responsible for understanding each data source and their limitations/appropriate use **OR** each FWS staff person should use data that is being distributed through official FWS gateways, servers, or other sanctioned data sources
There are additional DOI requirements and guidance available for using Google Maps Application Programmer Interface (API) in internal or external web pages
There are "online" internal or external web or browser based mapping applications which may be good substitutes for local desktop installed lightweight GIS software apps