Remote Sensing: Tracking the Salton Sea

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Abstract

The Salton Sea is a large lake created by an altered flow from the Colorado River. It has no point of outflow but is currently used as Imperial Valley's catch basin. It is now 25% saltier than the Pacific Ocean. LANDSAT images were taken of the area from 1985, 1995, and 2010 to monitor if the increasing salinity has caused the lake to shrink in size. The images were also used to monitor the amount of vegetation surrounding the sea. The images were both classified using a supervised classification and were all found to be over 98% accurate in the accuracy reports. A majority analysis was then performed before calculating change detection on the three different years.

1985 Original Image

1995 Original Image

2010 Original Image

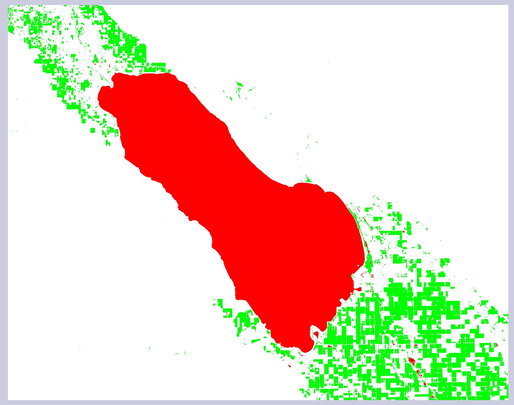
Introduction

The Salton sea was once one of the largest freshwater lakes in America. It is because of it's large size that the decision was made to use it as a catch basin. Water that drains from the surrounding vegetation is reintroduced into the irrigation system until it reaches a certain salinity level. Managers figured that because of it's large size, the saline irrigation water would not have any effect on the lake. But they were wrong. The Salton Sea is now at 4.0% m/v, which is saltier than ocean water. New fish species have been brought in and during the summer months when temperatures hit well over 120 degrees most fish species die.

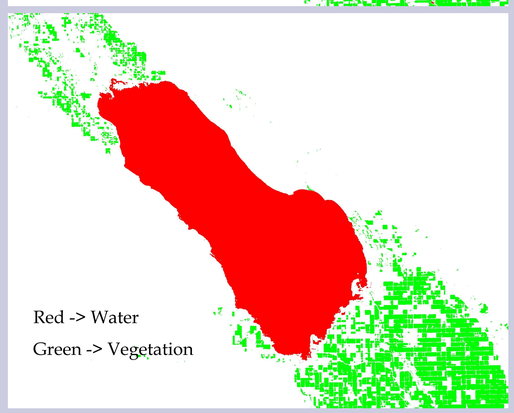
Landsat images of the Salton Sea were used to determine whether the increasing salinity had an effect on the size of the lake. It was also analyzed to see how the vegetation has been affected by the increased salt content, since sporadic floods often leave those plants under the Salton Sea's overflow. It is my belief that the vegetation will also be greatly affected due to the decrease in wildlife in the area. The decreasing number of fish leads to less birds frequent-

Methods

Three years with minimal cloud cover were selected to insert. The bands were then merged and clipped to focus mostly on the lake and the vegetation in the immediate area surrounding the lake. The area was clipped by drawing a polygon. All subsequent images were then clipped to match the 1985 image. Images were then classified into "Water", "Vegetation", and "Bare Soil." Since we were mainly concerned with the vegetation and water we were not concerned with the difference between sand and fallow ground. A majority analysis was then run on each image. Accuracy reports were generated from each image using point ROI's and achieved 98, 97.8, 99 percent accuracy respectively. A change detection analysis was then run to see how much the water and vegetation had been removed or added in that area. The analyses were run between 1985 and 1995, 1995 and 2010, and 1985 and 2010.



2010 Classified Image



1995 Classified Image

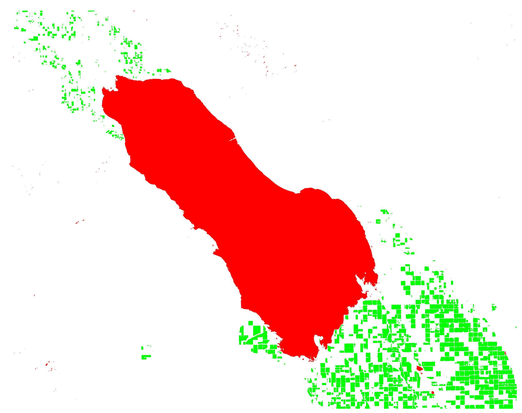
Results

For the change detection analysis run from 1985 to 2010 it was found that 5.7 square miles of water was lost from the lake and gained 66.82 square miles of vegetation. 8.49 square miles changed from water to bare earth while .52 square miles changed to vegetation. When looking at the 85 to 95 and 95 to 2010 change detection separately we see that the rate of water loss was greater (6.71 sq. miles) from 85 to 95. The rate of vegetation gained between 95 to 2010 is much less than the overall at 2.65 square miles with most of it changing to bare earth. The table below shows the way the different classes changed in each time period.

	Water	Vegetation	Bare Earth
85-95	-6.71	64.2	-57.49
95-10	1.01	2.65	-3.66
85-10	-5.7	66.82	-61.12

Conclusion

Although the change of the water is small in respect to the total area of the lake (5.7 sq. miles out of 359.27) and the vegetation has greatly increased since 1985 there is a much slower rate of growth over the last 15 years. As the amount of vegetation increases, the rate of saline water being deposited into this catch basin is increasing which will continue to slow the growth rate of vegetation in the area. As more salt is inserted into the Salton Sea the lake will continue to shrink. Action, such as inserting a desalination point, must be taken to maintain the health of the vegetation and the size



1985 Classified Image

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Howell, Laurie. "Profile: Effort under Way to save Salton Sea, an Inland Lake in California." *Weekly Edition: The Best of NPR News* 6 Jan. 2001. Print.