



An image from an instrument aboard NASA's Landsat Data Continuity Mission or LDCM satellite may look like a typical black-and-white image of a dramatic landscape, but it tells a story of temperature. The dark waters of the Salton Sea are shown in the semi-circle on the left-hand edge of the image. Crops create a checkerboard pattern stretching south to the Mexican border.

The size of this image is 26 km wide and 17 km tall. Each green square represents a planted crop measuring 160 meters on a side and an area of about 6 acres.

**Problem 1** - What percentage of the total area of this image is occupied by planted crops?

**Problem 2** – What percentage of all the farmed areas actually have growing crops?

**Problem 3** – The annual rain fall is about 3 inches per year (0.076 meters/yr). If one gallon of water has a volume of  $0.0038 \text{ meters}^3$ , how many gallons of water fall on the planted crop area each year?

New NASA Satellite Takes the Salton Sea's Temperature

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[http://www.nasa.gov/mission\\_pages/landsat/news/salton-sea.html](http://www.nasa.gov/mission_pages/landsat/news/salton-sea.html)

**Problem 1** - What percentage of the total area of this image is occupied by planted crops?

Answer: The total area of this image is  $26 \text{ km} \times 17 \text{ km} = 442 \text{ km}^2$ .

Students should count the number of green squares to tally the number of planted areas. A typical number would be about 50, so the total planted area is  $50 \times 0.16 \text{ km} \times 0.16 \text{ km} = 1.3 \text{ km}^2$ . The percentage of the total area is then  $100\% \times 1.3/442 = \mathbf{0.3\%}$ .

**Problem 2** – What percentage of all the farmed areas actually have growing crops?

Answer: This is a bit more difficult because students have to count all of the square patches that they can see in the image, not just the green ones. A typical answer would be about 100 patches, so the total number of green + brown patches is about 150, and so the percentage of the planted areas is  $100\% \times 50/150 = \mathbf{33\% \text{ or } 1/3}$ .

**Problem 3** – The annual rain fall is about 3 inches per year (0.076 meters/yr). If one gallon of water has a volume of 0.0038 meters<sup>3</sup>, how many gallons of water fall on the planted crop area each year?

Answer:

From Problem 1, the total planted area is  $1.3 \text{ km}^2$  or  $1.3 \times 10^6 \text{ meters}^2$ . If the rain covers a depth of 0.076 meters each year, the rain volume is just  $1.3 \times 10^6 \times 0.076 = 98800$  cubic meters. This equals  $98800 \text{ meters}^3 \times (1 \text{ gallon}/0.0038 \text{ m}^3) = \mathbf{26 \text{ million gallons each year}}$ .