

GISsurfer

How To Make Georeferenced Images

By: Joseph Elfelt, [contact](#)

This PDF file is online at
<https://mappingsupport.com/p2/help/GISsurfer-georeference-images.pdf>

The GISsurfer homepage is at
<https://gissurfer.com>

Table of contents

1.	Introduction.	1
2.	Training video.	2
3.	Comparison of maps with and without ArcGIS dynamic layers.	2
4.	Make your first georeferenced image	4
5.	Free hosting for JPG and PNG files	6
6.	Display your georeferenced image with GISsurfer.	7
7.	Make a KMZ file.	8
8.	Display your KMZ file with Google Earth	9
9.	Display your KMZ file with ATAK - iTAK - WinTAK.	9
10.	Display your KMZ file with a Garmin device	10
11.	Make georeferenced PNGs with a transparent background	10
12.	Make a series of screenshots.	11
13.	Stitch together a series of screenshots.	12
14.	GISsurfer links for USFS, NPS, BLM and NOAA maps	13
15.	GISsurfer example displaying GPX data	15
16.	Existing georeferenced JPGs anyone can use	16
17.	Existing georeferenced PNGs anyone can use	19
18.	Several ways to search ArcGIS servers for specific data	20

1. Introduction

A georeferenced image is one where you know the latitude longitude for the four edges of the image. Or to put it another way, you know the latitude longitude for two opposing corners. GISsurfer can help you produce:

- * Georeferenced JPG or PNG images that are 100% map. The GISsurfer interface is not shown.
- * Georeferenced images that are a **single screenshot or multiple screenshots that exactly adjoin** and are stitched together.
- * Georeferenced JPG files that display a basemap and data from multiple GIS layers.

- * Georeferenced PNG files that have a **transparent background** and data from multiple GIS layers.
- * KMZ files that contain one or more georeferenced JPG or PNG images.

Initially, the reason for adding this feature was so that these georeferenced images could be used with the [web app GeoJPG](#) (under development) to provide **offline maps**. The plan was to launch GISsurfer v3 and GeoJPG v2 at the same time. That plan changed when I started learning about the situational awareness app [ATAK \(Android\)](#). There is also [iTAK \(iOS\)](#) and [WinTAK \(Windows\)](#) but they currently have fewer features. Since all three versions of the TAK software can open KMZ files that contain georeferenced JPG or PNG images, I decided to release GISsurfer v3 even though GeoJPG v2 is not yet ready for release.

In addition, KMZ files that contain georeferenced images can be displayed by Google Earth, QGIS and various other programs. KMZ files can also be used to import custom maps into some Garmin GPS units.

Note that georeferenced images are best suited to **static data** and not appropriate for data that keeps changing.

If you need help using GISsurfer, please visit <https://gissurfer.com>. The detailed documentation is in a series of **PDF files on the “Help” page**.

2. Training video

Look for video links to appear here sometime in December 2022. Announcements will be posted on the MappingSupport project page (<https://mappingsupport.com>), Twitter (<https://twitter.com/MappingSupport>) and Facebook (<https://www.facebook.com/GISSurfer>).

3. Comparison of maps with and without ArcGIS dynamic layers

Using dynamic layers (if available) can greatly improve the appearance of georeferenced JPG and PNG images that you make with GISsurfer.

By default, GISsurfer will display data hosted on ArcGIS servers using the default styling (line color, line width, polygon fill, etc) defined on the server. However, often times the default styling makes the data hard to see on one or more basemaps. If the ArcGIS server supports “dynamic layers” for that data then you can use GISsurfer to tell the ArcGIS server to change how the data is styled before it appears on your map.

Here is an example of the impact that dynamic layers can have. Below are two GISsurfer map links which open at the same spot in Ventura County California. Both maps display the same GIS layers showing road and trail data from ArcGIS servers operated by Ventura County and the U.S. Forest Service. The only difference is that the first map uses dynamic layers to change how the data is styled and the second map uses the default styling.

GISsurfer map with **dynamic layers used to style the data**

https://mappingsupport.com/p2/gissurfer.php?center=34.478195,-119.245262&zoom=13&basemap=USA_basemap&overlay=Ventura_County_boundary,Proclaimed_forest,USFS_road_open_black,USFS_road_open_white,Ventura_road_black,USFS_road_closed,Ventura_trail_green,Ventura_trail_black,USFS_trail_green,USFS_trail_black,USFS_recreation_site&data=https://mappingsupport.com/p2/kmz_demo/ventura_county_trails_1.txt

GISsurfer map with the **default data styling defined on the ArcGIS servers**

https://mappingsupport.com/p2/gissurfer.php?center=34.478195,-119.245262&zoom=13&basemap=USA_basemap&overlay=Ventura_County_boundary,Proclaimed_forest,USFS_road_open,Ventura_road,USFS_road_closed,Ventura_trail,USFS_trail,USFS_recreation_site&data=https://mappingsupport.com/p2/kmz_demo/ventura_county_trails_default_styles.txt

Change the basemap on both maps to “**USA scanned topo**” and then to one of the **aerials**. Also try “**All white basemap**”. Note how hard it is to see the default data styling on some of the basemaps. No doubt someone had a good reason for styling the data in that manner but those choices might not meet your needs.

Here is another comparison. In this same general area of Ventura County I took four **screenshots that exactly adjoin** and stitched them together. I did this once using the map that displays dynamic layers and again using the map that displays the default styling. Here are links to the two composite **PNG files** I made:

Composite PNG file with dynamic layers used to style the data

https://mappingsupport.com/p2/georeference_demo/ventura_demo_transparent_restyle.png

Composite PNG file with default data styling defined on the ArcGIS servers

https://mappingsupport.com/p2/georeference_demo/ventura_demo_transparent_default.png

As part of the process of taking these screenshots GISsurfer provided the georeference data for each individual screenshot and also for the composite image. Below are links to two KMZ files. Each KMZ file includes (1) a KML file with the georeference data and (2) one of the composite PNG files. These PNG files have a **transparent background**. You can open these KMZ files and display the georeferenced composite PNG file with Google Earth, ATAK, iTAK, WinTAK, QGIS and various other software.

KMZ file with dynamic layers used to style the data

https://mappingsupport.com/p2/georeference_demo/ventura_demo_transparent_restyle.kmz

KMZ file with default data styling defined on the ArcGIS servers

https://mappingsupport.com/p2/georeference_demo/ventura_demo_transparent_default.kmz

To learn how to use GISsurfer with ArcGIS dynamic layers please see this PDF:

<https://mappingsupport.com/p2/help/GISsurfer-advanced-arcgis-tips.pdf>

4. Make your first georeferenced image

These step-by-step instructions will show you how to use GISsurfer to make a **single georeferenced JPG centered on your neighborhood**. This first JPG is quite simple since it will use only one screenshot and will show a basemap without any GIS layers added. **Doing a simple map first will help you learn the basics.** You can use any device from a cell phone to a desktop computer. But with that said, you should try to use the largest screen that is available so each screenshot covers a larger area.

If you are using a cell phone, tablet and other **touchscreen** device, note that the GISsurfer interface will let you shift the screen exactly one screen worth up/down/left/right on any type of touch screen device. However, making a useful georeferenced screenshot will only work if the screenshot can be saved as a **JPG or PNG file**.

Start by opening this GISsurfer map.

<https://mappingsupport.com/p2/gissurfer.php>

Zoom in on your neighborhood or click/tap Menu ==> Search. You can search on addresses, town names, coordinates, etc.

Decide what zoom level you will use when you take the screenshot. If you zoom in more then you will see more street names. If necessary, drag the map to where you want it centered.

Keyboard users (scroll down if you are using a touchscreen)

- A. Open the program you are going to use to save the screenshots. On a windows computer the Paint program works fine. **This is the old 2D version of Paint.**
- B. Press F11 to remove the browser controls from the screen. Now press F11 again. Doing this sometimes causes the coordinates for the center of the map to change slightly. This step is important so, if necessary, you can replicate the **same starting point** for a series of screenshots.
- C. Press F11 to remove the browser controls from the screen.

- D. Click **Menu** ==> **Screenshot mode**. The GISsurfer controls are removed from the screen.
- E. Click ‘Read me’ for some useful information. Answer the question about touchscreen by clicking “No” and then click “Ready to take screenshots”.
- F. Take a screenshot. On a windows PC, hold down the alt key and pressing the “Print screen” key.
- G. Hold down the alt key then hit the tab key. Keep holding down the alt key and use the arrow keys (or tab key) to highlight the program you will use to save your screenshot. Release the alt key, paste in your screenshot and save it as a jpg file.
- H. Hold down the alt key then hit the tab key. The screen will shift back to GISsurfer. Release the alt key.
- I. Exit screenshot mode by pressing F11 to restore the browser controls and pressing ESC to restore the GISsurfer controls.
- J. Save the georeference data.
When you press ESC the screen shows three buttons. Each one will copy the georeference data into the **clipboard**. If you followed this script then you only took one screenshot so press either of the first two buttons and then **paste** that data somewhere and save it. Then press the KML button and **paste** that data somewhere and save it.

The coordinate data is in the order **bottom latitude, left longitude, top latitude, right longitude** (south,west,north,east). The **clipboard** data will also include a GISsurfer link that will replicate the map you used to take the first screenshot. If you are doing a series of screenshots and make a mistake on one of them then you can use that link to open the map, go into screenshot mode, shift the screen up/down/left/right and redo just the bad screenshot.

Touchscreen users

- A. Tap **Menu** ==> **Screenshot mode**. The GISsurfer controls are removed from the screen.
- B. Tap ‘Read me’ for some useful information. Answer the question about touchscreen by tapping “Yes” and then tap “Ready to take screenshots”.
- C. Take a screenshot only of what the browser is displaying, not the entire screen.
Many phones save screenshots as PNG files. Your device may or may not have a setting that lets you change that file format to JPG.

- D. **Critical! Tap the center of the screen.**
GISsurfer has no way to automatically detect when you take a screenshot using a touchscreen device. When you take a series of screenshots that exactly adjoin you must tap the center of the screen after each screenshot.
- E. Tap the button to save the georeference data and exit screenshot mode.
You will see three buttons that let you save the georeference data. These are the same choices that desktop users see. See the last step in the preceding instructions for keyboard users.

If you put your georeferenced image files online then you will have more flexibility in how those images can be displayed.

5. Free hosting for JPG and PNG files

You do not need your own server to host JPG and PNG files. Instead, Flickr will host those files for free. But if you make a substantial use of Flickr then you should really pay for a **Flickr subscription**. The instructions below refer to JPG however PNGs work the same way (except PNGs are not compressed). If you upload a PNG with a transparent background and view that image with Flickr then you might see a dark background. Just ignore that. The background in your PNG is still really transparent.

Before uploading your JPG files you should apply some **compression**. If you use Photoshop then compression level 5 reduces the file size to about 1/3 the size compared to saving at maximum JPG file size and without any significant decrease in quality when the JPG is viewed at the same zoom level that was used to save the GISsurfer screenshot.

Tip: One nice thing about Flickr is that you can get a link to the JPG you uploaded without any additional compression being applied. If you use a different hosting service then you should find out if that service is applying its own file compression.

1. Sign in to your account. <https://www.flickr.com/>
2. Click the menu icon in one of the upper corners and then select “Photostream”. The screen will show the images you have uploaded.
3. Click the upload icon (cloud with an up arrow) and upload your screenshot(s).
4. Click a JPG you just uploaded. The screen will show that JPG along with some controls.
5. In the lower right corner, click the download symbol (down arrow).

6. Highlight “Original size”, Right click and select “Copy link”. You will get a link that looks something like:

https://live.staticflickr.com/65535/51654110536_bb1d79695e_o_d.jpg

The above JPG was made by stitching together 15 GISsurfer screenshots that each was 1280x1024. If the stitching had not been done then each of the 15 screenshots would need to be placed online and you would need to do careful record keeping so you could match up each of the 15 screenshot addresses with the correct georeference data for each screenshot. **The huge advantage of stitching screenshots together is that the resulting JPG can cover a large area and you only need to keep track of a single set of georeference data.**

When the stitched together this JPG at maximum quality was 10.8MB. Before uploading to Flickr the file size was reduced to 3.8MB using photoshop compression level 5. In the next section is a GISsurfer map link that displays this georeferenced JPG.

6. Display your georeferenced image with GISsurfer

Displaying a newly made georeferenced image with GISsurfer is a quick and easy way to make sure the georeferencing data is correct. All you need to do is place the JPG or PNG file online and then make a GISsurfer link like so:

https://mappingsupport.com/p2/gissurfer.php?data=name^https://____^georeference_data

You make up a name. GISsurfer map link should not include any spaces so in the name use an underscore character instead of a space. The https link must have .jpg or .png at the end.

For example, the following GISsurfer map displays the JPG hosted on Flickr that was described in the previous section of this PDF file.

https://mappingsupport.com/p2/gissurfer.php?data=Issaquah_area_trails^https://live.staticflickr.com/65535/51654110536_bb1d79695e_o_d.jpg^47.409561,-122.171831,47.552027,-121.732378

If you want to display more than one georeferenced image then make your GISsurfer link as follows. Think of the two vertical lines || as an end-of-line indicator for information being fed to the **data parameter**.

https://mappingsupport.com/p2/gissurfer.php?data=data=name^https://____^georeference_data||name^https://____^georeference_data

7. Make a KMZ file

If you want to display your georeferenced image with Google Earth, ATAK, QGIS, etc, then you will need to make a KMZ file that contains one or more georeferenced JPG or PNG files and one KML file that has the georeference data for the image(s).

Here is an example of a completed KML file with georeference data for **one image**.

https://mappingsupport.com/p2/kmz_demo/sample.kml

Here is an example of a KML file that can hold the georeference data for **more than one image**. The file has underlines where you need to add information.

https://mappingsupport.com/p2/kmz_demo/sample_multiple_images.kml

Here is an example of a completed KML file with georeference data for six images.

https://mappingsupport.com/p2/kmz_demo/ventura_county_all_transparent.kml

The following steps for making a KMZ file are written for a windows 10 PC.

- A. Use a text editor to open the KML file that you saved from the clipboard as you were done taking screenshots with GIS surfer. Alternatively you can open one of the example kml files shown above.
- B. The top of the clipboard data shows a GISsurfer map link which will replicate the map that was on your screen when you took the first screenshot. If you want to save that map link somewhere else then do so now. Then delete lines from the top of the file so that the first line that remains is `<?xml version="1.0" encoding="UTF-8"?>`.
- C. Edit the KML and then save it with the .kml file extension.

name	Add a descriptive name
href	This must be the file name and extension for the georeferenced image
LatLonBox	The georeference data you saved from GISsurfer is in the same order as you see in the sample KML file - south,west,north,east.
- D. Open the windows file explorer and select both the KML file and the georeferenced image file. (Hold down the ctrl key while clicking both file names). If the KMZ file is going to include **multiple images** then you need to select all those images along with the KML file that has the georeference data for all the images.
- E. Rightclick the highlighted file names and select "Send to > Compressed (zipped) folder". A new folder will be made with the **zip** extension.
- F. Change the extension of the folder from **zip to kmz**. You might also want to change the file name. You now have a KMZ file that contains both the georeferenced image file(s) and the KML file.

8. Display your KMZ file with Google Earth

The next steps will open your KMZ file in Google Earth. This is an easy and quick way to make sure your KMZ file has been correctly made.

- F. Open <https://earth.google.com/web/>
- G. Rest your cursor over the symbols in the left sidebar until you find the one that displays “Projects”. Click that symbol.
- H. Select “Open > Import KML file from computer”
- I. Navigate to your KMZ file and double click it. The JPG image will appear on Google Earth and be correctly positioned (i.e. georeferenced). If you see a red X then check the KML file. If you edit the KML file then you need to re-make the KMZ file.

9. Display your KMZ file with ATAK - iTAK - WinTAK

These instructions were developed using ATAK. You can also import KMZ files into iTAK and WinTAK although there might be differences in the interface for doing so.

- A. **Either** cable your Android device to your PC and load the KMZ file into local storage **or** place the KMZ file online.
- B. Open the ATAK “Import” feature and select the KML option.
- C. Enter a name.
- D. Tap the folder icon to import from local storage or enter a URL.
- E. Decide whether the two options (Auto refresh and Remove) should be on/off and then tap Add. These options should most likely be set to ‘off’.
- F. The Overlays screen should appear. Note the red X. Tap the download icon and a green checkmark will appear.
- G. Tap the name of the overlay and the map will shift to that spot and show the georeferenced JPG.

10. Display your KMZ file with a Garmin device

Many Garmin GPS units can display custom maps that you make or download from the internet. These custom maps are KMZ files. However, Garmin has imposed significant restrictions on this feature. Here are two possible ways to deal with those restrictions.

Option 1. Buy additional maps from Garmin. \$\$\$

Option 2. Use GISsurfer to make georeferenced JPGs and tile them with KMZFactory. Free

For instructions on using KMZFactory see the second part of the following article. You can skip the first part of the article which shows how to georeference an image.

<https://www.instructables.com/Create-Custom-Maps-for-Your-Garmin-GPS>

This FAQ describes the restrictions Garmin imposes on custom maps.

<https://support.garmin.com/en-GB/?faq=FtEncUXbaE0xE04yZ7gTq5>

11. Make georeferenced PNGs with a transparent background

If you are an ATAK, iTAK or WinTAK user then you likely already know how you can load a wide variety of basemaps. If you have georeferenced PNG files with a **transparent background** (instead of georeferenced JPGs) then those PNGs can be displayed as an overlay on top of any of your basemaps. Here is how to make georeferenced PNG files with a transparent background.

Before taking screenshots, change the GISsurfer basemap to “All white basemap”.

Save each screenshot as a PNG file.

If you took a series of adjoining screenshots then stitch them together and save the composite image as a PNG file.

The last step is to use image editing software to remove the white background so that the background becomes transparent. This is super easy to do with Photoshop but other tools will also get the job done. The following instructions were developed using Photoshop CS4 (last version you could buy and own outright).

- A. Start Photoshop and open your PNG file.
- B. Select > Color range
- C. The “Select” box should show “Sampled colors”. Set Fuzziness to 20. Click “OK”. You have now selected all the white background.

- D. Edit > Cut. This deletes the white background. The background should show the checkerboard which indicates that the background is now transparent.
- E. Save this as a PNG file. This is the file that you will include in a KMZ file along with a KML file that holds the georeference data.

12. Make a series of screenshots

The real power of using GISsurfer to make georeferenced JPGs and PNGs comes when you display GIS data that you want to see offline and then make a series of screenshots that you stitch into a larger composite image. **Stitching the screenshots together is optional but is easy to do since the screenshots exactly adjoin with no gaps or overlaps.** You do not need to ‘rubberband’ the final composite image since GISsurfer provides you with the georeference data for the composite image.

The following recommendations will help you stay organized as you take a series of adjoining screenshots.

Start taking screenshots at the **upper left** of the area to be covered.

Complete the first row of screenshots then shift the screen back on the same row to where you took the first screenshot. Then shift the screen down to start the next row of screen shots.

Keyboard: After saving a screenshot then use the **arrow keys** to shift the GISsurfer screen exactly one screen worth. Or you can use the letter keys l, r, u, d.

Touchscreen: Remember that after each screenshot you must **tap the center of the screen** so GISsurfer knows that you took a screenshot and it needs to save the georeference data. After you do that then **tap in about the middle of any edge** to shift the screen in that direction. For example, to shift the screen exactly one screen worth to the right, tap in about the middle of the right hand edge of the screen.

Desktop users can name the screenshot files based on the row and column for how the screenshots will be stitched together. If you name files in this manner then you automatically know where each image file goes as you stitch them together. For example, if you are going to take a series of screenshots that are 2 across and 3 down and save them as JPGs, then name your files as follows:

- 1_1.jpg (upper left screenshot)
- 1_2.jpg
- 2_1.jpg
- 2_2.jpg
- 3_1.jpg
- 3_2.jpg (lower right screenshot)

When you are done taking screenshots and are getting out of screenshot mode then you will see an interface screen with three buttons. Each button will put the georeferencing data into the **clipboard**. The clipboard data will also have a GISsurfer map link that will replicate the map that was on your screen when you took the first screenshot. This map link is extremely useful in case a screenshot in the series needs to be redone. **You then need to paste the clipboard data somewhere and save it.** You can save the data from more than one of these buttons.

Tip: A KML file can hold georeference data for multiple images. See the section in this PDF titled “Make a KMZ file” for examples of KML syntax.

Georeference for each screenshot

Use this button if you only took one screenshot or if you took a series of screenshots but do not intend to stitch them together. The georeference data will be provided in the same order that you took the screenshots. Instead of stitching the screenshots together, you can make a KMZ file that includes (1) all your screenshot images and (2) one KML file that has the georeference data for each screenshot.

Georeference for stitching

This button gives you the georeference data for a composite image you intend to make by stitching a series of screenshots together.

KML

This button will give you the syntax for a KML file. Use this button if you intend to make a KMZ file that includes the KML file plus one or more georeferenced images.

13. Stitch together a series of screenshots

You likely will quickly find it a routine matter to take 20 to 30 screenshots (or more) that exactly adjoin and stitch them together. Whatever software you use for stitching you will need to start by make a new empty file that is the size of the composite image you will make. For example, if your screen is 1280 x 1024 and you are going to stitch screenshots together that are 2 wide and 3 tall, then you would make a new empty image that is 2560 x 3072.

Tip: Here is what to do if you are stitching and discover that one of your screenshot images is somehow bad. Open the GISsurfer map link you saved from the clipboard when you were done taking screenshots. Go into screenshot mode and use the GISsurfer screen moving controls to move the screen to the correct position of the bad screenshot. You can now take a new screenshot that is in the exact position of the screenshot that was bad. There is no need to repeat all of the screenshots.

Below are a few options for stitching your JPGs together.

Photoshop

- A. Make a new file of the correct size and with a transparent background. This will become your composite image.
- B. Open your first JPG or PNG file. Select > All. Edit > Copy
- C. Go to your new file and do Edit > Paste
- D. Activate the Move tool, click-hold on the image you pasted in and drag the image into position. If you are following the advice in this PDF then the first position is the upper left corner of the composite image.
- E. Open the next JPG or PNG file and repeat the copy-paste-drag steps until the composite image is complete. One nice thing about using Photoshop is that when you are dragging an image and it gets close to the right location, then it seems to **'snap' into place**.
- F. If you are making a composite JPG file then when you save the final result apply some normal compression. Try **compression level 5** which results in a perfectly usable image that is about 1/4 the size of the uncompressed composite JPG.

Windows 2D Paint program

You will need to open the Paint program twice. In the first one, make a new empty file that is the size of the composite image you will make. To do this click File > Properties and enter the size.

Use the second instance of the Paint program to open your first screenshot image and copy it.

Go back to your first instance of the Paint program and paste in the image you copied. Then drag it into position.

I noticed that when dragging the images they do not 'snap' into place when they are close to the right position. Also I did not find any way using Paint to compress a composite JPG.

Hugin

This is a free open-source stitching program. I have not used this program but it is well regarded. There are versions for both windows and mac. <https://hugin.sourceforge.io>
And there is a forum at <https://forum.hugin.com>.

14. GISsurfer links for USFS, NPS, BLM and NOAA maps

Please keep in mind that the terms of service for GISsurfer specify **non-commercial use only**.

Below are GISsurfer links that anyone can use to make their own georeferenced JPGs and PNGs. You will notice that each link includes a txt file. You can copy that txt file link, paste it into a browser and look at the contents. You will see the syntax that GISsurfer uses to display GIS data. Anyone can make similar txt files, put them online and use GISsurfer to display that GIS data.

For details on where you can host txt files for free, see <https://mappingsupport.com/p2/help/GISSurfer-data-parameter.pdf> and look at the section titled “Free hosting for TXT and GPX files”.

When each map opens some overlay layers are turned on and there are other overlay layers you can also turn on. Also, each of these GISsurfer maps has a **“Map Tips”** link in the upper left corner with the map legend and other useful information for using the map. To get the most benefit out of any map you need to understand a few things about how GISsurfer works. Reading the “Map tips” is an excellent way to learn. Additional documentation for GISsurfer is at <https://gissurfer.com>. **The GISsurfer “Help” page has links to PDF files with detailed documentation on various topics.** One of the **most important** things to know is that the map will look very different depending on the order with which you turn GIS overlay layers ‘on’ and ‘off’.

Of course you can use any GISsurfer map to make georeferenced JPGs and PNGs. You are not limited to just the following maps.

National Forests

https://mappingsupport.com/p2/gissurfer.php?center=47.423543,-121.550976&zoom=14&basemap=USA_scanned_topo&overlay=Proclaimed_forest,USFS_trail_green,USFS_trail_black_line,USFS_road_open_black,USFS_road_open_white,USFS_road_closed,USFS_recreation_site&data=https://mappingsupport.com/p2/recreation/USFS_recreation.txt

Here is a brief description for three of the possible basemaps you can use.

- A. **USA scanned topo.** This basemap is displayed when the map opens. These are scans of the paper USGS 1:24,000 scale topographic maps. The USGS stopped updating these paper maps years ago but they show the most detail topographic lines.
- B. **USA topo.** These are current ‘all digital’ topographic maps that the USGS periodically updates. The topographic lines are smoothed a bit compared to the old paper maps.
- C. **USA forest service topo.** This map uses the same topographic line data that you see with USA topo. Road numbers and certain other forest service data are part of the basemap. Since this basemap does not include tree cover, the map link turns on the “2016 tree cover” overlay layer.

National Parks

<https://mappingsupport.com/p2/gissurfer-national-park-gis-trail-maps.html>

The above web page has a separate GISsurfer map link for each of the 63 national parks. You can use any of these map links to make georeferenced JPGs and PNGs. When you open any of these maps the trails are highlighted and will be easy to see on any basemap. Each map has additional GIS overlay layers you can turn on if they would be useful to you.

Bureau of Land Management (BLM) land

https://mappingsupport.com/p2/gissurfer.php?center=42.682309,-118.706245&zoom=12&basemap=USA_basemap&overlay=BLM_land_shaded,BLM_land_outline,State_boundary,BLM_recreation_facility,BLM-G_trail_not_assessed,BLM_trail_not_assessed&data=https://mappingsupport.com/p2/recreation/BLM_recreation.txt

The above BLM GISsurfer link uses the all digital “USA basemap” which is maintained by the USGS. To switch to scanned copies of the 1:24,000 scale paper USGS topo maps, change the basemap to “USA scanned topo”. **Caution** - The USGS stopped updating the paper topographic maps years ago.

The BLM GIS server has several different layers that **might** have data for roads or trails. To see a list of those layers, open the above BLM map and click the basemap button. Mobile users need to scroll down for the 'Overlay' section. **Some of these layers apparently have no data.** And whether or not a road or trail layer has data might vary from one area to the next.

The BLM map can display each road and trail layer twice. Once as a wide colored line and again as a narrow darker line. **This technique of displaying the data twice makes the road and trail data easy to see on any basemap.**

Road layers with a “Y” in the layer name will display a wide yellow line. Trail layers with a “G” in the layer name will display a wide green line. The companion layer will display the same data using the styling defined on the GIS server and in a narrow manner on top of the wider colored line. **Turn on a “Y” or “G” layer first** so it is on the bottom and then turn on the companion layer which is narrower and will be displayed on top of the wider colored layer.

NOAA marine charts - zoom in for more detail.

https://mappingsupport.com/p2/gissurfer.php?center=26.211214,-80.870361&zoom=7&basemap=NOAA_marine_chart&overlay=AWOIS_obstructions,ENC_wrecks,AWOIS_wrecks&data=https://mappingsupport.com/p2/recreation/USA_NOAA_nautical.txt

15. GISsurfer example displaying GPX data

Before taking screenshots you can tell GISsurfer to display both various layers of GIS data plus data from one or more GPX files. Currently this will only display GPX track data. The GPX file has to be online somewhere and reachable with a simple link that does not require any kind of login.

GPX files can be hosted on Google Drive for free. For instructions see this PDF file:

<https://mappingsupport.com/p2/help/GISSurfer-data-parameter.pdf>

Read the section “Free hosting for TXT and GPX files”.

To display a GPX file with GISsurfer, use the **data parameter**. Below is an example where the data parameter points to (1) a txt file that specifies GIS layers and also (2) a GPX file with track data (red line on the map). Note the two vertical lines || which separate pieces of information for the data parameter.

https://mappingsupport.com/p2/gissurfer.php?center=47.419697,-121.565351&zoom=14&basemap=USA_scanned_topo&overlay=Proclaimed_forest,USFS_trail_green,USFS_trail_black_line,USFS_road_open_black,USFS_road_open_white,Landform_names,USFS_recreation_site&data=https://mappingsupport.com/p2/recreation/USFS_recreation.txt||https://mappingsupport.com/gpx/Bandera.gpx

16. Existing georeferenced JPGs anyone can use

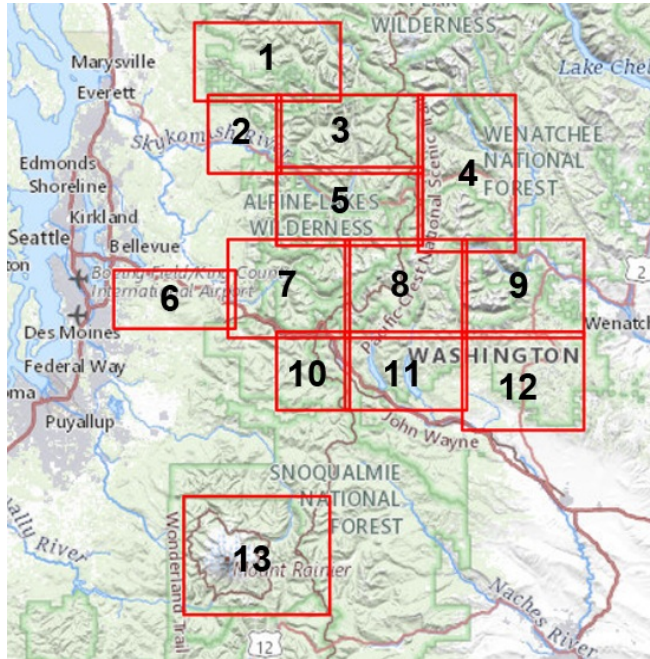
If you live in Washington State then a number of large and small georeferenced JPGs have been produced that highlight trails, roads and various recreation features. Links to these resources are provided below. These JPGs use the scanned USGS topo maps as the basemap and cover the much of the Washington State Cascade Mountains.

Two links are provided for each JPG. If you want to ‘tile’ the JPG for use as a custom map in a Garmin device, then rightclick the GISsurfer link, copy it and paste it into an editor. You will see the link to the georeferenced JPG and also the georeference data in the order south,west,north,east. Another way to get the GISsurfer link is to open a map and then click Menu > Link to this map. If you want to open the georeferenced JPG with software such as Google Earth, ATAK, iTAK, WinTAK, QGIS, etc then use the KMZ link.

When the GeoJPG v2 web app is finished and released you will be able to install any of these georeferenced JPGs on your phone and use them as offline maps.

Each large map was made by stitching together a number of adjoining screenshots. For example, maps 7, 8, 9 and 12 were made by stitching together a series of 25 screenshots (5 across and 5 down). A typical large map is about 7MB in size and covers 300+ square miles.

Here is an index map for the ‘large’ georeferenced JPGs.



- | | | |
|--------------------------|-------------------------------|--------------------------|
| 1. Mountain Loop south | GISsurfer map | KMZ file |
| 2. Wallace Falls | GISsurfer map | KMZ file |
| 3. US2 north | GISsurfer map | KMZ file |
| 4. Chiwaukum | GISsurfer map | KMZ file |
| 5. US2 south | GISsurfer map | KMZ file |
| 6. Issaquah | GISsurfer map | KMZ file |
| 7. I90 west of pass | GISsurfer map | KMZ file |
| 8. Cle Elum River north | GISsurfer map | KMZ file |
| 9. Mt Stuart | GISsurfer map | KMZ file |
| 10. Silver Peak | GISsurfer map | KMZ file |
| 11. Cle Elum River south | GISsurfer map | KMZ file |
| 12. Teanaway east | GISsurfer map | KMZ file |
| 13. Mt Rainier | GISsurfer map | KMZ file |

Below are links for the ‘**small**’ **georeferenced JPGs** that anyone can use. Most of these small JPG are intended to cover a single popular trail in the Washington State Cascades and often are only a single screenshot.

San Juan Islands

Cypress Island	GISsurfer map	KMZ file
----------------	-------------------------------	--------------------------

Mountain Loop south

Cutthroat Lakes	GISsurfer map	KMZ file
-----------------	-------------------------------	--------------------------

Dickerman Mtn	GISsurfer map	KMZ file
---------------	-------------------------------	--------------------------

Pilchuck Heather Lake 22	GISsurfer map	KMZ file
--------------------------	-------------------------------	--------------------------

US 2 west of pass

Barclay Lake	GISsurfer map	KMZ file
--------------	-------------------------------	--------------------------

Beckler Peak	GISsurfer map	KMZ file
--------------	-------------------------------	--------------------------

Copper Lake	GISsurfer map	KMZ file
-------------	-------------------------------	--------------------------

Evergreen Lookout	GISsurfer map	KMZ file
-------------------	-------------------------------	--------------------------

Hope and Mig Lakes	GISsurfer map	KMZ file
--------------------	-------------------------------	--------------------------

Johnson Ridge	GISsurfer map	KMZ file
---------------	-------------------------------	--------------------------

Lake Dorothy	GISsurfer map	KMZ file
--------------	-------------------------------	--------------------------

Lake Serene	GISsurfer map	KMZ file
-------------	-------------------------------	--------------------------

Tonga Ridge	GISsurfer map	KMZ file
-------------	-------------------------------	--------------------------

Wallace Falls	GISsurfer map	KMZ file
---------------	-------------------------------	--------------------------

I 90 west of pass

Granite Mountain	GISsurfer map	KMZ file
------------------	-------------------------------	--------------------------

Kendall Katwalk	GISsurfer map	KMZ file
-----------------	-------------------------------	--------------------------

Mailbox Peak	GISsurfer map	KMZ file
--------------	-------------------------------	--------------------------

Mason Lake	GISsurfer map	KMZ file
Melakwa Lake	GISsurfer map	KMZ file
Mt Si	GISsurfer map	KMZ file
Otter Falls	GISsurfer map	KMZ file
Rattlesnake Ledge	GISsurfer map	KMZ file
Snow Lake	GISsurfer map	KMZ file

I 90 east of pass

Kachess Ridge Beacon	GISsurfer map	KMZ file
Lake Lillian	GISsurfer map	KMZ file
Thorp Mountain	GISsurfer map	KMZ file

Teanaway

Miller Peak	GISsurfer map	KMZ file
Stafford Creek	GISsurfer map	KMZ file

17. Existing georeferenced PNGs anyone can use

The following example shows the benefit of (1) using **dynamic layers** to restyle ArcGIS data and (2) using PNG files with a **transparent background**. For this example, six PNG files were made that **exactly adjoin**. Each of those PNG files consists of multiple screenshots that **exactly adjoin** and were stitched together. These PNG files cover all of Ventura County California.

The GIS layers used for the map show road and trail data that is hosted by Ventura County and the U.S. Forest Service. Trails are green/black. Roads the USFS has closed are red dashes. The Ventura County boundary is orange.

Below is the GISsurfer map link that was used to take the Ventura County screenshots. Since the goal is to make PNG files with a transparent background, the basemap is set to “All white basemap”. If you want to see the **dynamic layers** syntax that was used to restyle the data, then download and open the txt file that you see at the end of the GISsurfer link.

[https://mappingsupport.com/p2/gissurfer.php?center=34.875123,-119.403963&zoom=14&basemap=All white basemap&overlay=Ventura County boundary,Proclaimed forest,Ventura trail green,Ventura trail black,USFS trail green,USFS trail black,USFS road open black,USFS road open white,Ventura road black,USFS road closed,USFS recreation site&data=https://mappingsupport.com/p2/kmz_demo/ventura_county_trails_1.txt](https://mappingsupport.com/p2/gissurfer.php?center=34.875123,-119.403963&zoom=14&basemap=All%20white%20basemap&overlay=Ventura%20County%20boundary,Proclaimed%20forest,Ventura%20trail%20green,Ventura%20trail%20black,USFS%20trail%20green,USFS%20trail%20black,USFS%20road%20open%20black,USFS%20road%20open%20white,Ventura%20road%20black,USFS%20road%20closed,USFS%20recreation%20site&data=https://mappingsupport.com/p2/kmz_demo/ventura_county_trails_1.txt)

Here is a **KML file** with the georeference data for the six PNG images.

https://mappingsupport.com/p2/kmz_demo/ventura_county_all_transparent.kml

And below is a link for a 20MB **KMZ file** that will display the six PNG files. If you open this KMZ as an overlay with ATAK, iTAK or WinTAK then you can **display this data on top of any basemap**. You can also open this KMZ with Google Earth, QGIS or any other software that supports KMZ files that contain georeferenced images.

https://mappingsupport.com/p2/kmz_demo/ventura_county_all.kmz

If for any reason the 20MB KMZ file does not work for you, then here are three smaller KMZ files. Each file will display two PNG files with transparent backgrounds.

Ventura County north

https://mappingsupport.com/p2/kmz_demo/ventura_north_transparent.kmz

Ventura County middle

https://mappingsupport.com/p2/kmz_demo/ventura_middle_transparent.kmz

Ventura County south

https://mappingsupport.com/p2/kmz_demo/ventura_south_transparent.kmz

18. Several ways to search ArcGIS servers for specific data

Let's assume that you are looking for GIS layers with trail data. **First**, to look for state level data a good place to start is with this website which had links to data portals for all states.

<http://opensourcegisdata.com/state/index.html>

If you use a data portal and find a 'hit' to some ArcGIS data that you want to see on a map, then you might have to poke around a bit to find the actual address to MapServer, FeatureServer or ImageServer data layer that GISsurfer can display. Look for a link or button that says "View data source".

Note that portals typically only index a relatively small number of layers on the state's GIS servers.

Second, you could look through the table of contents of an ArcGIS server. This is simply a series of web pages. Below is a link to a curated list with addresses for 3,000+ ArcGIS servers at all levels of government from federal to local. An updated list is usually posted each Wednesday

with any bad links either fixed or flagged. Each ArcGIS server link will open the top of the table of contents for that server.

https://mappingsupport.com/p/surf_gis/list-federal-state-county-city-GIS-servers.pdf

Third, you can also use google to search a specific ArcGIS server for data by making a search like so:

site:_____ keyword **Tip:** Do not leave a space after “site:”

For example, to search for trail data in Ventura County California you could start by looking at the curated list of ArcGIS servers. Sure enough, there is an ArcGIS server listed for Ventura County. So make your google search like this:

site:https://maps.ventura.org/arcgis/rest/services trail

Success! The above search turns up a layer of GIS data at:

<http://maps.ventura.org/arcgis/rest/services/SDs/HikingTrail/MapServer/0>

If you spend a few minutes with the documentation on the [GISsurfer website](#) then you will learn how to make a GISsurfer map link like you see below to display this trail data.

https://mappingsupport.com/p2/gissurfer.php?center=34.483320,-119.036865&zoom=10&basemap=USA_basemap&overlay=Hiking_Trails&data=overlay^name=Hiking_Trails^url=http://maps.ventura.org/arcgis/rest/services/SDs/HikingTrail/MapServer^layers=0

If you open the above map then you will see that the trail data is rather hard to see. It is even harder to see if you switch the basemap to “USA scanned topo”. This is the styling that is defined on the ArcGIS server. You can use GISsurfer and **“dynamic layers”** to restyle this trail data so it is easier to see on the map. For more information please see this PDF:

<https://mappingsupport.com/p2/help/GISSurfer-advanced-arcgis-tips.pdf>