

## Chuckanut Community Forest Trail Network Design Project

An integral part of Whatcom communities activism for conservatism, the protection of Chuckanut community forest may have been a big win at its time but has since degraded with minimal regulations concerning the anthropological impacts on the wetlands of the park. However, a satisfactory trail network will not be implemented until 2022 when a master plan for the park is agreed upon by the Bellingham parks department. Once conceived and implemented, this trail design network will hopefully regulate the desecration to the ecosystem from unmitigated recreational use. It is important, however, to take into account all the values this park provides when designing a trail network, both for ecosystem protection and allowing ample recreational use and aesthetic appreciation. The ideal trail network would link trails to all important access points to the park, minimize the trails environmental footprint, minimize impact to wetlands and wetland buffers, as well as maintaining a trail network that provides ample access to the diverse Chuckanut community forest regions.

As such, the criteria we will use in this project to evaluate any of single trail design will be decided by the sum of the percentages estimated through;

- (1) Percent (%) of the six major access points not included in trail design as marked and labeled in figure 1. (smaller is better).

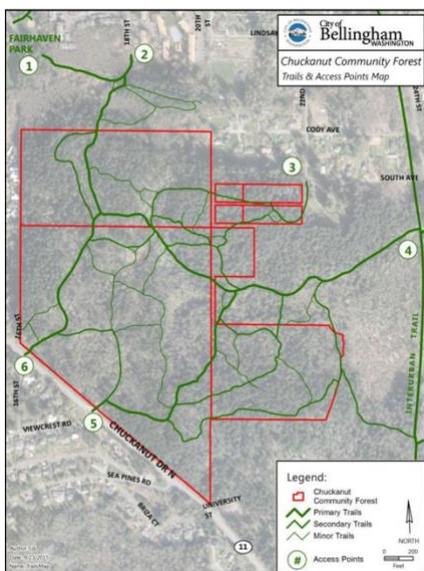


Figure 1. Current map of trail systems in and around Chuckanut Community Park, with major access points labeled 1-6. For the purposes of this design, access points 1 and 2 will be combined into a single main access point (1,2), as they converge before entry to Chuckanut community forest.

- (2) Total trail footprint (sum of trail length x trail width; less is better); expressed as % of current value (8853 m<sup>2</sup> ).
- (3) Trail length crossing wetlands without mitigation (boardwalks, etc.; less is better); expressed as % of current value (188 m).
- (4) Trail length within wetland buffers (less is better); expressed as % of current value (3384 m).
- (5) Total boardwalk length (a proxy for cost; less is better); expressed as % of current trail length crossing wetlands (188 m).

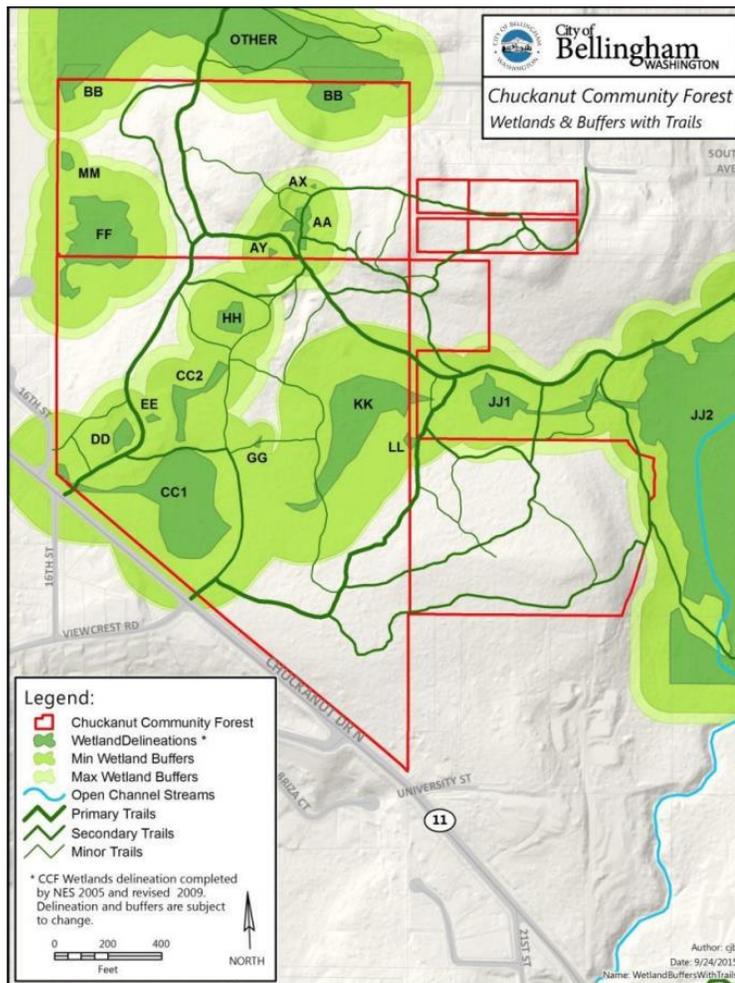


Figure 2. Current Trail networking map overlapped with wetland and wetland buffer delegations used as primary base for trails to remove and relocate throughout designs.

## Alternative Design Approaches

### 1.

One approach when considering the current trail system would be to prioritize the minimized intrusion to wetlands and wetland buffers while still connecting to all access points. Removing all paths through wetland buffers except when absolutely necessary to connect trails to exits and other main trails, and then convert trails crossing any wetland areas to boardwalks.

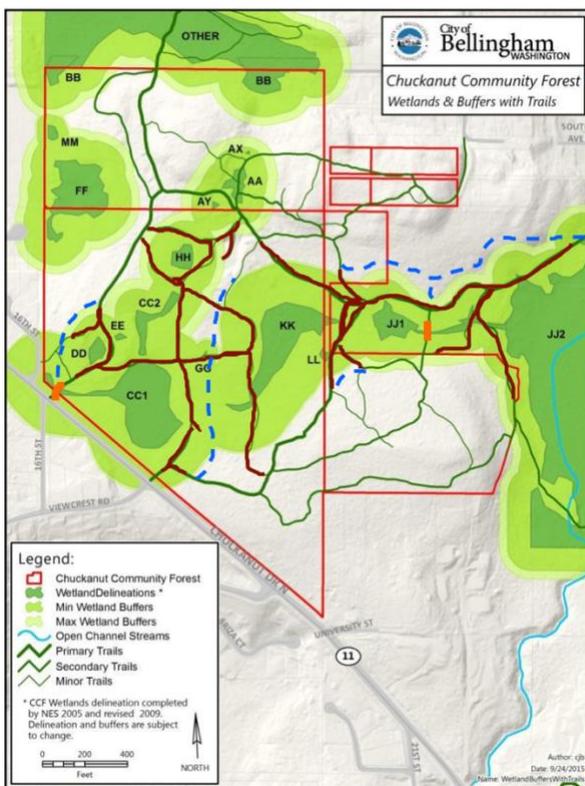


Figure 3. Alternative 1 trail design overlaid with previous existing trails of Chuckanut Community Forest, as well as wetlands and designated wetlands buffers. With red lines indicating which trails require removal, dotted blue lines indicating new trail additions, and orange indicating boardwalks.

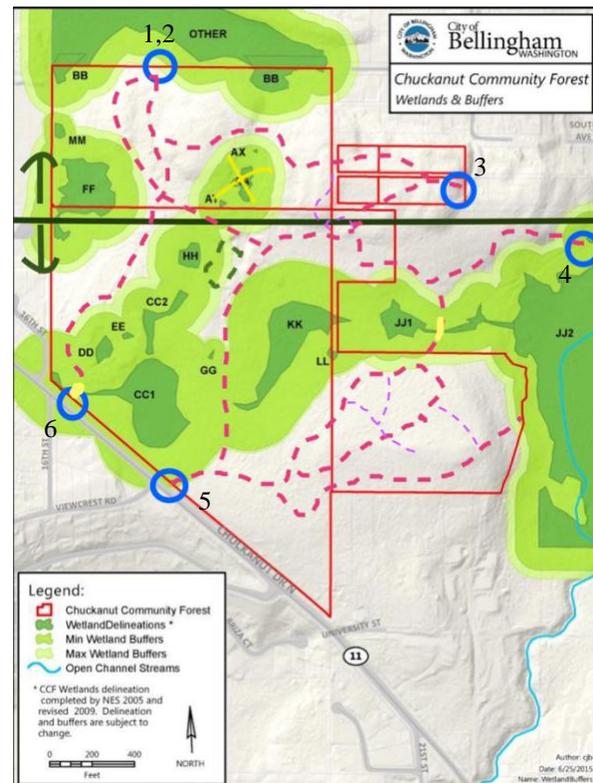


Figure 4. Alternative 1 trail design including remaining access points into Chuckanut Community Forest and interactions with wetlands and designated wetland buffers. With large red lines indicating major trails, smaller pink lines indicating minor trail systems, and blue circles marking entrances to the park.

As shown in Figure 3, many of the current trails passing damagingly through wetlands and much too deep into the buffers would need to be removed, as marked by the red lines overlaying the existing trail network. The trails outside of susceptible areas, however, could remain mostly untouched with slight adjustments. Entrance 6, as shown circled in blue in Figure 4, into the park would need to be rerouted as soon as possible to restrict access to wetland DD and surrounding buffers it ultimately continues to cut into (see the blue dotted line on figure 3). As well as a large new trail crossing buffers between wetlands GG and KK to allow access from entrance 5 to the Northern section of the park in addition to its connection to the southern trail systems. The trail system crossing JJ1 and JJ2 would be allowed to persist to retail a wider net of access throughout the park but as stated in the approach, a boardwalk would be necessary to protect the wetlands from traffic. Another boardwalk should similarly be put in place right after entrance 6 to protect the wetlands of CC1. Trails that have previously been added since the original map design by hikers would not need to be removed and rehabilitated to forest unless they passed through buffer regain, in which case they would need to be reforested to mitigate additional use.

In the center of all this, marked in dark green segmented square on figure 4, there exist a quarry located by wetlands HH that I believe should be repurposed to replace AA as a wetland and protected area, this would increase cost but ultimately allow for less impact to wetlands as they would be more accessible to each other. Wetland AA, due to the current trail cutting through its center, has suffered severe anthropological damage. With this in mind, for my evaluation, I excluded wetland AA and instead considered a protected area around the quarry the equivalent of a wetland buffer.

This Design would maintain access to all main exit points on the original map, earning it a 0% on its first evaluation. Additionally, all trail lengths were estimated in feet by the scale provided on the original map, converted to meters and then multiplied by either 1 meter or 2 meters to account for width on major and minor trails to get trail footprint, which concluded to be only 69.6% of the original trail footprint( 6159.5m<sup>2</sup>) . With the Exclusion of AA and the inclusion of the quarry as wetland protected zone, 0% of wetlands were crossed unmitigated, compared to the current amount. Due to the necessary connections between main trails on North

and South sides of the forest, some trails within buffer regions were necessary, yet still only a 12.2% of the original inclusions (411.8m). As for boardwalks, the two necessary to minimize the impact of the trails crossing them would still add up to only 16.2% compared to current trail systems impacting the wetlands(30.5m)

Summing these presents would evaluate alternative design #1 with a score as low as 98%.

2.

An alternative approach would be to section the park between wetlands and their buffers and create distinct paths only in safe areas with access to exits, less interconnection of paths necessary. This way would treat wetland buffers treated as un-crossable barriers and edges of buffered regions should be marked with informative signs of their ecological importance to the area to dissuade new trail creations.

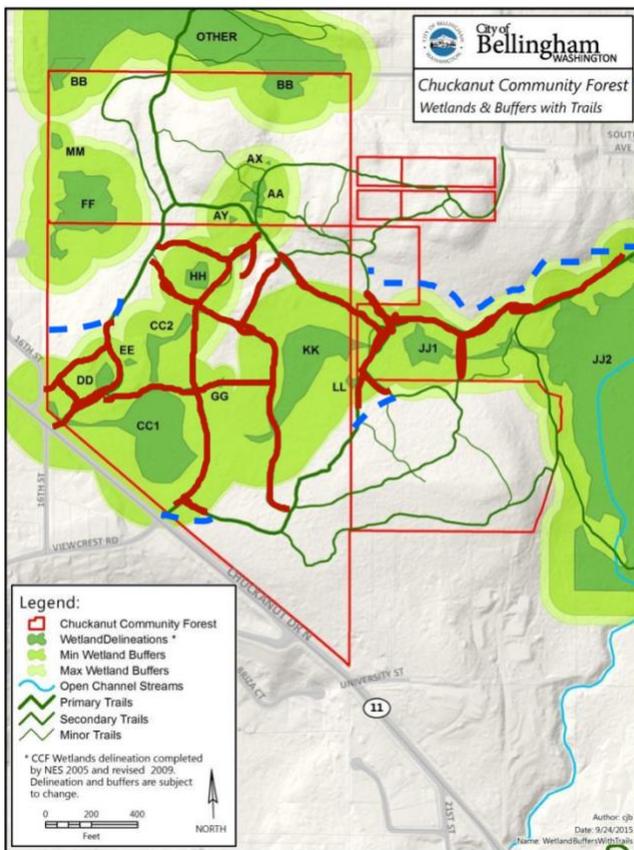


Figure 5. Alternative 2 trail design overlaid with previous existing trails of Chuckanut Community Forest, as well as wetlands and designated wetlands buffers. With red lines indicating which trails require removal, dotted blue lines indicating new trail additions, and orange indicating boardwalks.

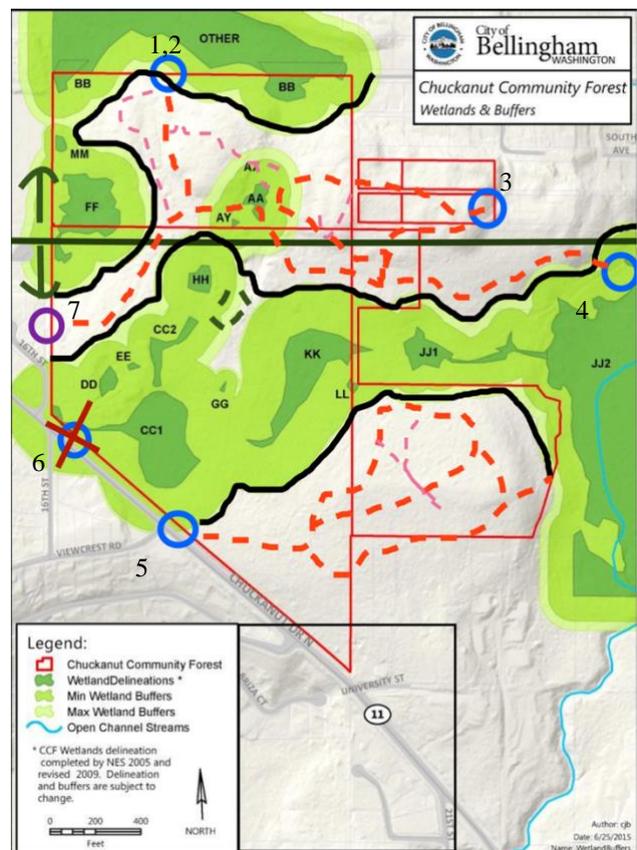


Figure 6. Alternative 2 trail design including remaining access points into Chuckanut Community Forest and interactions with wetlands and designated wetland buffers. With large red lines indicating major trails, smaller pink lines indicating minor trail systems, and blue circles marking entrances to the park.

The outline of buffers that would be labeled inaccessible is marked distinctly by black lines on figure 6. This approach prioritizes complete isolation for wetlands and wetland buffers alike with as much human exclusion as possible. It does deny access to main entrance 6, as that entrance goes right over a wetland, but a proposed alternative entrance, entrance 7, is marked with a purple circle on figure 6. Both entrance 1,2 and entrance 4 originate on buffer areas but have been allowed to maintain inclusion in this design as they boarder right on the edge of buffer regions as well as being located out of park boundaries. As such, alternative 2 still manages to score only a 16.7% on the number of entrances excluded. Using the same method previously outlined, the decrease in trail networking lowers the overall trail footprint to only 63.9% of the original( 5654m<sup>2</sup>). Wetland AA is allowed outside of the protected area due to the isolation from other wetlands and its excessive exposure to foot traffic makes it an appropriate sacrifice in order to not block off so much of the park it is non-functional. this results in a wetland access of 40.4% and 10.8% access to buffered areas around AA and due to the main entrance locations just inside the buffer regions. Due to the restricted access to wetlands and buffers as outlined, there would not be any necessary boardwalk additions, allowing it to score 0% on cost. This evaluation results in alternative 2 scoring 131.8%.

3.

My final alternative approach takes more of the recreational purposes of the park in mind, sectioning the Park for different specializations. Allowing quarry and accessing trails to be converted for biking and such activity purposes, with wetlands buffer borders marked with informative signs. Other sections would prioritize recreational viewing, with boardwalk access into select wetland and wetland barriers for exposure with minimal damage and allow an intricate trail system to expand over the non-buffered area for individual hiking and exploration

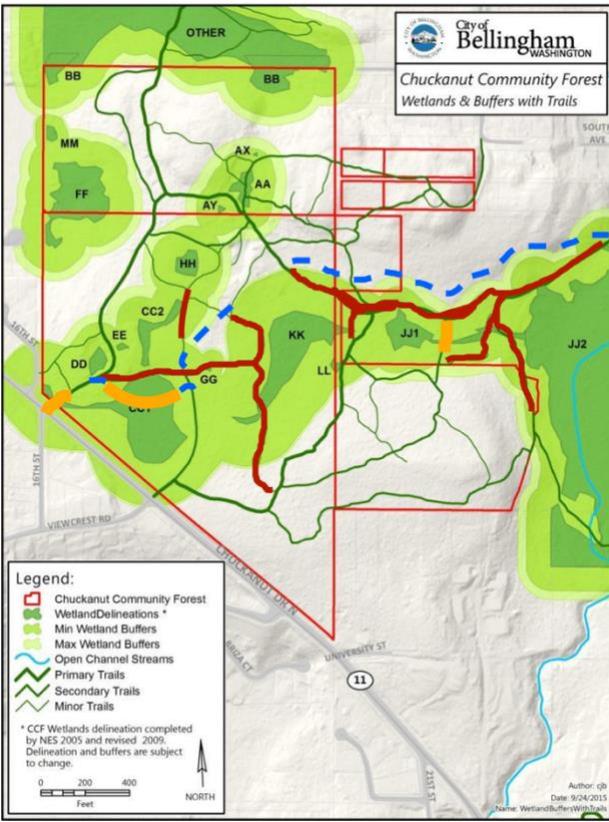


Figure 7. Alternative 3 trail design overlaid with previous existing trails of Chuckanut Community Forest, as well as wetlands and designated wetlands buffers. With red lines indicating which trails require removal, dotted blue lines indicating new trail additions, and orange indicating boardwalks.

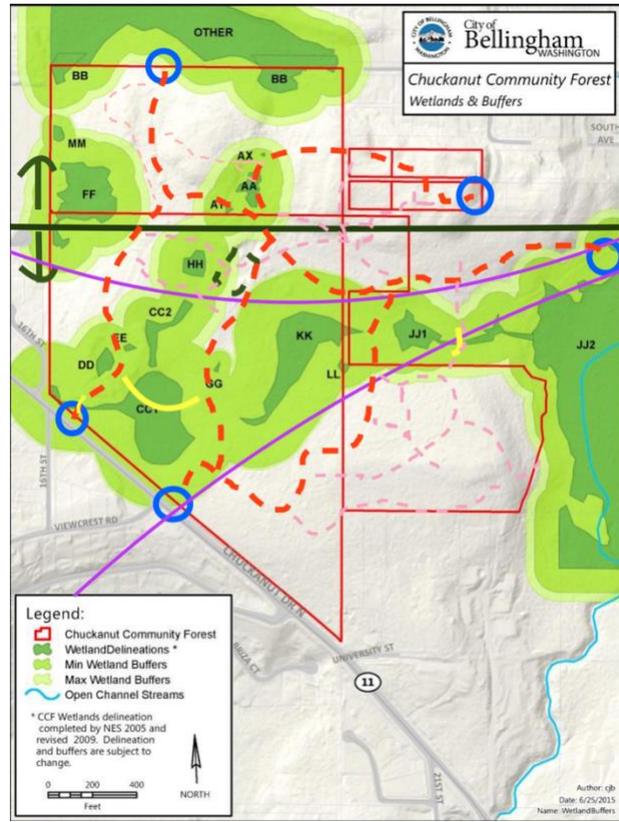


Figure 8. Alternative 3 trail design including remaining access points into Chuckanut Community Forest and interactions with wetlands and designated wetland buffers. With large red lines indicating major trails, smaller pink lines indicating minor trail systems, and blue circles marking entrances to the park.

As shown in figure 8 by the two purple lines, this approach of designing a trail system allows for excessive recreational use while hopefully creating a more environmentally conscious area closer to the wetlands. This would be accomplished through encouraging biking to remain in the northern section of the park, even going as far and converting the quarry into a cleared out area with bike jumps but it would be instrumental that all trails leading into the buffer zones be marked with informative signs on the damages that can be done to the surrounding wetland ecosystems. A similar process would be done on the southern section of the map marked in figure 8, especially with entrance to the buffer regions in the middle. This approach would be most successful with an educational twist, with excessive signs informing the public of certain ecological functions and features and how they help our community. Included in this design

would be a large boardwalk cutting through wetland CC1, allowing visitors to experience a wide range of unique regions while causing minimal damage.

This approach retains all 6 of the entrance points, so it gets to keep a )% on main entrance exclusions. Unlike the other two approaches, much of the trail system remains intact, or simply relocated, meaning at there is 94.4% of the original footprint remaining (8365m<sup>2</sup>). This approach also does not permit the designation of the quarry as wetland AA so there are still some unmitigated paths through those areas, though still only 40.0% of original trail system. The allowed access through buffer regions of many wetlands, though attempting to stay clear of innermost proximity to them when manageable, results in 42.7% from the original trails still crossing wetland buffer areas. Lastly, due to the necessity for a variety of wilderness, access through wetlands results in the creation of excess boardwalks, with 72.8 as much length of the boardwalk as there currently in trails crossing wetlands. Totaling alternative 4 at 250%, significantly higher, but more diverse, than alternatives 1 and 2.

## Final Design

In considering the evaluations of my three designs, the one that receives the lowest percentile score would be design alternative 1, and I believe it addressed many of the criteria addressed for a perfect trail system. It allows access to the majority of the parks important locations, including many of its diverse regions with minimizing impact to wetlands, buffers, and the overall trail footprint. The relocation of wetland AA to the quarry allows for the wetland protected areas to be in close proximity to each other. I believe one of the most important steps for maintaining the wetland environments that are being damaged by bikers and hikers, particularly when making their own trails, is for there to be informative signs of the consequences of those actions, as well as to inform the public of the ecological significance of those areas.

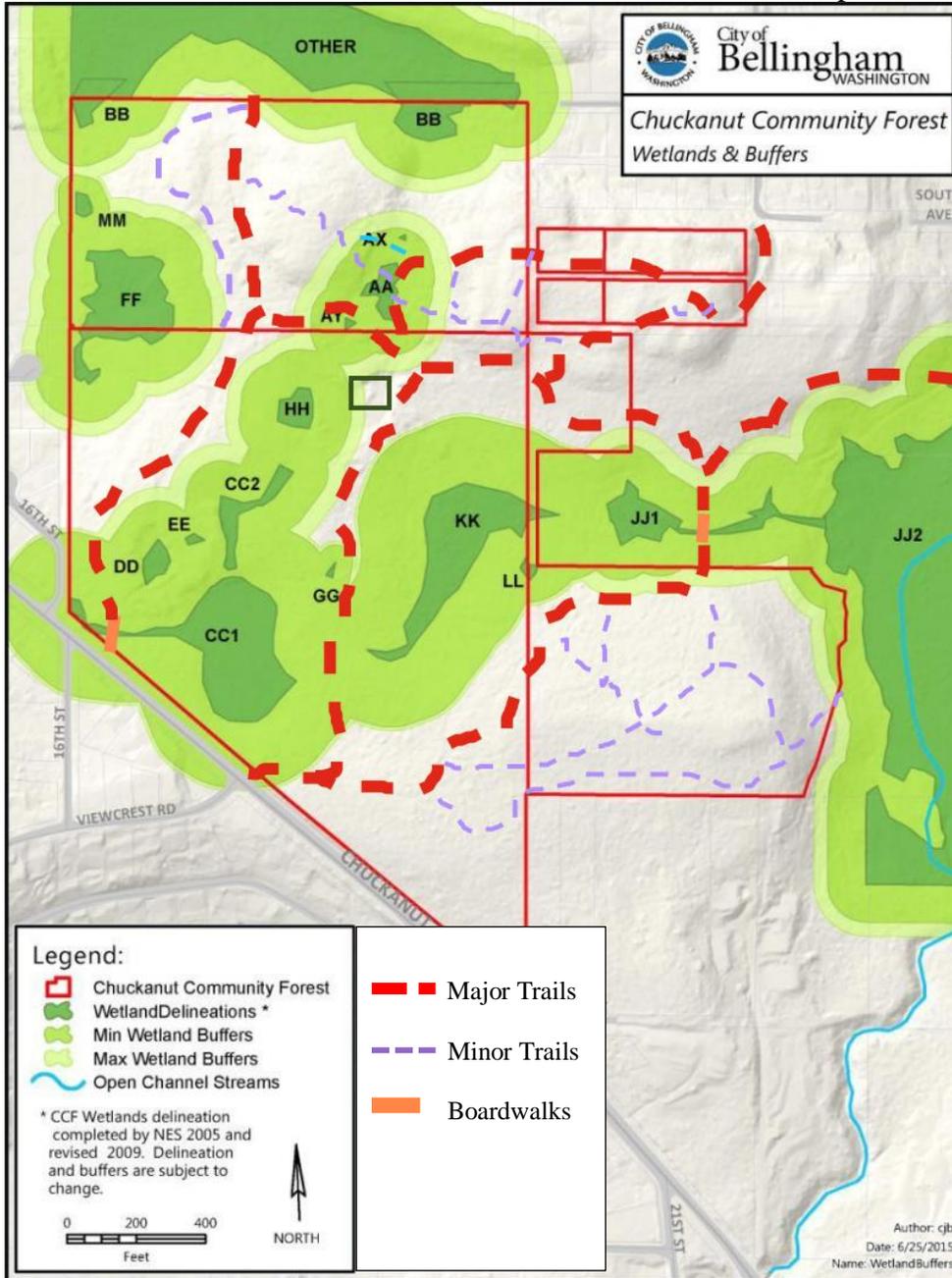


Figure 9. Final design map of trail system overlapped with wetland and wetland buffer regains.