## LESSON #2: BIOPHYSICAL AND SOCIAL DRIVERS

### OVERVIEW:

*In this lesson, students will learn about the various biophysical and social drivers which impact land use in detail. They will then use their knowledge about urban land use as a class to explore various data sources (maps, charts, figures, etc.) to determine how these drivers have influenced land use in New Orleans. Students will then relate their understanding of the case study to the Ecological Services Model.*

### SUB-QUESTION:

How do humans use land to support their needs?

### WAYS OF KNOWING URBAN ECOLOGY:

|  |  | *Students will…* |
| --- | --- | --- |
|  | ***Understand*** | • Understand that biophysical and social drivers influence the structure and function of an ecosystem.<br>• Understand that many different biophysical and social drivers exist and interact to influence land use policies. |
|  | ***Talk*** | *No specific goals connected with talking about urban ecology in this lesson.* |
|  | ***Do*** | • Do a case study of an urban city to determine what types of biophysical and social drivers have influenced its current structure and function. |
|  | ***Act*** | *No specific goals connected with acting on urban ecology in this lesson.* |

### SAFETY GUIDELINES:

No specific safety issues are associated with this lesson.

### PREPARATION:

#### Time:

2-3 class periods
        Day 1: Activity 2.1
        Day 2: Activity 2.2

#### Materials:

#### Activity2.1

For each student:
        Copies of the Ecological Services Model
        Definitions of Drivers Worksheet (optional)

**Activity 2.2**

> LCD Proejector
> M2_L2.2_New Orleans Power Point
> M2_L2.2_Elevations. pdf
> M2_L2.2_*S*_New Orleans Worksheet

## INSTRUCTIONAL SEQUENCE

### Activity 2.1: Biophysical and Social Drivers

1. Begin by reviewing the ecological services model.

2. Tell students that they will be thinking specifically on understanding forces and drivers (biophysical/social) and their relation to ecosystem services in this lesson.

3. Discuss how biophysical and social drivers fit into the ecological services model as well as how these drivers influence and inform the way land use in an urban environment. You may wish to write these down unorganized on the board. Once the students have finished, organize the students' drivers into a table split between biophysical and social drivers.
   A. Discuss biophysical drivers such as:
      o Climate
      o Nutrient cycling
      o Geologic features and topography
      o Natural history
      o Ecological community composition
   B. Discuss social drivers such as:
      o Governance
      o Land use policies
      o Human demography
      o Economics
      o Cultural practices and beliefs
      o Social history
      o Aesthetics
4. You may need to add some of the drivers if students do not refer to them. Definitions of each are provided below. After brainstorming student ideas about drivers first, you may wish to distribute a copy of the definitions for your students and go over them considering some possible questions:
   i. Which of the drivers do you think has most influenced the organization of the city you live in? Why?
   ii. Can you give an example of how one of these drivers has impacted the organization of the city you live in or another city you are familiar with?

> *Teacher Background Knowledge*
> It is important to note that these drivers interact with one another in order to inform land use.
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> **Biophysical Drivers:**
> 1. *Climate:* factors such as precipitation patterns and temperature can influence the way that land is used by ensuring that buffer flood zones are maintained around rivers.
> 2. *Nutrient cycling:* Critical nutrients in an ecosystem such as nitrogen (found in proteins) and phosphorus (found in DNA) can severely limit the growth of populations. The rates at which nutrients move through an ecosystem can alter the distribution and density of organisms
> 3. *Geologic features and topography:* being surrounded by water or mountains/hills on more than one side can constrain urban growth and promote denser growth patterns, while a flatter topography can potentially result in easier access to developable land and lower development costs
> 4. *Natural history:* The historical composition of plant and animal populations can influence land use patterns. Fore instance, fire dominated ecosystems have a very different pattern of forest growth than do moist woodlands.
> 5. *Community composition (ecological):* Referring to the distribution and abundance of species, the healthiest ecosystems have a complex community structure that is resilient to disturbance.
>
> **Social Drivers:**
> 1. *Governance:* the type of leadership in a city, state, and/or country can influence the way that land is used and what the priorities are in land use planning. This is especially true with respect to the degree to which neighborhoods can chart their own futures.
> 2. *Land use policies:* The policies, rules, and restrictions in place inform the way that land is used and where a (human) community's priorities are placed. This is typically where we consider zoning regulations as having their greatest impacts.
> 3. *Human demography:* a growing human population requires a greater amount of land or a denser urbanization pattern. The age distribution of the population has a huge influence as well. School system budgets are very different in retirement communities versus neighborhoods of starter homes and apartments.
> 4. *Economics:* higher income areas are usually provided with land use patterns aligned with the desires of the local human population (e.g., more parks, bigger yards, shops, etc.), while lower income areas are usually provided with less desirable land use patterns (industry, fewer parks, higher population densities, etc.).
> 5. *Cultural practices and beliefs:* the larger cultural ideas around land use greatly informs the way that land is used and what the priorities are in land use patterns. If a culture favors public interaction, then common green space is more likely to be built in that neighborhood.
> 6. *Social history:* The historical record legacy of a community influences land use patterns. The mill towns of Massachusetts have factories along the waterfront that remain to modern times, even though the rivers are no longer used for hydropower or transportation.
> 7. *Aesthetics:* Although influenced by other factors (economics, culture, etc.), humans tend to develop land use patterns that "look good" in certain areas, while relegating non-desirable land use

5. Inform your students that existing urban ecosystems are the result of the interactions among these drivers, and due to the complexity of these interactions, every city is unique.
6. Tell your students that Urban Ecologists use a variety of tools to understand urban landscapes and connect back to the narrative reading. Tools include:
   o GIS (Geographic Information Systems, digital maps)
   o Census Data (human population data)
   o Biodiversity data

## Activity 2.2: Looking at New Orleans with Drivers and the Ecological Services

## **Model**

1. Tell students that they will be doing a case study of New Orleans using the ecological services model. You may want to have students brainstorm some main points they know about this urban city before beginning the powerpoint.
2. Begin the powerpoint presentation. There are Notes added on each slide that point out key points that students should discuss with each slide.
3. When you arrive at the slide focusing on the various elevations of land in New Orleans, you may want to distribute a photocopy of the that image because students will be asked to compare other images to that one as the presentation continues.
4. Once students have finished the slide show, you can distribute the Ecological Services Model worksheet which will have students consider the different influences on the ecosystem.
5. Perhaps the most interesting questions to address with students are
   a. "Why does New Orleans exist?"
   b. "What does that say about human land use policies?"
   c. "What factors have most influenced the current state of New Orleans?"
6. If time permits or as a possible homework assignment, it may be interesting to have students do a brief search to learn about the legacy of New Orleans. What were the drivers that established it in a city many years ago?