Mapping Significant Natural Resources in Washington County, Oregon

Urban Greenspaces Institute

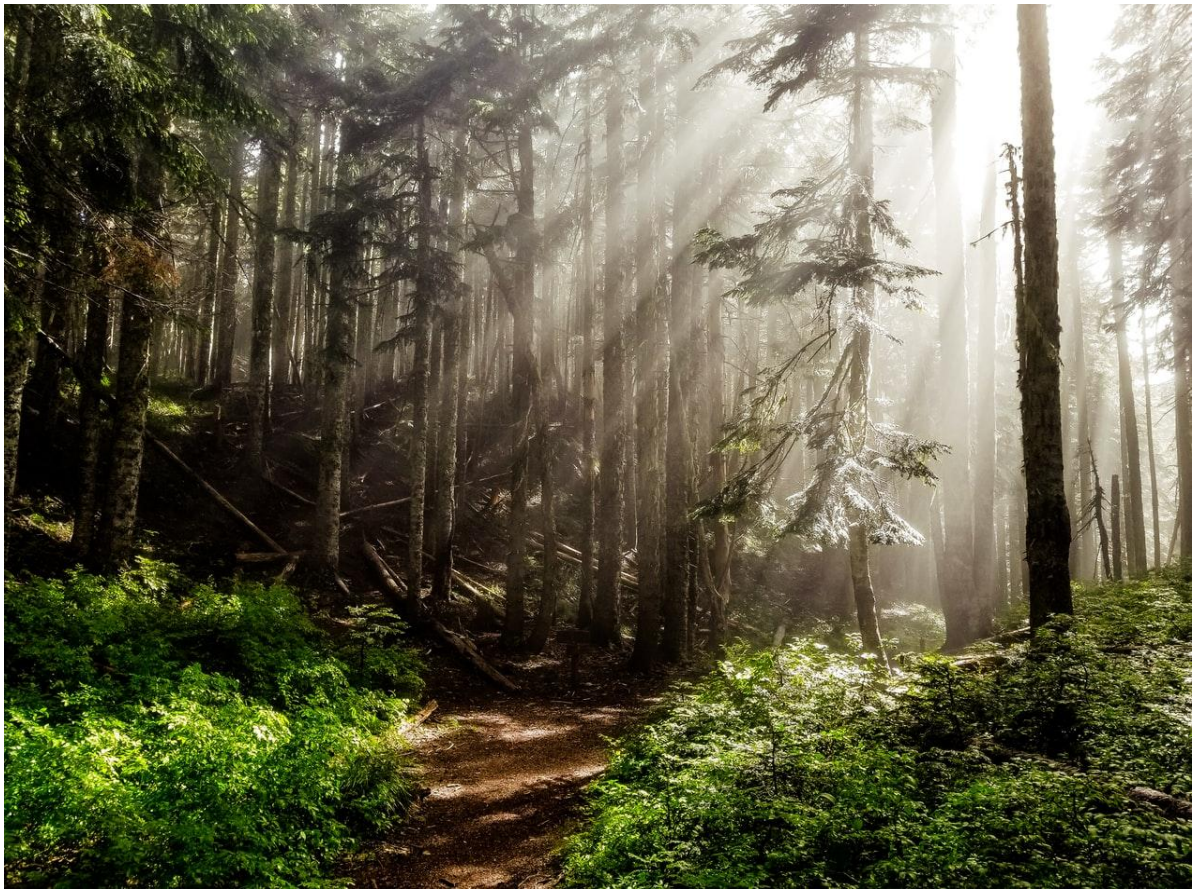

Photo by Dale Nibb via www.unsplash.com

Cameron Lynn Backus

GIS and Geospatial Technologies Intern, Portland Community College

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Edited by Theresa Huang and Ted Labbe

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INTRODUCTION

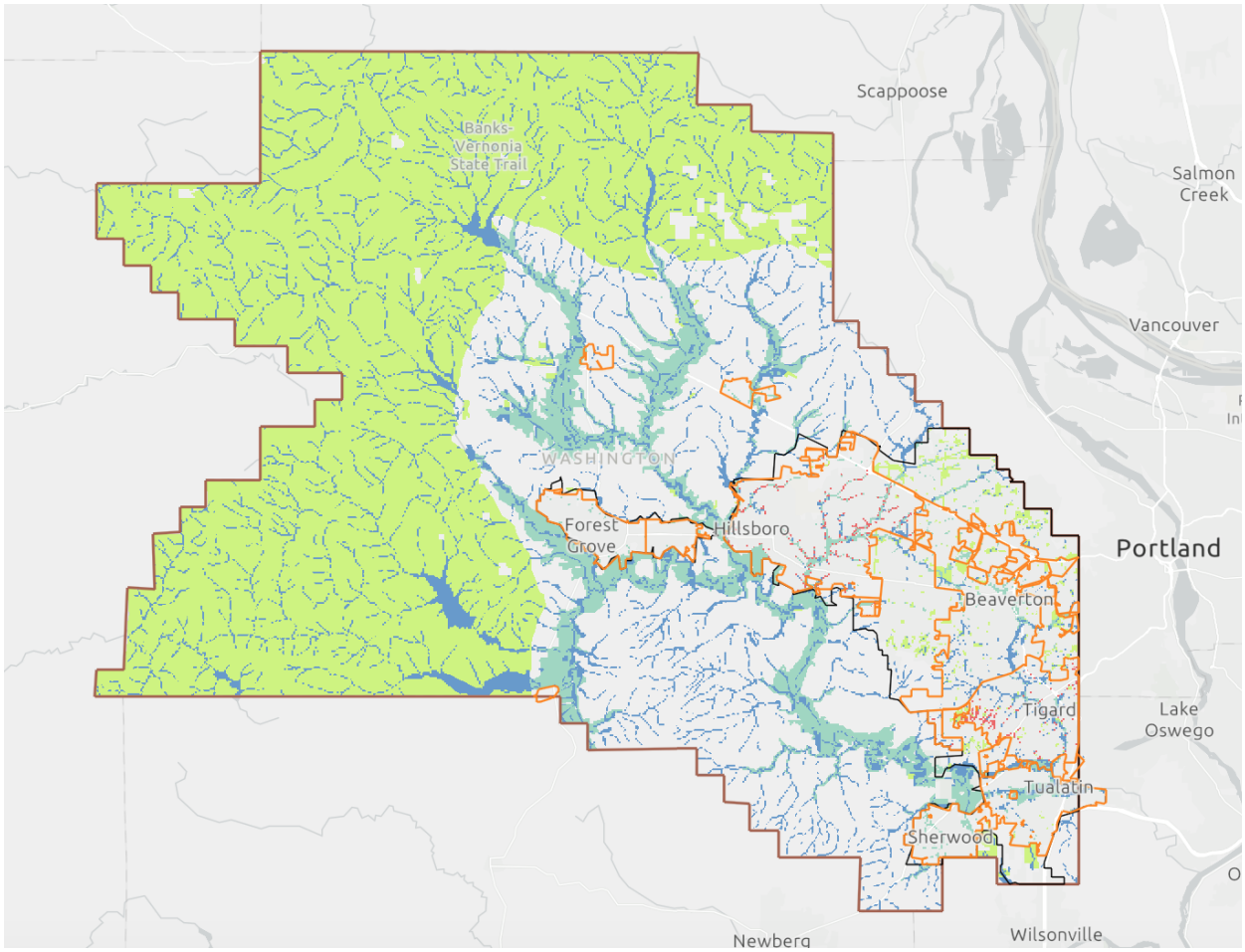
Portland metropolitan cities and counties maintain local programs for the protection of natural resources, including streams, wetlands, floodplains, and - in some cases - upland wildlife habitat. Local Significant Natural Resources (SNR) programs are a requirement under Oregon Statewide land use Goal 5. Although some cities have online map applications and details about their local SNR programs, nowhere is this information compiled and accessible so that residents of the region can interact with and compare SNR maps across jurisdictional boundaries.

With the support of various partners, the Urban Greenspaces Institute is undertaking an effort to collect and integrate local SNR map layers to better describe the levels and patterns of natural resources protection across the region. The maps of Significant Natural Resources (SNRs) are represented as points, lines or polygons depicting sites, networks, or natural areas identified as having a level of quality or sensitivity that requires specific protections and development restrictions to reduce the impact of human development and other activity.

The goal of this initiative is to develop a platform to share information on local SNR programs, to improve public transparency and access to information on local natural resources protection programs. Ultimately, we aim to develop a map so that residents of the whole region can compare and contrast SNR protections. In this first phase, we sought to compile SNR program data for the largest Washington County jurisdictions. The resulting map was created as a part of the Urban Greenspaces Institute's new internship program. The map is currently publicly available on ArcGIS Online at the link below:

https://urbangreenspaces.maps.arcgis.com/apps/webappviewer/index.html?id=4d28ea9d02524aed89652fcf4b6e24ef

Figure 0.1 Preview of the Washington County SNR Map



BACKGROUND

Washington County is among the fastest growing communities in Oregon. Commercial and residential development, as well as the expansion of roads and other infrastructure networks are diminishing and fragmenting natural areas and habitats. These pressures manifest in both urban and rural areas. Balancing housing, commercial and infrastructure development needs, with the protection of natural resources is crucial to the maintaining and improving the quality of life for residents and preserving fish and wildlife. .

The region outlined in this map belongs to the Tualatin Basin, the watershed region of the Tualatin River.[1] Washington County and the majority of its cities began mapping and

[1] Tualatin River Watershed Council. (2019) *Tualatin Basin Information.* Retrieved from

inventorying their own SNRs beginning in the 1980s, with most refinements continuing into the early 2000s. The region owes much of its recent success in this department to the Tualatin Basin Plan, a coordinated effort by Clean Water Services, Metro, Tualatin Hills Parks and Recreation District, Washington County, and the cities of Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, Sherwood, Tigard, and Tualatin to reach Goal 5 compliance.

Goal 5 is one of nineteen Oregon State land use goals, overseen by the Oregon Department of Land Conservation and Development, in order to preserve natural resources, open spaces, and scenic or historical places.[2] The Tualatin Basin Plan's strategy includes inventorying SNRs, examining the effects of potential development, and encouraging the implementation of low-impact/habitat-friendly development techniques. In the early 2000s, the majority of participating cities amended their development code to both allow and incentivize these techniques.[3]

Other efforts to meet the requirements of Goal 5 include Metro's Nature in Neighborhoods program, which encourages cities to adopt Metro's Title 13 model ordinance and adjust it to local needs.[4] Title 13 of the Urban Growth Management Functional plan provides recommended protections for wildlife habitat, and includes an inventory and map of proposed conservation areas located within the Portland Metro area.[5]

Although the currently available spatial data may be outdated, mapping this region is important to raising awareness of the conservation issues that Washington County faces.

http://trwc.org/tualatin-basin-information/

[2] Punton, A. (October 12, 2021) *Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces*. Retrieved from: https://www.oregon.gov/lcd/OP/Pages/Goal-5.aspx

[3] Tualatin Basin Steering Committee and Angelo Planning Group. (January 2007) *Tualatin Basin Goal 5 Program Implementation Report: Encouraging Habitat Friendly Development Practices.* Retrieved from: https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/Publications/loader.cfm?csModule=security/getfile&pageid=592831

[4] Portland Metro. (October 12, 2021) *Fish and wildlife habitat protections.* Retrieved from https://www.oregonmetro.gov/fish-and-wildlife-habitat-protection-plan

[5] Portland Metro. (October 19, 2021) *Title 13 Model Ordinance.* Retrieved from https://www.oregonmetro.gov/sites/default/files/2014/05/10/title_13_model_ordinance.pdf

OBJECTIVES

After reviewing the SNR-related spatial data from the GIS and planning departments of Washington County and its cities, a plan was developed to fill in the gaps in our data and create a map that is easy to understand:

1. Identify gaps and/or discrepancies between spatial data available for this region.
2. Expand the current map with missing and/or new data, while keeping the focus on Washington County and the cities in it.
3. Review the municipal or development codes of the cities and county to learn what each of them does to preserve their respective SNRs.
4. Sort the datasets into broad habitat categories for a more cohesive map.
5. Standardize the attributes of each dataset, to account for the inconsistencies across sources and make the pop-up tables easier for online users to read.
6. Perform appropriate analytics and edits to combine datasets from multiple sources into larger units.
7. Publish the map on ArcGIS online to create a single, connected spatial inventory of various local jurisdiction Goal 5 adopted inventories.

MATERIALS

All edits and spatial analysis were performed in ArcGIS Pro version 2.8.0 under UGI's Esri license. Microsoft Excel was used to prepare and edit attribute tables for joins. Datasets used in the Wash Co SNR map are listed in alphabetical order in Tables 1.1 and 1.2. The final version of the map was uploaded to ArcGIS Online.

Table 1.1 Inventory of SNR Data Used

DATASET(S)	TOPIC	SOURCE	CLEARINGHOUSE OR POINT OF CONTACT
cob_SigGrove_a_09 **cob_SigGrove_b_09** **cob_SigGrove_c_09**	Beaverton's significant tree groves	City of Beaverton	Public Records Request fulfilled by Alissa Forbes
cob_SigNatResource09	Beaverton's combined SNRs	City of Beaverton	Maurice Johns, GIS Specialist
COH_SNRO	Hillsboro's combined SNRs	City of Hillsboro	Amy Clark-Zimmerly and Sara Bruce, GIS Specialists
cws_veg_corridor	Streamside vegetation corridors by Clean Water Services	City of Tigard	Preston Beck, GIS Program Administrator
floodplain100yr	100-year floodplain	City of Tigard	Preston Beck, GIS Program Administrator
goal5_tree_groves	Tigard's Goal 5 Tree Groves	City of Tigard	Preston Beck, GIS Program Administrator
NRPO	Tualatin's combined SNRs	City of Tualatin	Martin Loring, Database & GIS Administrator
slope_25_lidar	Tigard's Slopes of 25% or greater	City of Tigard	Preston Beck, GIS Program Administrator
WETLANDS_BEAV **WETLANDS_CORN** **WETLANDS_FG** **WETLANDS_HILL** **WETLANDS_NP** **WETLANDS_SHER** **WETLANDS_TIG** **WETLANDS_TUAL**	Local Wetland Inventories (LWIs) for Beaverton, Cornelius, Forest Grove, Hillsboro, North Plains, Sherwood, Tigard, and Tualatin respectively.	Department of State Lands	Available at https://www.oregon.gov/dsl/ww/Pages/Inventories.aspx
WPD	Tualatin's Wetlands Protection District	City of Tualatin	Martin Loring, Database & GIS Administrator
WashCo_SigNat_20210331	Washington County's combined SNRs	Washington County	Michelle Miller, Senior Planner

Table 1.2: Inventory of Other Data Used

DATA LAYER(S)	TOPIC	SOURCE	CLEARINGHOUSE OR POINT OF CONTACT
cty_fill	City Limits of Portland Metro Area	Metro RLIS Discovery	Available at http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=123
co_fill	Washington County Boundary	OakQuest	Urban Greenspaces Institute
cws_streams_piped	Line shapefile of streams (open and piped) by Clean Water Services	City of Tigard	Preston Beck, GIS Program Administrator
FWS_Boundaries_Apri 2021	National Wildlife Refuge System	U.S. Fish & Wildlife Service	Available at https://www.fws.gov/gis/data/CadastralDB/links_cadastral.html
LO_Parks	Oregon State Parks	Oregon State Parks and Recreation Department	Oregon Spatial Data Library
orca_sites	Outdoor Recreation and Conservation Areas	Metro RLIS Discovery	Available at http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=3332
reserves	Urban and Rural reserves	Metro RLIS Discovery	Available at http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=2427
title13_inventory	Title 13 Resource Inventory	Metro RLIS Discovery	Available at http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=2087
ugb	Urban Growth Boundary	Metro RLIS Discovery	Available at http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=178

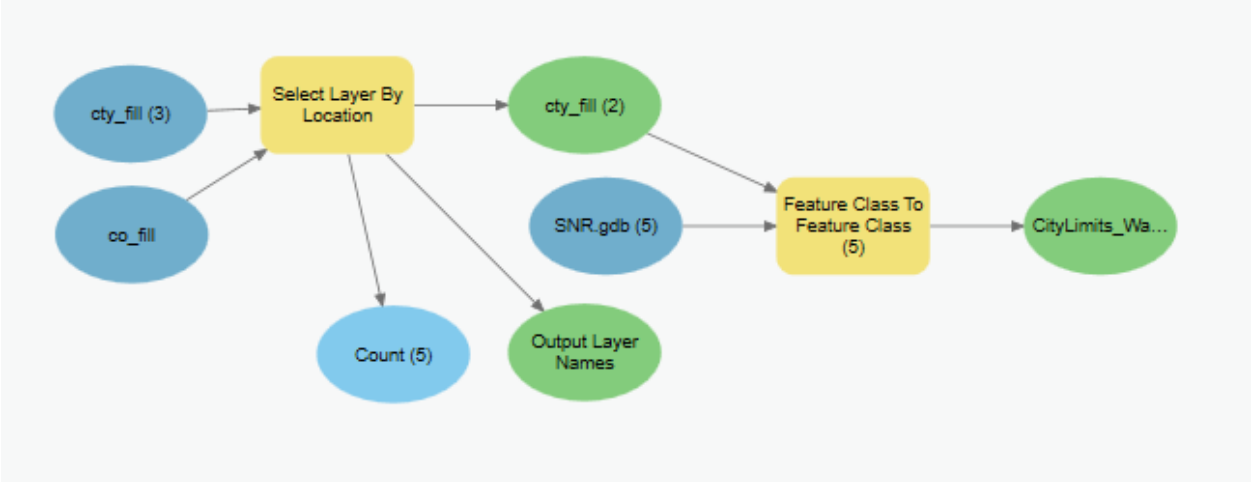
METHODS

This section explains the GIS procedures used to create the Washington County SNR map. It is intended to "show our work" and guide the creation of future maps.

First, three broad categories of habitat were developed to represent the many different types of SNRs provided by our five main sources: *Upland, Wetland, Riparian,* and *Other*. Each dataset was examined to determine which category or categories best fit each of them.

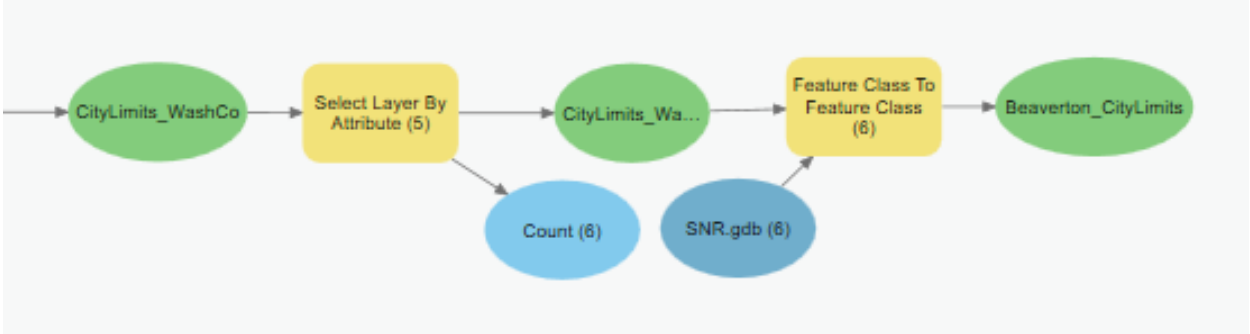
The dataset *cty_fill* included city limits for the entire Portland metro area, so a new version limited to Washington County was created by using the **Select by Location** tool to highlight the cities with their centers inside the *co_fill* dataset, and then using the **Feature Class to Feature Class** tool to export only those city limits into a new dataset, named *CityLimits_WashCo*.

Figure 1.1 Selecting and Exporting City Limits



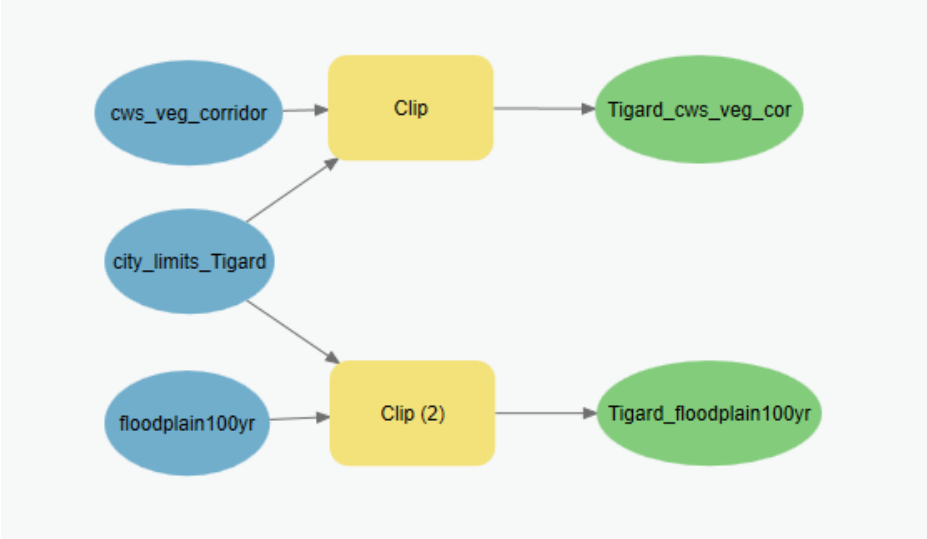
For analytical purposes, the city limits of Beaverton, Hillsboro, Tigard, and Tualatin were then derived from the *CityLimits_WashCo* dataset by using the **Select by Attributes** tool to select them each by name and likewise export each city using **Feature Class to Feature Class.**

Figure 1.2 Selecting and Exporting an Individual City



The **Clip** tool was used to limit each dataset layer to its respective city's limits. The datasets *cws_veg_corrido*r and *floodplain100yr* extended outside of Tigard and into the Beaverton, Hillsboro, and Tualatin. Because of this, the **Clip** tool was used to create four new, city-specific versions of each of these layers, which are also included in tables 2.1 through 2.4. For datasets that did not need to be clipped, the **Feature to Feature** tool was used to create a copy of the dataset in order to avoid editing the original version.

Figure 1.3 Clipping SNRs



All the resulting datasets are sorted by city and SNR habitat type in Tables 2.1, 2.2, 2.3, 2.4 and 2.5.

Table 2.1: Sorting Beaverton's Data

UPLAND	WETLAND	RIPARIAN
Beaverton_SigGroves	WETLANDS_BEAV	cob_SigNatResource09
	Beaverton_floodplain100yr	Beaverton_cws_veg_corridor

Beaverton's *cob_SigNatResource09* layer did not originally have any information in its attribute table to distinguish areas by habitat or SNR type, so they were manually identified as Riparian habitat using a pdf of the *Volume III Habitat Benefit Areas Map*. The **Merge** tool was used to combine the three Significant Grove layers into one layer (*Beaverton_SigGroves* in Table 2.1) to make it easier to use.

Table 2.2 Hillsboro

UPLAND	WETLAND	RIPARIAN	OTHER
COH_SNRO • "Upland" class	WETLANDS_HILL	COH_SNRO • "RipUp" class	COH_SNRO • "Impact" class • "Impact Area" class
	COH_SNRO • "Wetland" class		
	Hillsboro_floodplain100yr		

Table 2.3 Tigard

UPLAND	WETLAND	RIPARIAN	OTHER
goal5_tree_groves	Tigard_floodplain100yr	Tigard_cws_veg_corridor	slope_25_lidar
	WETLANDS_TIG		

Table 2.4 Tualatin

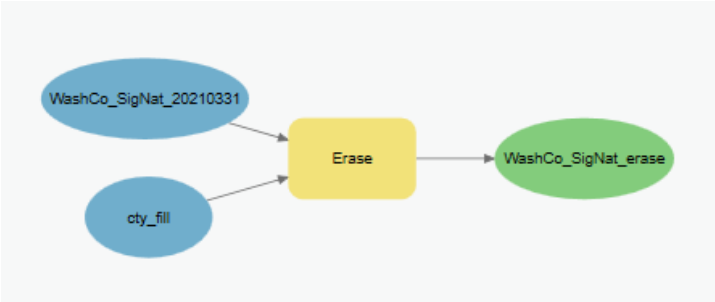
UPLAND	WETLAND	RIPARIAN
NRPO • "Other Greenways" class • "Open Space Natural Areas" class	NRPO • "Wetland Conservation Natural Area" class • "Wetland Preservation Natural Area" class	NRPO • "Creek Greenways" class • "Riverbank Greenways" class
	WETLANDS_TUAL	Tualatin_cws_veg_corridor
	WPD	

Table 2.5 Washington County (unincorporated areas)

UPLAND	WETLAND	RIPARIAN
WashCo_SigNat • "Open Space" class • "Open Space bk" class • "Significant Natural Area" class • "Significant Wildlife Habitat" class • "Upland Wildlife Habitat" class	WashCo_SigNat • "Water Area Wetland" class	WashCo_SigNat • "Safe Harbor" class • "Water Related Fish and Wildlife Habitat" class

The **Erase** tool to remove cities with their own SNR data from WashCo_SigNat, leaving only the unincorporated areas.

Figure 1.4 Erasing Features



Because the SNR features *cob_SigNatResource09* (Beaverton), *COH_SNRO* (Hillsboro), *NRPO* (Tualatin), and *WashCo_SigNat_20210331* (Washington County) all were all single

datasets that included feature classes for multiple habitat types, separate features from their Upland, Wetland, Riparian, and Other areas were create. This was done by using the **Select by Attributes** tool to highlight the appropriate features, then exporting them into new features using the **Feature Class to Feature Class** tool. This selection and export process resulted in the new features listed in Table 2.6.

Figure 1.5 Selecting and Exporting SNRs

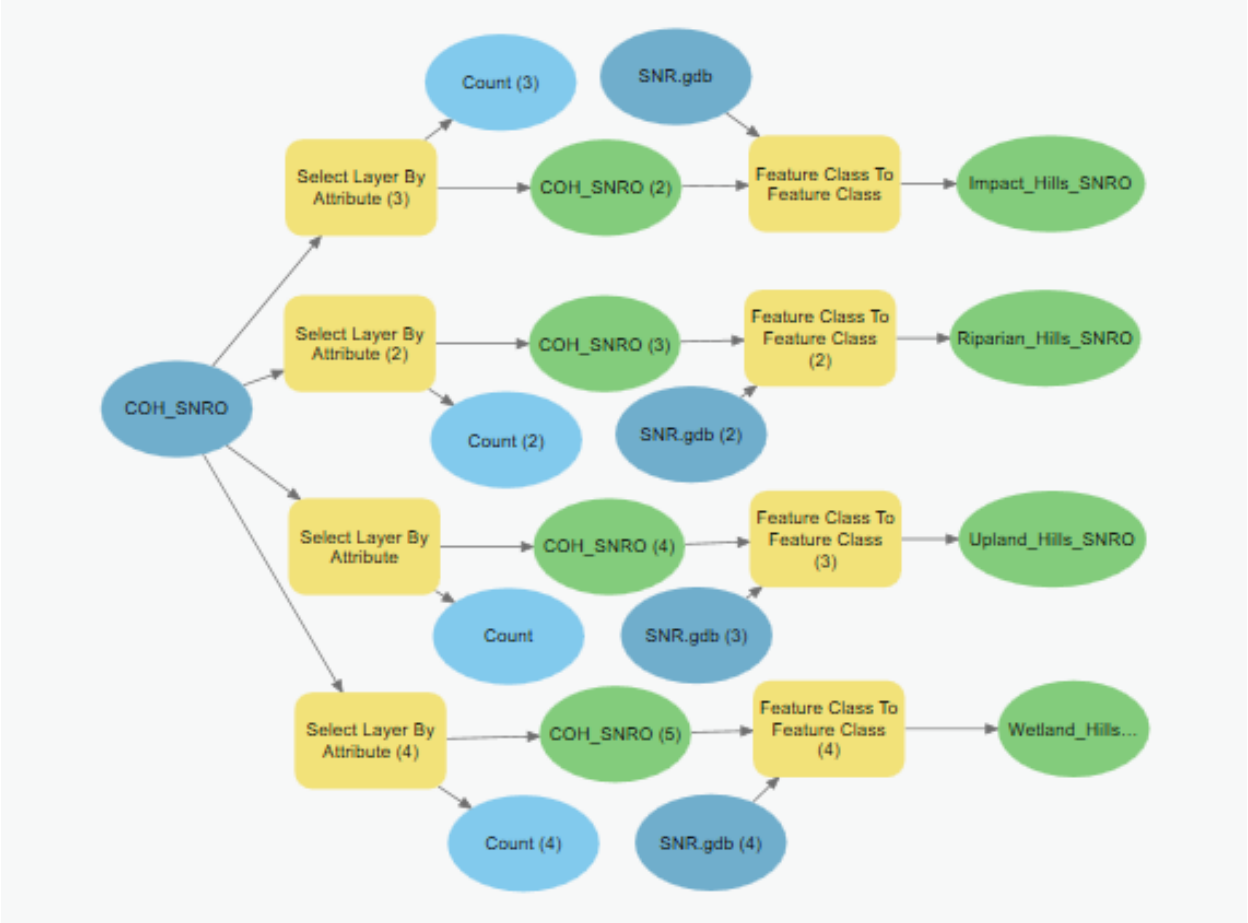


Table 2.6 New Data Layers Derived from SNRs

UPLAND	WETLAND	RIPARIAN	OTHER
Upland_Hills_SNRO	Wetland_Hills_SNRO	Riparian_Beav_CSNR	Impact_Hills_SNRO
Upland_Tual_NRPO	Wetland_Tual_NRPO	Riparian_Hills_SNRO	
Upland_WashCo_SigNat	Wetland_WashCo_SigNat	Riparian_Tual_NRPO	
		Riparian_WashCo_SigNat	

The total, final inventory of Upland, Wetland, Riparian, and Other data layers are listed in table 2.7:

Table 2.7 Final Inventory of SNR Shapefiles

UPLAND	WETLAND	RIPARIAN	OTHER
Upland_Beav_CSNR	Wetland_Hills_SNRO	Riparian_Beav_CSNR	Impact_Hills_SNRO
Upland_Hills_SNRO	Wetland_Tual_NRPO	Riparian_Hills_SNRO	slope_25_lidar
Upland_Tual_NRPO	Wetland_WashCo_SigNat	Riparian_Tualati_NRPO	
Upland_WashCo_SigNat	WETLANDS_BEAV	Riparian_WashCo_SigNat	
Beav_cob_SigGrove	Beaverton_floodplain100yr	Beaverton_cws_veg_corridor	
	WETLANDS_HILL	Tigard_cws_veg_corridor	
	Hillsboro_floodplain100yr	Tualatin_cws_veg_corridor	
	Tigard_floodplain100yr		
	WETLANDS_TIG		
	WETLANDS_TUAL		
	WPD		

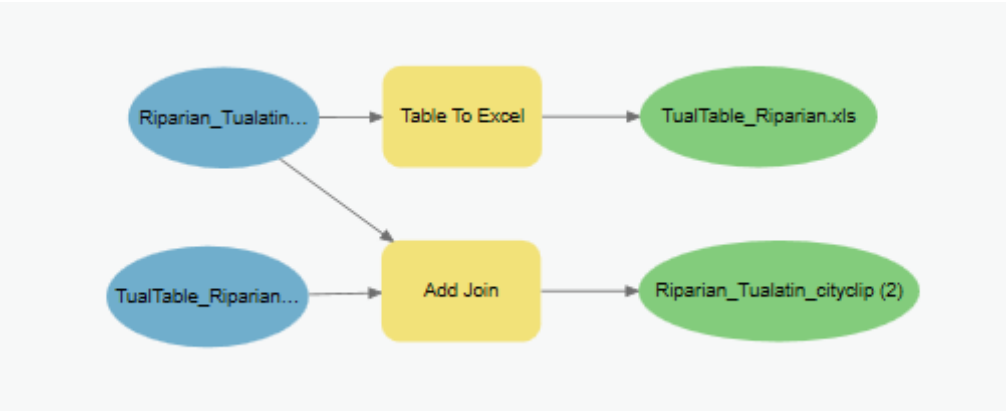
Next, the attributes essential for users of the new map were determined by reading city code and examining the datasets' original attribute tables. Because the datasets were produced by various sources, the attribute tables for each of them were all somewhat different in what information they included, how much information they included, and naming conventions. For the purposes of this map the attribute tables of each layer would need to be standardized. The following categories were created to streamline our final edit of the attributes tables:

- *Jurisdiction*: The city or unincorporated area this resource exists in and is governed by. Beaverton, Hillsboro, Tigard, Tualatin, or Washington County.
- *Habitat*: The broad habitat descriptor decided on. Categories included Upland, Wetland, Riparian, or Other.
- *Designation*: What this SNR is called specifically. (E.g. Creek Greenway, Local Wetland Inventory)
- *Name*: The names of specific SNR lands or sites. (E.g. Cedar Hills/Cedar Mills) Not applicable to all features.
- *Buffer_Width*: The distance buffer the city or county gives this SNR to keep it safe from development. This is either a single number of feet, a range of feet, or unspecified. This information was sourced from the city codes of the local governments included in the map.
- *Municipal_Code*: the chapter of city or county code relevant to a resource, where users of the map can find more information on its specific protections.

The other attributes required by ArcGIS Pro and automatically included in all shapefiles are: OBJECT_ID, Shape, Shape_Length, and Shape_Area.

To apply these attributes to each of the data layers, the **Table to Excel** tool was used to export their attribute tables. In each Microsoft Excel table, all columns except for OBJECT_ID were deleted and replaced with Jurisdiction, Habitat, Designation, Buffer_Width, Municipal_Code, and sometimes Name columns. Then each Excel table was saved as a .csv file and used the **Add Join** tool to attach these tables to my data layers. Unused attribute columns were deleted from the datasets.

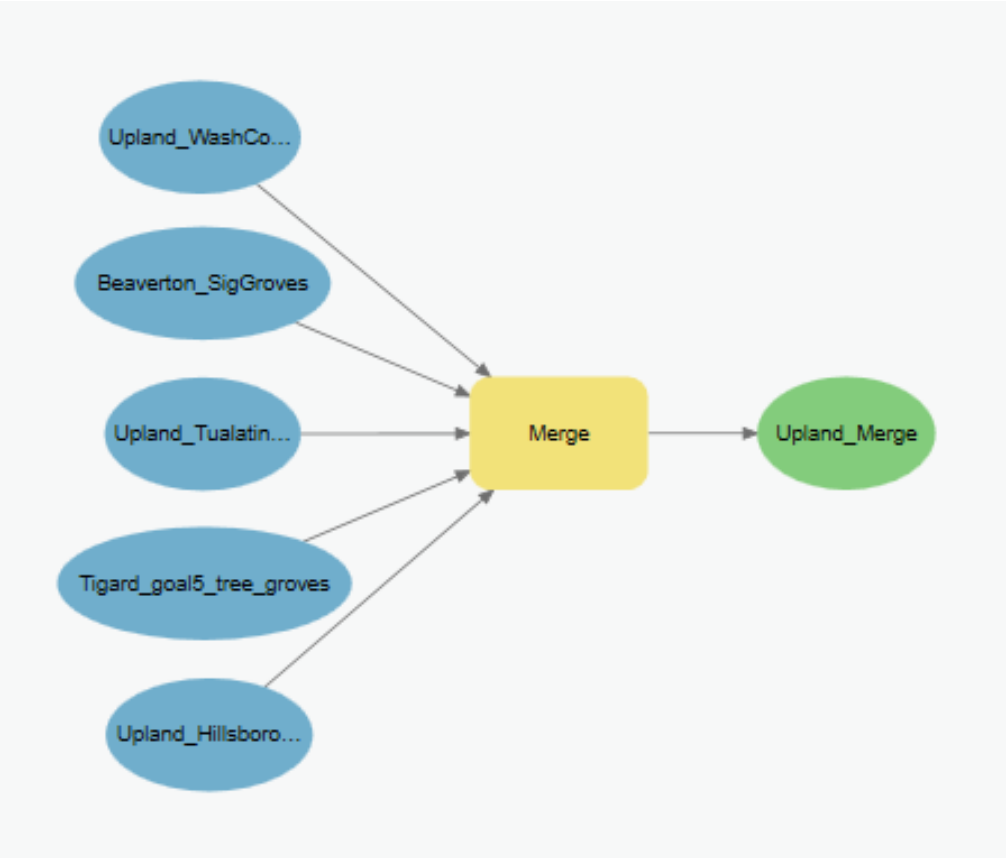
Figure 1.6 Exporting and Joining Tables



Next, the **Merge** tool was used to combine all the Upland layers into one, all the Wetland layers into one, all the Riparian layers into one, and both Other layers into one. After

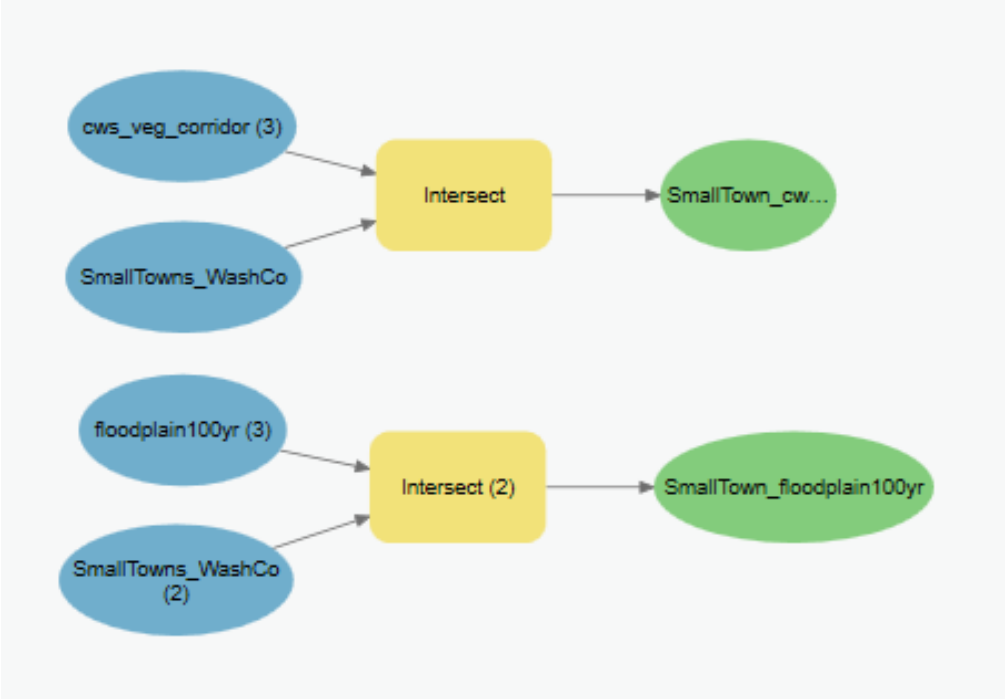
merging, the **symbology** of the merged layers was adjusted to be legible and visually pleasing.

Figure 1.7 Merging SNRs by Habitat Type



It became evident that the smaller towns located in Washington County were not being adequately represented in this map. To alleviate this issue as much as currently possible, Local Wetland Inventories for the cities of Cornelius, Forest Grove, North Plains, and Sherwood were obtained and **clipped** to their respective city limits. Because the *floodplain100yr* and *cws_veg_corridor* features also extended into multiple small towns, the **Intersect** tool was used to isolate areas of these features that fell into the city limits of Cornelius, Durham, Forest Grove, Gaston, King City, North Plains, and Sherwood, Oregon.

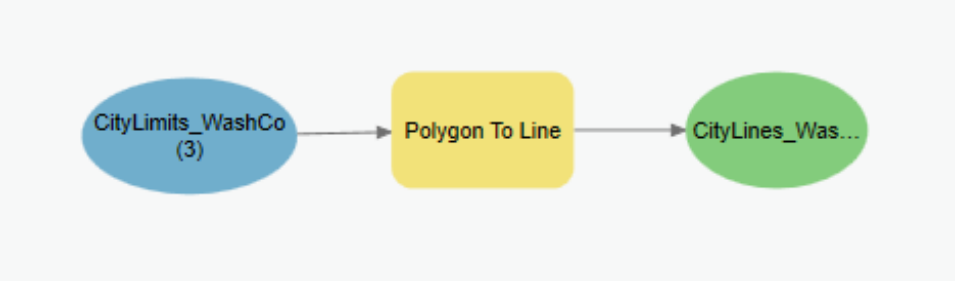
Figure 1.8 Intersect of Small Towns



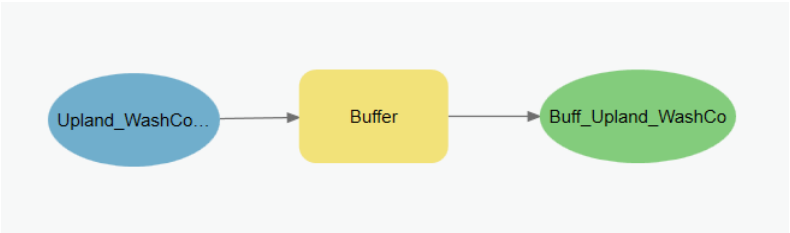
The only small town with no data of its own was Banks, Oregon. To account for Banks, the Washington County SNR (*WashCo_SigNat_20210331*) was **clipped** to its city limits to provide it with some data. After these edits were made, the tables of each new small town feature had to be edited to match those of the existing SNR features. The **Table to Excel** tool was used to export the attribute tables. These were then edited to include the categories of jurisdiction, buffer width, municipal code, designation, and name, and subsequently **joined** to the original features. The newly joined features were **merged** with the existing SNR features, and tables were adjusted once again.

For the final touch-ups on the Washington County SNR map, the data layers for city limits, Oregon State Parks, FWS refuges, Title 13 lands, Clean Water Services Streams, urban growth boundary, rural and urban reserves, and ORCA sites were **clipped** to the boundary of Washington County. The city limits, the urban growth boundary, and the county boundary were converted from polygons into line shapefiles using the **Polygon to Line** tool. The **symbology** of these additional features was also adjusted for legibility.

Figure 1.9 Polygon to Line



In addition to listing existing development buffers within the attribute tables of SNR layers, a data layer showing the minimum development buffer of SNRs was also created. This was done by using the **Buffer** tool to create a border of the minimum specified width around each SNR layer that is afforded a development buffer by the county or its respective city. All the resulting buffer layers were **merged** into a single Minimum Development Buffer layer showing the shortest possible distance that development can occur near SNRs.



The resulting map was uploaded and published to ArcGIS Online, where it was used to create a Web Application for ease of use. Appropriate widgets were added which allow users to zoom in and out, search addresses, add or remove layers, change the underlying base-map and access supplemental information, and more.

RESULTS

https://urbangreenspaces.maps.arcgis.com/apps/webappviewer/index.html?id=4d28ea9d02524aed89652fcf4b6e24ef

In the final web map application, available on ArcGIS Online, users can zoom in and out of Washington County and see the SNRs protected in both cities and unincorporated areas. Clicking on an SNR will provide details on its jurisdiction and protections. Additional layers related to conservation and development planning can be toggled on and off for comparison.

ANALYSIS

No organization has ever tried to create a seamless map of SNR protected areas for all of Washington County before. For many jurisdictions, this information is not readily available to the public. UGI wanted to make this SNR map because there have not been other similar accessible platforms on the internet that allows you to access SNR layers compared to local codes. This application also makes it possible to compare the different levels of protection for urban SNRs across jurisdictional boundaries. We see this as a tool that may potentially serve local planners in the future when making decisions related to the region's natural areas, and potentially become a useful tool for the public. In the interest of transparency and public access to information on protected public resources, this is a significant first step.

A few trends were noticed during the data collection stage of this project. Wetland was the habitat type with the most available spatial data, as wetlands are protected under the National Wetland Protection Act. As required by the state of Oregon, local jurisdictions are required to have Local Wetland Inventories, which allowed us to represent smaller cities on this map. Riparian habitat had the second most available data, also likely thanks to federal and local protections for the health of rivers and streams. Spatial data on upland habitats like forests and open spaces was the most lacking, with smaller towns not having any upland data. In the future, it would be beneficial for regional governments to allocate resources to the surveying of upland habitat. Unlike aquatic habitats, the protection of upland wildlife habitat is not required under the Tualatin Plan and Metro Title 13 guidance. Instead local jurisdictions are encouraged to offer incentives and other non-mandatory programs for the preservation of upland wildlife habitat. As a result, open spaces and woodlands have less spatial data being generated and made available for projects like this map.

Although this map uses the most recent spatial data available for Washington County's SNRs as of November 2021, most of this data is already several years old, and cannot provide an accurate picture of the current state of every area in the region. However, it can be used to observe trends in which areas are developed and which are being preserved throughout the region, particularly when it comes to comparing the cities and county's SNR inventories with Metro's Title 13 inventory. Using ArcGIS's imagery base-maps (updated August - November 2021 as of the time of this report) also allows users to compare these inventories against Esri's most recent aerial photography.

The habitat areas proposed by Title 13 cover only the Portland Metro area, and do not extend across the whole of Washington County. The four largest cities in the county all lie within the Metro boundary. Table 3.1 compares the cumulative number of acres protected by each of these cities with the number of proposed Title 13 acres located within their city limits. At this point in the development of our mapping application we are unable to include enough data to include smaller cities, such as Forest Grove and Cornelius in this spatial analysis.

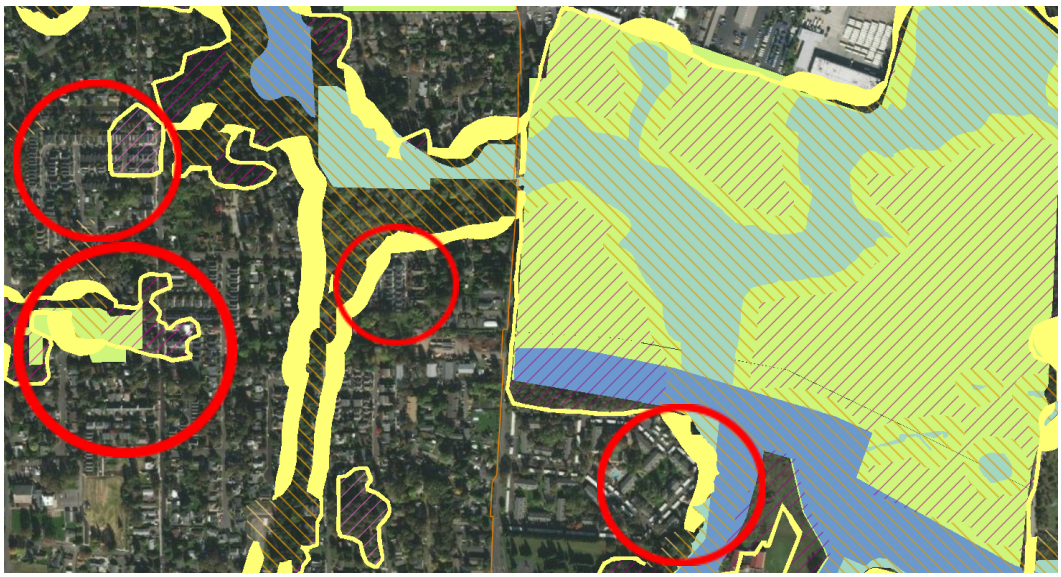
Table 3.1 Acreage by SNR vs Acreage by Proposed Title 13 Areas

City	Other SNRs	Riparian SNRs	Upland SNRs	Wetland SNRs	Total SNR acres (overlap removed)	Title 13 Riparian (Class I, II, and III)	Title 13 Upland (Class A, B, and C)	Title 13 Impact Area	Total Title 13 acres
Beaverton	N/A	673.3	726.7	883.4	1,676.5	1,600.8	808.5	1,037.7	3,474.0
Hillsboro	689.7	354.8	36.7	1441.6	2,421.5	2,295.3	651.3	995.2	3,941.8
Tigard	413.3	814.6	526.9	661.3	1,474.5	1,190.0	473.3	578.3	2,241.6
Tualatin	N/A	535.2	50.9	1046.4	1,176.0	968.6	197.0	305.5	1,471.1

The total proportion of Title 13 acres being protected by these major cities ranges from 48.3% (Beaverton) to 71.1% (Tualatin). The acreage of each resource type varies significantly from city to city, but this can be expected due to variance in the size and geographic locations of each city.

We must remember that Title 13 is not law, but recommendation. The age of available spatial data has already resulted in development of lands included under the Title 13 inventory. As mentioned previously, the age of both the Title 13 spatial data and the SNR spatial data means that there are currently large chunks of properties that are included under Title 13, and undeveloped natural areas with no protection are now being encroached by development across Washington County. For example, ArcGIS's most recent aerial imagery reveals housing and commercial development west of the Tualatin Hills Nature Park, particularly the Merlo Station Apartments, shown in Figure 2.1. Despite development encroachment, Beaverton is making strides in environmentally friendly policy. The city is a proud sponsor and participant of the Columbia Land Trust and the Portland Audubon Society's Backyard Habitat Program. In 2019, Beaverton's City Council approved its first Climate Action Plan, which consists of 86 action items designed to reduce the city's carbon footprint by 2030.

Figure 2.1 Satellite View of Title 13 vs Development, Merlo Station Apartments, Beaverton



Out of the listed four major cities in Washington County, Hillsboro has the most robust protection policy and is able to protect the most acres of SNRs in addition to the size. Satellite imagery demonstrates a trend within the city of Hillsboro to leave Title 13 lands undeveloped even if they are not included in Hillsboro's SNR geodatabase. This is likely thanks to protections that were put in place after the creation of this SNR spatial data.

Figure 3.1 Satellite View of Rock Creek, Hillsboro (with SNRs and Title 13)

Tigard does an outstanding job of protecting SNR areas, especially wetlands. As one of the founders of the Tualatin Basin Plan, the City of Tualatin has the most extensive set of legal protections for SNRs out of the four major cities included in this project, often going beyond the parameters suggested by Goal 5 and Title 13. However, development can still be seen encroaching on and replacing Riparian habitat. An example is shown in Figure 4.1, depicting the Fanno Creek at the intersection of SW Bonita Rd and Pacific Highway. Tigard's Goal 5 Tree Groves, here represented as part of the Upland habitat layer, also receive the smallest development buffer found in our research: only 4 to 10 feet.

Figure 4.1 Satellite View of Title 13 vs Protections, Gentle Woods/Ball Creek, Tigard (with Title 13)

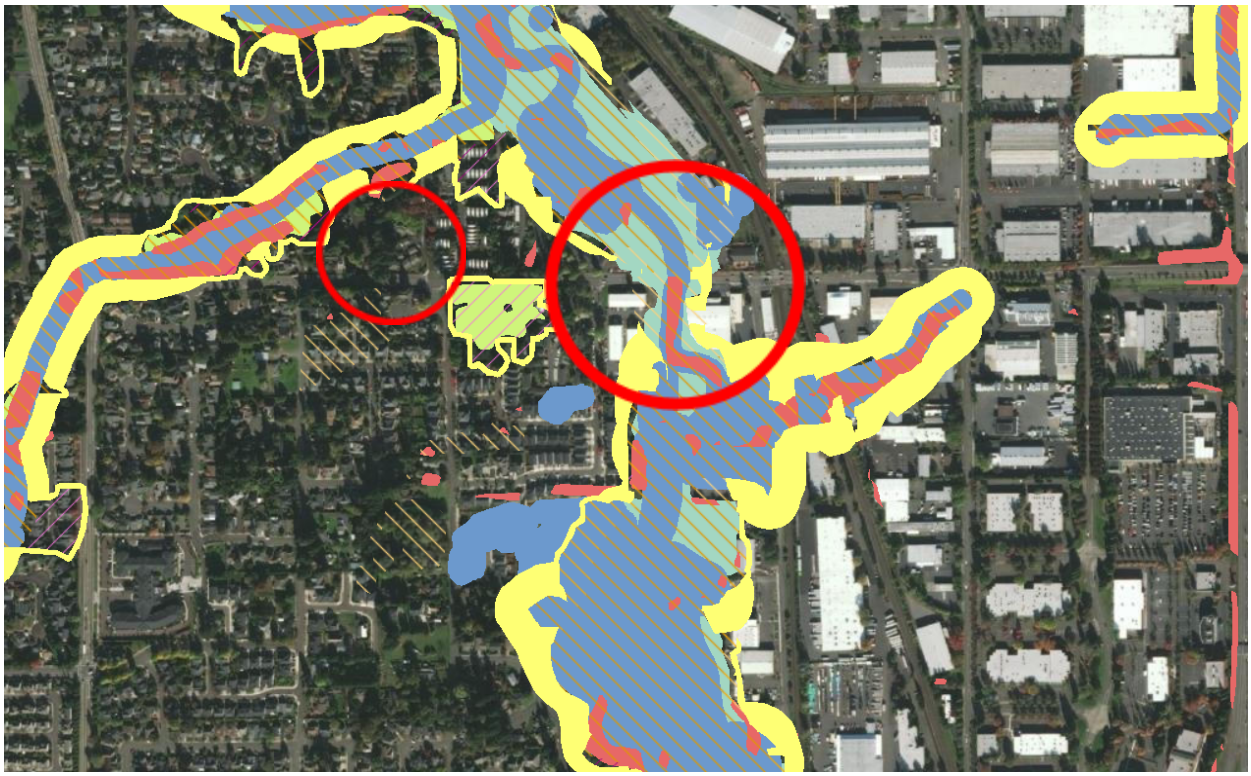


Figure 4.2 Satellite View of Title 13 vs Protections, Gentle Woods/Ball Creek Tigard (without Title 13)

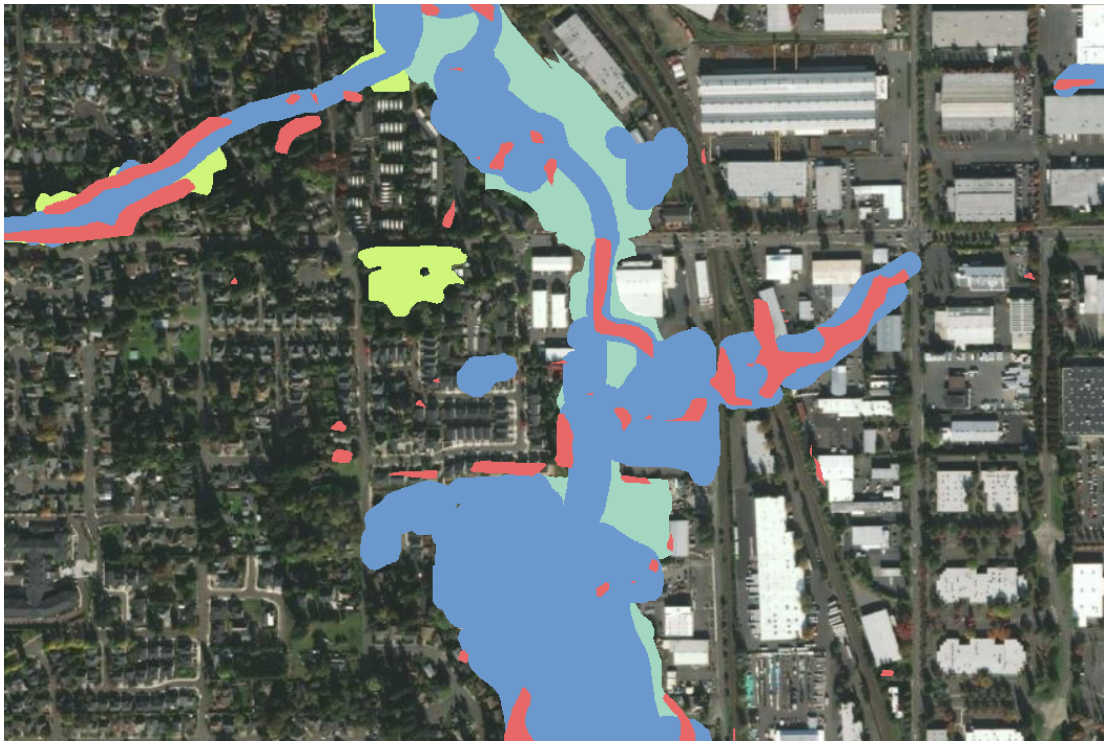


Figure 4.3 Satellite View of Title 13 vs Protections, Gentle Woods/Ball Creek Tigard (Upland Only)

Tualatin's SNR spatial data matches Title 13 almost completely, and many Upland Title 13 areas not included in the SNR data remain undeveloped. This shows that protections were put in place after the SNR spatial data was created, protecting Upland areas missing from Tualatin's SNR geodatabase. Much of the areas mapped as Wetland SNRs have already been thoroughly developed, leaving only corridors for Riparian SNRs. The Wetland Protection District is an area of the city which permits and encourages development with specific regulations protecting the integrity of remaining habitat.

Figure 5.1 Wetlands Protection District, Tualatin (with SNR and Title 13)

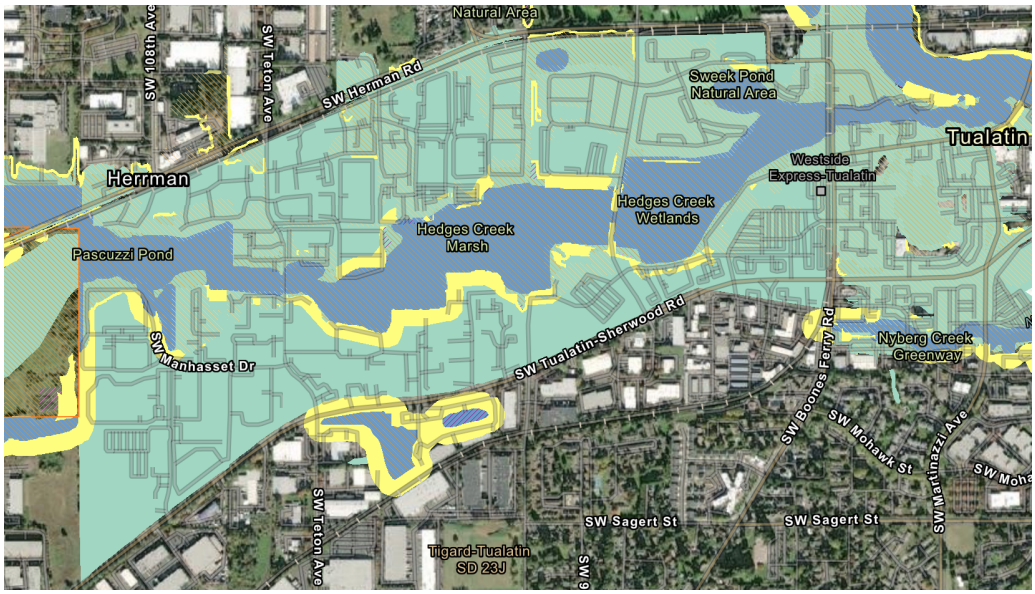


Figure 5.1 Wetlands Protection District, Tualatin (satellite only)

In unincorporated areas of Washington County, the encroaching developments are a greater issue the closer one gets to the City of Portland. For example, the unincorporated Bethany neighborhood north of Beaverton is almost completely developed up to the county line. While there are some remaining narrow green spaces for riparian/wetland stream corridors, most of the upland SNRs mapped are actually gone. This is likely because open natural spaces and forests included in both the Title 13 and Washington County's SNR inventories have less protections than water-related riparian or wetland areas.

Figure 8.1 Satellite View of Bethany Neighborhood, Washington County

Figure 8.2 Satellite View of Bethany Neighborhood, Washington County (with SNRs and Title 13)

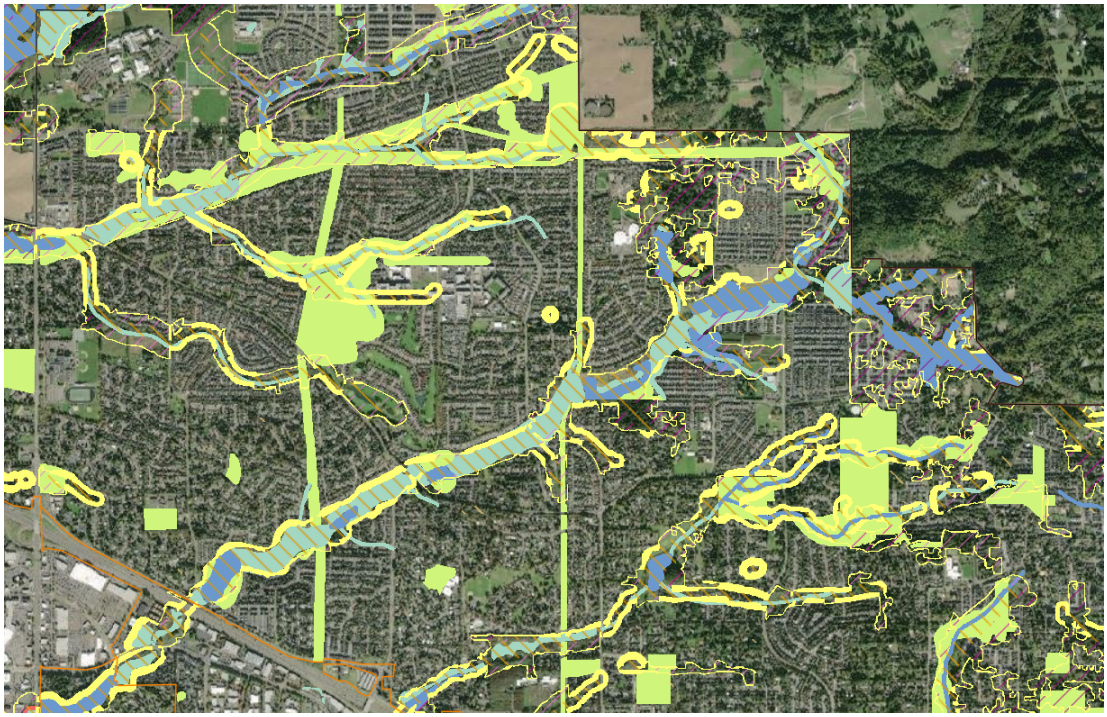
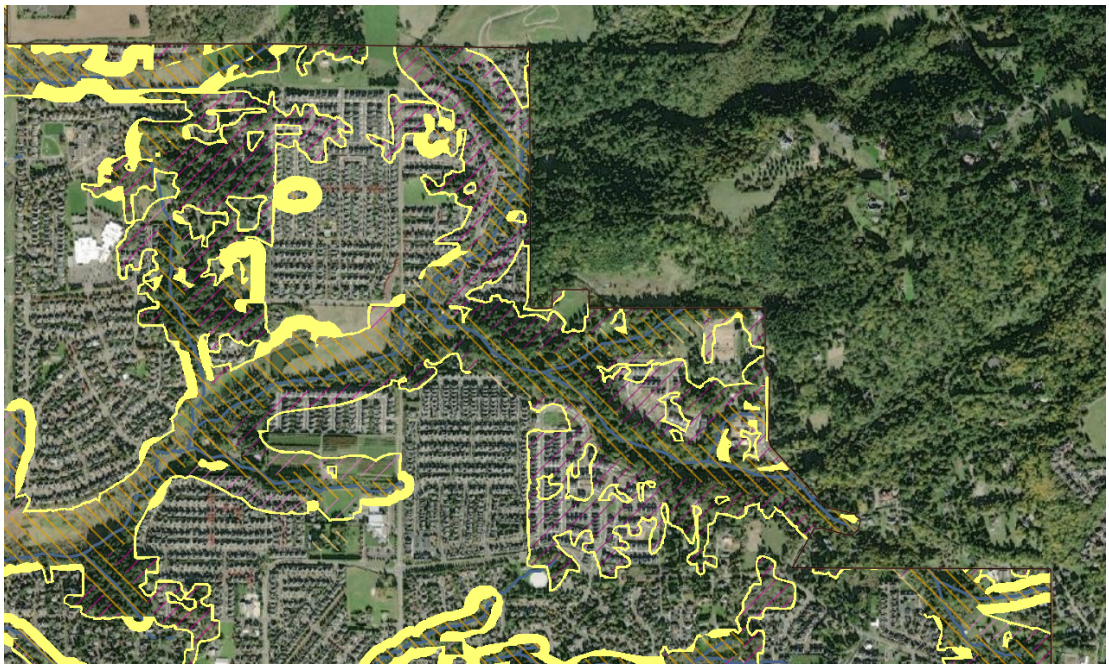


Figure 8.3 Satellite View of Bethany Neighborhood, Washington County (with SNRs)



DISCUSSION

This map is the first step towards documenting Oregon's SNRs in a comprehensive, easy to access format. Updating current SNR spatial data, creating SNR spatial data for underrepresented cities, and comparing existing SNR spatial data to up-to-date land use data will provide a more accurate picture of the natural resource conservation situation in Washington County. Cities and counties refining their definition of upland habitat, and distinguishing it from "green" areas no longer considered to be valuable to conservation (such as parks, golf courses, and cemeteries), would also be beneficial to more accurately documenting this area's SNRs.

We must remember that development encroaching on or even extending into the boundaries of SNRs on this map do not indicate that any developers are violating local law. The age of the most current SNR data and the constantly-changing nature of local development laws mean that the data included in this map does not always present an up-to-date picture of the current status of the region's SNRs. However, the Washington County SNR web map does allow users to view trends present across multiple cities in the region. From what data is available and included in this map, the major cities of Washington County protect about 50% of their recommended Title 13 lands at minimum. In general, Upland habitat is the habitat type that experiences the most development encroachment, while water-related Riparian and Wetland habitats receive the most regulation and protection.

Most cities and the County at large could benefit from increasing the minimum widths of the development buffers around their SNRs. It is clear from comparing this map's SNR data with more recent satellite imagery that development is encroaching on Washington County's established SNRs and other areas outlined by Title 13. Depending on the type of SNR, buffers specified in municipal code can be as little as 4 feet in some places, which may not adequately support the conservation of these natural resources.

Minor updates suggested for the Washington County SNR Map include adjusting the formatting of attribute tables, making small corrections to the code chapters and buffer widths that now differ from those found in our research, and integrating SNRs that lie outside the limits of their respective cities. Adding more conservation and administration-related features such as map layers for watershed areas or the FEMA Flood Hazard Zone may also help improve the map in the future.

With updated spatial data for the remaining natural resources, local jurisdictions will

have a better tool for combating climate change and the general public health of our community members. A recommended next step is a more comprehensive scan of the natural resource preservation policies in evaluating and comparing the effectiveness of local environmental protections. Nonetheless, the Washington County Significant Natural Resources map is a significant first step in the Urban Greenspaces Institute's initiative to compile and document SNR data in a form that is easy for the community to access.

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Michelle Miller, Washington County

BIBLIOGRAPHY

Below is a list of local development codes researched in the making of this map:

Oregon Metro Title 13

Municipal Codes:

- City of Banks, Oregon
- City of Beaverton, Oregon
- City of Cornelius, Oregon
- City of Durham, Oregon
- City of Forest Grove, Oregon
- City of Gaston, Oregon
- City of Hillsboro, Oregon
- King City, Oregon
- City of North Plains, Oregon
- City of Sherwood, Oregon
- City of Tigard, Oregon
- City of Tualatin, Oregon
- Washington County, Oregon