

## **Lesson 2: Land Use/Land Cover Data**

In this lesson you will work with polygon data describing the types of natural land covers and human land uses in each watershed. We will view and explore this data to learn about land uses and land covers and see how these uses are distributed across the watersheds. This is leading us toward our spatial analysis in which we will remove the areas that are already classified as urban and evaluate the remaining areas to see if they are suitable for the expansion of human settlements.

This lesson is only our first step in working with land use/land cover (LULC) data. We will use a raster form of LULC in lesson 4 when we do some spatial analysis to see where urban land use might expand in each watershed. Don't worry about spatial analysis yet – although later you will see how easy it is using GIS! The important objective of this lesson is to get familiar with the LULC data.

We will also see how close your estimates about urban and agricultural land uses were from Lesson 1.

Below are the LULC definitions that we will use (these LULC categories are aggregated categories developed from the original LULC data to provide easier analysis and visualization for the purposes of this project):

### Land Use/Land Cover definitions for the Big Thompson Watershed

Urban – this includes human settlement uses such as urban (city/town), residential, industrial, major transportation corridors, etc.

Agriculture – this includes farming, orchards, and other types of intensive agriculture. It does not include rangelands.

Rangeland – grazing lands not part of intensive agriculture.

Forest – this includes all types of forest such as conifer/softwood and deciduous/hardwood.

Lakes – this includes all large bodies of water such as lakes and reservoirs.

Forested Wetland – this includes wetlands in forested areas.

Nonforested Wetland – these are wetlands without nearby forest cover.

Rock – this includes all exposed rock without vegetation.

Mines – this includes all mining operations.

Tundra – this includes all types of tundra.

### Land Use/Land Cover definitions for the Espiritu Santo Watershed

Urbano - this includes human settlement uses such as urban (city/town), residential, industrial, major transportation corridors, etc.

Agricola y pasto - this includes farming, pastures, and other types of intensive agriculture.

Cocales – coconut groves.

Humedales forestados – forested wetlands, particularly coastal mangrove forests.

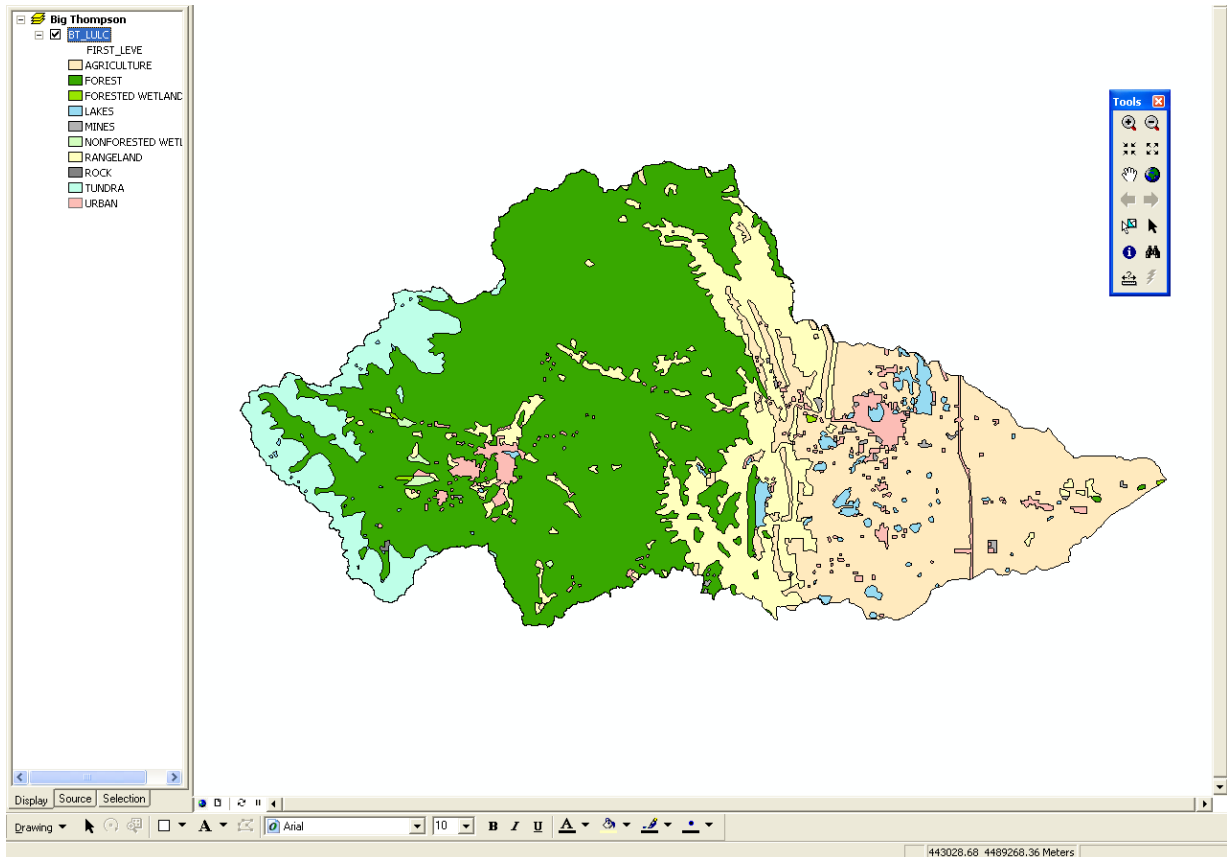
Humedales sin forestar – wetlands without nearby forest cover.

Agua – all large bodies of water including lakes, reservoirs, and major rivers.

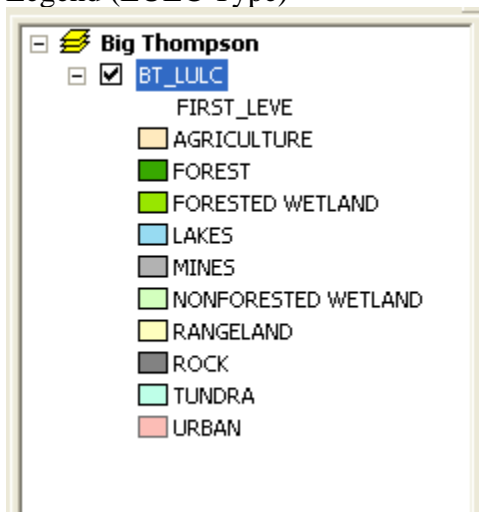
Bosque cerrado – forest cover in which the tree canopy is closed.  
Bosque abierto – forest cover in which the tree canopy is open.  
Suelo sin vegetación – bare soil without vegetation.

## Big Thompson Watershed Land Use/Land Cover Data

Below is a display that illustrates the LULC data for the Big Thompson watershed.



### Legend (LULC Type)



You can now see all of the different land uses and land covers for the Big Thompson Watershed.

Which **two** LULC types look as if they cover the largest area? \_\_\_\_\_

Let's now look at the actual areas covered by each land use or land cover by using the attribute table of the Big Thompson LULC data layer.

FID	Shape	FIRST_LEVE	LandUse	AREA	ACRES	HECTARES
0	Polygon	URBAN	1	64061994.826	15830.064	6406.199
1	Polygon	AGRICULTURE	2	529822868.201	130922.082	52982.287
2	Polygon	RANGELAND	5	278530701.677	68826.435	27853.07
3	Polygon	FOREST	4	1082158581.098	267407.208	108215.858
4	Polygon	LAKES	3	33622737.654	8308.359	3362.274
5	Polygon	FORESTED WETLAND	7	1864545.629	460.739	186.455
6	Polygon	NONFORESTED WETLAND	8	4559487.688	1126.674	455.949
7	Polygon	ROCK	9	555598.264	137.291	55.56
8	Polygon	MINES	6	6791309.82	1678.169	679.131
9	Polygon	TUNDRA	10	151520516.624	37441.535	15152.052

The fields of interest in this table are:

**FIRST\_LEVE:** These are the land use and land cover names. See the introduction of this lesson for a description of the land uses and land covers listed here.

**LandUse:** This identifies each of the land uses or land covers in **FIRST\_LEVE** by a unique number.

**AREA:** This gives the total area of each land use/land cover in square meters.

**ACRES:** This gives the total area of each land use/land cover in acres.

**HECTARES:** This gives the total area of each land use/land cover in hectares.

**Questions:**

What is the greatest land use/land cover by area in the Big Thompson watershed? \_\_\_\_\_

How many hectares is it? \_\_\_\_\_

What percentage of the total watershed area does this land use/land cover occupy? (HINT: the total area of the Big Thompson watershed is 215,350.827 hectares) \_\_\_\_\_

How many hectares are covered by agricultural use? \_\_\_\_\_

What percentage of the total watershed area does agricultural use occupy?  
\_\_\_\_\_

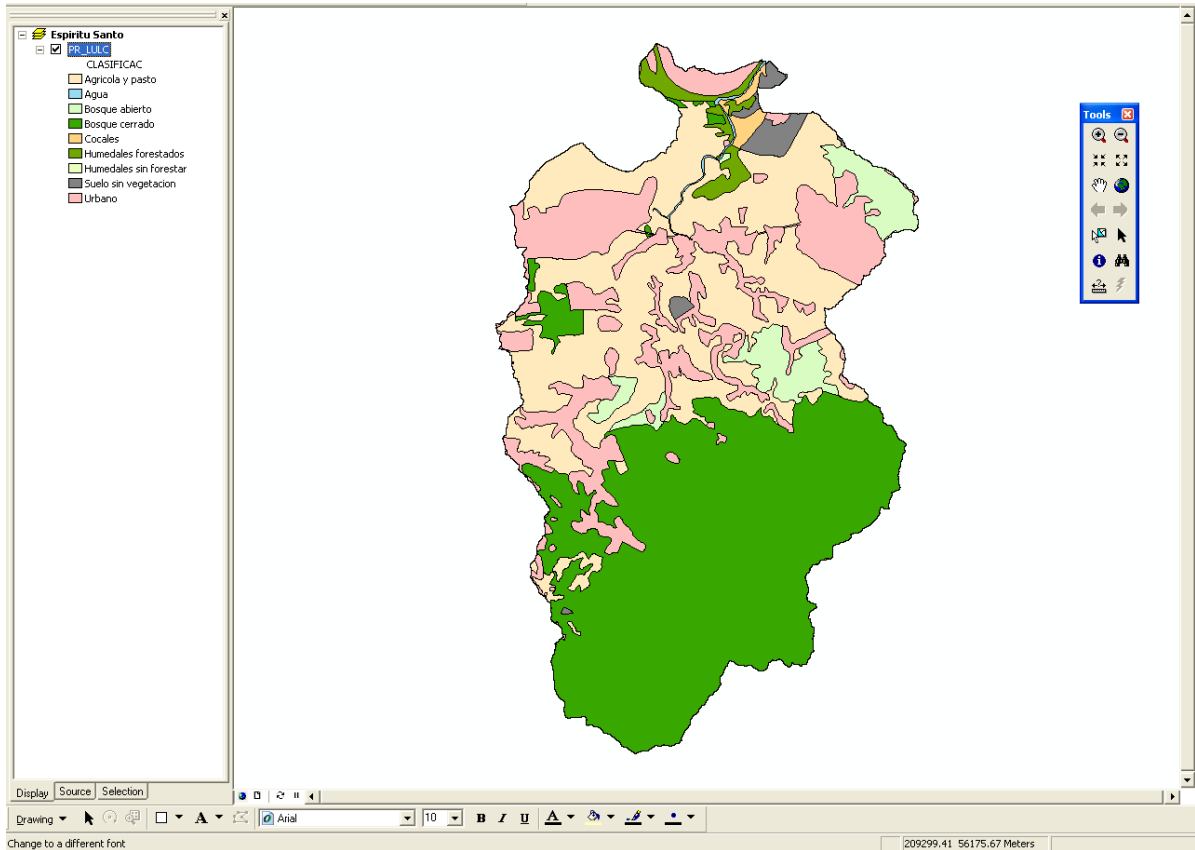
How many hectares are covered by urban use? \_\_\_\_\_

What percentage of the total watershed area does urban use occupy? \_\_\_\_\_

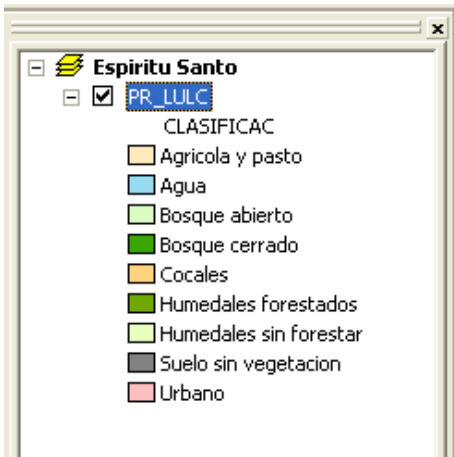
Let's go through the same analysis for the Espiritu Santo Watershed.

### Espiritu Santo Watershed Land Use/Land Cover Data

Below is a display that illustrates the LULC data for the Espiritu Santo watershed.



Legend (LULC Type)



Which two LULC types look as if they cover the largest area? \_\_\_\_\_

Let's now look at the actual areas covered by each land use or land cover by using the attribute table of the Espiritu Santo LULC data layer.

FID	Shape <sup>a</sup>	CLASIFICAC	AREA	ACRES	LandUse	HECTARES
0	Polygon	Urbano	17674418.4	4367.444	1	1767.442
1	Polygon	Suelo sin vegetacion	1347380.069	332.945	9	134.738
2	Polygon	Cocales	560383.036	138.474	6	56.038
3	Polygon	Humedales forestados	1655705.342	409.134	7	165.571
4	Polygon	Humedales sin forestar	2528.24	0.625	8	0.253
5	Polygon	Agua	227018.418	56.097	3	22.702
6	Polygon	Bosque cerrado	40820418.744	10086.945	5	4082.042
7	Polygon	Bosque abierto	4809558.519	1188.468	4	480.956
8	Polygon	Agricultura y pasto	28206164.746	6969.895	2	2820.616

The fields in this table are:

**CLASIFICAC:** These are the land use and land cover names . See the introduction of this lesson for a description of the land uses and land covers listed here.

**AREA:** This gives the area of each land use/land cover in square meters.

**ACRES:** This gives the area of each land use/land cover in acres.

**LandUse:** This identifies each of the land uses or land covers in CLASIFICAC by a unique number.

**HECTARES:** This gives the area of each land use/land cover in hectares.

Notice that some of the land uses and land covers are similar between the two watersheds and some are different. This is what we would expect considering where each watershed is located.

**Questions:**

**What is the greatest land use/land cover by area in the Espiritu Santo watershed? \_\_\_\_\_**

**How many hectares is it? \_\_\_\_\_**

**What percentage of the total watershed area does this land use/land cover occupy? (HINT: the total area of the Espiritu Santo watershed is 9530.83 hectares) \_\_\_\_\_**

**How many hectares are covered by agricultural use? \_\_\_\_\_**

**What percentage of the total watershed area does agricultural use occupy? \_\_\_\_\_**

**How many hectares are covered by urban use? \_\_\_\_\_**

**What percentage of the total watershed area does urban use occupy? \_\_\_\_\_**

So, how well did you guess about the percentages of urban and agricultural land use in Lesson 1? If you did well, congratulations! If you didn't, don't feel bad – it is very difficult to do by eye. That is why we are using a GIS!

This lesson should have added to your knowledge about the two watersheds and about how people are distributed across the watersheds and how they are using the land. You have also explored the use of vector (polygon) data in both Lesson 1 and Lesson 2. We will use the second data type, raster data, in Lessons 3 and 4.

### **Summary Questions**

**Which watershed has the highest TOTAL area (in hectares) covered by urban land use?**

\_\_\_\_\_

**Which watershed has the highest PERCENTAGE area covered by urban land use?**

\_\_\_\_\_

**One of the three uses you were asked about in earlier questions covers nearly the same percentage of land in each watershed. Which land use covers almost the same percent area in each watershed? \_\_\_\_\_**