



Department of Commerce

Puget Sound Mapping Project Tutorial

October 2017



Project Overview



Project Objectives



- Part of EPA National Estuary Program
- Part of a larger effort in Puget Sound
 - <http://www.psp.wa.gov/NEP-overview.php>
- Grant to Commerce/Ecology
 - Watershed characterization
 - Strategies to manage stormwater
 - Strategies for protecting and restoring watersheds
 - Land use and working lands



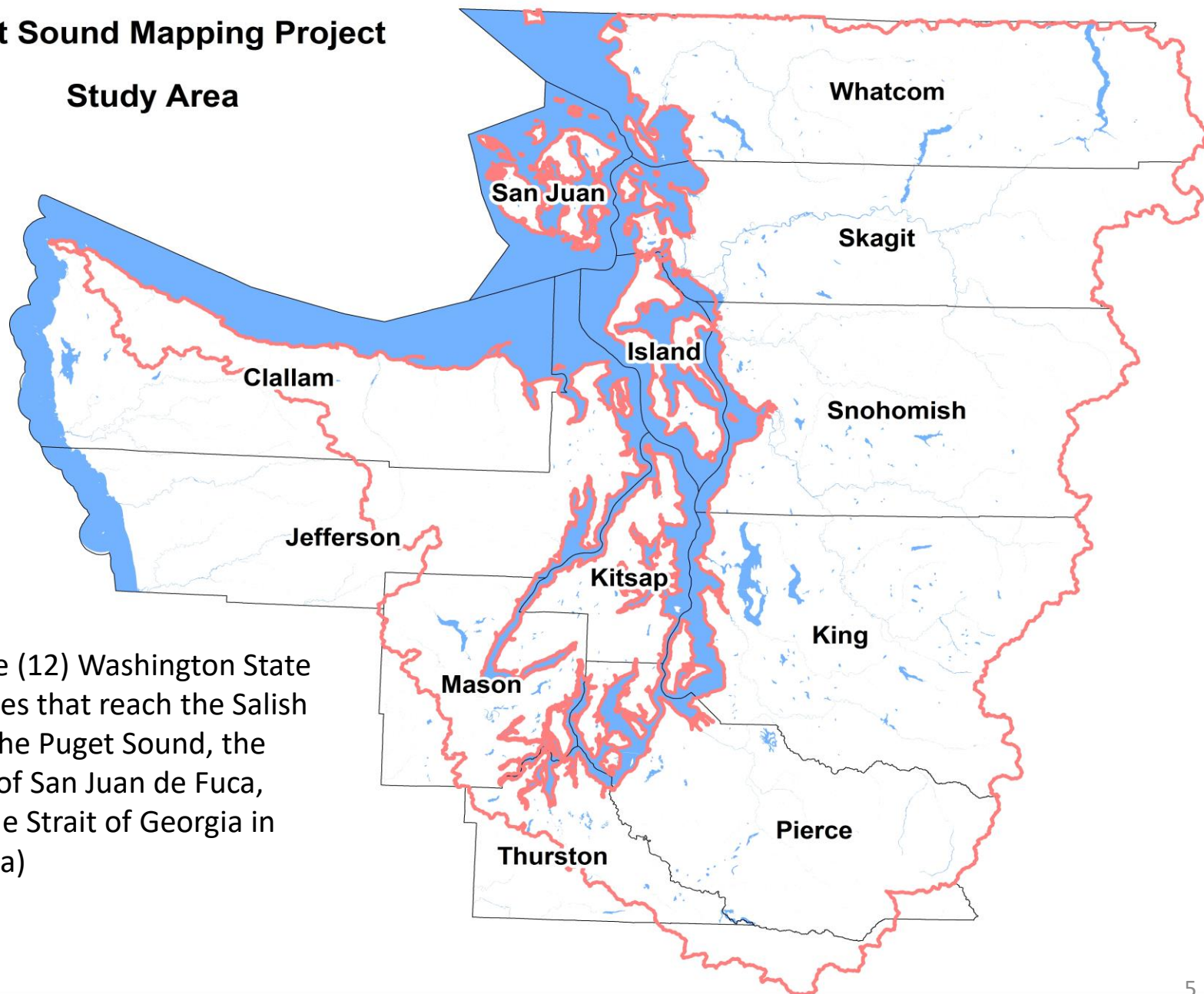
Project Objectives - Disclaimer

The Washington State Department of Commerce (Commerce) believes in the importance of the public's right to know about its operations and activities. Commerce prepares and uses this data and information as a conceptual tool. GIS Data is intended to be used as a GUIDE. These maps were created from available public records and existing map sources, and from different surveyors and their surveys. Map features from all sources have been adjusted to achieve a 'best fit' registration to the Zoning of parcels. While great care was taken in this process, maps from different sources rarely agree as to the precise location of geographic features. The relative positioning of map features to one another results from combining different map sources without field 'ground truthing'. This data and information may contain aggregate, anonymous statistics. This data and information should not be construed, express or implied, as legal advice or legal opinion on any specific facts or circumstances. Commerce discloses this data and information as-is without any warranty, and Commerce expressly disclaims all express or implied warranties of merchantability and fitness for a particular use. The burden for determining fitness for use lies entirely with the user. In no event shall the Commerce have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by Commerce. No public agency, public official, public employee, or custodian shall be liable, nor shall a cause of action exist, for any loss or damage based upon the release of a public record if the public agency, public official, public employee, or custodian acted in good faith in attempting to comply with the provisions of Washington's Public Records Act. Commerce reserves the right to alter, suspend, re-host, or retire this service at any time and without notice. This service can be used in custom web applications and software products. Your use of this service in these types of tools forms a dependency on the service definition (available fields, layers, etc.). If you form any dependency on this service, be aware of a significant risk to your purposes. Consider mitigating your risk by extracting the source data and using it to host your own service in an environment under your control.



Puget Sound Mapping Project

Study Area



Twelve (12) Washington State counties that reach the Salish Sea (The Puget Sound, the Strait of San Juan de Fuca, and the Strait of Georgia in Canada)

Project Objectives



- Create standardized and integrated map of Puget Sound
 - 12 counties
 - 113 cities
- Show zoning and land use patterns (2012)
- Integrate data on new housing development
 - OFM Small Area Population Estimates



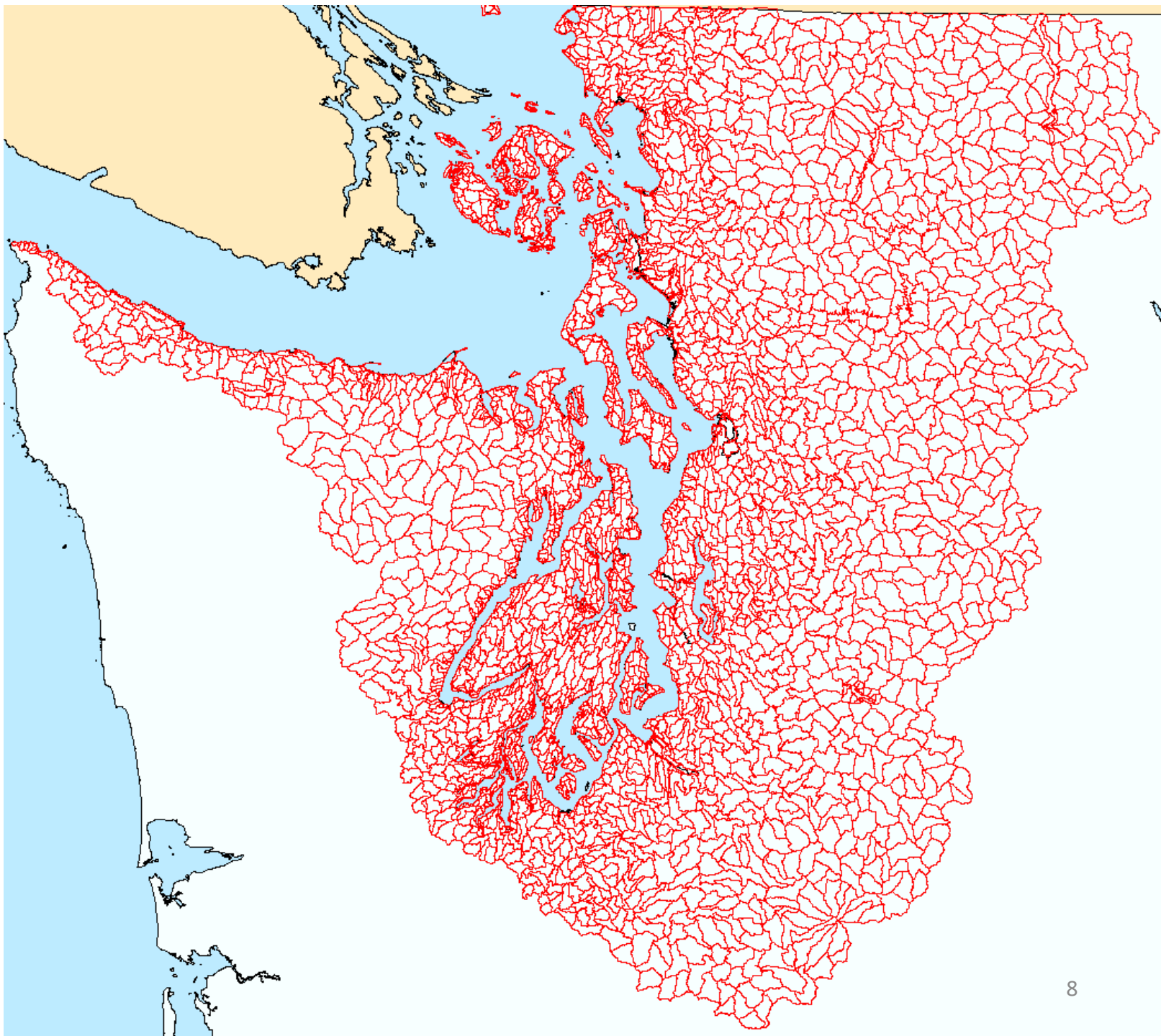
Project Objectives



- Show large scale growth patterns within
 - watersheds and sub-basins
 - floodplains
 - incorporated v. unincorporated
 - urban growth areas v. rural
 - land use categories



Assessment
Units used
to compare
geospatial
indices



Project Objectives



- Assist with regional planning and watershed recovery efforts
 - Track progress on indicators
 - Support grant applications
 - Target mitigation projects



Project Objectives



- Provide tool for local planning
 - evaluate land use/zoning “performance”
 - are “centers” capturing growth
 - is growth clustering along transit corridors
 - are some areas capturing more growth than others
 - is growth happening in vulnerable sub-basin areas



Project Objectives



- Provide tool for local planning
 - Depict existing conditions and trends
 - Show vulnerable areas
 - Prioritize recovery measures
 - septic replacement/sewer extensions
 - land acquisition, restoration sites, etc.
 - adjusting stream buffers, clearing allowances, etc.





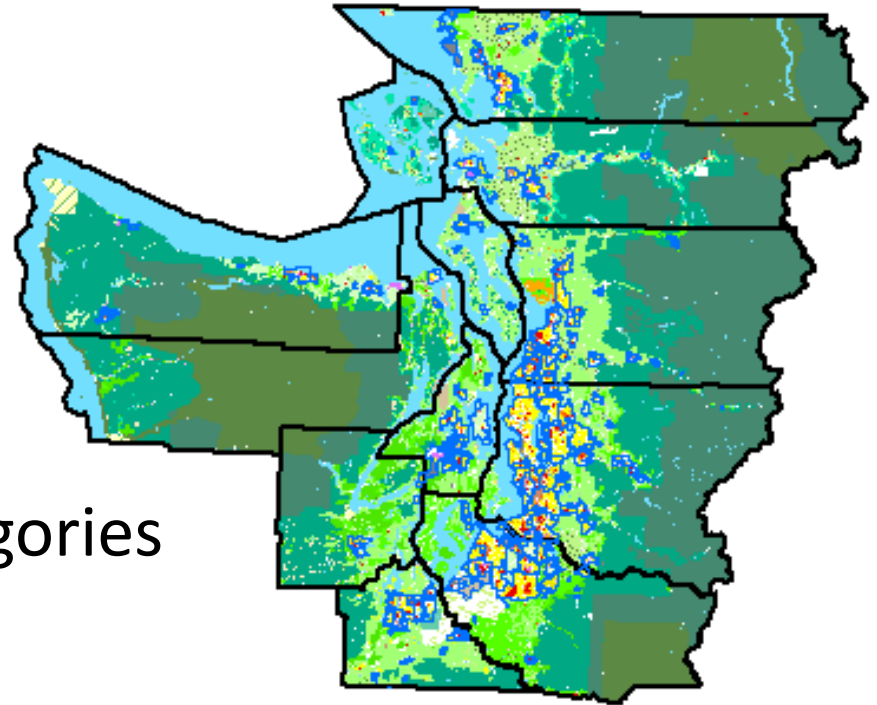
Project Description



Project Description

Zoning categorization

- 13 Master Categories
- 32 “Nested” Sub Categories



Project Description – Purpose of the Map

The PSMP mapping tool can be used by local governments, special purpose districts, state and federal agencies, legislative staff, consultants and the public to:

- Assess growth patterns and trends over time;
- Help support decisions related to development projects, urban growth boundaries, and the need for environmental protection measures;
- Allow integration with Puget Sound Basin watershed characterization data and other data resources;
- Help support and strategically target compensatory mitigation actions.





Exploring the Map



Department of Commerce

Exploring the Map

Subcategories Legend (by Master Category)

Intensive Urban

- Commercial/Office
- Institutional Uses (Hospital, Campus)
- Mixed Use
- Residential (12+ Units/Acre)

Industrial

- Airport/Seaport
- Heavy Industrial
- Light Industrial

Urban Residential

- Low Density Urban Residential (1.1-3 Units/Acre)
- Mixed Use/Planned Neighborhood (3.1-12 Units/Acre)
- Traditional Single Family Residential (3.1-12 Units/Acre)

Rural Residential

- Large Lot Residential (1 unit per 10 acres to 1 unit per 19.9 acres)
- Rural Transition (1 unit per 5 acres to 1 unit per 9.9 acres)
- Urban Edge (1 unit per acre up to 1 unit per 4.9 acres)
- Very Large Lot Residential (1 unit per 20 acres or more)

Agricultural

- Other Active Agricultural
- Primary Agricultural Area

Forest

- National Forest
- Other Forest Lands
- Primary Forest Area

Mineral

- Primary Mineral Area

Recreation and Preservation

- Active Open Space or Recreation
- National Park
- Natural Preservation and Conservation

Other - Military

- Intensively Developed Military
- Undeveloped Military Lands

Other - Tribal

- Tribal Inholding Lands
- Tribal Reservation

Undesignated

- Undesignated

Reference

- Water
- ROW
- ROW or Water

Public

- Public



Exploring the Map

Final Sub-Categories

Active Open Space or Recreation
 Airport/Seaport
 Commercial/Office
 Heavy Industrial
 Institutional Uses (Hospital, Campus)
 Intensively Developed Military
 Large Lot Residential (1 unit per 10 acres to 1 unit per 19.9 acres)
 Light Industrial
 Low Density Urban Residential (1.1-3 Units/Acre)
 Mining or Mineral Resource
 Mixed Use
 Mixed Use/Planned Neighborhood (3.1-12 Units/Acre)
 National Forest
 National Park
 Natural Preservation and Open Space
 Other Active Agriculture
 Other Forest Lands
 Primary Agricultural Resource
 Primary Forest Area
 Residential (12+ Units/Acre)
 ROW
 ROW or Water
 Rural Transition (1 unit per 5 acres to 1 unit per 9.9 acres)
 Traditional Single Family Residential (3.1-12 Units/Acre)
 Tribal Inholding Lands
 Tribal Reservation
 Undesignated
 Undeveloped Military Lands
 Urban Edge (1 unit per acre up to 1 unit per 4.9 acres)
 Very Large Lot Residential (1 unit per 20 acres or more)
 Water
 Public

Color Scheme

Light Vert
 Rose Dust
 Poinsettia Red
 Grey 50%
 Mango 255
 Tecate Dust
 Medium Apple
 Nubuck Tan
 Olivine Yellow
 Vineyard
 Fire Red
 Citron Yellow
 Deep Forest Green
 Lotus Pond Green
 Jadeite
 Scrub 1 Pattern & Moss Green
 Chryoprase
 Open Pasture Pattern & Lotus Pond Green
 Malachite Green
 Electron Gold
 Rhodolite Rose
 Topaz Sand
 Light Apple
 Solar Yellow
 Noise Overlay & Sahara Sand
 Wetland Pattern & Yucca Yellow
 Grey 20%
 Mangrove Pattern & Medium Lime
 Tzavorite Green
 Quetzal Green
 Apatite Blue
 Heliotrope

RGB Values

122 245 202
 215 158 158
 230 0 0
 130 130 130
 211 127
 215 194 158
 85 255 0
 205 137 102
 233 255 190
 uncodeable
 255 85 0
 230 230 0
 68 137 112
 92 137 68
 102 205 171
 114 137 68
 137 137 68
 92 137 68
 0 168 132
 255 170 0
 255 190 232
 255 235 175
 163 255 115
 255 255 0
 255 235 190
 255 255 190
 204 204 204
 205 245 122
 211 255 190
 76 230 0
 115 223 255
 223 115 255

Exploring the Map - Land Use Designations

INTENSIVE URBAN

Commercial/Office – Businesses located in these areas are a mixture of professional offices, retail stores and services such as salons or childcare facilities. In business parks, there may be large open spaces or parks but generally, these locations have limited landscaping. In central business areas, multi-story buildings predominate.

Mixed Use – Mixed-use areas incorporate a blend of commercial, apartments, public and other compatible uses. While one type of use may be predominant, the other types of uses have a significant presence. Apartments may be located in the same structure above commercial or retail spaces. These places are intensively developed and have high levels of impervious surfaces and often feature multi-story structures.

Residential (12+ Units/Acre) - This designation applies to areas zoned for apartments, townhouses and condominiums. Some of these locations may have pre-existing uses such as detached single-family homes or small scale commercial development. The intent of these areas, however, is to eventually transition to higher levels of residential development.

Institutional Uses – Some jurisdictions create special districts or zones for multiple building facilities such as hospital complexes or college campuses. These types of locations may also incorporate civic uses such as fairgrounds or a cluster of governmental buildings.



Exploring the Map - Land Use Designations

PUBLIC

Public – Unlike Institutional Uses, public use areas may have a mixture of intensively and sparsely developed locations that apply to a range of civic oriented places such as parks, schools, reservoirs, libraries and stadiums.

INDUSTRIAL

Light Industrial – Businesses located in light industrial areas typically include warehouses, trucking terminals, bakeries, machine shops and similar types of activities that do not result in significant noise, odor or traffic impacts. They may have commercial uses clustered or interspersed and many auto-service oriented businesses such as body shops or two yards will locate in these places.

Heavy Industrial – Intensive manufacturing plants, railroad yards, oil refineries, breweries, paper mills are usually restricted to heavy industrial zones in order to limit the impact of noise, odor and traffic impacts on residential, retail and rural locations. Light industrial uses may also be allowed in these locations.

Airport/Seaport – While airports and seaports often have heavy industrial components, they also feature a mixture of significant office, retail and sometimes residential development. Hotels and parking facilities are often found near passenger airports. Warehousing and other light-industrial uses are more prevalent than around other heavy industrial locations.



Exploring the Map - Land Use Designations

URBAN CHARACTER RESIDENTIAL

Traditional Single Family Neighborhood – Detached homes predominate in these neighborhoods. Limited compatibles uses such as parks, churches and schools may be interspersed. In some locations, small apartments may be scattered but do not have a significant presence. Lot sizes in these areas range from 3,600 square feet to 14,500 square feet per housing unit.

Mixed Use/Planned Neighborhood – These neighborhoods contain a mixture of retail, civic, apartments and detached homes. The overall residential density and amount of impervious surfaces is similar to that of a traditional single-family neighborhood (3.1-12 Units/Acre). Moreover, building height does not generally exceed two stories on average. This category also includes many Master Planned Communities that integrate a range of detached units, limited apartments, neighborhood commercial stores, parks and schools.

Low Density Urban (1.1 Unit/Acre to three Units/Acre) – While these areas are similar in many ways to traditional single family residential areas their amount of open space and overall density is noticeably lower. Lots in these areas range from 43,560 square feet to 15,000 square feet per housing unit.



Exploring the Map - Land Use Designations

RURAL CHARACTER RESIDENTIAL

Large Lot Residential – Ranging in size from 10 acre to 19.9 acres, residential lots in this district may features small scale agricultural uses such as hobby farms. More intensive residential or agricultural use may be precluded by environmentally sensitive and aquifer recharge areas.

Rural Transition (1 per 5 to 1 per 9.9) – Lots in the rural transition category range in size from one unit per 5 acres to one unit per 9.9 acres. They may incorporate some limited agricultural uses including equestrian farms. Limited commercial and civic uses like churches and bed and breakfasts may be allowed in some locations.

Urban Edge – These locations allow residential development on lots of one unit/acre to one unit per 5 acres. Often located near urban growth boundaries, there may be a significant amount of pre-GMA development at higher densities through subdivisions and short-plats. In addition to structures that pre-date the GMA, there are pre-existing lots that have grandfathered development potential.

Very Large Lot – Often used as private small timber lots, these locations feature parcel sizes of 20 acres or larger. They differ from timber lands by the amount of residential or recreational uses located in these areas.



Exploring the Map - Land Use Designations

MINERAL

Mining or Mineral Resource – These locations may or may not be designated as mineral resource areas under the state's Growth Management Act. They are often open pit operations (like gravel pits and quarries) for construction materials and aggregate. <http://www.commerce.wa.gov/serving-communities/growth-management/growth-management-topics/natural-resource-lands/>

FOREST LANDS

Other Forest Lands – Timber production is a predominant feature of these locations although incorporation of other recreational, residential and agricultural development may be interspersed.

Primary Forest Area – Often formally designated as forest resource areas, these locations are intended for timber production. <http://www.commerce.wa.gov/serving-communities/growth-management/growth-management-topics/natural-resource-lands/>

National Forest – the U.S. Government designates these locations as National Forests. Privately held inholding lands which pre-date establishment of the National Forest may be located in these areas and result in some limited residential development.



Exploring the Map - Land Use Designations

AGRICULTURAL AREAS

Primary Agricultural Areas – These areas are typically designated as agricultural resource areas under the GMA, and these places are intended to incorporate a range of agricultural uses including dairies, ranches and farms. <http://www.commerce.wa.gov/serving-communities/growth-management/growth-management-topics/natural-resource-lands/>

Other Active Agriculture – While farms and other agricultural activities have a significant presence and are encouraged through zoning designations they may not predominate and other non-agricultural development is interspersed. These locations may be within urban growth boundaries that may be intended to preserve agricultural heritage or incorporate existing hobby farming.

RECREATION AND PRESERVATION

Active Open Space or Recreation – Campgrounds, resort developments, large parks and open spaces with extensive trail systems typify locations with this type of zoning.

Natural Preservation and Open Space – While some recreational uses may occur in these areas, the intent is the preservation of habitat, vegetation and other natural features. Municipal watersheds are included in this category if they have been zoned to limit human activity around the reservoir.

National Park – Three national parks (Olympic, Mt. Rainier and North Cascades) are located within the study area and their boundaries correspond with this category.



Exploring the Map - Land Use Designations

TRIBAL

Tribal Reservation – This designation is intended to show the location of formally designated tribal reservations located within the study area. Local governments do not control land use decisions in these areas and they may feature a range of development and land uses.

Tribal Inholding Lands – Located outside of formal tribal reservation areas, inholding lands are also control by tribal entities. These areas are typically not intensively developed.

MILITARY

Intensively Developed Military – Naval, Army, Air Force, Marine and Coast Guard facilities that have buildings, piers, airports or other similar active uses are included within this designation.

Undeveloped Military Lands – Large portions of some military facilities are sparsely developed and may be used for practice areas.



Exploring the Map - Land Use Designations

REFERENCE

ROW – Formally, designated rights-of-way by jurisdictions are included in this designation. This may include roads, railroads or power transmission corridors. Locations identified by the Washington State Department of Transportation as a part of the state's road network are incorporated as 60-foot wide rights-of-way from the centerline of the road.

Water – Tidal bodies, lakes, ponds, streams and rivers are consolidated within the Water designation. Some water features may not have been included in source material and inadvertently omitted from these locations.

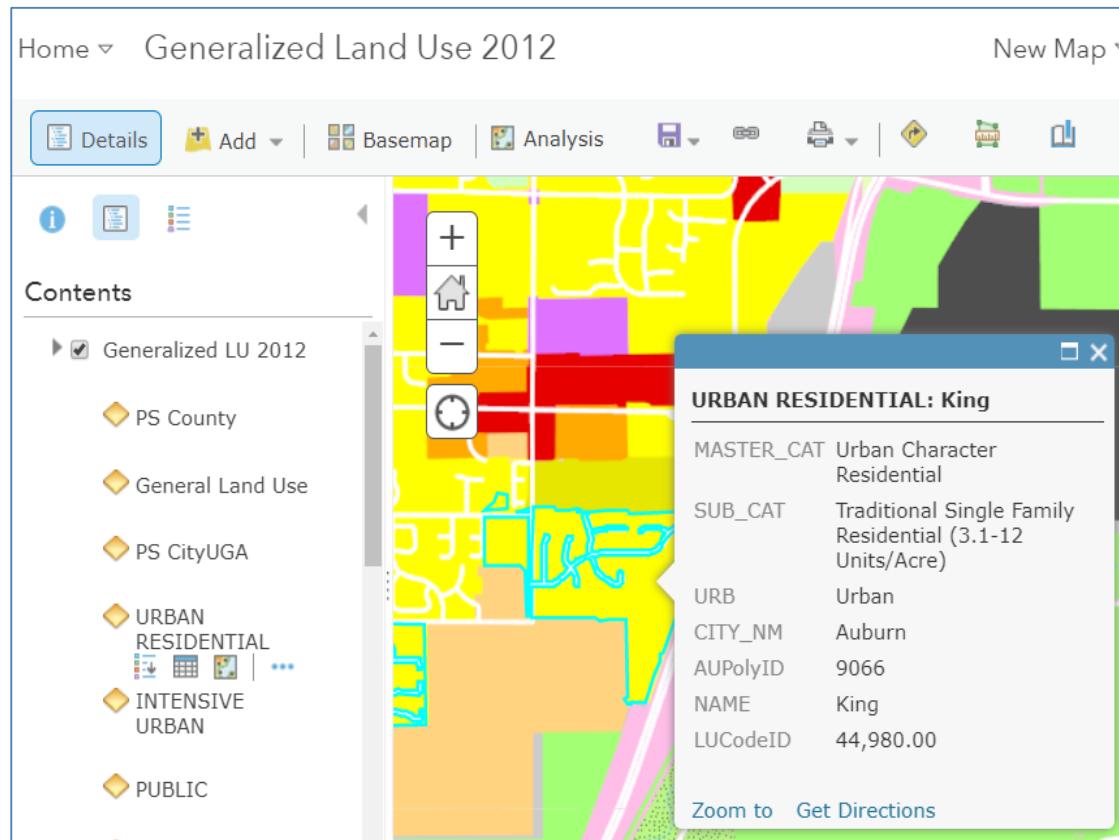
ROW or Water – Mapped information and assessors land use code indicate these locations are likely Rights of Way or water features, however, the exact nature cannot be distinguished and needs to be resolved through field observation, remote sensing or other method.

UNDESIGNATED

Undesignated – Zoning and existing land use cannot be positively identified for these locations. This occurs in places for which jurisdictions have not created zoning designations. In addition, overlaps or gaps in maps along the boundary between jurisdictions may inhibit the ability to categorize these areas.



Exploring the Map – Pop-up Details

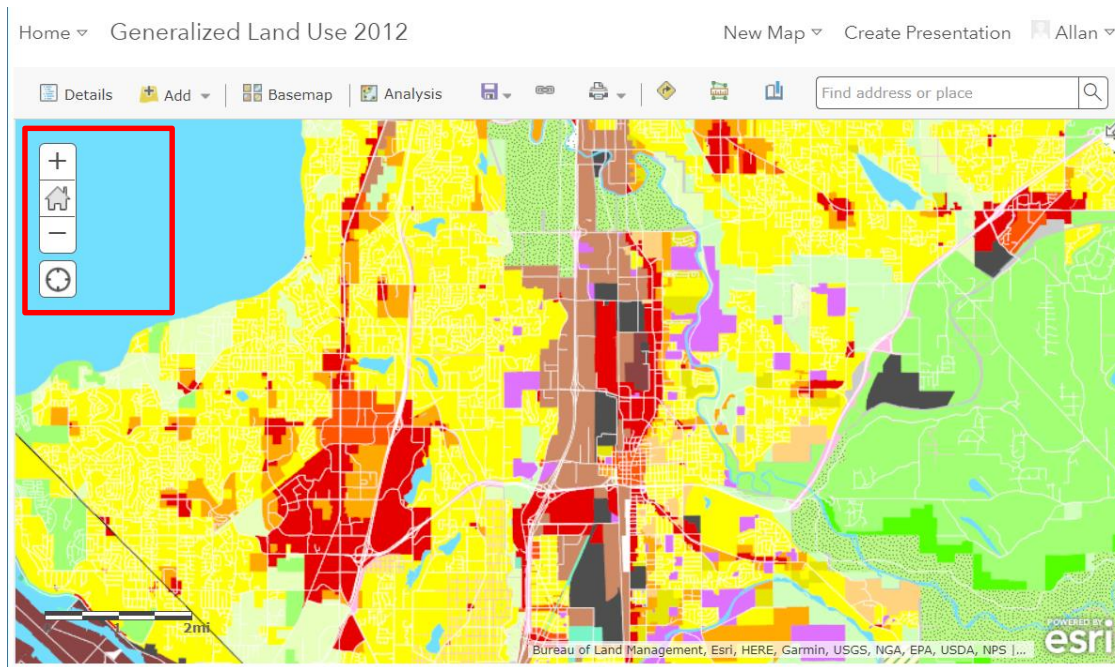


Click on an item to see “pop-up” details.

Pop-ups provide a detailed, stylized view of attribute data associated with a specific layer. They provide relevant and contextual information of the data.



Exploring the Map – Zoom/Pan



Zoom (+ or -),
Home/Default
Extents, and Find
My Location tools

Hold down the left mouse button to **Pan**




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Extracting Data



Extracting Data


The **Extract Data**  tool is a convenient way to package the layers in a map into datasets that can be used in ArcGIS Desktop, Excel, and other products.

Limitations:

- Extractable layers include layers that the user owns and layers where export has been enabled.
- When exporting lines or areas to a CSV file, only non-spatial attributes are extracted.
- Attachments will only be extracted if the output data format is a file geodatabase and Clip features is unchecked.






Extracting Data

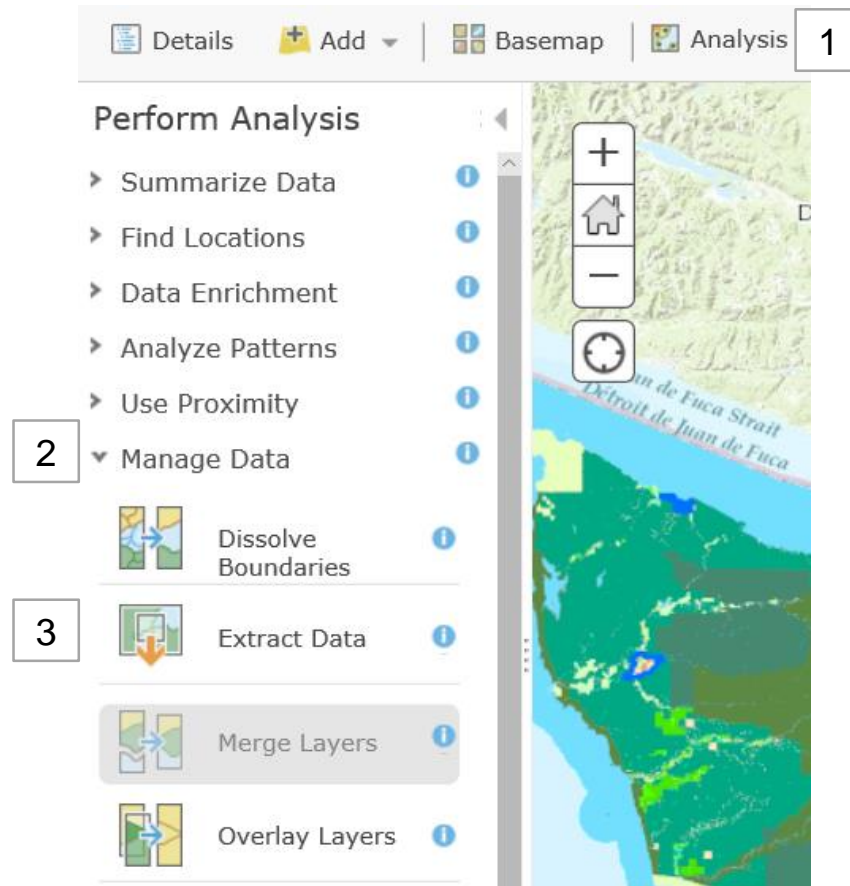
The **Extract Data**  tool gives many options when exporting data, including the option to export features that are in a study area the user defines. If the user wants to extract the entire dataset to a shapefile or CSV file, the Extract Data tool can also be used. Extract Data creates an item in Content containing the data in the layers panel. The data can then be downloaded from the item created.



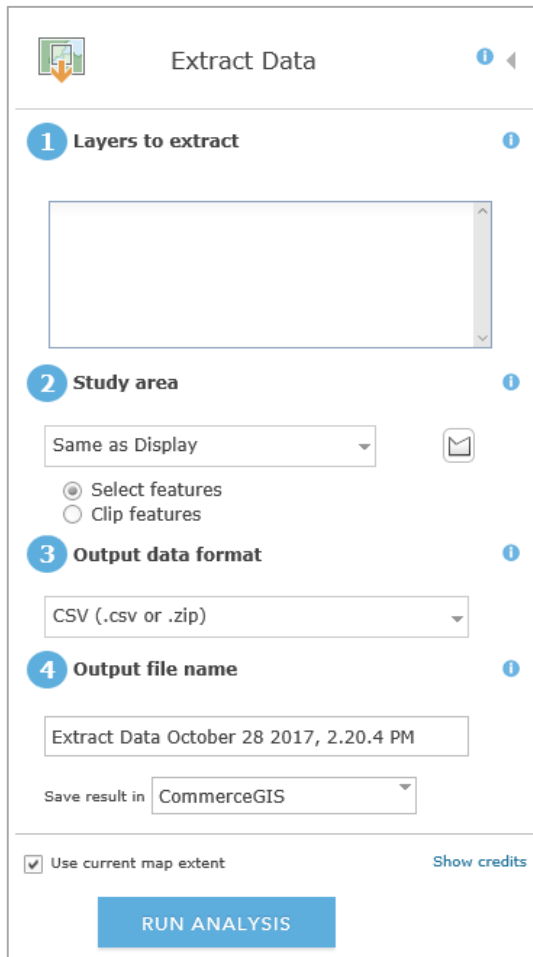
Extracting Data

Extract Data

- 1 Click the  Analysis icon
- 2 Select the  Manage Data tab
- 3 Select  Extract Data



Extracting Data



The screenshot shows the 'Extract Data' web application interface. It has a title bar with a map icon and the text 'Extract Data'. Below the title bar are four numbered steps: 1. Layers to extract, 2. Study area, 3. Output data format, and 4. Output file name. Step 1 has a large empty box for selecting layers. Step 2 has a dropdown menu set to 'Same as Display' and two radio buttons: 'Select features' (selected) and 'Clip features'. Step 3 has a dropdown menu set to 'CSV (.csv or .zip)'. Step 4 has a text box containing 'Extract Data October 28 2017, 2.20.4 PM' and a dropdown menu set to 'CommerceGIS'. At the bottom, there is a checkbox for 'Use current map extent' which is checked, and a 'Show credits' link. A large blue button labeled 'RUN ANALYSIS' is at the bottom center.

Select **layers to extract** for export. Only layers that the user owns or that the owner has enabled for export can be selected.

A **study area** must be selected from which your data is extracted. The boundary can be the visible extent of your map (Same as Display), the extent of one of your layers, for a specific area of interest, or a custom boundary created using the Draw tool.



Extracting Data

Features within the boundary can be extracted based on one of two methods: Select Features or Clip Features.

Method	Description
Select Features	Entire features that cross the boundary of the study area will be extracted.
Clip Features	Only those portions of features that are within the study area will be extracted.

Output data formats are as follows: CSV, File geodatabase, KML, and Shapefile.






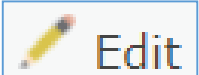
To Update the Map



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Update the Map – Approach #1

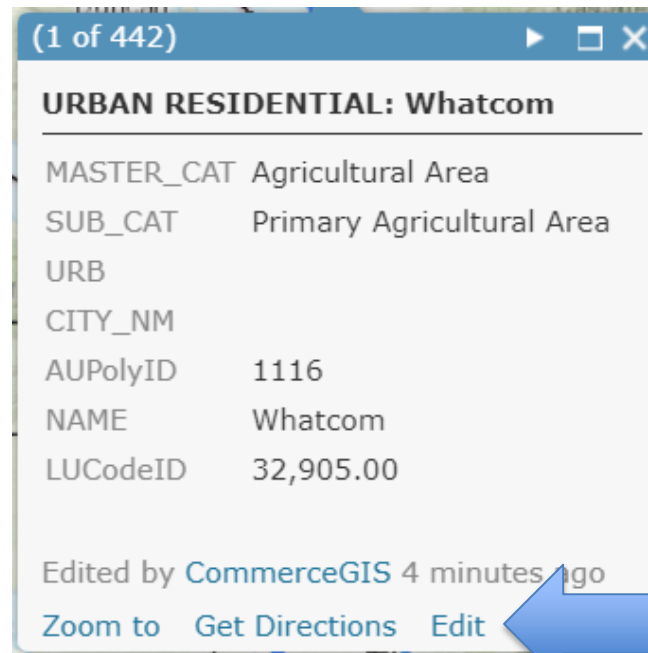
If boundaries are staying the same and only attribute designations are changing – start editing the layer and enter the revised designation directly into the attribute table, as follows:

1. Open the map in Map Viewer that contains the feature layer you want to edit, **OR** open the feature layer in a new map by clicking 
2. Click on the  tab.



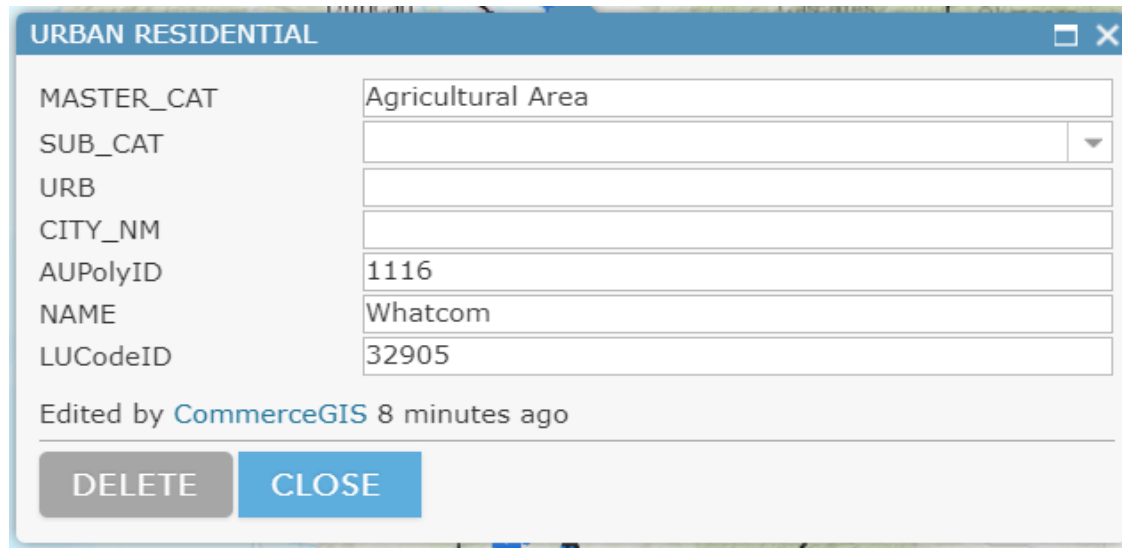
Update the Map – Approach #1

3. To edit the attributes of an existing feature, click it on the map to select it and open the pop-up. Click on the [Edit](#) tab at the bottom right corner of the pop-up.



Update the Map – Approach #1

4. Change the necessary Attribute details.



The screenshot shows a pop-up window titled "URBAN RESIDENTIAL" with a close button (X) in the top right corner. The window contains a table with the following attributes and values:

Attribute	Value
MASTER_CAT	Agricultural Area
SUB_CAT	
URB	
CITY_NM	
AUPolyID	1116
NAME	Whatcom
LUCODEID	32905

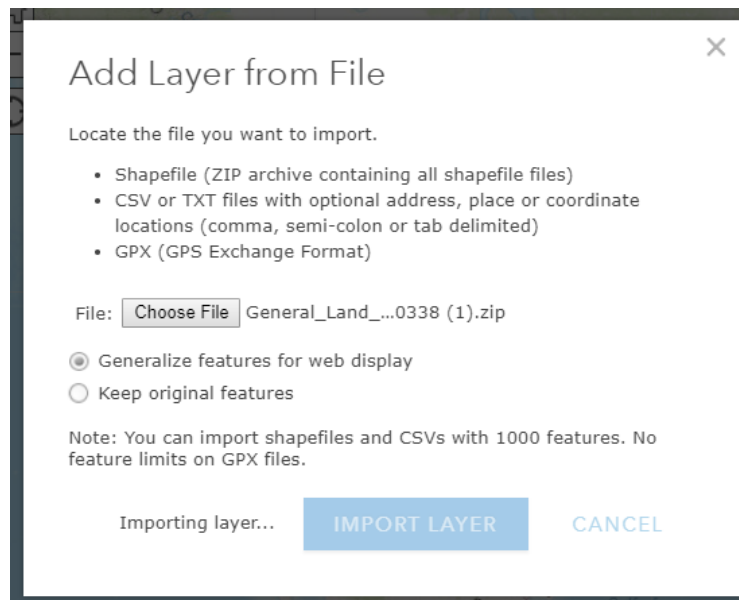
Below the table, it says "Edited by CommerceGIS 8 minutes ago". At the bottom, there are two buttons: "DELETE" and "CLOSE".

5. Click **Close** in the pop-up when you finish editing. (For more information, go to <http://doc.arcgis.com/en/arcgis-online/create-maps/edit-features.htm>)



Update the Map – Approach #2

1. Create a **Clip** of the area to update (i.e. Extract Data as described previously)
2. Erase the clip area from the original map
3. Prepare a New Map ▾ for area with revision (or expansion)
 - + Add ▾ new .zip shapefile to the New Map



Update the Map – Approach #2

- Publish shapefile as a Feature Layer

The screenshot shows the ArcGIS Content Manager interface. The top navigation bar includes Home, Gallery, Map, Scene, Groups, Content, and Organization. The 'Content' tab is active, showing a list of items. The left sidebar has a 'Folders' section with 'All My Content' and 'CommerceGIS'. Below it is an 'Item Type' section with a list of categories: Maps, Layers, Scenes, Apps, and Tools. The main content area displays a table of items with columns for Title, Type, and Modified date. The table shows 16 items out of 32 in the CommerceGIS group, sorted by Date Modified. Two blue arrows point from the right to the 'FW_buffer_CLIP' items, one labeled 'Feature Layer' and the other 'Shapefile'.

Title	Type	Modified
FW_buffer_CLIP	Feature Layer (hosted)	Oct 31, 2017
Generalized_LUUse_2012	Tile Layer (hosted)	Oct 31, 2017
FW_buffer_CLIP	Shapefile	Oct 31, 2017
Generalized_LUUse_2012	Feature Layer (hosted)	Oct 31, 2017
Generalized_LUUse_2012	Web Map	Oct 31, 2017
PSMP_LU2	Tile Layer (hosted)	Oct 30, 2017
Generalized_LUUse_2012	Service Definition	Oct 30, 2017
Generalized_LUUse_2012	Map Package	Oct 29, 2017



Update the Map – Approach #2

- Select the Feature Layer and edit Settings to Enable Editing

General Settings Feature Layer (hosted) Settings

Feature Layer (hosted) Settings

Editing

- ☒ Enable editing.
- ☐ Keep track of created and updated features.
- ☐ Keep track of who created and last updated features.
- ☐ Enable Sync (disconnected editing with synchronization).

• Who can edit features?

Share the layer to specific groups of people, the organization or publicly via the Share button on the Overview tab. This layer is not shared.

• What kind of editing is allowed?

- ☒ Add, update, and delete features
- ☐ Only update feature attributes
- ☐ Only add new features

• What features can editors see?

- ☒ Editors can see all features
- ☐ Editors can only see their own features (requires tracking)
- ☐ Editors can't see any features, even those they add



Update the Map – Approach #2

4. Update the New Map:
 - Use Symmetrical Difference in GIS or Compare Documents in PDF
 - Enter an editing session and manipulate the existing polygon boundaries to conform to new shapes
 - Split polygons to create new areas and enter the appropriate classifications in the attribute fields
 - In new areas – ensure there are attribute columns for Master and Subcategory
 - o Make assignments based upon the **Land Use Designation guidelines**.
 - o If ROW layer does not exist – create it using gaps or create 60 foot ROW width from lines using the Buffer tool.
5. **Merge** the new map with the base map.





Determining the Amount of Growth



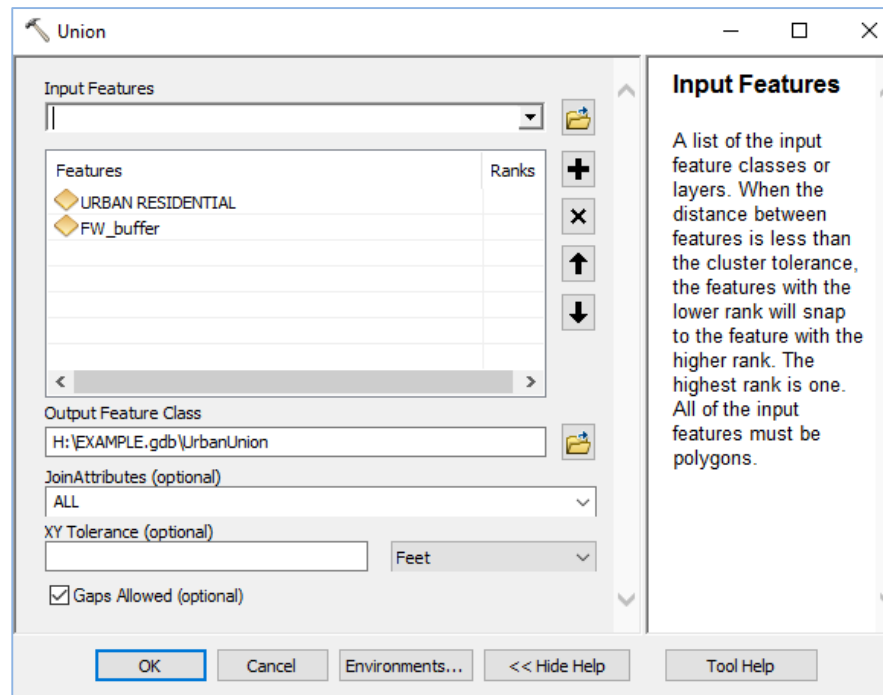
Determine the Amount of Growth

1. Select polygons that fall within the area of analysis (*Note – polygons that fall along boundaries will result in an undetermined margin of error in calculations – to minimize this error, fully include all polygons even if they extend beyond the analysis area boundaries.)
2. Export records into a new shapefile or feature class. (If the analysis area and clip area are coterminous and you don't need to summarize growth by sub-areas, attribute or date ranges – you can right click on the attribute column and toggle the summarize option to see the total amount of growth for that column.)



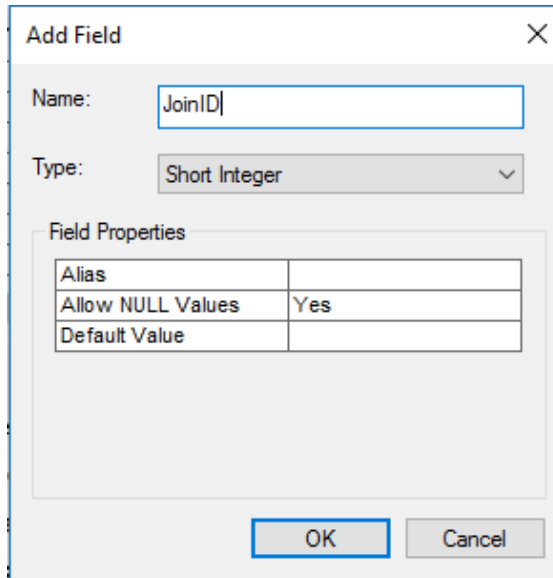
Determine the Amount of Growth

3. Create a **Union** between the new shapefile and the analysis area boundary.



Determine the Amount of Growth

4. Create a new 'Float' attribute field called JoinID and calculate attribute value by using $FID + 1$



Field Properties

Alias	
Allow NULL Values	Yes
Default Value	

5. Select all records, enter the attribute table, click on highlighted/selected records and click **Copy**.
6. Open an Excel table and **Paste** the attribute table into Excel
7. Summarize data using Excel formulas, as desired, to derive growth estimates, land use categories or date ranges.





Department of Commerce

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Puget Sound Mapping Project

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