2020 BUSH FIRE

Remote GISS Lessons Learned

ABSTRACT
Informal lessons learned during Southwest Incident Management Team 5's successful implementation of remote team GISS support on the 2020 Bush fire.

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Introduction

Southwest Team 5 (a type 2 team) was assigned to the Bush Fire on the Tonto National Forest from June 15 to June 19 and then handed the fire off to a Southwest type 1 team. During the time assigned the Team 5 GISS group successfully deployed and worked within an entirely virtual environment. As a whole the team had available to them a SITL and SITL(t) on site plus another SITL remote and two qualified GISS and a trainee.

Disclaimer

This document is an informal product written from our experiences and discussions from several after action reviews conducted by the GISS section. It is **not** an official team document and may not fully represent the thoughts and views of remote GISS support from outside of the team GISS section. Every effort was made to get this document out as quick as possible so that other teams can learn from our experience.

GIS Team Members

Lead GISS: Eric Ege (qualified). Used ArcPro 2.5.

Second GISS: Ruben Rodriguez (qualified). Used ArcPro 2.4.

Third GISS: Dena Forrer (trainee). Used ArcPro 2.5

Technical Configuration

The team worked exclusively in ArcPro and their agency laptops. The lead and third GISS used Forest Service laptops and the Second GISS used a BLM laptop. The team used the One Drive application to sync a local copy of the incident file structure between each team member. Once the incident structure was downloaded it easily synced between all 3 team members with minimal effort. There was a slight syncing lag due to uploads/downloads via internet connections, however having a local copy of the data synced between all 3 computers created huge efficiencies within the GIS software. The process worked so easy and hands off that it was easy to forget we were working off a synced cloud drive. The agency equipment and software were sufficient for the task.

Internet Connection Speeds

Lead GISS – Worked from his home office. 16mbps download, 1.5mbps upload.

Second GISS – Worked out of his BLM office. He could not test internet speed due to a firewall on his BLM network. The BLM office internet was sufficient for virtual GIS support and using OneDrive.

Third GISS – Worked from her home. 116mbps download, 10mbps upload.

One Drive

Information on the One Drive sync process is available via this Microsoft support document:

https://support.microsoft.com/en-us/office/sync-files-with-onedrive-in-windows-615391c4-2bd3-4aae-a42a-858262e42a49?ui=en-us&rs=en-us&ad=us

OneDrive Key Points

- We were logged into our agency account in the OneDrive app and needed to re-login with our firenet account.
- To get the files to sync you need to save and close out of your software. The OneDrive app will "lock" the files for syncing until you close your software. With ArcPro this was a minimal interruption because of how fast the software starts up.
- As you update your geodatabases and sync them up to OneDrive the other people working on the same data will need to close out their software so that the OneDrive app can sync the updates down to the local copy.

Communication

Communication was a huge key to the successful implementation of remote GIS for Team 5. The team leveraged several communications platforms including GroupMe and cell phones but used Microsoft Teams for a majority of communications. The GISS/SITL team had a video call twice daily at 0900 and 1500. The calls typically lasted from 30 to 45 minutes. There was also a running group chat with all SITL's and GISS's in it that was heavily utilized. Screensharing and screen control were also used frequently.

It should be noted that the Team 5 GISS and SITL's have a very close working relationship and many of the core members have worked on many fires together before this assignment. The biggest takeaway for making remote GIS work is the communication and one of the factors in our success was the core team having a good working relationship established already.

Successes

Microsoft Teams

Microsoft Teams was the single best tool we had for communication. The entire GIS team logged out of their agency accounts on the desktop version of the app, and logged in with their firenet account. Having everyone log into firenet in the desktop Teams application was important because of the difficulty for different agency Microsoft accounts talking to each other. The web version of Teams is not recommended as you can't take control of someone's screen via the web app. Everyone needs to be logged into firenet to facilitate screen control. There are also a lot of missed messages in the web version because it lacks a notification system.

The twice daily video calls brought us together to discuss everything we needed to and the two calls were adequate for our large group needs.

The running group chat was also vital to our working together. The SITL's on site had it running on their phones and were able to paste map screenshots (for edits) directly into the chat. Their ability to attach pictures of requested map edits directly into Teams not only created a record of map requests, but made it easy for the GISS team to visually see changes that needed to be made.

Onsite Situation

The team utilized an onsite SITL and SITL(t) which put us in a position to be successful. The SITL's coordinated between the virtual GISS and onsite customers to provide timely information and map changes.

Failures

Overall the GISS team was able to communicate effectively. It is our belief that our success relied on our previous familiarity and working relationship with each other. The major difficulty faced was the review of map products before production. It is believed that this was due to being pulled in several directions at once and being slightly understaffed.

There were also minor issues with Teams video calls. Teams worked well but if more than 5 people had their video running at a time the video and sometimes the call would tend to drop, even with good internet connection. It is recommended for calls with over 5 people that only the speakers share video. Also if there are connection problems it is recommended for the user to select the option to turn off incoming video to their device.

The Lead GISS attempted to use the Planner app within our Teams group to assign and track workloads and assignments, however that system was underutilized by the rest of the group.

What to do next time

- Tighten up map review process so we are producing products with less error on them.
- Virtual white board via OneNote to help facilitate note taking in a visual way. Could put the OneNote notebook file in the incident file structure under documents and then we would be able to collaborate on notetaking.
- More heavily utilize the Planner app to help track workloads and progress.

File Structure and Data Sharing

Successes

OneDrive

Using OneDrive to sync the file system across each computer was the **single most important** factor in our success. Running the OneDrive app kept the local incident file structure on each of the GISS's computer synced almost in real time. This created a situation where there was minimal to no effort involved in keeping 3 local copies synchronized with each other. It is difficult to envision successful remote GIS support without OneDrive Sync. It worked almost exactly like an onsite NAS would work with a slight delay as data was uploaded/downloaded.

We additionally had the incident file structure synced to each of our onsite SITL's computers. This allowed them to pull our maps out for printing with no effort on the GISS's end. This is a recommended practice to continue and if fully onsite it is also recommended to give the SITL access to a NAS file structure as it mitigated the distraction of having to transfer PDF's to the SITL.

We had no trouble with corrupt data, missing data or data locks while syncing OneDrive. We followed the S-341 editing workflow where we edited the geodatabase in a separate edit folder and then did a complete replacement of the "master" geodatabase. We believe that this mitigated some of the issues that are being reported by other teams with internal geodatabase file corruption and locks.

Collector and Avenza

The team utilized the NIFC templates for Collector and utilized the National Incident Feature Service. Collector was the primary way to pass the GIS field collected data and worked very well. There were small hiccups at the start of the incident with account management but everything was fixed quickly. The Team 5 operations section is committed to Collector as their primary data collection system and we have previously heavily relied on it. Our previous heavy use of Collector created the knowledge in our operations section to easily rely on it on this incident. The team has also produced a set of videos walking a user through every step in the use of Collector. Additionally the location of our fire (directly outside Phoenix) created a situation where there was cell service virtually everywhere making it much easier to sync. Many people in the field did not even bother with an offline copy and instead just collected live.

ArcPro

The fire was run entirely in ArcPro with mostly successful results. The efficiency of ArcPro over ArcMap is astounding and any time we spent learning a task in ArcPro was more than well made up for with the time savings and efficiency that Pro provides. It is recommended that in most cases GIS work is switched to ArcPro. Working in OneDrive with ArcPro was simple and required little thought. Pro stored the data in a relative file path so even though each GISS had a copy of the incident folder in their User folder on their computer we could open other people's projects and not have any issue with broken data links.

Failures

National Incident Feature Service

The National Incident Feature Service (NIFS) was the single biggest failure of the entire assignment. It was buggy, unreliable and frequently needed to be reset. The Lead GISS was able to follow the NIFC suggested editing workflow successfully about 50% of the time due to the unreliable nature of the NIFS. While the NIFS is somewhat out of our control we did have the ability to have EGP reset and the team received very good service from NIFC - especially from Katie Hansen. As of this writing NIFC has provided a hosted feature service to replace the NIFS and we believe that should solve all issues mentioned.

ArcPro

While the implementation of ArcPro was a success there were minor failures, mostly in the exporting of PDF's. The PDF's generated had printing issues that are discussed in the Product Dissemination section. We also had difficulty with the fonts exported from Pro; specifically we could not use italic or bold fonts. Anything that was exported in italic or bold would show up as squares in the PDF. We also had custom templates that had trouble linking to the dynamic text standalone table. Sometimes our dynamic text would just lose its link with the table and we would have to relink it. This was not an issue with data file paths stored in the aprx.

We also had minor issues with ArcPro versions. One GISS (a BLM employee) was not able to install ArcPro 2.5 so we had to work back and forth between versions. This was a much simpler process than it was with ArcMap but still caused some minor issues for the GISS with 2.4. Pro 2.4 is able to open Pro 2.5 documents but loses some of the functionality. We carried over the ArcMap practice of saving

the aprx with a software version number in the file name and the GISS with 2.4 worked in his 2.4 versioned aprx's.

Minor OneDrive Issues

There were minor issues with the OneDrive sync but they were all human error. When doing edits you need to save them and close out of your GIS software. This frees the files up to sync back up to the cloud. Then the people receiving the sync on the other end need to also close their GIS software to receive the updates. There is also a minor lag between when changes made on a local copy make their way up to the cloud and then back down to everyone else. As the team is used to working on site with a network file system (NAS) and having geodatabase changes happen instantly there was a learning curve to adjust to the sync delay. However as a whole OneDrive functioned perfectly and without flaw and is now highly regarded by our GISS team. The One Drive application shows the progress syncing files so it is recommended after closing your software to watch the application to make sure everything fully syncs before reopening.

Firenet Office 365

For the most part the office 365 environment provided by Firenet is extremely useful. However Firenet requires you to enter your password every 24 hours. This resulted in several of us having to reenter our passwords at inopportune moments like in the middle of a Teams call. The OneDrive app will also require a password every 24 hours but it doesn't always notify you (or you won't notice the notification) so there will be periods of time when you don't know that you're not connected to the OneDrive cloud. Ideally you would get your password reset times to sync with typically slow times of the day, or first thing in the morning. The downside of having to reenter your password first thing in the morning is that if any work happened overnight it won't slowly sync back up (as files are modified and created). It will sync in bulk which slows everything down. It is recommended that a GISS remains connected to OneDrive while they are off shift so the work happening while they sleep syncs over a longer period of time (as files are modified or created) instead of in bulk.

What to do next time

As we had this piece of the puzzle planned out well in advance it worked very smoothly and it is difficult to think of anything we need to change for next time.

Product Dissemination

Successes

On Site SITL

We had two SITL's on site who handled printing off of the team plotter (HP T930). They were able to print all requested map products by the requested deadlines. Without their presence and knowledge of the printing process we would have had to have at least 1 GISS on site.

Failures

ArcPro PDF Export

We had difficulty with the exporting of map products from ArcPro. ArcPro was exporting our maps in a format that our plotter (T930) couldn't flatten before printing. To fix this problem we had to export a raster copy of the map. However, the raster PDF is not georeferenced so we had to export a

separate vector version that was georeferenced for use in Avenza. This created some confusion and we ended up posting some non-georeferenced PDF's onto the FTP site. One of our GISS's also could not get ArcPro to export georeferenced PDF's no matter how many times they unchecked and checked the georeferenced box in the options. We are suggesting they try to reinstall Pro before the next assignment. It is also recommended to use the Geospatial Measure tool within the Adobe PDF software to verify the PDF Georeferencing before posting to the FTP site.

No Copy Trailer

While we had the ability on site to produce printed maps using the team plotter, we had ordered and been planning on getting a copy trailer at some point during the assignment. The order was never filled. Nor was an order for copiers filled. This created a situation where the SITL's had to work longer hours to produce plotted maps. We were also not able to produce IAP map books. To mitigate the missing IAP map books we created division zoom maps in size C and D to distribute. We also relied on the georeferenced PDF's and Avenza maps to lower the amount of printed product.

What to do next time

- Investigate a way to flatten PDF's prior to printing. There is a flatten function within Adobe Acrobat Pro but we did not have time to explore that function.
- Consider adding 11x17 copy capabilities to the team's inventory of equipment. The team currently has a plotter so it isn't a stretch to consider other copy and printing capabilities.

Training

Successes

We had a one GISS trainee who was on their first fire assignment. The trainee was also fairly new to ArcPro so there was a double learning curve for them. However they learned ArcPro very quickly and the time spent on the learning curve of ArcPro was more than made up for in the efficiency of Pro over Map. We successfully leveraged Teams screen share and the request control function to provide quality training to our trainee.

Failures

As the lead GISS I feel we weren't able to provide as much of a training opportunity to the trainee and they had to learn some things on their own instead of from one of the qualified GISS's. However this was not due to the virtual environment but had to do with being short a GISS that we normally carry on the team which resulted in an increased workload. Additionally we were assigned as a type 2 team to a fire with type 1 complexity which added to the workload.

What to do next time

- Try to find additional GISS support to lessen the workload on the qualified GISS's.
- Try to work in a scheduled time to work with the trainee so that it is more of a defined task with a priority similar to a map product.

Conclusion

The use of a virtual GIS brought the team to the point where they were 2 days ahead in the creation of map products. Because there was no travel time the GISS's were able to set up the incident and start working immediately upon receiving the order. This allowed the team to be a day ahead of map product production the minute they assumed command of the fire. Additionally working offsite reduced distractions for the GISS's and we estimate that gave us an extra 25% productivity over being onsite. By the time we handed the fire off to the incoming type 1 team we estimated we were 2 days ahead of where we would have been on a normal incident. We intend to leverage the knowledge gained when operations return back in a non COVID world. We think the lead GISS could work on setting the incident up during the team's travel day while the other GISS's traveled to the fire. The lead GISS could then sync the incident to OneDrive and travel to the incident while the other GISS's start working. It is believed this could give us similar efficiencies as we gained by being able to work during the travel day on the Bush incident.

Being virtual also helped to reduce fatigue and reduce risk on the GISS staff. Because GIS is a highly detail oriented position combined with the frequent 16+ hour days on a regular assignment GIS is very susceptible to errors caused by cumulative fatigue. Being virtual eliminated the fatigue of a long drive to the incident and all 3 GISS's report that while working 16 hour days they did not feel the fatigue they do on a normal assignment. The Lead GISS was assigned to another fire (virtually) previous to this assignment and was on the equivalent of day 12 when the transition occurred. Despite being on day 12 he reports that his fatigue level is much reduced compared to day 12 of an onsite fire. The reduction in fatigue is a huge bonus with the virtual work, especially with the detail oriented requirements of the position. Virtual GIS support could also be used to reduce risk beyond just COVID-19. The fact that positions aren't working in fire camp (with its associated risk), and especially not travelling (biggest risk we take), reduces the overall risk that a GISS will be exposed to.

A common theme reported by the virtual positions on the incident was that their internet connect was a lot faster and more reliable than when they are on site in most situations. Not only did the GISS's report this but also the FBAN, LTAN and IMET who also rely heavily on an internet connection. With the increasingly cloud based nature of the GISS's position (National Feature Service etc.) it is advantageous to be in a location with a strong reliable internet connection.

As a GIS group we believe there are many benefits to supporting an incident remotely however we feel that remote GIS is only good in certain situations and will not fit every incident. There is also much benefit to being on site and being able to interact with members of the incident management team and we consider remote GIS as a temporary solution to an unusual situation. Going into the assignment and any future assignments it is understood that if at any time virtual GIS support is not fully meeting its obligations the GISS unit will need to reevaluate and potentially move to an onsite location. Therefor it is recommended to have the GISS's supporting an incident to be located within the Geographic Area so they can easily get onsite within an operational shift. A hybrid approach of some onsite and some virtual GISS support may also be considered for the future.