

2024

# MAPPING ACCESSIBILITY ALONG THE HUNTOON TRAIL IN THE SEHOME ARBORETUM

Magdalen Alexander  
Allen Baughman  
Sam Beaumont  
Finley Bell  
Emmett Bonds  
Nina Bracht-Bedell  
Hannah Cole  
Soren Cooley  
Sydney Freeman  
Adrena Hamilton  
Alexis Jordan  
Anya Kallgren  
Ben Kassof  
Auggie Kaster  
Hannah Kudlich  
Jayden Lehner  
Berit Manser  
Gareth Miller  
Ryan Mueller  
Will O'Connor  
Ben Pratt  
Kylee Shumway

## Table of Contents

---

Abstract.....	5
Introduction.....	5
Methods.....	10
Data Preprocessing.....	10
Field Collection.....	11
Slope Analysis Using LiDAR.....	14
Verbal Directions and Mapillary Contributions .....	15
Results.....	18
Huntoon Trail Accessibility: Slope.....	19
Huntoon Trail Accessibility: Construction .....	21
Obstacles and Observations .....	23
Discussion.....	29
Works cited.....	33
Appendix A - Script for Verbal Directions of the Trail.....	35
Appendix B - Data Catalog.....	49

# Table of Figures

---

Figure 1. Reference map of the Sehome Hill Arboretum. ....	9
Figure 2. Data collection teams 1 and 2. Photo credit to Soren Cooley. ....	12
Figure 3. FieldMaps collection process for segment characteristics .....	13
Figure 4. FieldMaps collection process for trail observations. ....	14
Figure 5. LiDAR point cloud of the arboretum, combination of two point cloud layers. ....	15
Figure 6. General advisement on verbal direction guidelines from David Engebretson Jr., written by Hannah Cole. ....	17
Figure 7. Mapillary view after the addition of new photos. ....	18
Figure 8. This chart graphs both the elevation and slope of each segment along the Huntoon Trail. ....	19
Figure 9. This map displays the slope of 20-meter segments along the Huntoon Trail. ..	20
Figure 10. This map displays ground material type along the Huntoon trail, broken into the categories of asphalt, gravel and dirt. ....	22
Figure 11. This bar graph displays the count of each obstacle observed by the data collection team. ....	23
Figure 12. This figure shows the breakdown of the different descriptions of potholes observed. ....	23
Figure 13. This map displays the recorded obstacles on the Huntoon Trail, including potholes, roots, rocks, low hanging branches, etc. ....	25
Figure 14. This map displays points of interest on the Huntoon Trail, including art, permanent landmarks, seating, and signs. ....	26

Figure 15. Map of the trail intersections along Huntoon trail..... 27

Figure 16. This map displays the observed seasonal features on the Huntoon Trail,  
including moss and puddles. Puddles were observed more frequently than moss. .... 28

## Abstract

---

Access to outdoor spaces is vital for the mental and physical health of all populations, including those with physical or mental impairments. Creating accessible maps is a critical step in reducing barriers for those with disabilities to fully navigate spaces, fostering acceptance between all communities. The goal of this project was to collect data and map the accessibility of the Huntoon Trail in the Sehome Arboretum, Bellingham, Washington. We collected data for every 20-meter segment on the trail, analyzed slope using LiDAR data, recorded and transcribed verbal trail directions, and finally used these results to create an Esri web map and StoryMap, and a Mapillary virtual trail walk-through, as well as seven static maps showcasing various attributes of the trail such as obstacles, trail intersections, ground material, and slope.

## Introduction

---

Sehome Hill Arboretum is a 175.5 acre (71 ha) open space jointly owned and operated by Western Washington University and the City of Bellingham. The park's genesis can be traced back to 1891, when C. X. Larrabee proposed that local landowners donate portions of their land on Sehome Hill to build a park. Portions of the arboretum were purchased by the Washington Normal School at Bellingham (now Western Washington University) in 1915, and by the City of Bellingham in 1920. A road was built through what is now the arboretum in 1923, following the route of a logging road that existed in the 1880s. The road followed the route of present-day Arboretum Drive to its northern terminus and continued southwest on what is now the Huntoon Trail (Joy, 1999). The road was continuously open to automobile traffic until 1960, when a landslide wiped out a portion of the road on what is now the Huntoon Trail. The section of road affected by the landslide was permanently closed to car traffic and converted into the Huntoon Trail, and the tunnel was closed to cars in 1975.

A new master plan was adopted by the City of Bellingham in 2002 after a period of community consultation beginning in October of 2001, and some new trails were built along the eastern slopes of the arboretum. These trails are generally inaccessible to individuals with mobility impairments and are outside the scope of this analysis. However, there was a proposal during the planning phase for a new, wheelchair-accessible watchtower, which was rejected (Sehome Arboretum Master Plan, 2002).

Although it was originally paved with an asphalt surface, the Huntoon Trail is in poor condition, with large portions of the surface having been eroded away, exposing the underlying gravel bed. A study undertaken by undergraduate GIS students at Western Washington University in March 2024 found that 26% of the 150+ 20-meter segments measured on the Huntoon Trail were inaccessible for wheelchair users (Belanger et al., 2024). Compared to other trails in the arboretum, the Huntoon Trail is more readily accessible to individuals with conditions affecting their mobility. Therefore, any efforts to make trails in the arboretum more accessible would likely be focused on the Huntoon Trail.

There is a considerable body of research indicating that improving accessibility in the arboretum would be a worthy goal. Individuals with disabilities often find fulfillment in accessing outdoor spaces and are less likely to experience depression if they regularly spend time recreating outside (Wilson et al., 2012). Outdoor activities are also very important to some people with conditions affecting their vision. Birding, which often requires access to natural areas, is important to some blind people because it provides an effective means to experience and describe their surroundings in a way that does not require eyesight (Marvar, 2023). However, navigating outdoor spaces can be difficult and sometimes dangerous for people with limited or no vision, and uneven surfaces, unexpected obstacles, and low-hanging objects all pose hazards.

(Riazi et al., 2016). Because of these dangers, people with vision difficulties experience a heightened fear of falling and spend less time physically active than people without vision impairments (Van Landingham et al., 2014).

People with mobility and sensory impairments have historically been physically and sociologically excluded from activities and spaces frequented by able-bodied people. Improving physical accessibility for people with such conditions allows them to fully navigate these spaces, which in turn gives them greater visibility and helps make disabilities more socially acceptable (Taylor et al., 2008). Western Washington University made a commitment in its 2018-2025 strategic plan to provide equitable access to educational and employment opportunities, services, and extracurricular activities to persons with disabilities (WWU Strategic Plan, 2018-2025). The City of Bellingham, which jointly administers the arboretum, has made a similar commitment (City of Bellingham, 2023). However, the poor condition of the Huntoon Trail is at odds with these commitments, especially given that the arboretum is used by Western Washington University students for research.

The central goal of this project was to quantify the accessibility of the Huntoon Trail (Figure 1) through a variety of methods, including identifying potentially hazardous areas so that individuals with impairments can navigate the Huntoon Trail more safely. The trail was broken up into 20-meter segments and a variety of data was collected on the number and type of potential hazards, including potholes, branches lying across the trail, low-hanging branches, slopes that are too steep for wheelchair users, and trail intersections that could be confusing for people with no or limited vision. As some people with conditions affecting their vision or mobility are likely unable to access the trail, an ArcGIS StoryMap was created to allow people to explore some of the attractions of the Huntoon Trail without ever visiting the arboretum. The

StoryMap includes an interactive display of the Huntoon Trail created using Mapillary, a service similar to Google's Street View. The following report details the process and results of this project.



# Sehome Hill Arboretum

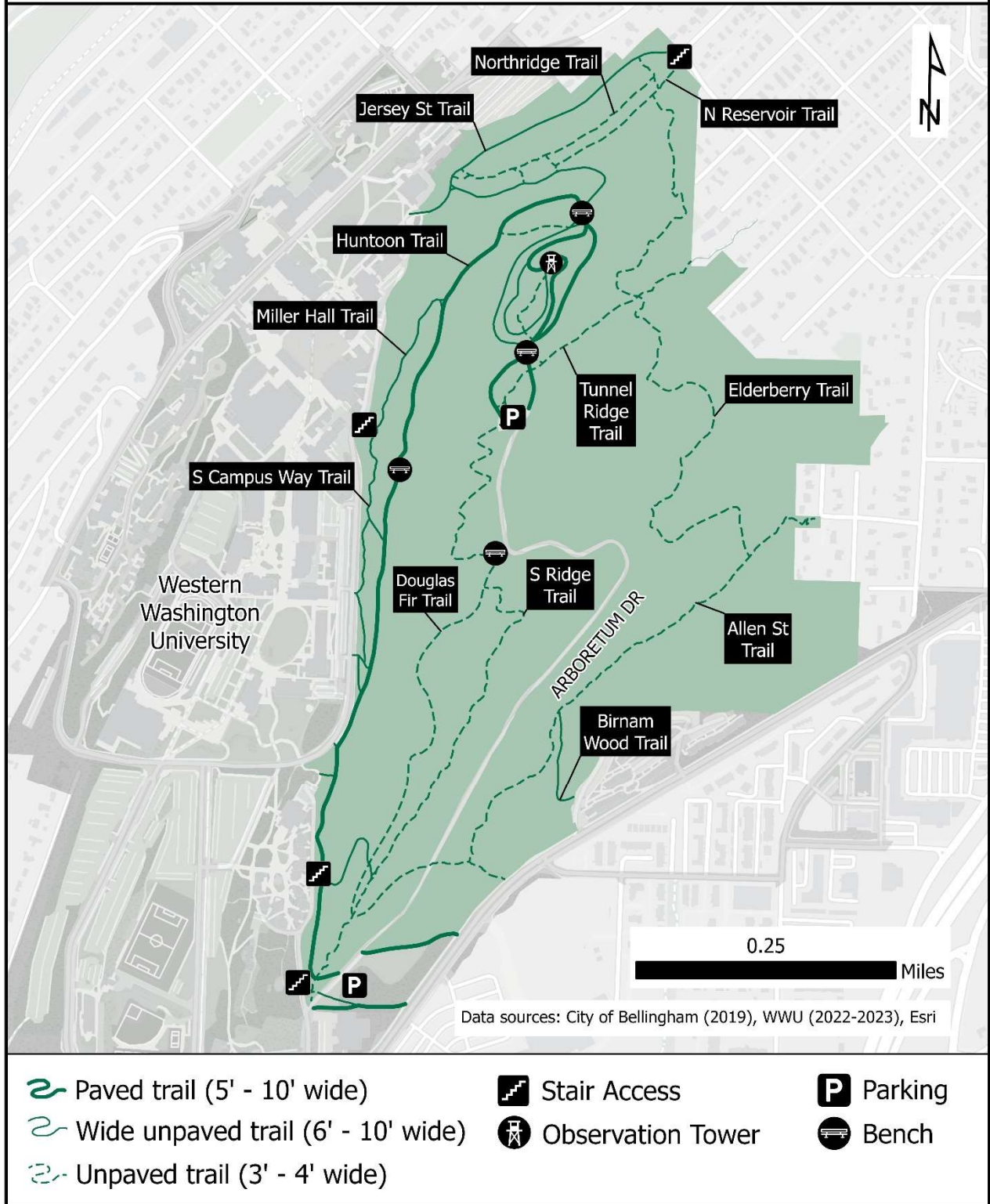


Figure 1. Reference map of the Sehome Hill Arboretum.

## Methods

---

A team of 10 people worked together to map the Huntoon Trail of the Sehome Arboretum on Western Washington University's campus. Working with WWU's Disability Access and Outreach centers, the goal was to map the trail with a variety of disabilities in mind, including wheelchair users and the visually impaired. Before any data collection or analysis was conducted, our team spent five days doing research on disability access, collecting and compiling data, and creating comprehensive maps and presentations to show our findings. Our team also met with a member of WWU's Digital Technologies Accessibility Coordinator, David Engebretson Jr., to discuss the importance of this project and what aspects they are looking for specifically.

### Data Preprocessing

Creation of the 20-meter segments used for the purposes of data collection and analysis began by selecting the Huntoon Trail from the *Sehome Hill Trails With Average Grade* layer published to ArcGIS Online by user `reckase_wwu` on 03/10/2023 and modified on 03/15/2023 (additional details can be found in the Data Catalog of this report, see appendix B). This was accomplished through a definition query followed by the copy features tool using the selected records. The resulting line feature was projected into NAD 1983 UTM Zone 10N and dissolved into a single segment roughly 1.8-kilometers in length. The trail was then broken into 20-meter segments using the edit banner's divide tool. The equal parts method was selected due to the distance methods limited repetitions, resulting in 91 segments of approximately 20.10 meters in length. Segment length was confirmed using the calculate geometry attributes tool and geodesic measurement method to ensure that the segments were as similar in length as possible. A Segment ID layer was added, numbering from bottom to top in sequential order and beginning at

1. The divided layer was then uploaded to ArcGIS Online and used for teams to visually reference their location along the trail during the field collection process. Additionally, this layer was later joined to the segment characteristics collected during the process outlined in the Field Collection section of this report.

## Field Collection

Two teams of five people (Figure 2.) were assigned to collect data directly from the Huntoon Trail. Each team had two people working Garmin GPSMAP 67i devices, two people working with the FieldMap app, and one person taking notes on a data collection sheet. Each observation was recorded using all three collection types stated above simultaneously to ensure quality control. One group started at the top of the trail, by the satellite tower and headed South, while the other group started at the bottom by the entrance sign and headed North. Each team collected data on each individual segment, visually estimating the center of the segments using the 20-meter segments layer created from the Sehome Hill Trails with Average Grade layer. Segment characteristics were recorded using a point layer in Field Maps, which was later joined to the corresponding segment using the Segment ID field.



*Figure 2. Data collection teams 1 and 2. Photo credit to Soren Cooley.*

Segment characteristics and trail observations were recorded independently within the FieldMaps application to keep the data separate when conducting analysis. The required segment characteristics were attributes such as slope, trail width, ground surface material, elevation, and whether the segment had elevated edges. Slope, surface material, and elevated edges were primarily used in analysis. Attributes such as trail width, slope, surface material, and elevated edges were primarily used in analysis. Slopes were categorized as under 5%, 5% to 10%, or over 10% in line with current research and existing standards and was collected using the Apple measure app with IOS16 compatibility on the visually estimated steepest portion of the trail (Lepoglavec et al., 2023; United States Access Board, 2010). Surface material was categorized as either paved, gravel, or dirt. To ensure segments marked as paved were fully paved, any segment containing a mix of paved and unpaved surfaces was counted as the unpaved surface, while distinctions between gravel and dirt surfaces were left to the discretion of the field collection teams. Elevated edges were defined as ridges along the trail edge, railings, or other barriers that could prevent a trail user from falling off the trail and counted only if both sides of the trail had some sort of incline or fence to keep hikers from falling over the edge of the trail.

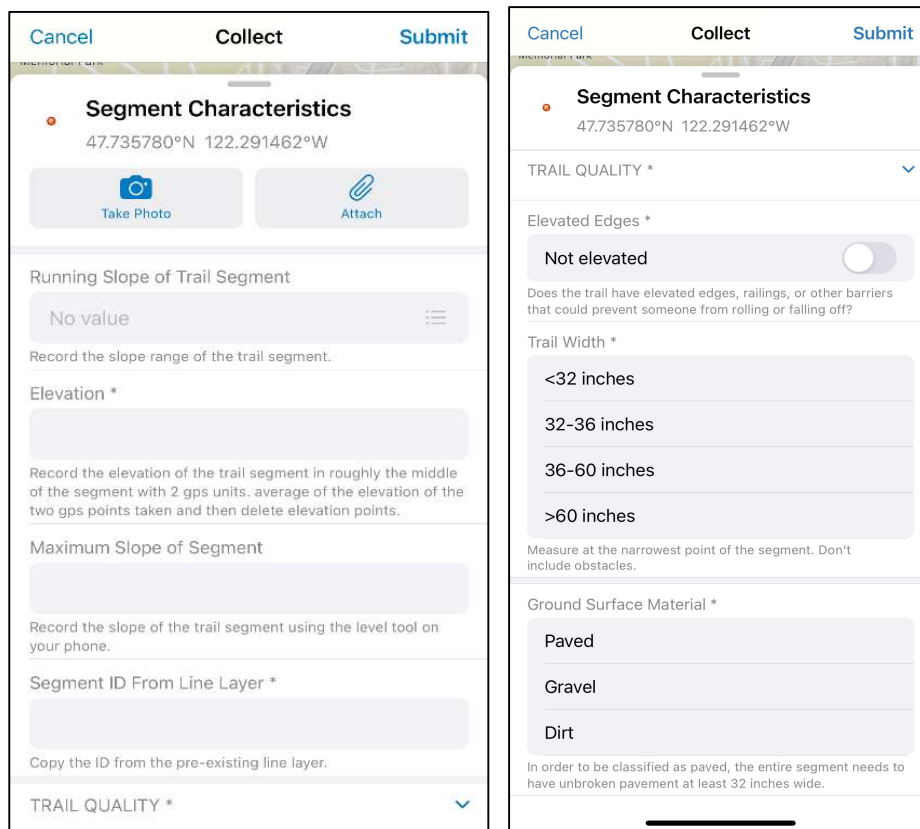


Figure 3. FieldMaps collection process for segment characteristics

Trail observation characteristics were recorded as either an obstacle, a trail intersection, a point of interest, or a seasonal feature. An obstacle was defined as anything that might inhibit someone’s ability to traverse the trail and was an obstacle year-round such as rocks, roots, potholes, or low hanging branches. Low hanging branches were defined as being over the trail and under 203 centimeters from the trail surface (United States Access Board, 2010). A trail intersection was anything that might confuse someone. For example, a fork in the trail that a visually impaired person might not realize is a division of the trail. A point of interest was anything a hiker might want to stop and consider such as benches, trail markers and signs were included. Seasonal features were defined similarly to obstacles, but they only occurred at a certain point in the year, such as slick moss or patches of mud someone might slip on.

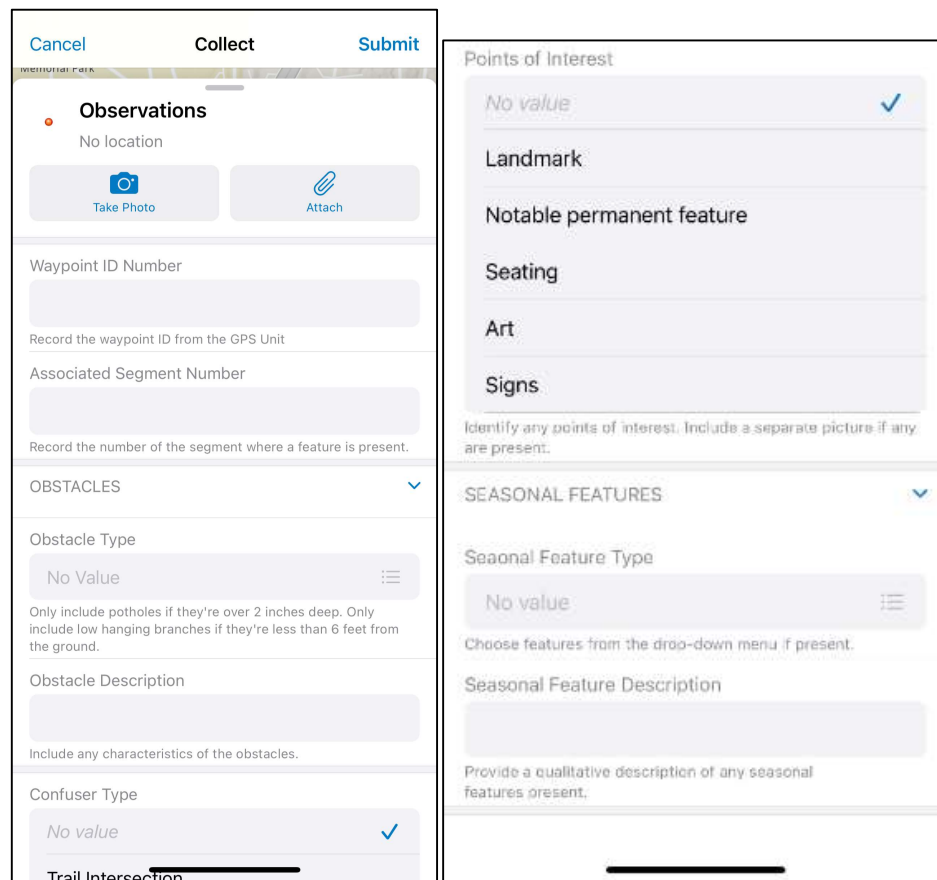
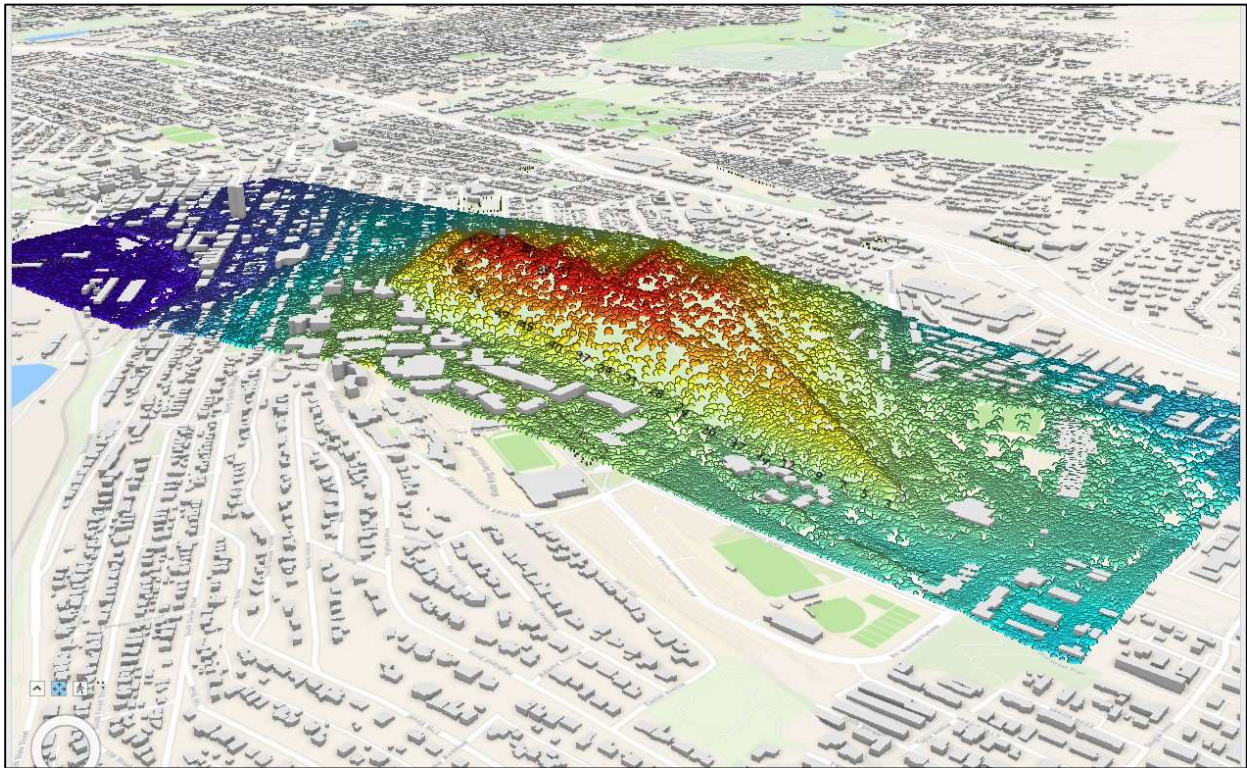


Figure 4. FieldMaps collection process for trail observations.

## Slope Analysis Using LiDAR

As mentioned previously, the slope of the trail was collected using the Apple measuring app and converted to grade percentage. For accuracy and additional analysis, that slope was compared to remote sensing data of the arboretum from 2013 in the form of point clouds. The point clouds were downloaded from the Washington State DNR LiDAR Portal in the form of LAZ files. The Convert LAS and Create LAS Dataset tools in ArcGIS Pro v3.2.2 were used to compile the LiDAR data into a single point cloud of the arboretum shown in Figure 5. The height for the LAS tool was set to use the NAD 1983 StatePlane Washington South Height US ft. The

Add Surface Information tool calculated slope statistics from the point cloud data and merge the data onto the 20-meter segments trail line. The slope calculated from the point clouds were used for cross-referencing the calculated slope from field collection and accessing the quality of the collected field data.



*Figure 5. LiDAR point cloud of the arboretum, combination of two point cloud layers.*

## Verbal Directions and Mapillary Contributions

For those who would benefit from verbal directions or visual aid, verbal directions were recorded, scripted and updated contributions to a pre-existing Mapillary. A team of two people walked the Huntoon trail in both directions, recording verbal directions on Apple's Voice Memo application IOS16 on how to access and navigate the trail. This included any notable features or obstacles to be aware of, and changes within the trail width and ground surface. Any trail

features and obstacles were verbally noted by visual confirmation at recording time and reference collected field data, mentioned previously. The verbal directions on how to navigate the trail were through the advisement of WWU's Digital Technologies Accessibility Coordinator, David Engebretson Jr., shown in Figure 6. Once the script was written from the audio recordings, it was divided by which of the 20-meter segments it was recorded at and uploaded as a web layer.

The long-term intention of these verbal directions is to incorporate the audio recordings into a tracking device that will know which segment of the trail the user is at, which direction the user is walking, and when to play the next recording associated with their location along the trail. As of this report, we are only in the early stages of this.



## **Verbal Direction Guidelines**

### **Do Use:**

- Directionality/Laterality
  - The bookshelves are to your left
  - Your spoon is directly to the right of your plate
- Positional terms, using prepositions
  - The storage cabinet is next to the bookshelves
  - Evan's desk is between Emily's desk and John's desk
- Distances
  - The chalkboard is 3 feet in front of you (use only for short distances)
- Clock-face directions
  - Your water glass is placed in front of you at 1 o'clock
- Degrees
  - The bathroom door is 90 degrees to your right
- Compass Directions
  - Exit the classroom through the south door (use sparingly)

### **Avoid:**

- Using vague phrases as "over there" or "right by you" or "look out"
  - These are not specific enough to provide direction that individuals with blindness or other visual disabilities need
- Pointing to objects or directions
  - If you must, be sure to give clear verbal directions, too
- Having the student count steps
  - Although the general population holds the belief that counting steps is fundamental to the orientation of a person with a visual impairment, frequent use of counting steps between destinations is not an efficient method of developing spatial orientation.

### **To keep in mind:**

- Clock orientation is not bad to use but younger generations might not know the analog clock due to electronic clocks
- Same goes for cardinal directions, as many may not know where north and south is so it will lead to confusion
- Use tactile descriptions such as texture transitions: "brick to smooth pavement" or "once you hear the fountain, start angling to the right"

*Figure 6. General advisement on verbal direction guidelines from David Engebretson Jr., written by Hannah Cole.*

Mapillary is a platform that works with OpenStreetMaps to upload first person perspective photos to certain areas on a map. The Mapillary IOS application v5.10.2 was used synchronously with the collection of the audio recordings to capture new photos of the trail. The collection team held an iPhone in front of them as they slowly walked through the Huntoon trail, in both directions. As they walked, the Mapillary app took continuous photos, which were

uploaded to the Mapillary servers shortly after. Anytime there were other people walking along the trail, the collection team would stop and pause the Mapillary app until the trail was clear. The process of uploading the photos onto Mapillary took approximately four days total (Figure 7).



Figure 7. Mapillary view after the addition of new photos.

## Results

---

To assess the accessibility of the Huntoon Trail for individuals with mobility impairments, the following attributes were recorded for each of the trail segments: slope, trail width, ground surface material, elevation, and elevated edges of the trail. Additionally, obstacles (including seasonal changes), trail intersections, and points of interest along the trail were recorded to identify potential challenges in trail accessibility.

## Huntoon Trail Accessibility: Slope

For each of the 92 trail segments, the percent gradient was calculated to determine accessibility based on slope. Of the 92 segments, 26 segments had a percent gradient of 5.5 percent or less, 34 of the segments had a grade between 5.5 and 9 percent, and 31 of the segments had a grade greater than 9 percent. The distribution of each segment with its corresponding slope and elevation is displayed in Figure 8. While Figure 9, provides an overhead view of the segments and their slope mapped along the Huntoon Trail.

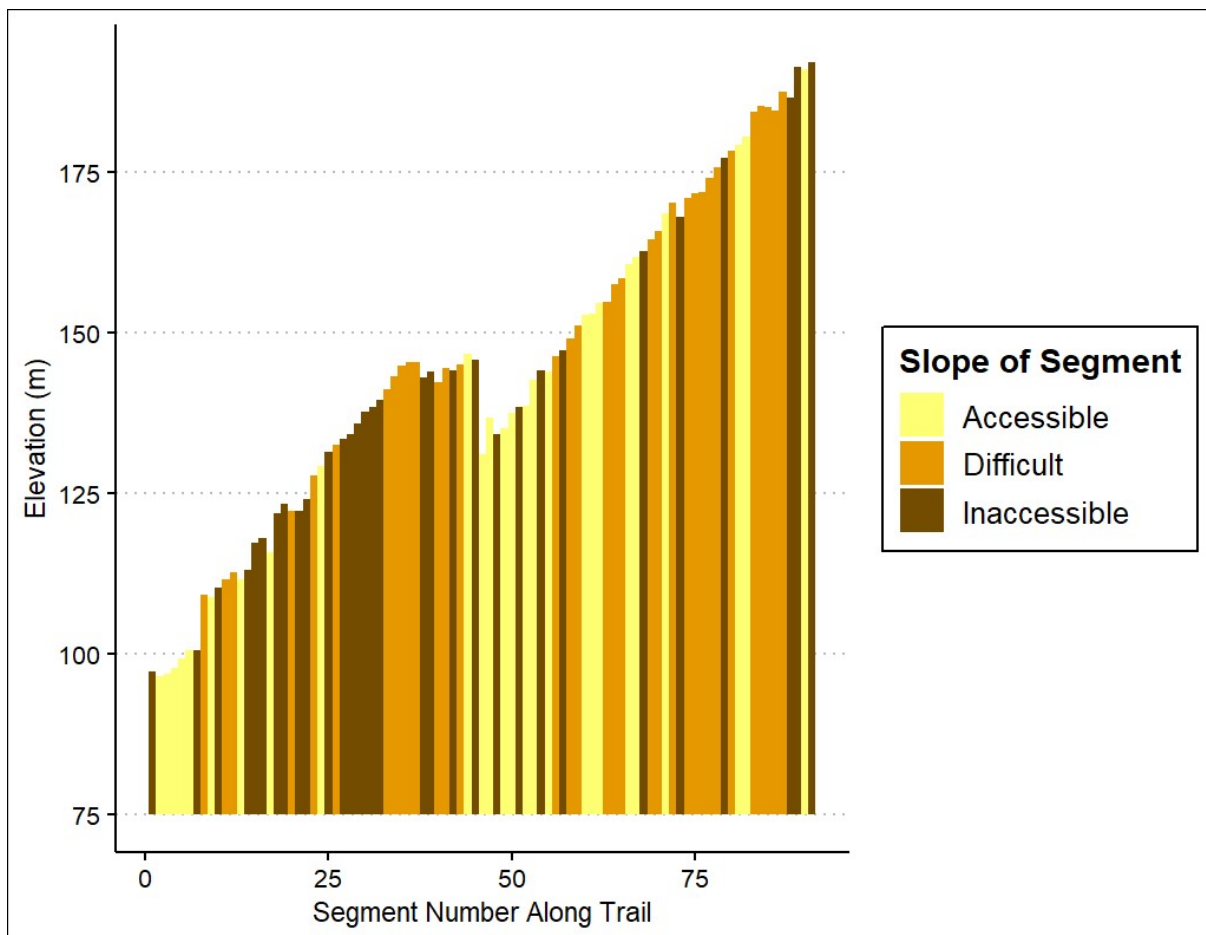


Figure 8. This chart graphs both the elevation and slope of each segment along the Huntoon Trail. Slope accessibility defined 0 – 5.5 % grade as “Accessible”, 5.5 – 9 % grade as “Difficult”, and >9 % grade as “Inaccessible”.

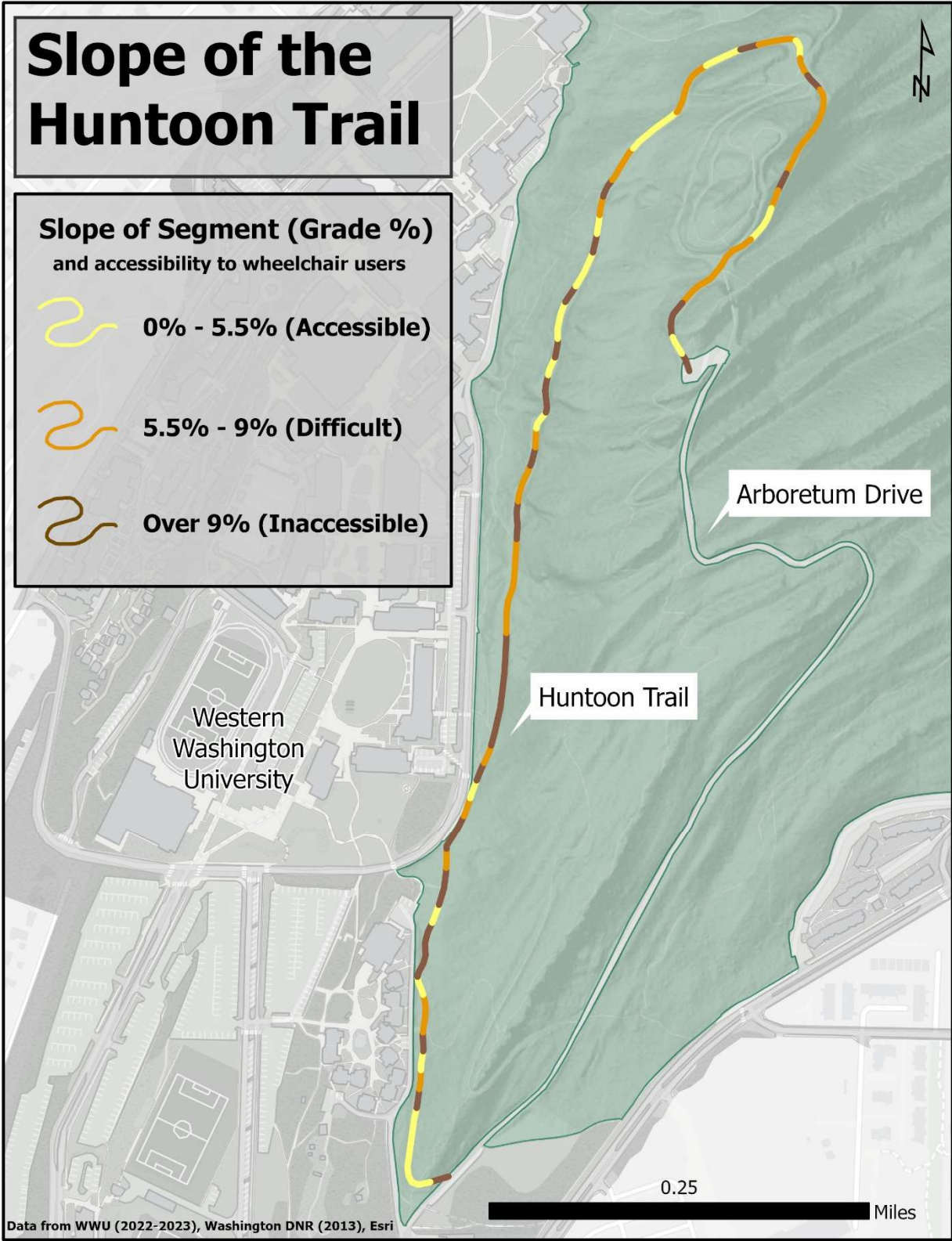


Figure 9. This map displays the slope of 20-meter segments along the Huntoon Trail. There are more segments with >10-degree slopes near the bottom of the trail than the top.

## Huntoon Trail Accessibility: Construction

The collected data showed that 3 segments of the trail, segments 4, 6 and 15, were recorded to be less than 91 centimeters wide, 11 segments of the trail were measured between 36 and 152.4 centimeters wide, and 77 segments of the trail were measured to be greater than 152.4 centimeters wide. In addition to trail width, observations for trail construction included the type of ground cover for each segment of trail with three categories: dirt, gravel, or paved. A total of five segments of trail were recorded to be covered by dirt, 27 segments were observed to be gravel covered, and 59 segments were paved. The distribution of ground cover can be seen in Figure 10, which shows a map of each segment and its corresponding ground cover. The last category of construction considered was whether the trail had raised or elevated edges along the side of the trail. In only two instances were these observed, in segments 21 and 90.

To view additional information on our data collection results, see our web map:

- <https://www.maps.arcgis.com/apps/mapviewer/index.html?webmap=44c4aeef6c7b42b581fca24735cafa5b>

To preview the obstacles, we encountered along the trail along with a general overview of the trail's accessibility, see our dashboard:

- <https://www.maps.arcgis.com/apps/dashboards/dfd36b4d44314112ba09be9d126397e0>

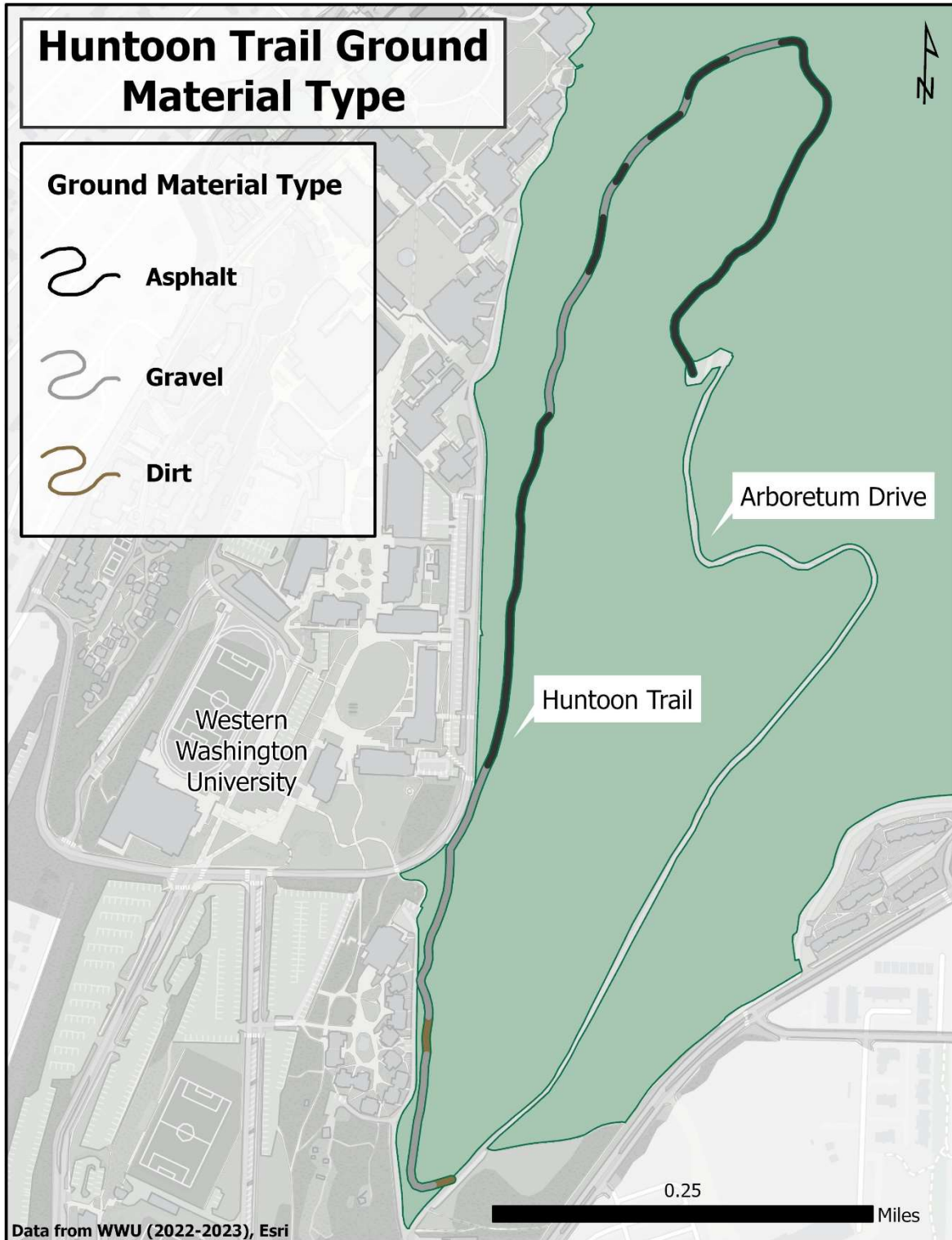


Figure 10. This map displays ground material type along the Huntoon trail, broken into the categories of asphalt, gravel and dirt. About half of the trail is paved, with most of the gravel and dirt sections near the bottom of the trail.

## Obstacles and Observations

A total of 54 obstacles were observed across the five categories, with a count of 31 potholes, 7 roots, 6 rocks, 5 low hanging branches, and 5 obstacles classified as ‘other’ as shown in Figure 11. Observation descriptions for roots included cracking of trail pavement and a root that impacted the entire width of the trail in Segment 15. Low-hanging branches were observed in Segments 3, 4, 5, and 6. The observations for rocks identified areas of sparse pavement and persistent rocky sections in trail segments 44, 45, 67, 68, 69, and 70. Obstacles classified as ‘other’ noted downslope in the trail in segments 76, 79, and 90; as well as downed logs near the trail and a section of stairs in segment 1. A detailed map of the observed obstacles can be found in Figure 13.

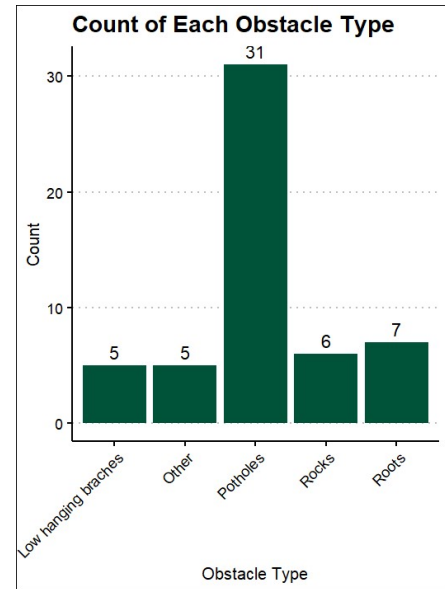


Figure 11. This bar graph displays the count of each obstacle observed by the data collection team.

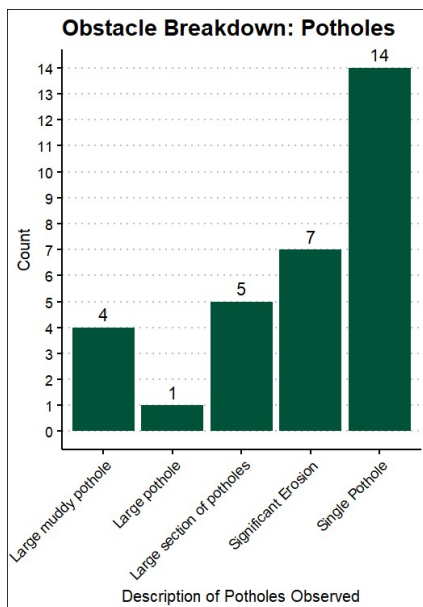


Figure 12. This figure shows the breakdown of the different descriptions of potholes observed.

With 31 observations, a breakdown of the observed potholes and their characteristics is shown in Figure 12. The majority of pothole observations included single potholes with a count of 14 observations throughout the Huntoon Trail. The second highest observations indicated significant erosion in segments 41, 47, 49, 56, 57, 62, and 64. Large sections of potholes were observed in segments 31, 57, 60, 88, and 91. Lastly, large potholes were observed in segments 28, 47, 56, 62, and 63.

Additional observations made by the data collection team included points of interest, intersections, and seasonal features along the trail. The points of interest, which can be seen mapped along the trail in Figure 14, were categorized as art, landmarks, available seating, and trail signage. One observation was made of each trailside art and landmarks in trail segments 46 and 39 respectively. While three benches were reported in segments 45, 71, and 85. Nine signs were observed along the trail, four of which corresponded to intersections with other trails in segments 2, 21, 25, and 27. The other five signs were reported in segments 53, 59, 72, 82, and 91. An additional 11 intersections were reported without corresponding signage in segments 11, 15, 18, 22, 37, 44, 72, 73, 84, and 85, with a noted two intersections in segment 84. The locations of intersections throughout the Huntoon Trail have been mapped and displayed in Figure 15. Lastly, the data collection team observed seven total seasonal features, which have been mapped and displayed in Figure 16. These features are split between mossy sections or locations of increased mud and large puddles on the trail. Three mossy sections were reported in segments 43, 55, and 71. While four significant muddy puddles were observed in segments 1, 6, 7, and 11.



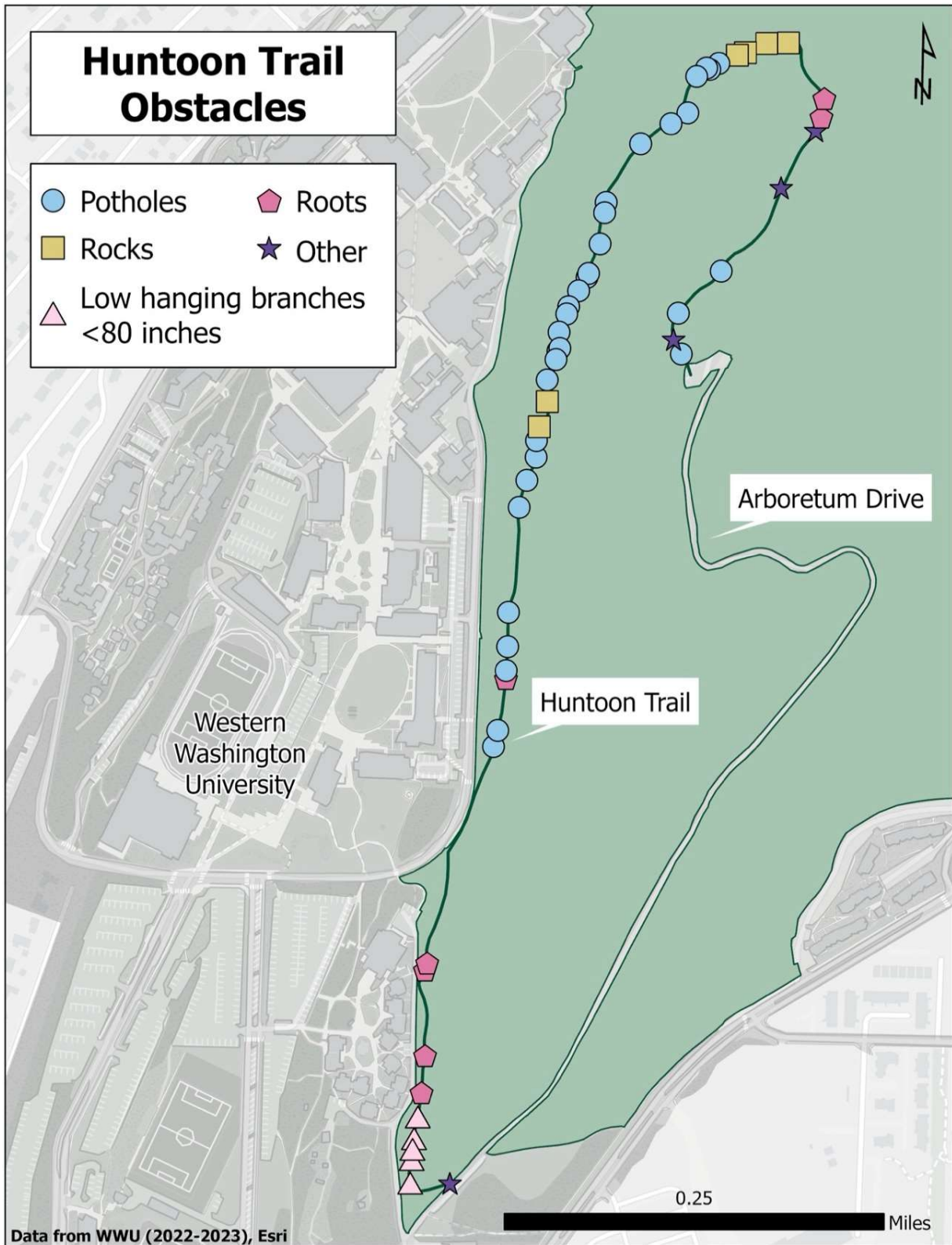


Figure 13. This map displays the recorded obstacles on the Huntoon Trail, including potholes, roots, rocks, low hanging branches, and other. Obstacles were defined with consideration for individuals with mobility impairments.

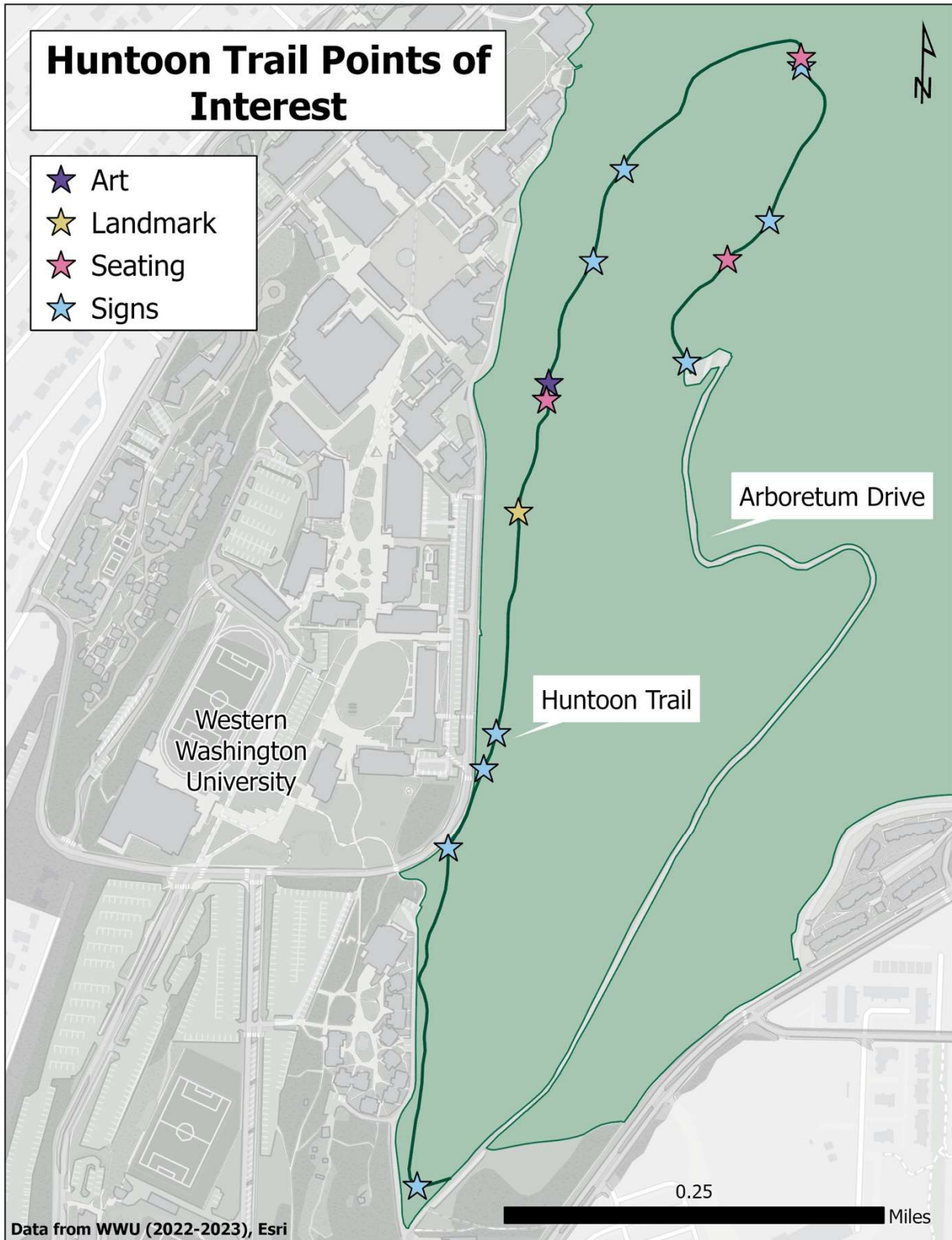


Figure 14. This map displays points of interest on the Huntoon Trail, including art, permanent landmarks, seating, and signs.

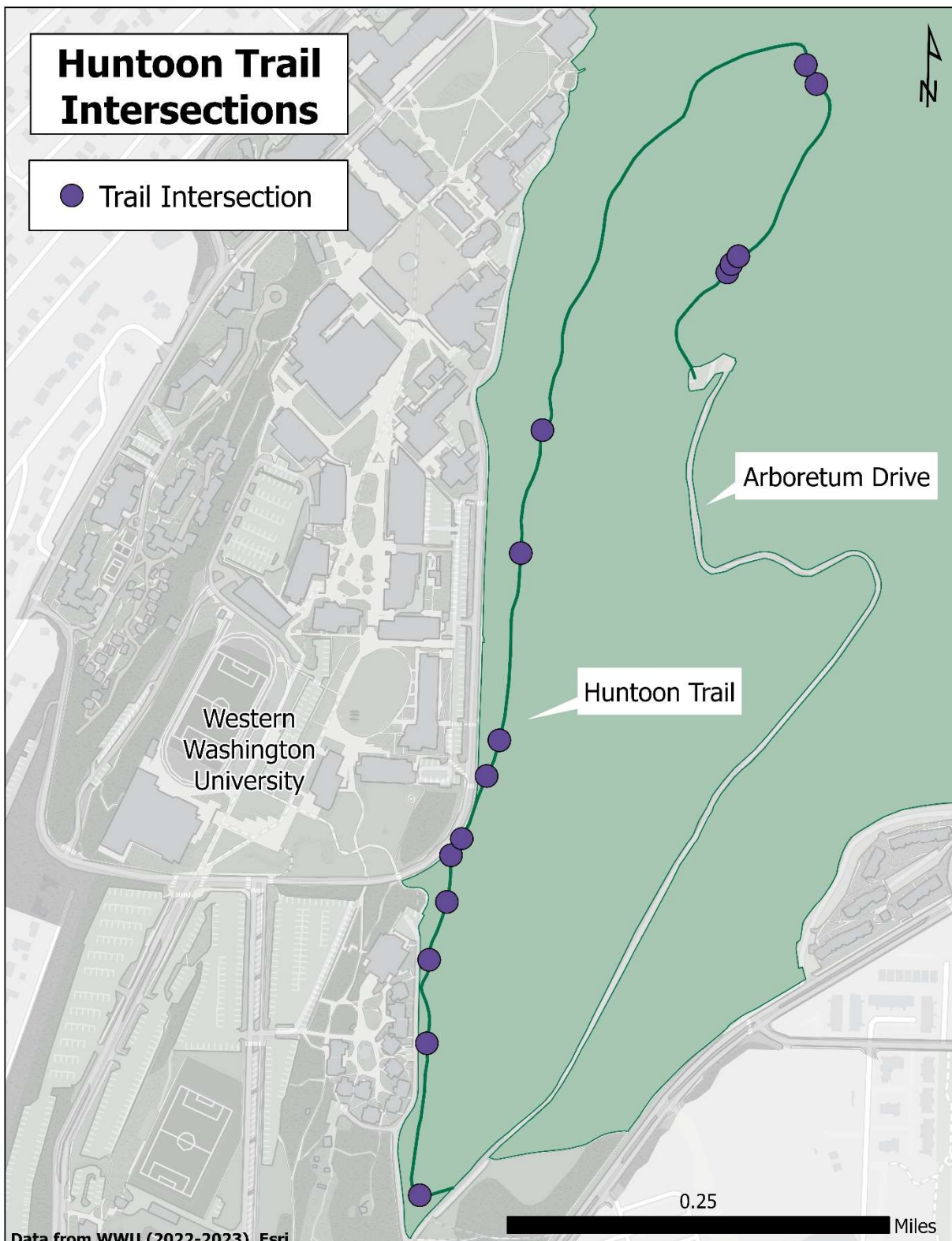


Figure 15. Map of the trail intersections along Huntoon trail.

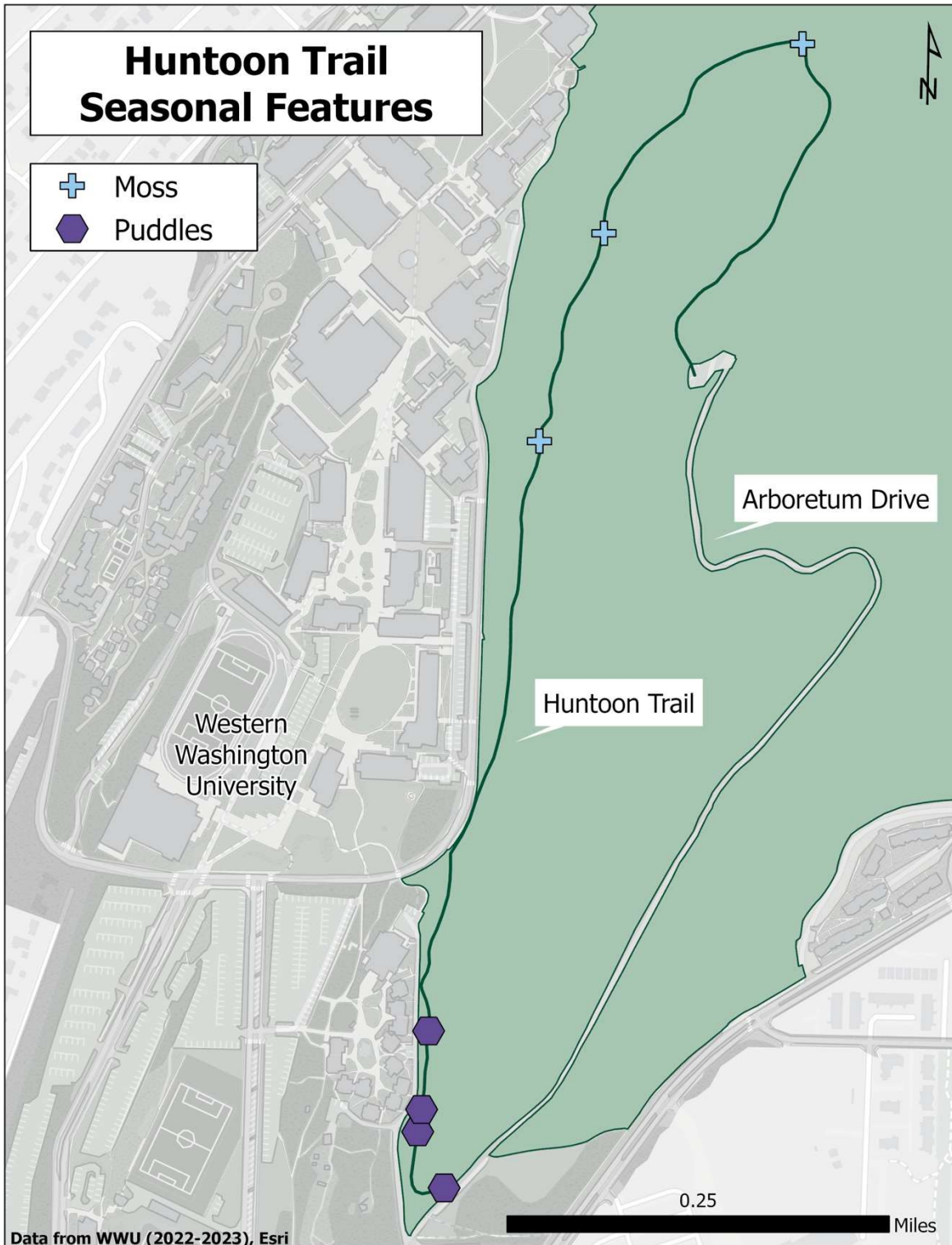


Figure 16. This map displays the observed seasonal features on the Huntoon Trail, including moss and puddles. Puddles were observed more frequently than moss.

## Discussion

---

There are always obstacles in large studies performed by large teams of people. Two teams worked together simultaneously to complete data collection on the trail, and many precautions were made to ensure standardized data including utilizing a standard form, testing data collection before collecting data, meeting before and after data collection, and communicating during data collection. The unique experiences of the data collectors impacted the data in two ways: first, it introduced biases to the data collection. Using two teams can help mitigate the inherent biases within a group, yet with each team concentrating on distinct halves of the trail, there remained potential for inaccuracies. Furthermore, while communication was maintained, each team handled obstacles in data collection slightly differently. This was overcome in the post-collection period through robust teamwork, but it undoubtedly influenced how the data was used for the study.

The majority of the Huntoon Trail would be considered inaccessible by the standards of this study. The slope is generally far too steep for wheelchair users to navigate safely, and a myriad of obstacles are scattered throughout the length of the trail. Only 26 of the 92 20-meter segments, comprising approximately 28% of the trail, had a low enough grade (5%) to meet ADA standards for people using wheelchairs (2010 ADA Standards for Accessible Design). Modifying this grade to be accessible for wheelchair users would require the construction of an entirely new trail, as the current grade reflects that of the original road that was built in 1923. This would involve removing dozens, if not hundreds, of mature trees within the arboretum and would require significant funds. Because the arboretum was founded as a natural area with the intent of preserving the second-growth forest that grew after it was originally logged (Sehome Arboretum Master Plan, 2002), this approach would face vigorous opposition if formally

proposed and is unlikely to ever be seriously considered. For this reason, the authors of the study find it highly unlikely that the Huntoon Trail will ever meet ADA accessibility standards for wheelchair users. This conclusion, admittedly, uses a simple criterion based on ADA regulations and does not consider the varied physical abilities of wheelchair users, nor the variety of wheelchair models available on the market.

Although it will likely never be possible for most wheelchair users to navigate the entire length of the trail safely, there are other measures that can be taken to make the trail safer and easier to navigate for people who have conditions that affect their mobility but do not require the use of a wheelchair. There are three 20-meter segments less than 91 centimeters wide, which is too narrow to be considered accessible (2010 ADA Standards for Accessible Design). As the Huntoon Trail is built on an old road grade that in many places is wider than the trail itself, widening these sections would likely require little more than clearing vegetation adjacent to the trail and extending the trail surface outward such that the trail was at least 91 centimeters wide, although 152.4 centimeters would be preferable to provide enough space for two people to pass each other in opposite directions.

Repaving the surface with fresh concrete or asphalt would also improve accessibility. Gravel surfaces erode more easily and provide less traction than paved surfaces. While there are sections along the whole trail that are accessible to wheelchair users, the north trailhead is the only accessible entrance. The south side of the trail has small trail entrances and stairs to access the trail, making it difficult for wheelchair users to access. This could be fixed by removing the stairs and adding in a paved ramp. The installation of a guide rope could also be an easy addition that can help make the trail more accessible to people with sight limitations. Additionally, with sight limitations in mind, braille could be added to trail markers and information plaques to

ensure everyone has equal accessibility. Repaving the trail surface could also help with the issue of trail erosion. Segments 41, 47, 49, 56, 57, 62, and 64 were all observed to have significant erosion, and since these sections have been previously paved, repaving them to fix the erosion would be feasible. To prevent further erosion, adding raised edges such as retaining boards on the downslope side of the trail could be beneficial. These would use the principle behind terraces used in areas of steep agriculture to add support to the material underneath the pavement and prevent it from sliding downhill and leaving the pavement unsupported and vulnerable.

Overhead obstacles present another hazard for individuals with little or no vision. 2010 ADA accessibility standards mandate that overhead hazards be at least 203 centimeters above walking surfaces (2010 ADA Standards for Accessible Design). Although most of the trail is free of such obstacles, there are several points along the southernmost portion of the trail (segments 3-6) with low overhanging branches. Removing these branches would be fairly easy and inexpensive and would improve accessibility for users with visual limitations.

Another accessibility issue for wheelchair users on the Huntoon Trail are the roots present in sections 5, 6, 7, 8, and 11 of the trail. Sections 5, 6, and 11 have relatively small roots and do not cover the entire trail, meaning they could be removed. In contrast, sections 7 and 8 have multiple large roots that are likely taproots essential for the health of the trees bordering the trail, and removing these could compromise the well-being of the trees. Further, if these roots were removed, the large trees they support would be much more vulnerable to falling from high wind. Trees falling across the trail would not only block access and require a lot of work to remove, but also present a massive safety hazard, considering the trees near sections 7 and 8 are large enough that they could hit the Fairhaven commons if they fell. One potential approach to address the presence of large roots without resorting to their removal could involve resurfacing

those areas with additional gravel and implementing raised edges along the downhill side of the trail to serve as retaining barriers. The lower sections of the trail with roots present aren't paved to begin with, so bringing in more gravel to resurface it and cover up the roots would be a sensible solution. Furthermore, sections 7 and 8 are too steep for wheelchair users to navigate, and distributing more surface material to these sections and extending it out down the slope could make them flatter. This would solve both the accessibility issues of the root obstacles and the steepness of the segments, so it's an action worth considering.

These suggestions for improving the accessibility of the Huntoon Trail are just that— suggestions. For the trail to be improved, steps must be taken to organize trail maintenance work. The City of Bellingham has many infrastructure projects being undertaken at any given time, and the Huntoon Trail is low on the list of priorities. However, with some organizing, Western Washington University could be the force behind improvements to the trail. The possibility of creating a class within the College of the Environment centered around equitable access to the outdoors could have work parties to fix up the trail. This would allow students to engage in community outreach and give them an opportunity to be physically active outdoors, while having the added benefit of taking some of the responsibility for trail maintenance away from the city. The concept of student-led work parties would be an excellent idea to propose to both the university and the city. The Huntoon Trail is far from achieving complete accessibility for all; however, with the collaborative efforts of students and faculty at Western Washington University, it has the potential to reach that goal.



## Works cited

---

- 2010 ADA Standards for Accessible Design (2010). <https://www.ada.gov/law-and-regs/design-standards/2010-stds/>
- Accessibility and equal opportunity*. City of Bellingham. (2023, October 23).  
<https://cob.org/about/access>
- Belanger, H., Bridge, E., Cederholm, M., Chisholm, A., Coblentz, A., Hartt, K., Magee, S., McAteer, L., McNett, B., Reed, A., Storbeck, L., Thatcher, M. (2024). *Sehome Hill Arboretum: Huntoon Trail Accessibility* [Unpublished manuscript]. Western Washington University.
- Joy, A. (1999). *History of Bellingham Parks*. Self-published.
- Lepoglavec, K., Papeš, O., Lovrić, V., Raspudić, A., & Nevečerel, H. (2023). Accessibility of Urban Forests and Parks for People with Disabilities in Wheelchairs, Considering the Surface and Longitudinal Slope of the Trails. *Sustainability*, 15(10), 7741.  
<https://doi.org/10.3390/su15107741>
- Marvar, A. (2023, August 3). 'Birds Are My Eyesight.' New York Times (Online).  
<https://www.proquest.com/docview/2845563216/citation/29B38BD601A240A3PQ/1>
- McNeal, D., Brown, M., Dart, L (2002). *Master Plan Update: Sehome Arboretum*. Prepared for the City of Bellingham and Western Washington University by JGM Landscape Architects. <https://cob.org/wp-content/uploads/sehome-hill-arboretum-master-plan.pdf>. Retrieved 4 June 2024.

- Riazi, A., Riazi, F., Rezvan, Y., & Bahmeei, F. (2016). Outdoor difficulties experienced by a group of visually impaired Iranian people. *Journal of Current Ophthalmology*, 28(2), 85–90. <https://doi.org/10.1016/j.joco.2016.04.002>
- Taylor, S. and Butler, J. in Taylor, A. (2008). *Examined Life* [Film]. Zeitgeist Films.
- United States Access Board. (2010). *U.S. Access Board Technical Guide — Accessible Routes*. <https://www.access-board.gov/files/ada/guides/accessible-routes.pdf>
- Van Landingham, S. W., Massof, R. W., Chan, E., Friedman, D. S., & Ramulu, P. Y. (2014). Fear of falling in age-related macular degeneration. *BMC Ophthalmology*, 14(1), 10. <https://doi.org/10.1186/1471-2415-14-10>
- Western Washington University. (n.d.). *Sehome Hill Arboretum*. <https://cedar.wwu.edu/sehomearboretum/>
- Western Washington University Strategic Plan 2018-2025* (2018). Western Washington University. <https://provost.wwu.edu/files/2020-03/WWU%20Strategic%20Plan%202018-2025.pdf>. Retrieved 5 June 2024.
- Wilson, J. F., & Christensen, K. M. (2012). The relationship between outdoor recreation and depression among individuals with disabilities. *Journal of Leisure Research*, 44(4), 486–506. <https://doi.org/10.1080/00222216.2012.11950275>

## Appendix A - Script for Verbal Directions of the Trail

---

### Southbound

91- Exiting the parking lot. There are two boulders on each side of the trail entrance with waist level metal pole in the center. Align yourself between the metal pole and the right-hand boulder. Continue forward aligning yourself where the paved path meets the moss on the right-hand side.

90- Steep drop off to the left.

89- Steep drop off on the left-hand side of the trail. The trail is dominated by ferns. Be mindful of potential rockfalls and landslides in rainy seasons. There is a black chain link fence to the left of the trail that is approximately 10 feet long and waist level.

87 & 88- Steep drop off on the left-hand side of the trail. The trail is dominated by ferns. Be mindful of potential rockfalls and landslides in rainy seasons. There is a black chain link fence to the left of the trail that is approximately 10 feet long and waist level. Black fence has ended.

86- Trail fork towards Sehome arboretum tunnel at 3 o'clock. The path of alignment will change from asphalt and moss to just asphalt for approximately 4 feet and then return. Steep drop off on left hand side of trail. Stay to the right.

85- Trail forks to the Tower Trail at 10 o'clock. The Huntoon trail continues at 12 o'clock. Steep drop off on left hand side of trail. Stay to the right.

84- Trail begins to have a drop off on the right-hand side. Realign yourself to the left-hand side.

83 & 82- Trail begins to have a drop off on the right-hand side. Realign yourself to the left-hand side.

81- Trail path cover becomes less uniform, be cautious of bumps in the asphalt.

80 & 79 - Trail path cover becomes less uniform, be cautious of bumps in the asphalt. Maintain alignment on the left-hand side of the trail.

78 & 77- Trail path cover becomes less uniform, be cautious of bumps in the asphalt. Maintain alignment on the left-hand side of the trail. Ground may be slick due to moss, beware of low hanging branches near the path of alignment.

76- Trail path cover becomes less uniform, be cautious of bumps in the asphalt. Maintain alignment on the left-hand side of the trail. Ground may be slick due to moss, beware of low hanging branches near the path of alignment.

75- Be mindful of uneven terrain, asphalt begins to be uneven due to roots. Right hand side still has a steep drop off.

74- Be mindful of uneven terrain, asphalt begins to be uneven due to roots. Right hand side still has a steep drop off.

73- Path begins to widen. Align yourself with the right side of the trail. Continue to be mindful of uneven terrain.

72- Trail forks to the tower at 8 o'clock. Continue path of alignment on the right side.

71- Path widens considerably and will start to curve to the left. The trail will fork at 3 o'clock towards an unknown trail, followed immediately after this fork will be a bench. After reaching the bench, maintain a path of alignment on the right side following the curve.

70 & 69- Path will change from paved asphalt to compact gravel. Continue alignment on the right-hand side of the path. Be mindful of uneven terrain.

68- Right side of the paths begins to have a steep drop off. Realign yourself with the left side of the path. Asphalt has begun to erode, be extra cautious of the uneven terrain.

67- Right side of the paths begins to have a steep drop off. Realign yourself with the left side of the path. Asphalt has begun to erode, be extra cautious of the uneven terrain.

66- Right side of the paths begins to have a steep drop off. Realign yourself with the left side of the path. Asphalt has begun to erode, be extra cautious of the uneven terrain. Be mindful of low hanging branches.

65- Right side of the paths begins to have a steep drop off. Realign yourself with the left side of the path. Asphalt has begun to erode, be extra cautious of the uneven terrain. Be mindful of mud, low hanging branches, and uneven terrain.

64- Right side of the paths begins to have a steep drop off. Realign yourself with the left side of the path. Asphalt has begun to erode, be extra cautious of the uneven terrain. Be mindful of mud, low hanging branches, and uneven terrain. Be mindful of a large tree near the path of alignment at the beginning of the section. Path still has a steep drop off to the right.

63- Trail forks to an unknown gravel trail at 9 o'clock along the path of alignment. Continue past.

62- Path widens to 6 feet and is now mainly paved. Be mindful of uneven or cracked asphalt.

61- Path widens to 6 feet and is now mainly paved. Be mindful of uneven or cracked asphalt. Continue alignment on the left-hand side of the path.

60- Path widens to 6 feet and is now mainly paved. Be mindful of uneven or cracked asphalt. Continue alignment on the left-hand side of the path.

59- Path forks at 3 o'clock towards Miller Hall Trail.

58 & 57- Path forks at 3 o'clock towards Miller Hall Trail. Beware of changing terrain and eroded asphalt.

56 & 55- Continue alignment on the left-hand side of the path.

54- Continue alignment on the left-hand side of the path. Be mindful of potholes near the path of alignment.

53- There is a sign explaining invasive English Ivy at 9 o'clock.

52- Continue path of alignment on the left-hand side. There is still a considerable drop off on the right side of the path.

51- Continue the path of alignment on the left-hand side. There is still a considerable drop off on the right side of the path. Drop off to the right has gotten steeper.

50- Continue the path of alignment on the left-hand side. There is still a considerable drop off on the right side of the path. Drop off to the right has gotten steeper.

49-Continue the path of alignment on the left-hand side. There is still a considerable drop off on the right side of the path. Drop off to the right has gotten steeper. Terrain on the right is uneven due to eroding asphalt.

48 & 47- Continue the path of alignment on the left-hand side. There is still a considerable drop off on the right side of the path. Drop off to the right has gotten steeper.

46- Align yourself with the right side of the path for approximately 10 feet to avoid obstacles such as boulders and debris from past landslides. After 5 feet realign yourself with the left-hand side, to avoid uneven terrain and steep drop off.

45- Path narrows to be approximately 4 feet wide, and surface changes to compact gravel. Continue alignment on the left-hand side.

44- Continue on the left-hand side of the path. There is still some remaining asphalt, making terrain uneven.

43- Path widens. Be mindful of a large rock near the path of alignment at the beginning of this section.

42- Continue the left side of the path, considerable drop off to the right of the path.

41, 40, & 39- Continue the left side of the path, considerable drop off to the right of the path. Be mindful of uneven terrain from eroded asphalt.

38- Path widens at the beginning of this section due to the outdoor classroom at 9 o'clock. The outdoor classroom is along the path of alignment and spans approximately 10 feet. Be mindful of the potential of large groups gathering here.

37- Continue alignment on the left side of the path. Be mindful of uneven terrain due to eroded asphalt. The path widens to 10 feet.

36, 35, & 34- Continue alignment on the left side of the path. The right side sloped downwards into bushes. The path widens to 10 feet. Be mindful of debris near the path of alignment.

33- Path becomes more uniform.

32 & 31- The terrain becomes uneven again.

30- Uneven terrain, eroded asphalt and loose gravel. Be extra mindful of potholes.

29- Continue using left side as path of alignment

28- Trail forks at 3 o'clock leading to the new computer science building on East College way.

27 & 26- Uneven terrain

25- Trail Forks to the South Campus Trail at 4 o'clock. Path narrows. Continue alignment on the left side of the trail, drop off to the right.

24, 23, & 22- Continue using the left side of the path, uneven gravel terrain and drop off to the right.

21- Path narrows and begins to curve at the beginning of this section. Sehome Arboretum trail board at 9 o'clock and waist level wood fence at 3 o'clock. Continue using the left side.

20 & 19- Continue using the left side of the trail. The right side sloped downwards into bushes.

18- Path widens. 5 feet into section 18 there is an unnamed path down to Fairhaven commons at 3 o'clock. Be mindful of mud.

17, 16 - Continue to use the left side of the path. There is uneven terrain, obstacles, and a dropoff on the right side.

15- Trail begins to curve, with a path fork at 9 o'clock. Continue straight after the curve towards a small wooden fence at about waist level, align yourself so that the fence is to your right.

14- Fence spans about 10 feet. The path will slope downwards after you reach the fence, and narrows. There are several roots along the path for the duration of the downward slope, be extra mindful and cautious during this section. There is still a drop off on the right.

13 & 12- Continue using the left side of the trail. The path is about 5 feet wide. Mud frequently forms here during the rainy season. The terrain is uneven.

11- Stairs at 3 o'clock leading to Fairhaven residences stack 3 & 4. The stairs are uneven and have metal traction on top. This area becomes extremely muddy with rain, use extreme caution during rainy seasons. There is a trail fork at 9 o'clock directly across from these stairs, the trail post does not have a name on it.

10- At the beginning of this section, align yourself with the right side for approximately 10 feet to avoid large roots. Realign yourself with the left side of the trail and continue.

9- Path narrows, continue using the left side of the trail. Watch for uneven terrain and mud.

8- Be mindful of small roots and uneven terrain.

7- Path narrows to 3 feet wide.

6, 5, & 4- Path narrows to 2 feet wide. Be mindful of low hanging branches and foliage.

Continue using the left side of the path. This section of the path is extremely muddy most of the year. There is a steep drop-off on the right-hand side of the path. Use caution.

3- Path widens.



2- Use the left side to align yourself. Sehome Arboretum trail board at 9 o'clock, trail fork at 3 o'clock leading to 25th Street and East College Way. At 9 o'clock directly after the trail board there is a set of concrete stairs leading to an unmarked path.

1- At the end of section one, approximately 15 feet into it, there is a set of six large concrete steps. These steps lead to a parking area for the Arboretum, and the road that goes to the watchtower. These stairs mark the end of the trail going southbound.

### Northbound

1- Orient yourself so that you are facing the trailhead with Arboretum Drive running perpendicular behind you. There are six large steps that will lead to the dirt trail.

2- Stay aligned to the right side of the trail where the surface changes from compacted gravel to dirt and is indicated by a slope. In less than 5 feet, you will hit an intersection. The left set of stairs leads to the outback farm and the right set of stairs leads to a steep and narrow dirt trail. At two o'clock, there is a kiosk that displays the Sehome Hill Arboretum.

3 & 4- Staying aligned to the right side of the trail, keep in mind that this section of trail is narrow. The majority of this section is covered with low hanging branches that may affect those who are taller than 6 feet. The ground is uneven with a scatter of divots across the path.

5- The path becomes increasingly narrow with thick vegetation impeding on both sides. As you continue, the right side of the trail has a low slope to the right so use caution. Low hanging branches on the right side of the path are frequent along this segment.

6- This section is muddy for most of the year, especially towards the center of the trail. Use extra caution during the rainy and wet seasons as the path may be slick.

7- Stay aligned to the right side of the trail. Keep in mind that this section of trail is still narrow. The majority of this section is covered with low hanging branches that may affect those who are taller than 5 feet. The ground is uneven with scattered divots and logs across the path of alignment. The path widens exponentially.

8- Stay aligned to the right side of the trail. Keep in mind that this section of trail is narrow. The majority of this section is covered with low hanging branches that may affect those who are taller than 5 feet. The path widens exponentially. Large logs protrude on the right side of trail as we exit segment 8.

9- Be cautious of uneven ground. The surface type is uniform with compacted dirt, staying to the right side of the path.

10- The path becomes much wider than earlier segments. Due to large roots that pose a tripping hazard, start to align yourself with the left side of the trail by slowly walking towards ten o'clock until you can feel where the compacted dirt path meets the loose dirt on the side. There is a slight slope on this side. In 10 feet, start to angle yourself towards the right side of the trail by walking towards two o'clock until you reach the path of alignment. Orient yourself where the compacted dirt meets the slope of the right side.

11- At this intersection, there is a small and narrow trail that leads up to the eastern side of the arboretum. On your left there is a large set of stairs that leads to the back of Fairhaven dorms three and four. These stairs are uneven and have metal traction on each step. This area is prone to mud, use extreme caution if it has rained as the surface may be slick.

12- The path becomes much wider than before. Stay aligned with the right side of the trail, feeling where the compacted path meets the loose dirt on the side.

13- As we continue into segment thirteen, the surface type of the path now consists of loose gravel but stays aligned with the right side.

14- Starting on segment fourteen, the path starts at a soft incline.

15- There is a wooden fence at the start of the segment on your direct right. It is roughly shoulder level on the right side of the trail. Once you arrive at the fence, start towards eleven o'clock until you are aligned with the left edge. Orient yourself so that you are now facing north, and the wooden fence is still on your right but across the path. There are five large roots on the right side of the trail that are extreme tripping hazards. Once you pass the large Douglas fir on your left, we can start to align ourselves back to the right side of the trail.

16- The surface type is uniform, with logs that may be protruding in the path but are no cause for concern.

17- Both sides of the path are dominated by ferns with Douglas fir that are roughly 100 feet high. The path has full canopy coverage.

18, 19, 20- This section is prone to mud throughout the year, so be cautious of slick surfaces in the center of the trail. Stay aligned with the right side where the compacted path meets the soft dirt on the side.

21 & 22- This section is prone to mud throughout the year, so be cautious of slick surfaces in the center of the trail. Stay aligned with the right side where the compacted path meets the soft dirt on the side. We will start on a soft incline.

23- On our right is a kiosk that displays the Sehome Arboretum. On the left is a trail that leads to the fire road behind Academic East.

24- As we start on segment twenty-four, there is a steep incline on the path of alignment of the right side. Be cautious of the uneven surface as you continue. You will be able to hear the hum of the new construction to your left. A new building is being built, connecting to Academic East.

25- Segment twenty-five consists of larger rocks and uneven gravel throughout the entire path. The Huntoon Trail immediately forks into two trails, but you will stay on the right side of the trail on the path of alignment.

26- There is broken asphalt littered throughout the entire path. You should also be able to feel the immediate change from loose gravel to asphalt once the segment starts. Be aware of the step ups and drop downs that are minimal but frequent. Stay aligned where the asphalt meets the soft dirt on the right.

27, 28, 29- The Huntoon Trail starts to incline at a modest slope.

30- The Huntoon Trail starts to incline at a modest slope and there are large maple trees and Douglas fir with complete canopy coverage of the path.

31- Segment thirty-one consists of larger rocks and uneven gravel throughout the entire path.

32- 20 feet into the segment, there are large chunks of asphalt that might be a tripping hazard.

33- The Huntoon Trail becomes uniform in texture and surface type with a few divots. These features are nothing of concern as they are minimal in depth.

34, 35, 36- The Huntoon Trail is uniform in surface type. The Huntoon Trail used to serve vehicles which is why most of this section is hard asphalt

37- Both sides of the Huntoon trail consist of Western sword ferns and extreme exposure of Chuckanut sandstone.

38- Segment thirty-eight drop downs due to broken asphalt. Otherwise, the path is uniform in texture.

- 39- On your right, the remains of the outdoor school are present as several short stumps in the ground.
- 40- The path is made up of broken asphalt. Stay on the path of alignment where loose gravel meets the loamy dirt on the right.
- 41- The path is uniform in slope with a few divots of asphalt that are of no cause for concern. The right side of the Huntoon Trail is spongy moss which could be slick.
- 42- The left side has a slope down to a drop. Stay aligned to the right side of the trail. About 5 feet in, the surface becomes uneven with reasonable sized chunks of broken asphalt. Use extreme caution.
- 43- The path becomes uniform, consisting of hard asphalt
- 44- The right side of the path has exposure to large pieces of Chuckanut sandstone within the hillside. This area will be slick as it is most often muddy throughout the year. The uniform asphalt changes within the path to cobble-sized rock, equivalent to 1-2 inches in diameter.
- 45- The right side shows signs of previous landslides through lack of vegetation and rock piles below the slope. This segment is uneven throughout the entire path.
- 46- The start of the segment steps back up onto asphalt with a modest lip. There are large boulders in the path of alignment and piles of dirt from past landslides. The trail also starts to become flat and uniform
- 47- The path is consistently uniform and flat
- 48- The asphalt is broken into smaller chunks, but you will stay on the right side of the trail in the path of alignment where loose gravel meets the loamy dirt.
- 49- The path is uniform in surface type while the left half of trail has a slight slope
- 50- The path is uniform with a slight slope upwards towards right side of trail

51- About 15 feet into segment 51, the path becomes uneven with a lip on the left half of the trail. Stay to the right side of the path.

52- The path becomes uniform with a few divots. Orient yourself so that you are still headed north

53- The path consists of broken asphalt in first 10 feet with a lip on left side

54 & 55- The path is uniform, but we are staying aligned to the right side of the trail. There is a high frequency of potholes that are ten inches in diameter.

56- The path consists of broken pieces of asphalt as well as loose gravel

57 & 58- The surface type of the Huntoon Trail is now sandy with a mix of gravel. Be cautious as it might be slick if dry.

59- The path is uneven in both surface type and slope. To your direct left, a path goes down to Miller Hall called Miller Hall Trail. Orient yourself so that we are still headed north towards the top of the Huntoon Trail.

60- The surface type of the Huntoon Trail is now sandy with a mix of gravel. Be cautious as it might be slick if dry.

61- The start of the segment steps back up onto asphalt with a modest lip

62 & 63- There is a high quantity of moss on right within the path of alignment which may cause the path to be slick

64, 65, 66- The Huntoon Trail is uneven overall throughout the entire section. Align yourself with the path of alignment where the asphalt meets the sandy path on the right.

67- The path is uniform throughout. 15 feet into the segment there is a change in surface type from asphalt to gravel. Once the change is made, there is a high frequency of asphalt chunks.

68- Stay closer to the right side as there are long sections of asphalt in the middle of the path that might be a tripping hazard.

69 & 70- The path to cobble sized rock which is equivalent to one to two inches in dia.

71- There is a step up onto asphalt, leading to an open area with no canopy coverage. There is a bench at 10 o'clock. Orient yourself so we are now facing east. Downed branches along the path of alignment may impact the clarity of the path but still stay to the right as it is the safest path.

72- You have reached an intersection. The left trail goes to Sehome Neighborhood while your immediate right goes to the lookout.

73-Start towards ten o'clock until we feel the path of alignment on the left side, where asphalt meets dirt and vegetation. There is a fork that leads to the lookout on our right side.

74- The path itself is uniform in nature with some roots. To distinguish the tripping hazards, there are uneven surfaces prior to the roots.

75-The Huntoon Trail consists of Western sword ferns on each side. The path itself is uniform in nature with some roots. To distinguish the tripping hazards, there are uneven surfaces prior to the roots.

76, 77, 78, 79- The Huntoon Trail is uniform, but the left side slopes down significantly.

80, 81, 82- The Huntoon Trail is uniform, but the left side slopes down significantly.

83- You are now facing southwest with north behind us. The Huntoon Trail has curved, forcing you to face a different direction.

84- When facing five o'clock, this path will lead you to a lookout of Bellingham Bay. You entered a large open area with a bench at two o'clock. The path of alignment comes to an end, but you can start towards eleven o'clock. Be aware of finding the path of alignment on the left

side. This is going to be where the compacted asphalt path meets the soft dirt and vegetation on your left.

85- Stay aligned to the left side of the path where the path meets the soft dirt on the side. Once you start to feel the path beginning to curve, start towards three o'clock. Orient yourself so that you are headed southbound on the Huntoon Trail.

86- At nine o'clock lies the Sehome Arboretum tunnel and we are going to stay to the left throughout this open area.

87 & 88- Both sides of this section of the Huntoon Trail are dominated by Western sword ferns. This section also has signs of rockfalls on the left side, so use extreme caution during the rainy season. The right side of the trail drops off into a steep valley which ends at the east side of the Western Washington University's campus.

89 & 90- Both sides of this section of the Huntoon Trail are dominated by Western sword ferns. This section also has signs of rockfalls on the left side, so use extreme caution during the rainy season. The right side of the trail drops off into a steep valley which ends at the east side of the Western Washington University's campus. A black chain link fence that is roughly waist high is on the right side of the trail. The fence starts at the beginning of the segment and is 10 feet long.

91- You are now entering the parking lot at the top of the Sehome Arboretum. There are two round boulders on each side of trail along with a waist level metal pole in the center, indicating you have now exited the Huntoon Trail.



# Appendix B - Data Catalog

Table 1. Data Catalog.

Description	Source and Owner	Coordinate System	Units	Extent	Type
Western Washington University Basemap	Western Washington University (2022)	WGS 1984 Web Mercator (auxiliary sphere)	Meters	Western Washington University Campus	Vector Tile
	WWU_Map				
Arboretum Outline	Western Washington University (2023)	WGS 1984 Web Mercator (auxiliary sphere)	Meters	Sehome Arboretum	Vector Polygon
	WWU_Map				
Arboretum Trails	City of Bellingham (2019)	NAD 1983 Stateplane Washington North FIPS 4601 (US Feet)	Feet	Sehome Arboretum	Vector Line
LIDAR – Bellingham 2013 DTM and Point Cloud	Washington DNR (2013)	NAD 1983 HARN StatePlane Washington South FIPS 4602 (US Feet)	Feet	122.4997795°W 48.749810°N to 122.3763952°W 48.6887444°N	Raster
				(From downtown Bellingham to Larabee State Park)	
Sehome Hill Trails with Average Grade	Western Washington University (2023)	WGS 1984 Web Mercator (auxiliary sphere)	Meters	Sehome Arboretum	Vector Line
	Reckase_wwu				
Arboretum Parking Lots, Stair Access Points, and Benches	City of Bellingham (2019)	NAD 1983 Stateplane Washington North FIPS 4601 (US Feet)	Feet	Sehome Arboretum	Vector Point

**Western Washington University Basemap** – Simple basemap of Western Washington University. No attribute table and no pre-processing necessary since this layer is being used exclusively for cartographic purposes.

**Arboretum Outline** – Outline of the Sehome Hill Arboretum. Used exclusively for cartographic purposes, no pre-processing is necessary. The attribute table contains the park's name (Sehome Arboretum), the hours it is open for, and a link to the City of Bellingham webpage.

**Arboretum Trails** – Trails within the Sehome Hill Arboretum, accessed from the Parks geodatabase provided by the City of Bellingham GIS data center. Used exclusively for cartographic purposes, no pre-processing is necessary. The attribute table contains the trail name, location, trail system name, surface type, who maintains the trail, and if the trail is public.

**Bellingham 2013 LIDAR** – Raster digital elevation model containing elevation values in feet. This dataset was generated in 2013. It has an average resolution of 8 pulses per square meter. Both the digital terrain model and point cloud datasets from this LIDAR survey were used to estimate slope along the Huntoon Trail, primarily with the goal of validating field measurements. Due to the highly forested nature of the Huntoon Trail, it is uncertain whether LIDAR can produce readings on such specific points to the degree of accuracy required for this project. However, this dataset could provide a useful way to double-check data collected in field work.

**Sehome Hill Trails With Average Grade** – Dataset containing trails with the Sehome Hill Arboretum. The attribute table contains the name of the trail, surface type, width (feet), and auto-generated “Shape\_Length” and “Shape\_Area” fields. The only field important for the purposes of this study is the “Name” field. The Huntoon Trail will be selected for, and all other trails ignored. We will use the divide tool in ArcGIS Pro to create 91 ~ 20-meter segments for which data points will be associated with during field data collection using the divide tool in ArcGIS Pro.

**Arboretum parking lot, stair access points, and benches** – Dataset containing point features for parking lots, stair access points into the arboretum, and benches in the arboretum. All records were accessed from the park facilities feature classes that are contained in the City of Bellingham Parks geodatabase.