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Whatcom Land Trust

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COLLEGE OF THE ENVIRONMENT

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Organization Worked For: Whatcom Land Trust

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DATE: 5/8/23

Stewardship of Whatcom County using GIS/GPS Skills

Adriano de Oliveira

The South Fork of the Nooksack River (de Oliveira)

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Introduction

I feel fortunate to live in such a place as Whatcom County. Here, we are surrounded by not only many different examples of ecosystems, but also by people passionate about maintaining the integrity and function of these intricate systems. Whatcom Land Trust (WLT) is a local organization which embodies exactly this. They uphold principles of conservation and restoration. They are a non-profit, making the biggest difference they can with the support of local donors and receipt of government grants. I had the opportunity this spring to join their stewardship branch, functioning as a GIS/GPS specialist intern. As such, I was able to participate in and learn about how an organization like WLT makes their impact on this little corner of the world.

In this report, I will cover the role I played with the organization and the things I was able to learn during this experience. I went into the internship with a few learning objectives:

- Learn how to take data points using GPS devices and format them to input into Arc Desktop
- Gain Non-profit experience
- Gain experience with GPS data management
- Practice cartography for professional and public consumption

Duties and Responsibility

This spring I worked with a local non-profit, the Whatcom Land Trust, as a GIS/GPS specialist in their stewardship department. Whatcom Land Trust aims to buy land for the main purpose of conservation. They also buy up conservation land easements, which are the rights to land development. This allows WLT to restrict any further development of land in the future, even if the landowner sells their property. As a nonprofit, they are heavily restricted by their available funding, and are forced to utilize mostly donations and State Grant funding. Even so, they own around 6,500 acres of property and are approaching 10,000 acres of land easements. The state of Washington has allocated a large amount of money for salmon recovery, and as such, there is more grant money available for riparian conservation, leading to much of WLT's land existing as riparian areas near the North, Middle and South fork of the Nooksack. They own land representing many kinds of Whatcom counties ecosystems (Figure 1).

Figure 1: Mid-successional forest, Riparian Floodplain, and Valley Wetland. Each important ecosystems and examples of properties owned by Whatcom Land Trust. (de Oliveira)

I assisted my co-worker and former intern/WWU alumni, Bryce Auburn, with any work he had. To maintain their status as a Conservation Land Trust Non-Profit, the WLT has to perform annual site visits for each of its properties and conduct site visit reports. This was a part of our duty in the stewardship department. We were also tasked with collecting GPS coordinates of county surveyor's border monument installation and updating relevant maps. Finally, we were tasked with creating base-line maps and stewardship plans for newly acquired properties.

Site visits were my personal favorite part of the job. It consists of three steps. First is filling out preliminary site visit materials, involving reading through the year priors report and planning for any additional work that the previous report called for (like minor invasive removal, contacting landowners, or trash pickups). The second step is the site visit itself. This involves traversing through the property, collecting 4-direction photo points at preset, annually repeated coordinates (Fig. 5,18,19). These photos allow WLT to document how these sites change from year to year. Along the way, we monitor and record animal presence and sign (Fig. 2,3,4,6), as well as major changes in geology and plant communities. Some examples could be large levels of riverbank erosion, or river otter tracks (Fig. 3)!

Figure 2: Beaver Sign on the South Fork Nooksack River (de Oliveira)

Figure 3: Coyote Tracks (Top) and River Otter Tracks (Bottom) from the Bear Creek Property on the North Fork Nooksack River (de Oliveira)

Figure 4: Salmon Jaw bone found 300 meters up into the forest on the Racehorse Creek property. A great example of nutrient cycling. (de Oliveira)

Figure 5: An example of a photo point from Racehorse Creek. (de Oliveira)

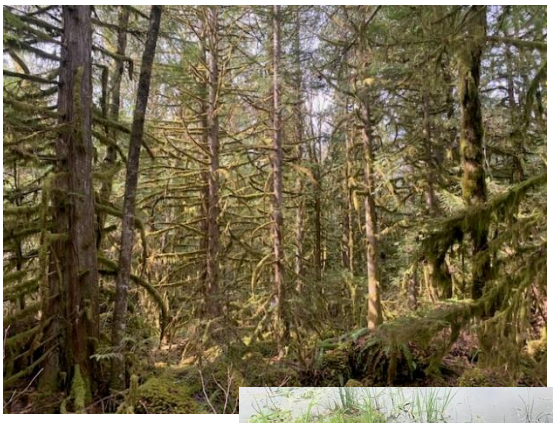

Figure 6: Oregon Spotted Frog Egg Clutches. OSF's are an endangered species in Washington, and Whatcom's wetlands provide essential habitat. (de Oliveira)

Returning to the office, we then finish the site visit report by filling in the day's weather conditions and any relevant observations. We also create a document of the renamed and organized photos taken throughout the day, attaching this to the site visit report. Site visits allowed me a personal viewing of a side of Whatcom I hadn't seen before. I'm sure watching these sites change throughout the years must be ultimately gratifying.

Boundary line marking was the most arduous aspect of this position. WLT hires surveyors to mark property boundaries, which they do by inserting rebar into the ground at property corners, and wooden stakes with flagging intermittently along the lines. Due to the nature of PNW forests, being as productive as they are, these indicators are quickly lost to the forest. So, before that happens, Bryce and I are tasked with locating these markers, taking GPS coordinates of each, and installing a 6-foot-long metal T-post into the ground at each marker (Fig. 7). We did this at two sites this spring, those being neighboring sites on the North Fork Nooksack, Racehorse Creek and Bear Creek. We installed upwards of 50 T-posts across the two sites. We often completed this task in tandem with the relevant site visit report. The final step was inputting this GPS data into the network database, and then updating the property's existing map to reflect the work done (Fig. 18,19).

Figure 7: Adriano (far left) and Bryce (mid-left) pounding T-posts in at surveyed points for easier locating in the future. (Mid-right) Bryce searching for a long-lost survey monument on the hillside among tree roots. (Far right) Adriano carrying T-posts and pounder through thick brush along property border. (de Oliveira & Auburn)

Finally, I was tasked with creating “base-line” maps for the newly acquired 5950 Saxon Rd property on the South Fork Nooksack. This involved creating 10 maps of varying theme (Fig. 8-17). The purpose was to have arial imagery showing changes over years past, to have information on soils composition, reference to the surrounding region, topography, information on the historic migration of the river, showcase the restoration plan, and display the plot in reference to surrounding properties. I will show case each of these maps, along with the updated Bear Creek and Racehorse Creek maps in the following section. I also created base line maps for a land easement, which included the same maps, but decided it was unnecessary to include them in this report. I unfortunately was unable to partake in creating the rest of the baseline document, which includes history of the property, former licenses, and restoration plans, but did partake in much of the conversation surrounding.

As an intern, I also took part in two “Field Fridays”, where we work with the volunteer department to include volunteers in our site visits. During these site visits, we also incorporated some invasive removal. Working with volunteers was encouraging! They all came with a lot of righteous energy, ready to remove as many invasives as possible. I found this energizing, especially after seeing the great extent to which invasives have moved into these wild places.

Outcomes

There were a few things I hoped to learn with this internship which I did not have the chance to at WWU. One was using handheld GPS units (not mobile apps) for coordinate collection. I was able to perform this task continuously, as well as porting the GPS data into the mapping software. Another objective was learning how to use the Arc Desktop interface. At Western, we were only exposed to ArcGIS Pro, the newer, superior interface from ESRI. Many smaller organizations utilize the cheaper, older ESRI interface, Arc Desktop. I feel that being proficient in both is important to being a well-rounded, competent employment candidate. As such, I gained a great deal of exposure to using Arc Desktop for cartography. I feel well versed in using it for this purpose and was able to create a multitude of professional maps for the companies' use. This was another of my learning objectives, and I feel I was able to complete this as well. Below, I will include 12 maps I created this spring. I created many more, but these I feel encompass the range of what I did. First are the 10 maps for the 5950 Saxon Road property Baseline (Fig. 8-17). Second, are the updated Racehorse Creek and Bear Creek Property Maps (Fig 18,19).

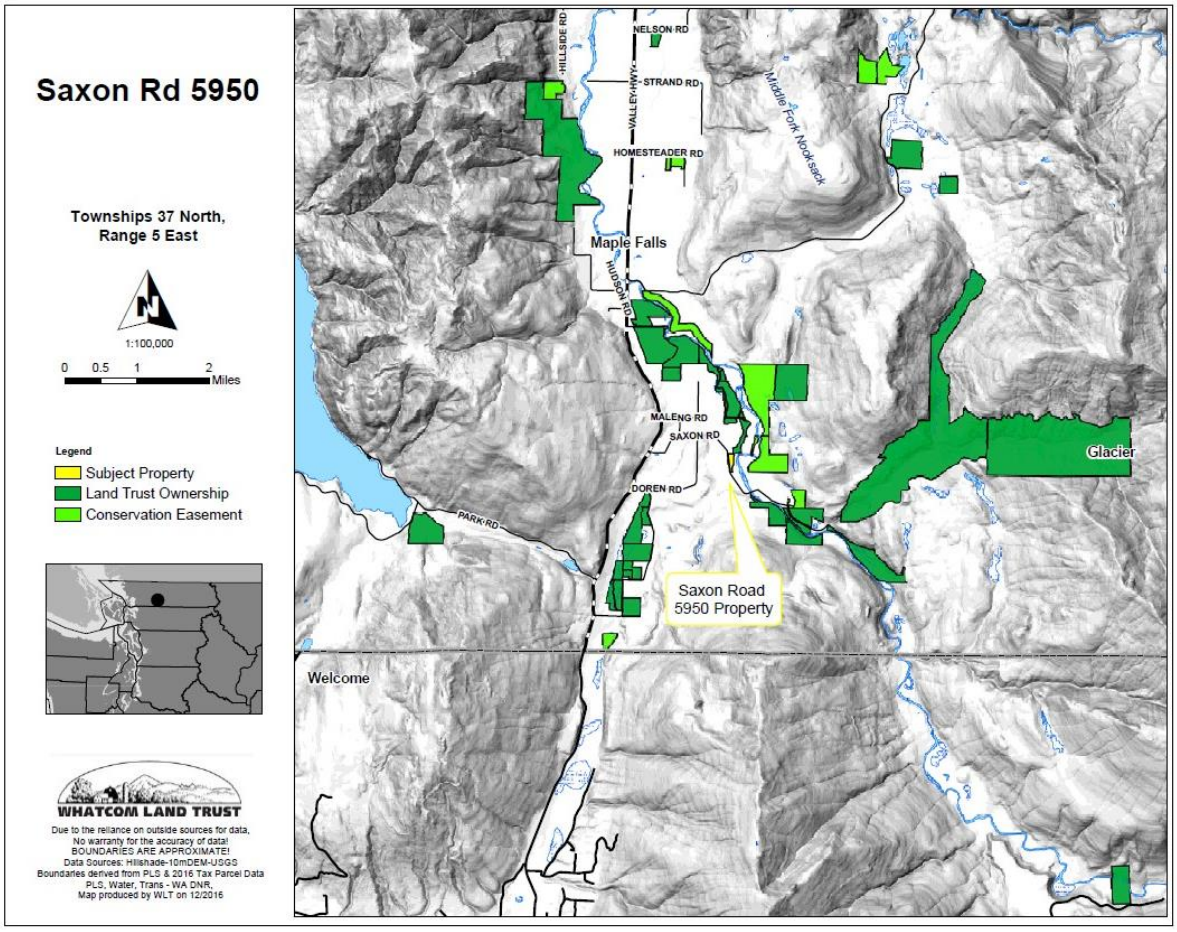

Figure 8: This is the Reference Map for the Saxon Rd 5950 property Baseline map series. Here, we were looking to provide some spatial context for the location of the property, in relation to cities, roads, and other WLT properties.

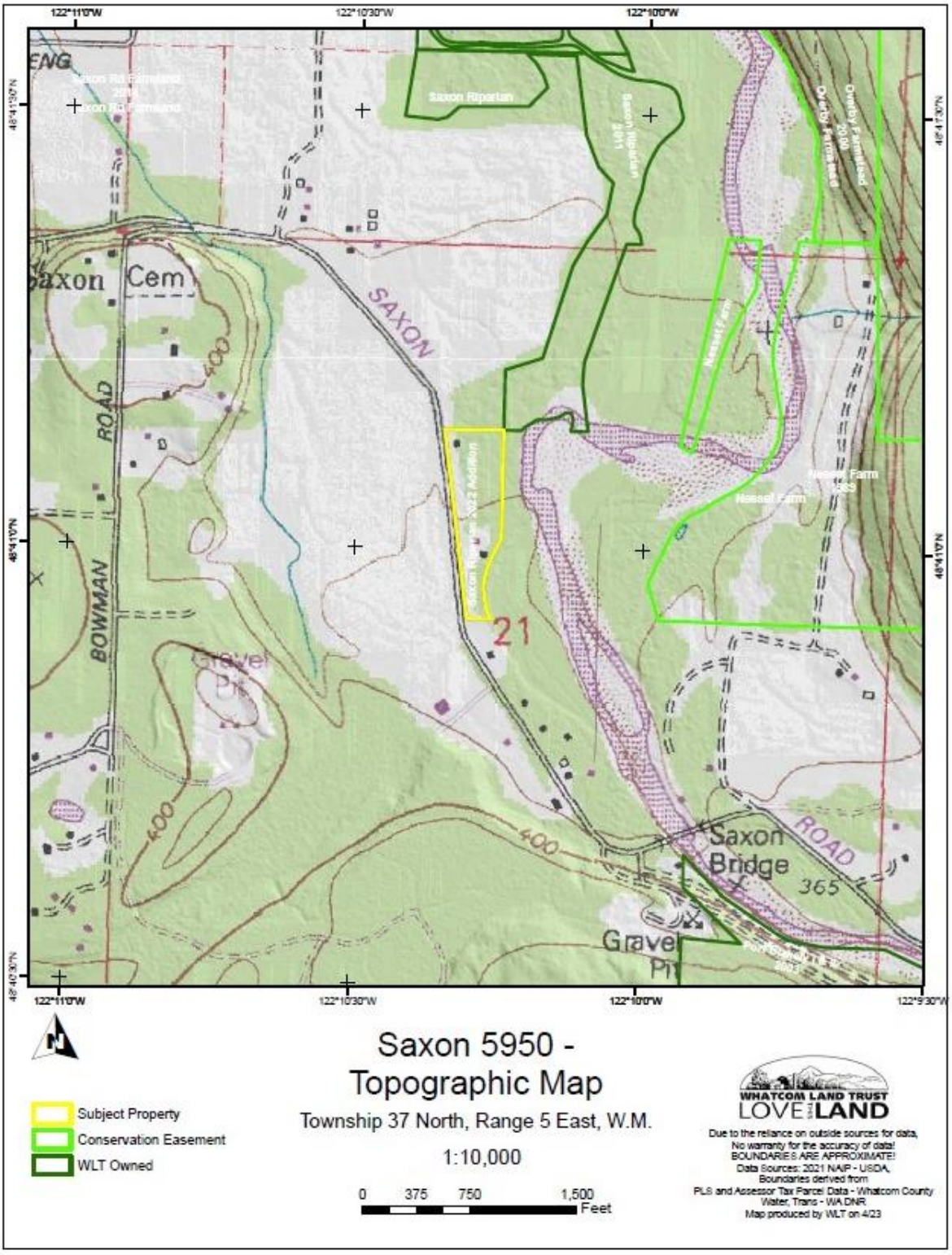

Figure 9: Map 2 of the Saxon 5950 Property Baseline series. Here we were looking to display the topography of the region, utilizing a United States Geologic Survey (USGS) topographic map layer.

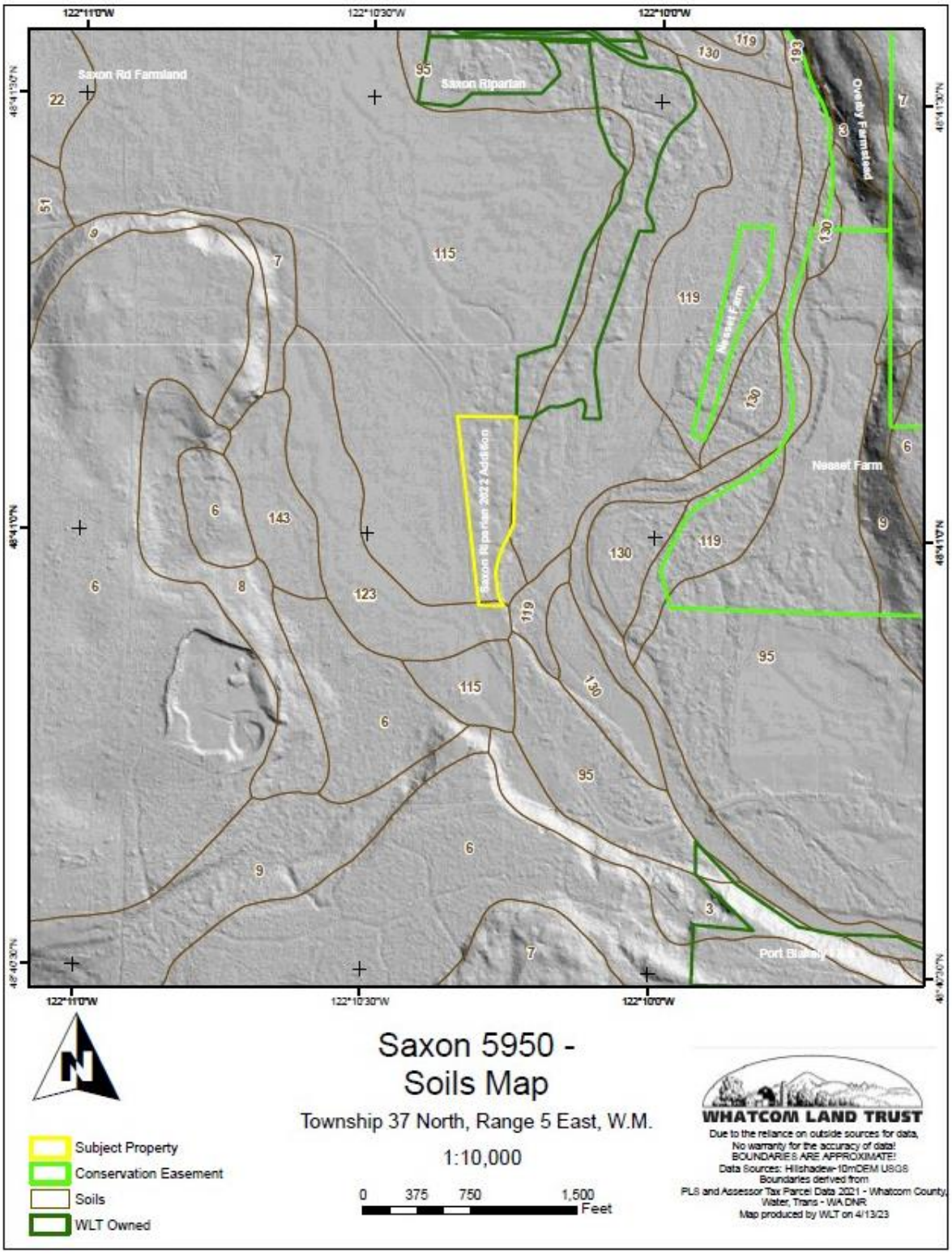

Figure 10: Map 3 of the Saxon 5950 Baseline Map series. Here we display soil types, also coming from the USGS. The numbers represent different soil types, with the legend occurring in the baseline report itself.

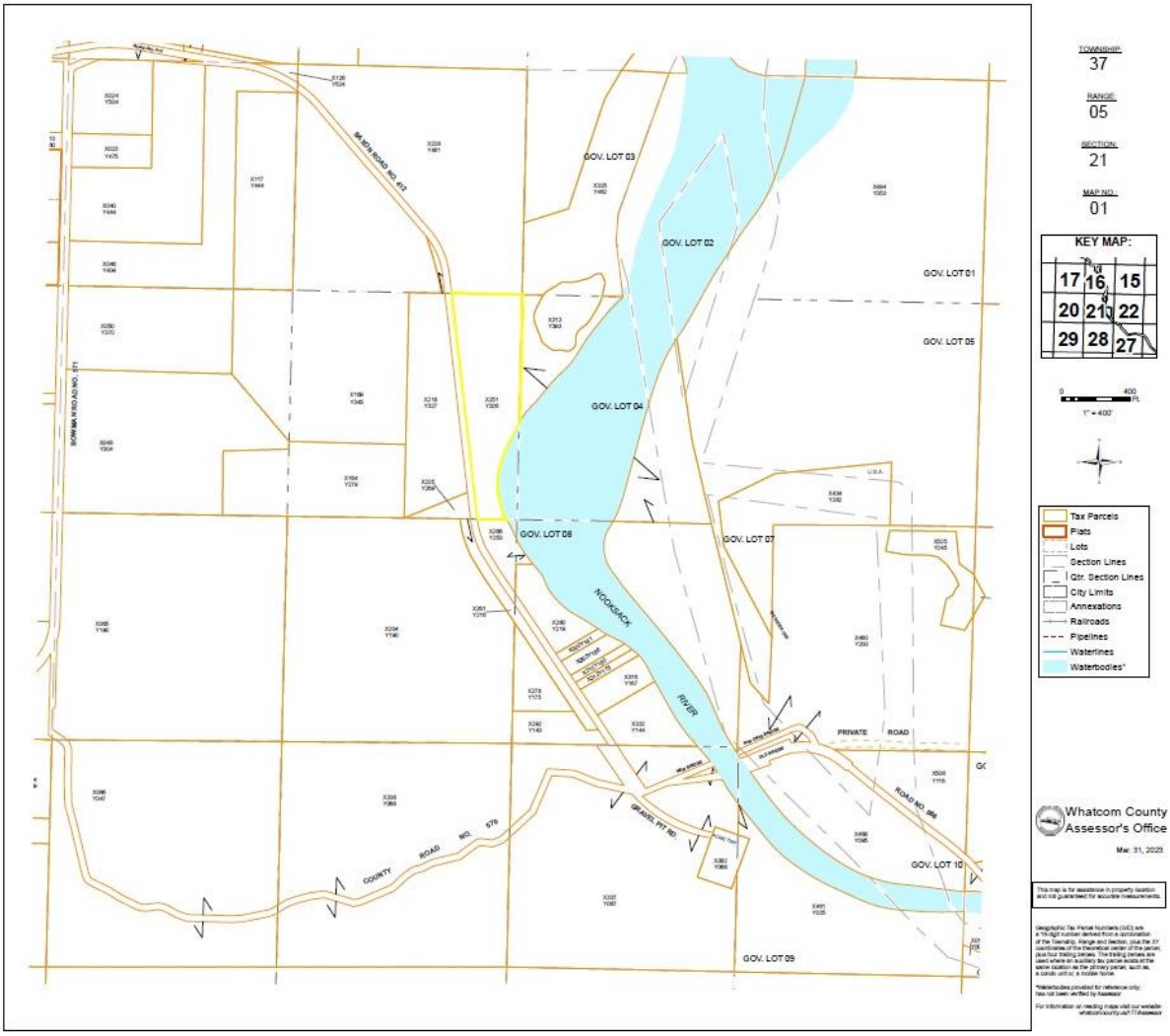

Figure 11: Map 4 of the Saxon 5950 baseline map series. Here, we are simply showing the property outline in reference to all other properties in the area. Map comes from the Whatcom County Assessor's office.

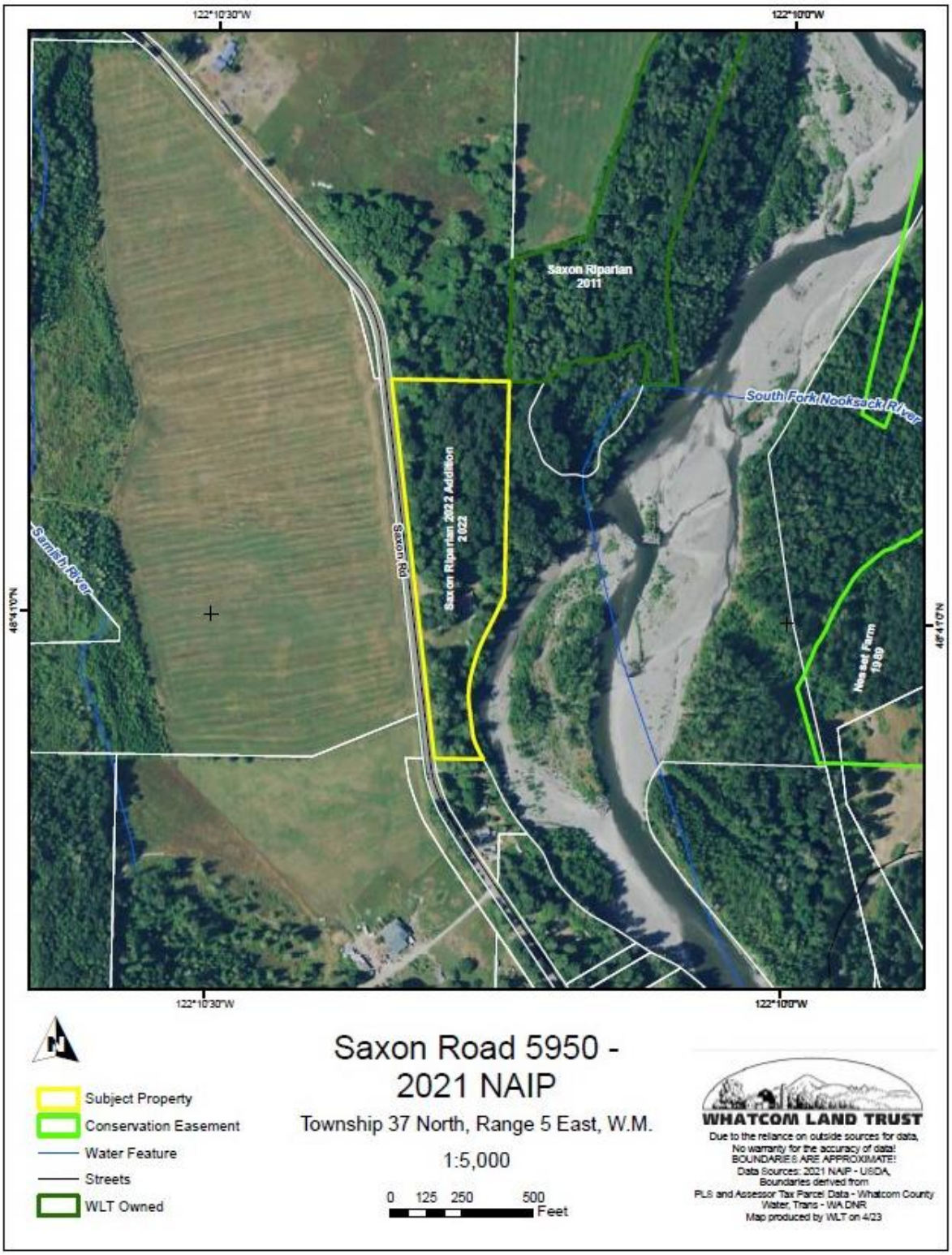

Figure 12: Map 5 of the Saxon 5950 baseline map series. This is a simple 2021 NAIP imagery map at a smaller scale than the previous maps. It also showcases nearby WLT managed lands, and 2021 Tax parcel borders.

Figure 13: Map 6 of the Saxon 5950 baseline map series. This is a simple 2011 NAIP imagery map. The purpose of this map is to display change over time of the property and nearby properties via arial imagery. It also showcases nearby WLT managed lands, and 2021 Tax parcel borders.

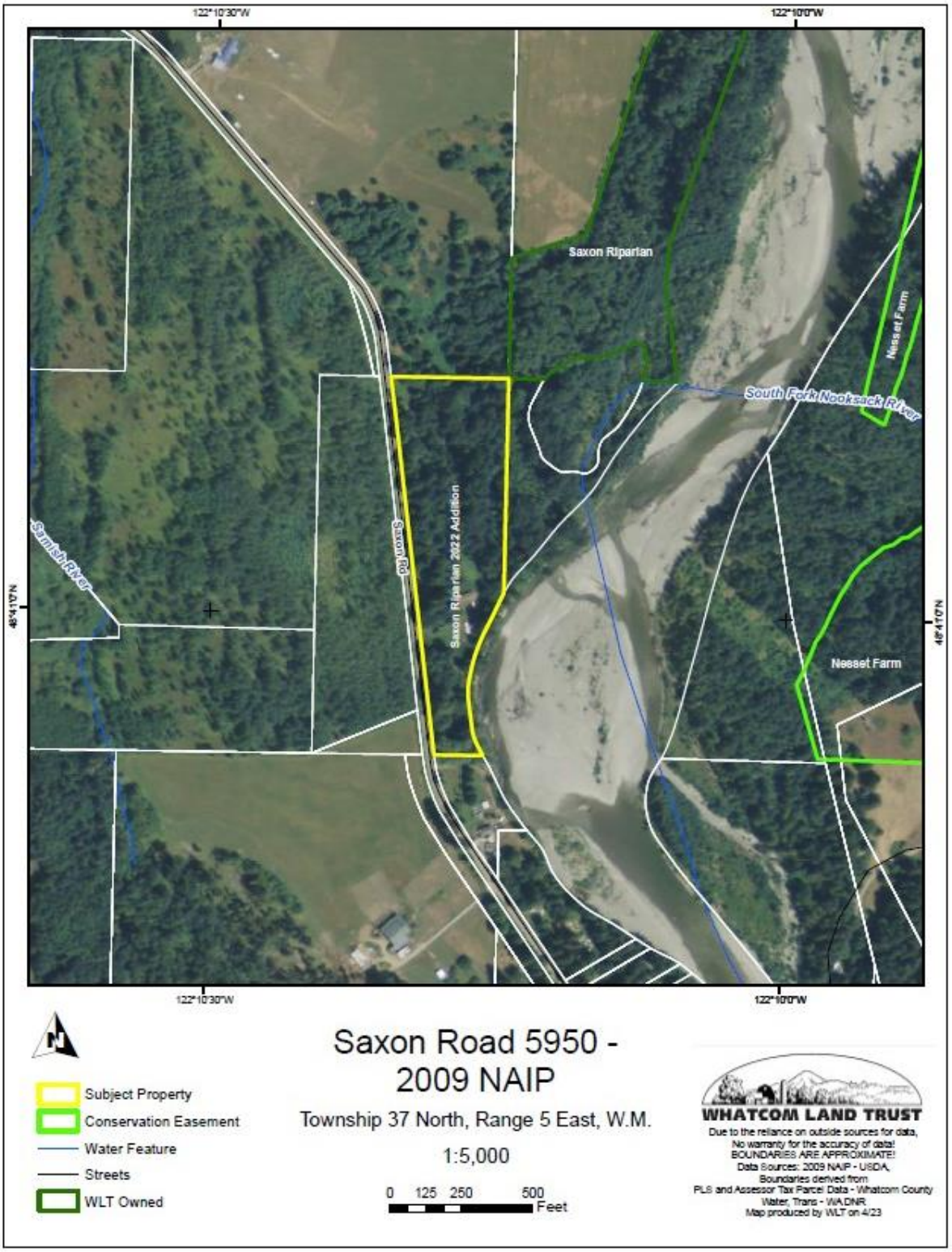

Figure 14: Map 7 of the Saxon 5950 baseline map series. This is a simple 2009 NAIP imagery map. The purpose of this map is to display change over time of the property and nearby properties via arial imagery. It also showcases nearby WLT managed lands, and 2021 Tax parcel borders.

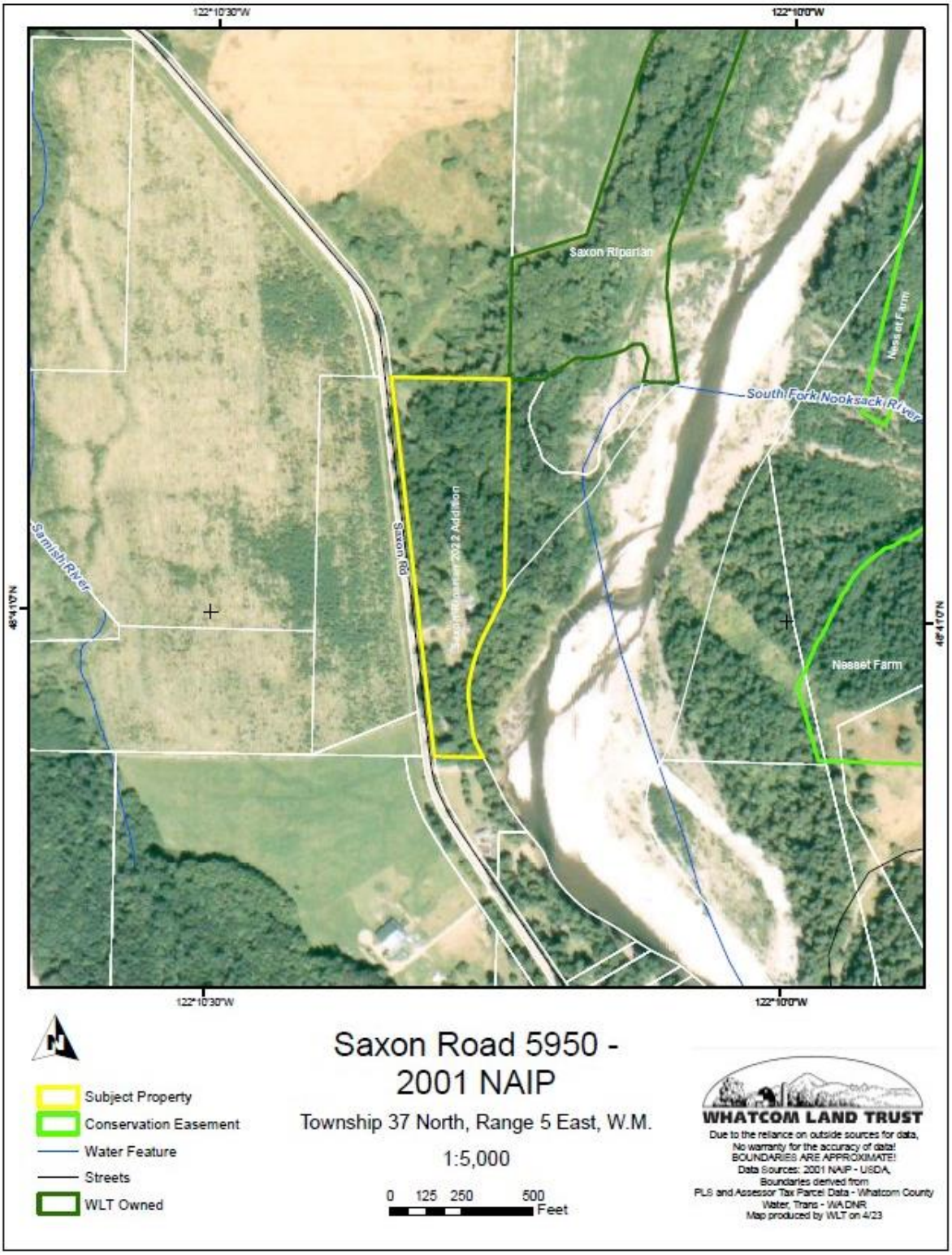

Figure 15: Map 8 of the Saxon 5950 baseline map series. This is a simple 2001 NAIP imagery map. The purpose of this map is to display change over time of the property and nearby properties via arial imagery. It also showcases near-by WLT managed lands, and 2021 Tax parcel borders.

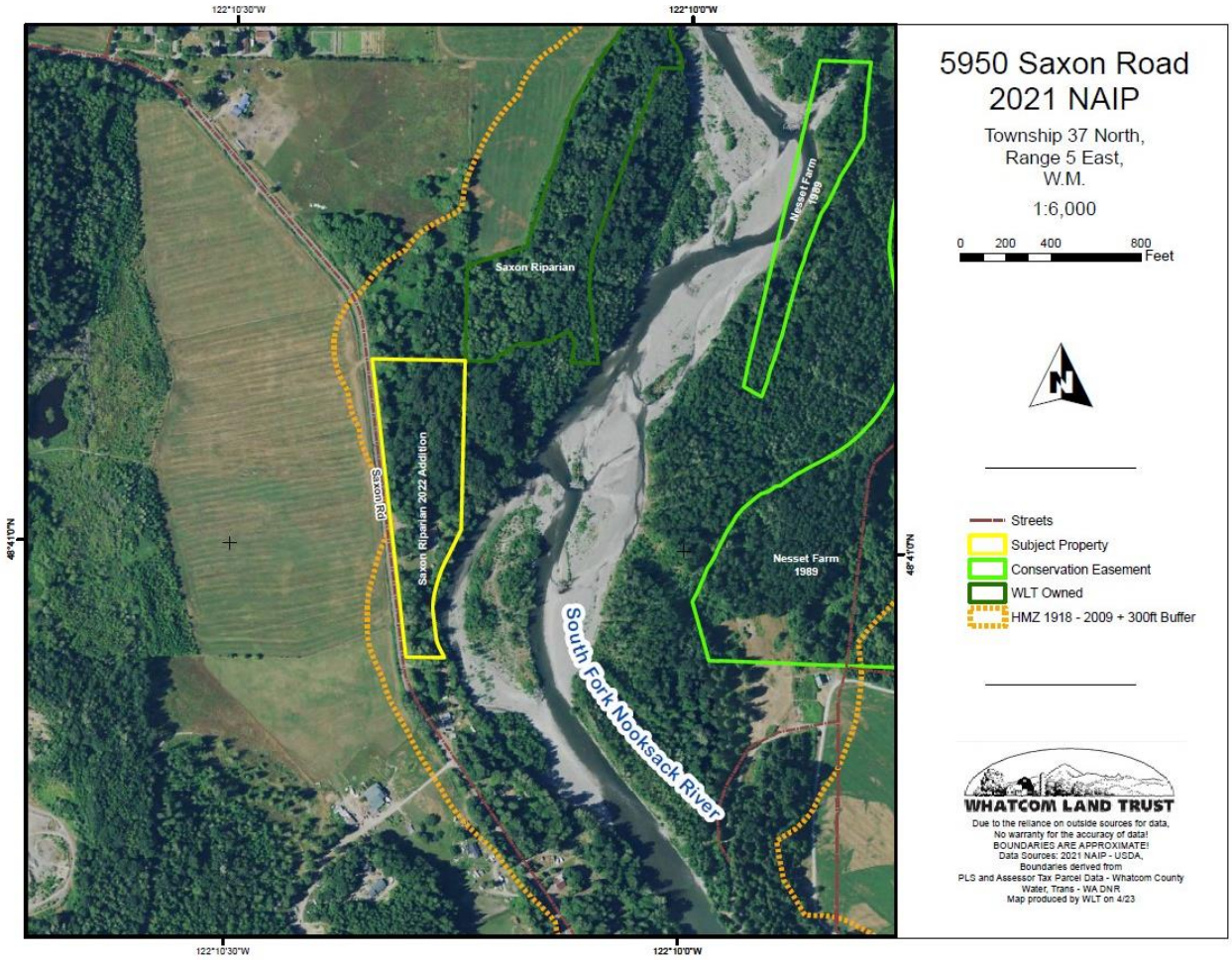

Figure 16: This is not a part of the 5950 Saxon Road baseline map series, but rather one used by a coworker in the office to help in their applications for State grant funding. It shows the Historic Migration Zone (HMZ) of the South Fork Nooksack between 1918 and 2009 with a 300 ft buffer (Data from DNR). This clearly shows the property is well within the historic path of the Nooksack, making it critical for salmon habitat.

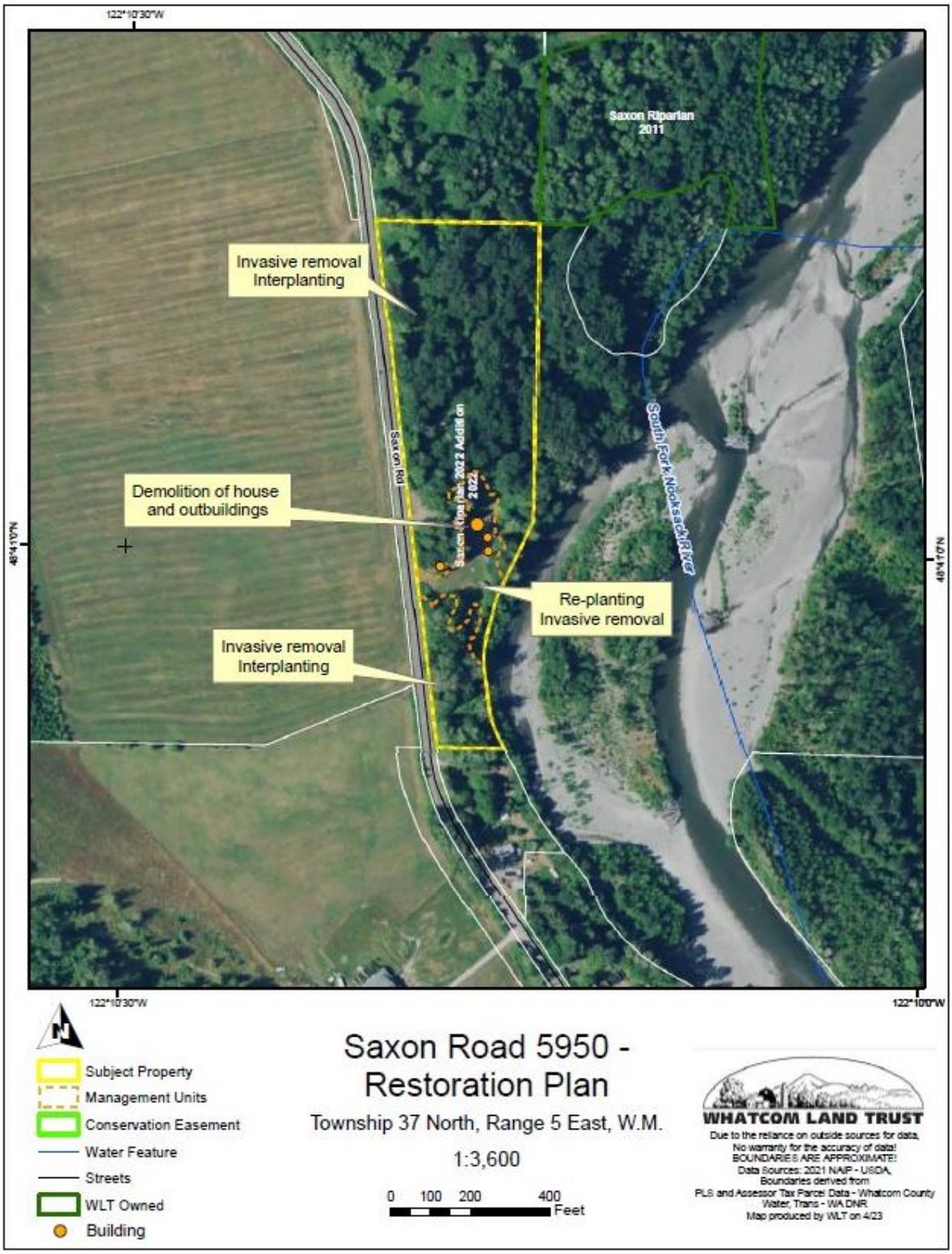

Figure 17: This is not a part of the 5950 Saxon Road baseline map series, but rather one used by a coworker in the office to help in their applications for State grant funding. It shows how we split the property into 3 management units, each to be managed slightly differently according to need.

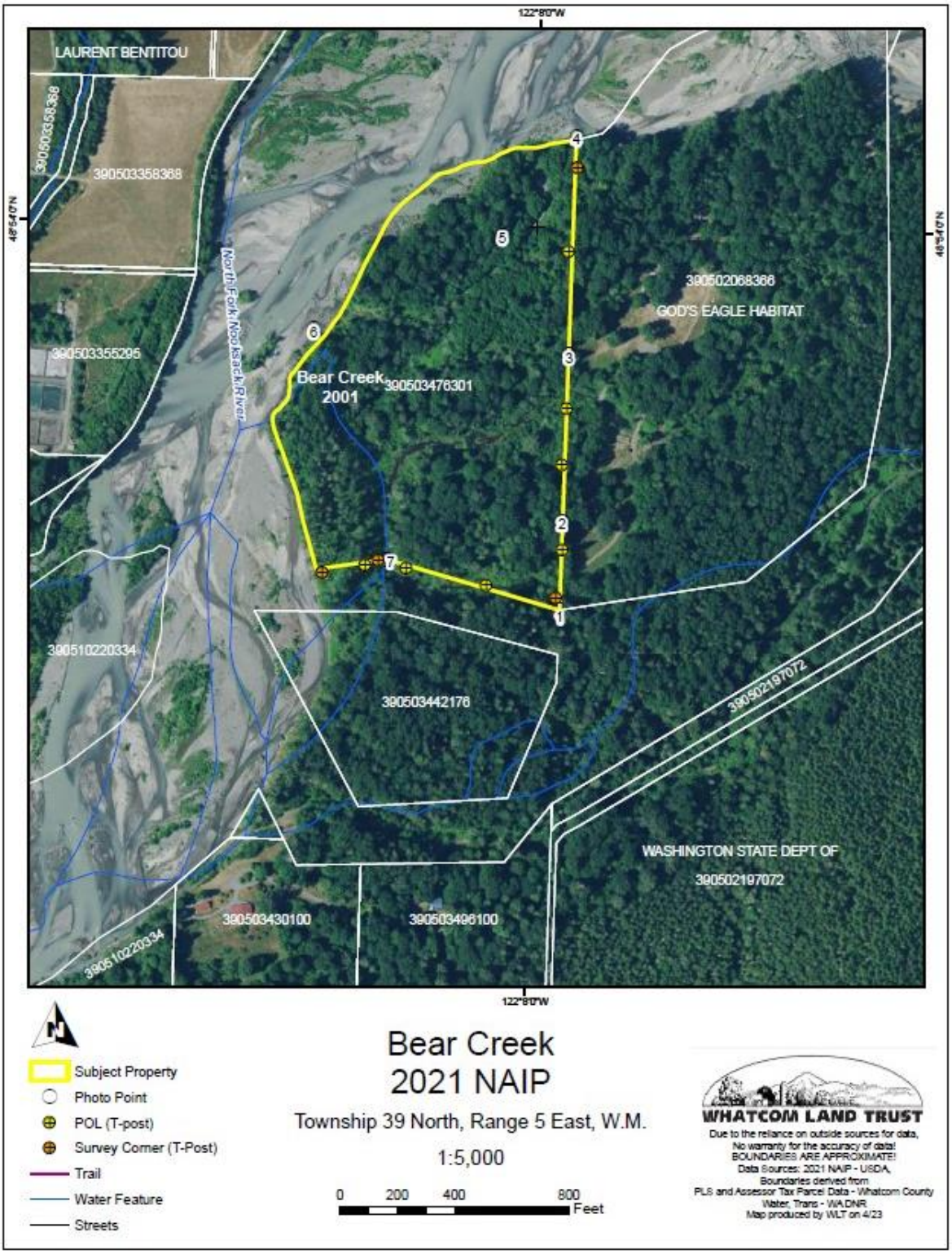

Figure 18: My updated version of Bear Creek's 2021 NAIP map. This is the map which we carry with us in the field when performing site visits. I added the orange and yellow cross hair circles, displaying where we added T-posts according to the markers that surveyors left. These points were ported over from our GPS unit. Also, take note of the white haloed numbers. These represent the locations where we collect annual photos for the site visits.

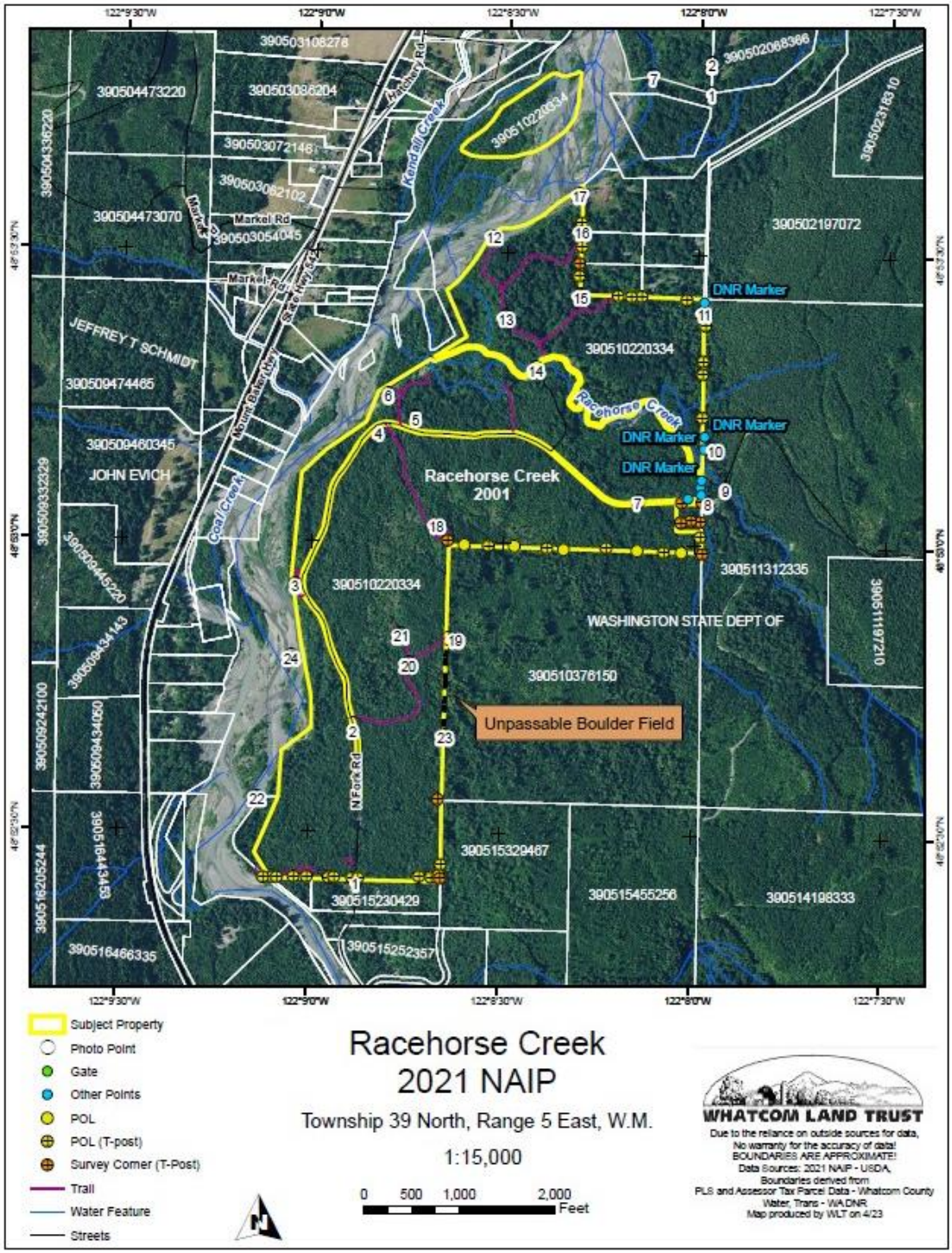

Figure 19: My updated version of Racehorse Creek's 2021 NAIP map. I added the orange and yellow cross hair circles, displaying where we added T-posts according to the markers that surveyors left, as well as the open yellow circles showing points where we took GPS coordinates but left no t-post. I also added the Black dash line to indicate the unpassable boulder field. We attempted to but found quickly that it was not the best path forward. Again, take note of the white haloed numbers representing the locations where we collect annual photos for the site visits.

Assessment

Each of our projects was ultimately successful. Bryce and Jenn both were ecstatic about the progress we had been able to make in the short amount of time I was with them! WLT is now 65% through site visits for the year, with a majority of the larger properties completed. Completing the boundary marking for Racehorse Creek and Bear Creek in only 3 days was also unexpected, but Bryce and I persevered! I brought a lot of energy, strength, and experience moving through the forest off trail to the position, which allowed me to jump right into being a useful player on the team.

In terms of conservation, I learned much about just how limited the organization is by funding. Interestingly enough, it is relatively easy to obtain grant funding for purchase of land and initial conservation efforts, but it is nearly impossible to gain grant funding for any further maintenance of properties. Continual maintenance is absolutely essential for many of these properties, and the land trust is forced to rely almost completely on volunteer labor for any maintenance. Unfortunately, volunteering has dropped since the pandemic in 2020. Whatcom Land Trust can do a lot by just owning riparian land, disallowing developers and deforestation, but needs a lot more help to maintain these properties. I feel proud to have given 100+ hours of my time to this organization, and I hope many more decide to do so as well.

Another great success this summer was streamlining WLT's GPS to database data exchange. When I arrived, they did not know how to connect the GPS with the computer to transfer data more easily. After a call with the folks at Garmin's support desk, I was pointed in the direction of a desktop application that pairs with the GPS device to allow seamless access to

GPS data and download. This will speed up their data transfer process considerably, as they used to type in the coordinates for each point individually.

As I had mentioned before, I gained ultimately valuable experience using Esri's Arc Desktop. I will most likely use this skill again in the future at some point, especially as non-profit work is prevalent in the field of environmental sciences. Also, learning to make professional maps and reports was a valuable experience that will surely set me up for success in my professional endeavors.

I had a wonderful experience interning with Whatcom Land Trust this spring. I would highly encourage any other students interested in GIS to pursue this position in the future. Connecting field data collection with computer mapping was helpful for my perception of how GIS can be applied practically, and of the full process involved. To offer my time and effort to such a passionate, local cause filled my soul and I implore others to do the same!

Appendix:

Daily Log Whatcom Land Trust GPS/GIS Internship Spring 2023

March

Tuesday, March 28 (1:00-5:00)

Orientation day! Met most Whatcom Land Trust staff today. Also watched an orientation video on WLT's mission, land holdings, and conservation. Worked closely with Jenn and Bryce to introduce me to their data organization methods, as well as introducing me to site visitations an how to fill out site visit forms, filling out the preliminary data for our site visits which we are performing this Friday. Bryce walked me through Using Esri ArcGIS desktop, a software which I haven't had the opportunity to learn to use through WWU.

Friday, March 31 (7:00 – 4:00)

Early start today. Began with a site tour partnering with the US Fish and Wildlife Service and Whatcom County Amphibian Monitoring Program. Stephan Nyman, lead scientist at WCAMP, showed us 3 major Oregon Spotted Frog egg masses on the property. Jennifer Mackey laid out plans to redivert river flow back into the stream which feeds the wetland in the area. The previous land owner had diverted stream flow to the train track ditch, causing lower water retention for the wetland. Very preliminary stage of planning, but beneficial project to both OSF populations as well as Salmon spawning.

We then went to visit our two sites for the day in Acme. The first was a forested hillside with a wetland at the base. I was surprised to find that WLT had owned 450 more acres of forest adjacent, but had opted to sell it to a logging company a few years back who had promptly clear cut. I understand that logging is necessary, but I was taken aback that an organization that spouts conservation did as much. In any case, we walked the boundary, taking photo points and marking boundary markers. We repeated this process for a 33 acre plot of farm land they own. They are planning to sell this farm land, and have sold hay licenses for growers to utilize it in the past.

We then returned to the office, where I input our photos into the database, renaming and categorizing all. I also filled out the remainder of the site visit reports.

April

Wednesday, April 5 (8:00 - 5:00)

Site visit today. Focus today was to mark the recently surveyed border of WLT's Racehorse creek property. We pounded, flagged and took GPS coordinates for 26 t-posts, collecting a total of 7miles walked. It was an arduous task carrying our gear in the thick forest underbrush. Checked out some areas with large amounts of trash to return to and clean at a later date.

Friday, April 7 (8:00-5:00)

Field Friday! A combo day on one of WLT's oldest properties, Kelsey. Today was a work party combined with a site visit. We walked the border, taking pictures, but did so with some volunteers! Also completed about an hour of barbed wire removal, followed by a few hours of blackberry removal, and finished up with sword fern planting. It was great working with some volunteers today.

Wednesday, April 12 (8:00 – 5:00)

Back at Racehorse Creek. We finished marking the remainder of the border with T-posts and GPS points. After lunch, we returned to the abandoned encampment and dumping sites, cleaning up all of the garbage. We then dropped it off at the dump on the way back to the office, cleaning up 500 lbs of trash for the day.

Friday, April 14 (8:00 – 5:00)

Office day. Today we input our GPS data into different system files, recording which markers we had T-posted and those we had not. We then updated our maps of the property. I got some great exposure using Esri ArcDesktop. The software is very similar to ArcPro, which we use at WWU, but also limited in function in comparison. I created a 5 map series of a new property WLT had acquired on the Southfork Nooksack. These maps were a regional map, a topographic map, a soils map, and a 2021, 2009, and 2001 satellite imagery map with greater detail into property boundary lines. Taking the field data we took and creating a map out of it was a great experience.

Wednesday, April 19 (8:00 – 5:00)

Site visit day! Headed out to a property just north of Racehorse creek, on the south bank of the North Fork Nooksack named Bear Creek. Here, we walked the property, collecting photo point photos, as well as marking the recently surveyed property border with T-posts, similarly to Racehorse Creek. Found a beaver dam today, as well as coyote, elk, and skunk tracks.

Friday, April 21 (8:00 – 5:00)

Today we began in the office. Jenn had me finalizing the baseline maps I had created on Friday, as well as creating a pair of maps for a presentation my coworker Solvei was giving on the new property, 5950 Saxon Rd. These maps displayed the property split into 3 sections based on restoration plans for each section, as well as a more general regional map of the Southfork Nooksack, where the property resides. In the afternoon, Solvei, Jenn and I completed 3 land easement property visits. Land easements are properties where the landowner sells development rights to WLT, which WLT maintains even if the owner sells their property.

Wednesday, April 26 (8:00 – 5:00)

Office day. Input all GPS data for the Bear Creek boundary marking Bryce and I completed last week. I updated the maps for this property accordingly, as well as finalized the updated map for the Racehorse Creek property. Additionally, I created photoplates for Racehorse

Creek and Bear Creek, which is simply a document displaying the Photopoints we collected for each site. I finished off the day creating simple land parcel maps for about 15 properties with a simple outline of the properties owned by WLT.

Friday, April 28 (8:00 – 5:00)

Sunny, hot day! Today, we (Jenn, Bryce, Solvei and myself) traveled to 5950 Saxon to complete the baseline visit and create/take photopoints for the property. Beautiful property on the South Fork Nooksack. We saw the buildings, found the river access, took note of all plant species present, as well as changes in composition across the landscape. Also, we took note of invasive species locations and created plans for removal.

After this baseline visit, Bryce and I completed site visits for 2 properties just north of 5950 Saxon. Temperatures reached the 80's, and I certainly am not used to that. These two properties were large, and we ended up hiking around 7 miles through the thick undergrowth of the floodplain. Great day!

May

Wednesday, May 3 (8:00 – 5:00)

Office day. While entering GPS points into our master spreadsheet, I found that many of the points had been corrupted. I called Garmin, and the costumer service rep talked me through installing Garmin BaseCamp to retrieve our data. Not only was the data there, but utilizing this app will make data entry much more efficient for WLT in the future, and I feel proud for having helped them streamline this process. I added all GPS data from the past that the land trust was unable to get to.

Today I also created Baseline maps for a land easement we visited 2 weeks ago, the Vanderwerff property. After that, I renamed all photos we took and created a photo plate for the Saxon riparian property we visited last Friday, as well as finishing up the site visit report.

Friday, May 5 (8:00 – 5:00)

Field Friday! Today we (Madeline, Bryce and I) took 2 volunteers to complete some invasive removal on a property on the North Fork Nooksack. We also used to time to complete the annual site visit for the property. In the morning, we pulled licca that was growing rampant near to the creek that runs through the property. After lunch, we headed out into the flood plain to destroy blackberry and knotweed which had grown over smaller conifers. The idea was to provide these confers a chance to survive into adulthood, as total removal of the blackberry and Japanese knotweed is a tall order. Fun fact, knotweed is not only edible, but also delicious!

Wednesday, May 10 (8:00 – 5:00)

Last day. Performed a land easement site visit with Solvei in the morning. Then worked on a few quick maps, got my performance review from Jen, and went out to Gruff after work to celebrate! Beautiful, sunny, last day.