

## ANSWER KEY FOR MODULES 2 THROUGH 6

### MODULE 2:

1. The physical size of a region is important for many reasons. For example, elected officials or land managers may need to know the size of a county, city, or particular management area to improve economics and to support decision-making activities. At local scales, farmers need to know the size or area of an agricultural field to determine how much seed to use. Real estate agents need to know the size of parcels to estimate value and determine cost.

By evaluating the *Utah Counties* data layer, identify the two largest and two smallest counties in Utah. You will need to sort the attribute *AREA (ACRES)* to identify these counties.

**What are the two largest counties in Utah by area? Identify names of counties and area in acres.**

**San Juan County - 5,075,154 acres**

**Tooele County - 4,663,363 acres**

**What are the two smallest counties in Utah by area? Identify names of counties and area in acres.**

**Morgan County - 390,689 acres**

**Davis County - 406,258 acres**

2. Turn on the *Utah Cities & Towns* data layer by placing a checkmark in the checkbox. This data layer is located above the *Utah Counties* data layer in the *Content* window. This data layer represents the locations and boundaries of cities and towns in Utah, and it is useful for identifying where people are located within the state of Utah.

By visually evaluating the *Utah Cities & Towns* data layer, identify the geographic region in Utah that appears to have the greatest number of cities. You can identify regions of the state, such as Southwestern Utah, or you can identify counties.

**What regions or counties in Utah appear to encompass the greatest number of cities and towns?**

**Wasatch Front, North Central Utah, or Salt Lake, Utah, Davis, and Weber counties**

By evaluating the attribute table associated with the *Utah Counties* data layer, identify the county that contains the greatest number of cities and towns and identify the county that contains the fewest number of cities and towns. You will need to make sure that the attribute *NUMBER OF CITIES* has been selected in the *Configure Attributes* window and added to the attribute table. You will then need to sort the attribute in either ascending or descending order.

**What county in Utah contains the greatest number of cities and towns? Include the name of the county and the number of cities and towns.**

**Utah County - 26 cities**

**What county in Utah contains the fewest number of cities and towns? Include the name of county and the number of cities and towns.**

**Morgan County - 1 city**

3. Turn on the data layer *Utah Land Ownership* by placing a checkmark in the checkbox. This data layer is located below the *Utah Counties* data layer in the *Content* window. This data layer represents **land ownership** in Utah, or the the owner or proprietor of the land.

The type, amount, and distribution of land ownership is important for land managers and planner when considering the development of urban areas and the protection of ecologically and culturally sensitive lands. Land ownership in Utah can be broadly divided into four categories: federal, private, state, and tribal. Federal lands are lands owned and managed by departments and agencies of the federal government, such as the Forest Service, Bureau of Land Management, or Department of Defense. Many of these lands are accessible for public use and recreation. Private land is land owned by non-governmental legal entities. State lands are lands managed by state agencies. Tribal lands are lands owned and managed by sovereign tribal nations.

**By visually evaluating the Utah Land Ownership data layer, who appears to be the majority land owner in Utah?**

**Federal agencies/entities**

By evaluating the attribute table associated with the *Utah Counties* data layer, identify the county that contains the greatest area (in acres) of federal land and identify the county that contains the greatest percentage of private land. You will need to make sure that the attributes *FEDERAL OWNERSHIP (ACRES)* and *PRIVATE OWNERSHIP (PERCENT)* are added to the attribute table.

**What county in Utah contains the greatest area (in acres) of federal land? Include the name of the county and the number of acres.**

**Tooele County - 3,637,100 acres**

**What county in Utah contains the greatest percentage of private land? Include the name of the county and the percentage.**

**Box Elder County - 16.60%**

**MODULE 3:**

1. The population of cities and towns within a region is an important dynamic to understand because it influences the environment through the use of natural resources, through impacts to water and air quality, and through the production of garbage and sewage. Population is also important to understand because it allows city and county administrators to assess taxes that support the development of infrastructure and public utilities. Using the *Cache Cities & Towns* data layer, identify the two cities with the highest 2016 population and the two cities with the lowest 2016 population. You will need to open the attribute table and sort the attribute *2016 POPULATION* in either ascending or descending order.

**What two cities or towns have the highest population in 2016? Include the names of the cities/towns and the population counts.**

**Logan City - 49,539**  
**Smithfield City - 10,629**

**What two cities or towns have the lowest population in 2016? Include the names of the cities/towns and the population counts.**

**Cornish Town - 271**  
**Trenton Town - 451**

2. Using the *Cache CDPs* data layer, open the attribute table, and explore the data to identify the number of CDPs in Cache County and the area (in acres) and population of Benson CDP.

**How many CDPs are there in Cache County, Utah?**

**5**

**What is the area (in acres) and the 2016 population of Benson CDP?**

**Area = 38,446 acres; Population = 1,485**

3. Land ownership is an important factor in determining where future population growth and urban development may occur. Private lands are more likely to be sold to developers and municipalities for urban expansion and development. Using the *Cache Land Ownership* data layer, click on any polygon that represents private land. Evaluate the pop-up window and attribute table to identify how many acres of private land there is in Cache County.

**How much private land (in acres) is there Cache County?**

**764,817 acres**

4. The area of a city, town, or municipality frequently influences the impact on the local environment. The area can impact how and where urban development occurs and it can affect transportation networks, water supplies, sewer treatment, and open space. Using the *Cache Cities & Towns* data layer, evaluate the attribute table to determine which city or town has the greatest area and which city has the smallest area in Cache County, Utah.

**What city or town has the greatest area (in acres)? Identify the name of the city or town and the area (in acres).**

**Lewiston City - 29,435 acres**

**What city or town has the smallest area (in acres)? Identify the name of city or town and the area (in acres).**

**River Heights City - 761 acres**

**Does this correspond to the size of the population? Use your answers from Question 1 to make a comparison and note any observations.**

**No, the area of a city/town does not necessarily correspond to the size of the population.**

5. Annual growth rates are important indicators of population change. High growth rates suggest that the population is growing quickly and that urban development needs to expand to accommodate that growth. Using the *Cache Cities & Towns* data layer, identify the top three cities with the highest growth rates. You will need to make sure that the attribute *ANNUAL GROWTH RATE (%)* has been added to the attribute table and you will need to sort the column in either ascending or descending order.

**What three cities or towns have the highest annual growth rates? Identify the names of the cities/towns and the growth rates.**

**Nibley City = 6.67%**

**North Logan City = 3.75%**

**Providence City = 2.95%**

6. The population density of cities and towns can have differing impacts on environmental resources. In Cache County, cities and towns with low population densities generally occupy greater areas. With greater areas and more diffuse populations, the infrastructure and environmental costs may be higher. Using the *Cache Cities & Towns* data layer, identify the cities or towns with the lowest and highest population densities. You will need to make sure that you have created and calculated the new attribute *2016 POPULATION DENSITY*.

**What city or town in Cache County has the lowest population density in 2016? Identify the name of the city or town and the population density.**

**Cornish Town - 7.74 persons/square mile**

**What city or town in Cache County has the highest population density in 2016? Identify the name of the city or town and the population density.**

**River Heights City - 1,731.85 persons/square mile**

#### MODULE 4:

1. The size of a watershed can frequently indicate the amount of water that is collectively discharged from a topographic area. Planners and administrators can use this information to estimate how much water may be available for various uses, such as drinking water, irrigation, wildlife, and recreation. Also, by knowing the location of a watershed in relation to urban development, planners and administrators can account for several environmental concerns, such as water quality and water quantity.

By using the *Logan City Watersheds* data layer that you created in this module, identify the largest of the four watersheds that intersects with Logan City. You will need to open up the attribute table and sort the column *AREA\_ACRES*.

**What is the name of the largest watershed that intersects with Logan City?**

**Blacksmith Fork**

**What is the area (in acres) of this watershed?**

**328,897 acres**

By using the *Cache Watersheds* data layer that you created in this module, identify the watershed that the town of Paradise is located within. You can identify this watershed by visually examining the data or by developing a spatial query.

**What is the name of the watershed that intersects with the town of Paradise?**

**Headwaters Little Bear River**

**What is the area (in acres) of this watershed?**

**247,924 acres**

2. Clean rivers and streams are critical components of healthy thriving communities. Not only do clean rivers and streams provide safe drinking water, they are also critically important for wildlife, recreation, and irrigation. However, as urban and industrial development expands, clean rivers and streams may become polluted from improper use and management. The impacts of urban and industrial development on rivers and streams can be minimized by creating riparian buffers. Riparian buffers can limit the pollution that enters waterways and they can reduce flood-related damage.

Using the skills that you learned from the Summit Creek exercise, select the Little Bear River from the *Cache Rivers & Streams* data layer and place a 200-foot buffer around it. You will need to use the *Filter* tool to select the Little Bear River from the *Cache Rivers & Streams* data layer. You will then need to use the *Create Buffers* tool to place a 200-foot buffer around the Little Bear River.

**What is the length (in miles) of the Little Bear River?**

**33.45 miles**

**What is the total area (in square miles) of the 200-foot buffer that surrounds the Little Bear River?**

**2.42 square miles**

3. Wetlands are important aquatic features that provide a range of benefits for both humans and wildlife. They provide critical wildlife habitat, they filter pollution, they provide storm and flood water control, and they provide scenic and recreational opportunities. Due to significant losses of wetlands in the United States, it is important for counties and cities to create wetland inventories.

Using the *Cache Wetlands* data layer, identify the total area of riverine wetlands and herbeceous wetlands in Cache County. You will need to review the attribute table associated with the *Cache Wetlands* data layer.

**What is the total area (in acres) of riverine wetlands in Cache County?**

**785.92 acres**

**What is the total area (in acres) of herbaceous wetlands in Cache County?**

**19,659.20 acres**

4. The town of Trenton is interested in asking the State of Utah for some funds to improve and establish playa wetlands to attract nesting snowy plovers (<https://www.audubon.org/field-guide/bird/snowy-plover>). Populations of snowy plovers have declined in some regions due to human disturbance and lack of high-quality nesting habitat. The town of Trenton would like to improve their local economy by developing a bird-watching tourism and bird conservation program.

If the town of Trenton is interested in eventually managing a total of 200 acres of playa wetlands, how much playa wetland do they need to establish to meet this goal? In order to determine this, you will need to use the skills that you learned from the Lewiston City exercise. You will need to use the *Filter* tool to select the town of Trenton from the *Cache Cities & Towns* data layer, and then you will need to use the *Summarize Within* tool to calculate the area of different wetland types in Trenton. You can name the new data layer *Trenton Wetlands*. Once you have identified the area (in acres) of playa wetlands in the town of Trenton, you will want to subtract that value from 200 acres.

**What is the total area (in acres) of wetlands within the town of Trenton?**

**396.45 acres**

**What is the total area (in acres) of playa wetlands in the town of Trenton?**

**22.32 acres**

**How many acres of playa wetlands would the town of Trenton need to establish to meet their goal of 200 acres?**

**177.68 acres**

## MODULE 5:

1. Planners and administrators understand that building in floodplains must be done with extreme caution. Therefore, it is often better, in terms of public safety and welfare, to restrict urban development in these areas. If Wellsville City was developing a comprehensive city plan that protected floodplains for safety, wildlife habitat, and recreation, they would need to know the location and area of these floodplains. They may also be interested in knowing what percentage of the city was classified as floodplains. To determine this, you will need to know the area of floodplains within Wellsville City and the total area of Wellsville City. You determined the area of floodplains within Wellsville City in the first exercise of this module. You can find the total area of Wellsville City in the attribute table associated with the *Cache Cities & Towns* data layer. The equation to calculate the percentage is:

Percent Floodplain = (Acres of Floodplain with Wellsville/Total Area of Wellsville) x 100

**What is the total area (in acres) of the 100-year floodplain within Wellsville City?**

**356.20 acres**

**What is the total area (in acres) of Wellsville City?**

**8,234 acres**

**What percent of Wellsville City is classified as 100-year floodplain?**

**4.33%**

2. Urban planners and administrators should be cautious when permitting urban and industrial development on lands susceptible to liquefaction, particularly those that have been assigned high and moderate-to-high ratings. The county planner has asked you to just map the liquefaction zones with high (7) and moderate-to-high (6) ratings. Once you have done that, you will need to identify the top three cities or towns that have the greatest area of high and/or moderate-to-high liquefaction zones.

**What is the total area (in acres) of high liquefaction zones in Cache County?**

**9,934.18 acres**

**What is the total area (in acres) of moderate-to-high liquefaction zones in Cache County?**

**17,211.75 acres**

**What three cities/towns have the greatest area of high and/or moderate-to-high liquefaction zones? Include names of cities and area (in acres) of liquefaction zones.**

**Logan City - 1,936.61 acres**

**Nibley City - 878.15 acres**

**Lewiston City - 837.46 acres**

3. Since earthquake fault zones can be extremely dangerous to build on, planners and administrators should establish regulations and restrictions for building on and around fault zones. In most instances, these areas are better left undeveloped and maintained as natural open space for use by recreationists and wildlife.

One of the most visible fault zones in Cache County is the Cache Fault Zone on the east side of Cache Valley. The East Cache Fault Zone Central Section and the East Cache Fault Zone Northern Section traverse the most populated municipalities in Cache County. The county planner has asked you to identify what cities or towns would be affected by earthquake events that occurred along these two fault zones.

**How many cities might be affected by an earthquake event along the East Cache Fault Zone Central Section and/or the East Cache Fault Zone Northern Section?**

**8**

**Of these cities, what three that have the greatest 2016 population? Identify the names of cities and the 2016 population.**

**Logan City - 49,539**

**Smithfield City - 10,629**

**North Logan City - 9,820**

**What is the total length (in miles) of the East Cache Fault Zone Central Section and the East Cache Fault Zone Northern Section?**

**70.26 miles**

4. Fires that occur within or near city and town boundaries pose a significant threat to public safety and welfare. Without proper fire management planning, there is a risk to life and property. Additionally, air and water quality may be affected and wildlife habitat may be destroyed or degraded. By evaluating the *Cache Fires* data layer and the *Cache Fires Urban* data layer that you created, answer the following questions:

**What is the name and area (in acres) of the largest fire that has occurred in Cache County? What year did this fire occur?**

**Millville - 2,200 acres**

**Year: 2013**

**What two cities or towns have the highest number of fires occurring within their boundaries? Identify the names of cities/towns and the number of fires?**

**Hyrum City - 6**

**Smithfield City - 6**

**How many fires have occurred within Logan City?**

**5**

## **MODULE 6:**

1. Urban planners and wildlife managers in Cache County are interested in the area of different habitat types, specifically crucial habitat. By opening up the attribute table associated with each habitat data layer, identify the area of each specified habitat type.

**What is the total area (in acres) of crucial summer and crucial winter mule deer habitat?**

**962,818 acres**

**What is the total area (in acres) of crucial Rocky Mountain elk habitat? This includes crucial summer, crucial winter, and crucial winter/spring habitat.**

**936,795 acres**

**What is the total area (in acres) of crucial year-long sharp-tailed grouse habitat?**

**293,836 acres**

- Using the the *Cache Important Habitat* data layer that you created, identify the total area of important habitat in square miles and square kilometers. To do this, you will need to use another tool within the *Manage Data* tools. First, open up the attribute table associated with the *Cache Important Habitat* data layer. You will notice that there are 13 features. If you examine the area fields, it appears that there are duplicate values. You will need to combine all the features, remove (or dissolve) the boundaries, and create one single polygon feature.

**What is the total area (in square miles) of important habitat in Cache County?**

**208.17 square miles**

**What is the total area (in square kilometers) of important habitat in Cache County? You will need to calculate this value by creating a new field within the attribute table.** You may need to refer to *Module 3 - Understanding Population Dynamics* to review how to add a new field to the attribute table. Hint: Square Kilometers = Square Miles \* 2.58999.

**539.16 square kilometers**

- Now that you have created a single-feature data layer that includes important wildlife habitat in Cache County, urban planners and wildlife managers are interested in identifying which cities or towns have the greatest area within their municipal boundaries. You will have to review some of the work you did in previous modules to do this. You will need to click on the *Analysis* button, then click on *Summarize Data*, and then click on *Summarize Within*.

**What three cities or towns encompass the greatest area of important wildlife habitat? Include the names of the cities/towns and the area in acres.**

**Logan City - 1,237.31 acres**

**Lewiston City - 948.62 acres**

**Trenton Town - 606.11 acres**