

## LESSON 1:

# CLIMATE CHANGE & TOURISM IN LA PLATA COUNTY



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### Driving Question:

How will climate change affect tourism in La Plata County?

### Sub-questions:

- Will there always be snow at Purgatory?
- Is being a raft guide a viable summer job?
- Does climate affect mountain biking? How?

### Goal:

For students to form a personal connection to climate change by identifying how it may affect activities of interest to them and economic opportunities important in La Plata County.

### Grade Level:

9<sup>th</sup> Grade

Lesson time: 1.75  
hours

### Climate literacy principle addressed:

- Principle 4 - Climate varies over space and time through both natural and man-made processes.
- Principle 7 - Climate change will have consequences for the Earth system and human lives.

### Learning Objectives:

- Students will form a personal connection to climate change by identifying how it might affect recreational activities of interest to them and important economic opportunities in La Plata County.
- Students will form hypotheses about how tourism in La Plata County might be affected by climate trends in the San Juan Mountains.
- Students will develop a climate-change forecast for a tourism recreation activity in La Plata County.

### Colorado State Standards:

- Earth Sciences Standard #4: Climate is the result of energy transfer among interactions of the atmosphere, hydrosphere, geosphere, and biosphere
  - Inquiry question #5: How have climate changes impacted human society?

## 9R Dashboards for Earth Systems Science - High School:

- HSS 4b. Analyze and interpret data on Earth’s climate (DOK 12) (I)
- HSS-4c. Explain how a combination of factors such as Earth’s tilt, seasons, geophysical location, proximity to oceans, landmass location, latitude, and elevation determine a location's climate (DOK 1-3) (E)
- HSS-4e. Analyze the evidence and assumptions regarding climate change (DOK 1-3) (E)
- HSS-4f. Interpret evidence from weather stations, buoys, satellites, radars, ice and ocean sediment cores, tree rings, cave deposits, native knowledge, and other sources in relation to climate change (DOK 1-3) (N)

### Prior Knowledge Required:

- Students must be able to compare and contrast climate and weather.

### Common student misconceptions and prior understandings:

- Students may not believe that climate change is happening, and thus be skeptical about its impacts on tourism.
- Students may confuse “natural variability” i.e. multi-year to decadal cycles (La Niña, El Niño, etc.) with climate change.

### Lesson 1 Materials and Handouts:

- "Climate & Tourism in La Plata County" - PowerPoint presentation
- *Article: Resorts Grapple with Global Warming* at:  
[http://www.durangotelegraph.com/04-12-30/cover\\_story.htm](http://www.durangotelegraph.com/04-12-30/cover_story.htm)
- Video: *Hotter, Drier Colorado* climate (7:59) at:  
<http://learnmoreaboutclimate.colorado.edu> (under the water tab)
- Reactions Recording Sheet
- Pre-assessment questions worksheet

### Introduction to Lesson/Background Information:

Is climate change going to have an effect on tourism in southwest Colorado? In this lesson students will analyze the relationship between climate and tourism and examine regionally specific climate data coupled with data from tourism companies to draw conclusions as to how climate change may impact a tourism activity of their choosing.

## Lesson 1 (1.75 hours)

### Enduring Understanding:

- Climate plays an important role in tourism in La Plata County and worldwide.
1. Have students fill out pre-assessment to understand the general understanding of climate change. (15 minutes)
  2. Watch video and hand out the Reactions Recordings Sheet (15 min)
    - *Hotter, Drier Colorado* climate video (7:59) from <http://learnmoreaboutclimate.colorado.edu> and fill out the "Reactions Recording Sheet"
  3. Read (10 min) "Resorts Grapple with Global Warming"
    - *Resorts Grapple with Global Warming* at: [http://www.durangotelegraph.com/04-12-30/cover\\_story.htm](http://www.durangotelegraph.com/04-12-30/cover_story.htm) and fill out the "Reactions Recording Sheet"
  4. Group brainstorm warm-up (10 min)
    - What activities do you like doing in La Plata County?
    - What activities do tourists/visitors like doing in La Plata County?
    - In which of those activities do climatology patterns in precipitation, temperature, etc. play a role? In other words, if we had a rainy climate like the Pacific Northwest, which activities might not be on your list? A tourist's list?
  5. Background information for teachers - to be presented to students as a brief PowerPoint presentation "Climate and Tourism in La Plata County" (10 min)
    - Tourism is the number one industry in La Plata County<sup>1</sup> and as such plays a major role in local employment, especially within the service sector. In 2006, overnight visitors were the "economic driver" for 18% of local employment<sup>2</sup>.
      - If they didn't brainstorm all of these things, mention: Tourism in La Plata County includes skiing at Durango Mountain Resort, whitewater rafting on the Animas River, hunting, fishing, golfing, visiting public lands, biking, hiking, hunting, fishing, and the Durango Silverton Train.

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<sup>1</sup> "La Plata County 2011." *Region 9 Economic Development District of Southwest Colorado*. Southwest Colorado Access Network, 2011. Web. 09 Aug. 2012. <<http://scan.org/5%20-%20La%20Plata%20County%20Update%202011.pdf>>.

- Climate is a major factor governing recreation-related activities. The World Tourism Organization (WTO) says that climatic factors are the "prime motivation for mass leisure travel."<sup>3</sup> Student Question: How will tourist activities and tourism marketing need to change as a result of climate changes (drier summer and winter, wetter spring, high temperatures year round)?
- In 1985, a Tourism Climatic Index (TCI) was developed to assess the world's climates for their suitability for tourism and recreation<sup>4</sup>.
- The TCI considers the following variables: maximum daily temperature, mean daily temperature, minimum daily relative humidity, daily relative humidity, precipitation, daily duration of sunshine, and wind speed. The TCI then rates a given location for a specific activity from "ideal" to "impossible."
- While TCI data specific to La Plata County (LPC) is not available, based on the prevalence of tourism in the county, it can be gathered that the climate is "ideal" for a wide range of tourism activities. Furthermore, on "Sperling's Best Places" comfort index, where the comfort index is based on humidity during hot months, Durango is a 73/100 while the U.S. average is 44/100<sup>5</sup> (higher is better).

6. Discussion (25 min): What specific climate change impacts will affect recreation in La Plata county?

- What are different climate change impacts of importance that will have an effect on La Plata County?
- What natural and human-induced factors are causing these changes?
- What forms of recreation will they affect? How can industries adapt to climate change?

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<sup>3</sup> 1st International Conference on Climate Change and Tourism. Proc. of Climate Change and Tourism, Tunisia, Djerba. 2003. 1-55. World Tourism Organization, 11 Apr. 2003. Web. 10 Aug. 2012. <[http://sdt.unwto.org/sites/all/files/pdf/tunisia\\_finrep\\_en.pdf](http://sdt.unwto.org/sites/all/files/pdf/tunisia_finrep_en.pdf)>.

<sup>4</sup> Long, Patrick. "Tourism and Climate Workshop: Introduction and Overview." Lecture. Climate and Tourism Workshop. CO, Boulder. 23 Jan. 2007. Web. 8 Aug. 2012.

<sup>5</sup> "Climate in Durango, Colorado." *Climate in Durango, Colorado*. Sperling's Best Places, 2010. Web. 10 Aug. 2012. <<http://www.bestplaces.net/climate/city/colorado/durango>>.

- Designate 4 groups- Count off in fours (1-4) and reorganize students into the following groups:
  - Alpine & Backcountry Skiing & Snowmobiling (Snow Sports)
  - Fishing, Rafting, Kayaking and Tubing (River Sports)
  - Four Wheeling, Motorcycling, Wildlife Viewing, Backpacking and Hiking (Mountain Sports)
  - Mesa Verde National Park, Durango and Silverton Train, Film Festival, Snowdown Celebration & Parade (Destination Events)
- Have each group pretend they are an executive or owner of their group's industry and create either a poster or act out a television commercial. In each group they should include a brief summary of the effects that climate change is having on each industry and a marketing strategy involving new activities that will keep the company in business. Have the groups define the audience and explain why the new activities appeal to them. Bring up the idea of any budget changes and risks that may be involved with the companies new activities.
  - Bring up the topic of economics involved with employees losing jobs and the number of employees each activity will require.
- Ask each group to answer the following questions:
  - How will climate trends affect your tourism industry?
  - How might the tourism industry adapt to climate trends to offer similar but different types of activities to increase or stabilize their client base?
  - What technology and industry advancements will be needed to adapt your tourist industry to new conditions?

Concepts to discuss as students share out:

- Shortening of snow season (because of early snowmelt in spring; more rain than snow in fall, spring and even winter at lower elevations; dust on snow which will accelerate snowmelt (more dust storms can result from climate change))
- Effects on fishing (fish population decreases with increased water temperatures; water quality from wildfires and large scale tree mortality, low flows in summer)
- Effects on skiing and other snow sports
- Effects on boating (Low flows in summer months)
  - Lower stream flows in summer because of early season runoff, greater water loss to evaporation because of climate warming.

- Increased risk of forest fires in summer (because of early snowmelt; increased dryness; hotter temperatures; and possibly more dead trees)
    - Wildfire scars landscape, affects water quality and wildlife
  - Large scale tree mortality (because of bark beetles; drought; hot temperatures. Bark Beetles are related to climate warming because the fewer amount of very cold nights increases the number of times they go through their life cycle, enabling them to reproduce faster.
7. Groups reporting out on tourism issues and adaptability (15 minutes)
- Wrap-up and final discussion. Answer any questions/misunderstandings.
  - Homework: Have student research a concept related to climate change impacts that came up in this lesson. It could be less snow, water shortages, wildfires, agricultural effects, etc. Have them find two sources from somewhere credible and somewhere non-credible and explain based on the Credible Sources Handout and Homework Sheet.