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Geoprocessing Tools (Part 2)

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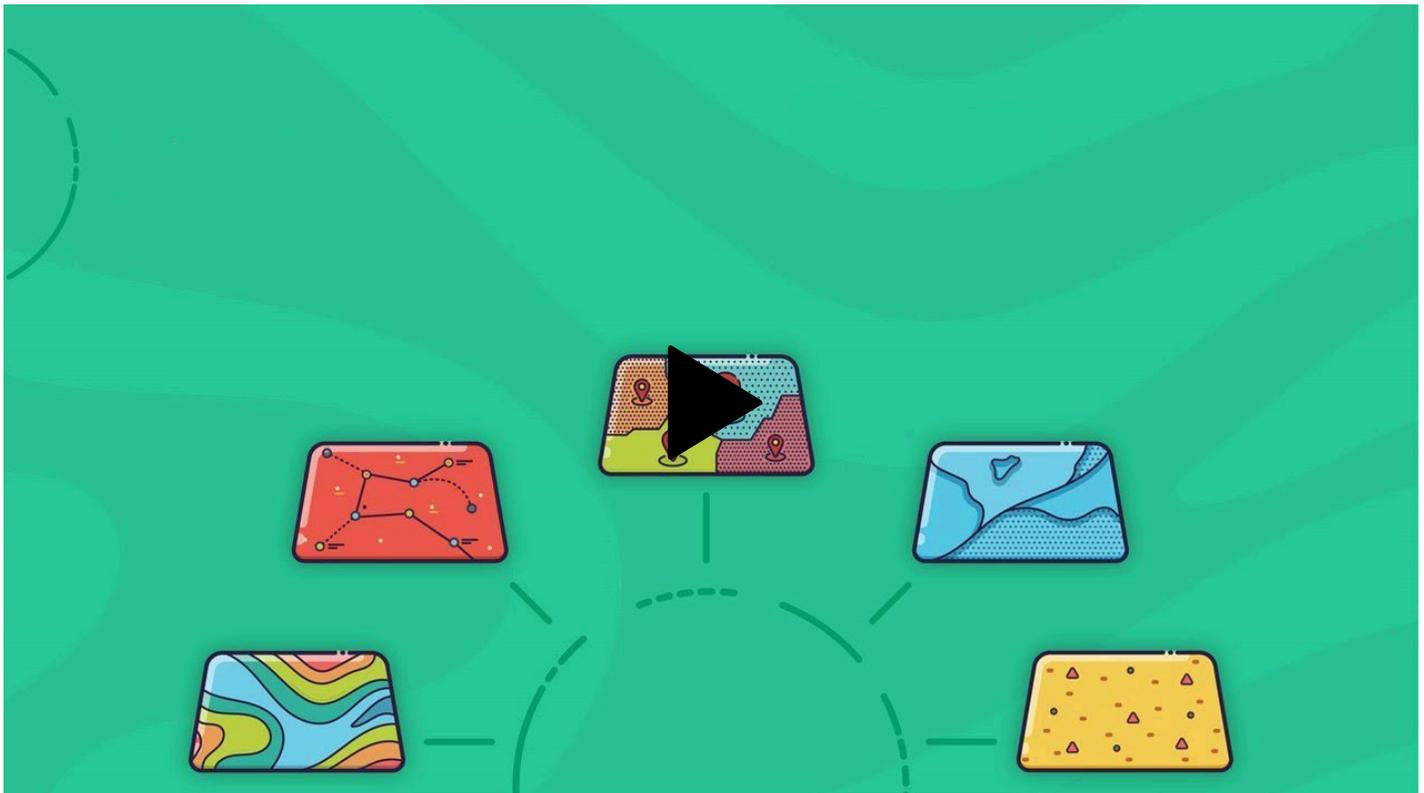
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QGIS Demo 18



▼ Geoprocessing Tools (Part 2) - Video transcript

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With the riparian land-cover layer loaded from Part 1, we'll begin by assessing land-cover over the entire clipped area. To do so, we'll use the Dissolve tool. This will combine feature geometries with matching entries in one or more of the selected Dissolve fields – resulting in multi-geometry outputs. This can be applied to any geometry type, as we've done previously, such as dissolving road segments by their full street name, grain elevators by consolidated company or census tracts by census metropolitan area. Here we'll dissolve by the "Class" field. Save the layer to File – which I'll call DRipLC2000 – with the D for Dissolved. Click Run and once complete we'll continue.

So with the Dissolved layer loaded and symbolized - the original RipLC2000 file contains around 11000 features, while our dissolved layer contains only the number of unique land-cover classes within our clipped area – in this case 12. As noted previously, fields with spatial measurements are not automatically updated when geometries of a layer are changed, such as being clipped or dissolved. So now you can update the IAreaHA field with the Field Calculator to determine the total coverage of each class. Use the established update field procedures and appropriate expression.

So with the field updated, we'll use the Statistics Panel to determine the total riparian area - clicking the icon on the Attribute toolbar Select the dissolved layer from the first drop-down and the field to summarize from the second. We can select categorical or numerical fields to summarize. Here we're interested in IAreaHA and specifically

the Sum value. The specific statistical summary variables of interest can be specified by expanding the triple dot icon. This gives us a general understanding of the count, central tendency, distribution and variance of the variable for all features in the layer. Copy the Sum value, which we'll use to calculate the percent coverage of land-cover classes.

In the Field Calculator, we'll name the field PrcRipLC for percent riparian land-cover, with the previously applied parameters. Expanding the fields and values drop-down - divide IAreaHA by the pasted Sum value and multiply by 100.

Opening the attribute table and sorting by the percent field we can see the predominant land-cover classes. Wetland, Grassland and Deciduous Forest are the three most prevalent classes covering around 82% of the riparian area - indicating relatively healthy conditions. Anthropogenic land-uses, comprised of Built-Up and Agriculture, account for roughly 14% of the riparian land-cover - - unsurprising with Winnipeg and intensive surrounding agricultural land-use within our clipped area. Overall, the dominance of naturalized classes indicates a strong riparian health given the location. We'll use the Statistics Panel again to verify that our percentages add up to 100%.

So this provides a general assessment of conditions within our clipped area. However, to inform land-use planning and target restoration initiatives a finer resolution analysis would be required. So we'll use the Aggregate tool, with the original riparian land-cover layer and the ID field created at the end of part I, to establish land-cover variations

by watershed. Aggregate can be used to combine the geometries of a layer - according to the Group By parameter - and the attributes of a layer with the operators in the Aggregate function drop-downs.

So for SubBasin, Class and UBasinLCID fields we'll use First Value - which will match subsequent entries given our group-by field. For FAreaHA and PrcLCinRip we'll use mean - for the average field size and percent coverage within riparian areas of each class. We'll remove the FID field and leave IAreaHA with Sum to determine the total area of each class by watershed. We'll save to file, calling it RipLC2000WSHed. Click Run and we'll continue once the output is created.

Now we have the total area of riparian land-cover classes by watershed. Aggregate has summed the IAreaHA field - meaning we do not need to update with the Field Calculator. However, we need to determine the total riparian area of each watershed to determine the percent coverage of each class within.

For the first, we'll use an Aggregate expression. Call the field HAreaHA and enter the additional parameters. Expand the Aggregates drop-down and double-click Sum. Enter the expression, first specifying the field to sum - IAreaHA - and the group by parameter used to sum the values - typing group underscore by colon equal sign (group_by:=) and entering the subbasin code field. We could optionally apply a filter expression to only sum features with specified conditions.

Now we can calculate the percent coverage- dividing IAreaHA by HAreaHA and multiplying by 100.

We could then use the Aggregate or Statistics by Categories tools to ensure percentages add up to 100% for each watershed. I prepared an Aggregate layer earlier for this purpose, as well as two statistics by categories outputs – which we'll discuss shortly. Opening the Aggregate layer's attribute table percentages vary between 99.99 and 100.01 percent. However, we can see that the summed intersect area and the total riparian watershed area are equal – suggesting this is related to rounding of decimal places. Using the Refactor Fields tool I increased the precision of the percent riparian land-cover area field to 12 and reran the layer through Statistics by Categories – which shows that all percentages add up precisely to 100%.

Statistics by Categories generates statistical summaries of a selected field, numeric or text, by another field with categories. We could apply it to our original intersect layer to assess variations in the area of classes by watershed using UBasinLCID as the categorical field. Thus, we can use Statistics by Categories to provide an understanding of the counts, distribution, variance and central tendencies of a numeric field by different categories. This information can then be used for descriptive analysis, or fed into further assessments as required.

And just before concluding we'll go over geoprocessing tools not covered in the demo, and show some additional buffer tools and another case-use to highlight the diverse applications of these tools.

So the first tool is Union. This is similar to Intersection with two notable exceptions. Union is restricted to polygon inputs for both layers and retains overlapping and non-overlapping geometries. Overlapping features will contain entries for all fields in the attribute table, while areas of separate coverage contain NULL entries for one of the associated layers. Union is used to combine geometries and

attributes into a single layer for further analysis – - such as combining habitat extents and counts of different species in separate layers or suitabilities of different land-uses into a composite layer for assessing total biodiversity potential or land-use suitability. Here I combined a circular polygon with our AOI layer, with both overlapping and non-overlapping areas retained.

Symmetrical Difference is the opposite of the Union tool. It retains features of both the Input and Overlay layer in locations where their features do not overlap. As such, it can be applied to keep the attributes and geometries of two layers in areas of disparate coverage – such as retaining farm fields that have historically remained unflooded - and flooding areas that did not impact farmland or other human land-uses. Once again I used the circular polygon and AOI layer as the inputs. And as shown, only non-overlapping geometries and attributes were retained.

As noted, here are some additional buffer tools that have been processed further with additional geoprocessing tools. For example, we could create a multi-ring buffer around grain elevators and intersect them with the clipped land-cover layer to establish variations in incremental distances around the grain elevators. Intersecting this layer again, we can isolate locations within the buffer that have been affected by historical flooding. We could also create a multi-ring buffer around our road features to assess pollutant concentrations at incremental distances. With a buffer width field we could also apply a variable width buffer to the different road feature classes.

Finally as a different case-use I used geoprocessing tools to estimate populations around the new O-train stations. First a 500 metre buffer was created around the O-train stations and intersected with the

census dissemination areas, which had joined demographic variables. This was then intersected with a built-up layer, to remove any undeveloped areas. The population density and remaining area was then used to approximate the number of residents around the new O-train stations. We could further this analysis – such as subsetting by different phases of the LRT or combining with additional socio-economic variables to assess median income of residents around these stations. Thus geoprocessing tools have diverse analytical applications, in spatially overlaying any layers of thematic interest, and integrating their feature geometries and attributes.

(The words: "For comments or questions about this video, GIS tools or other Statistics Canada products or services, please contact us:

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