Draining and Re-flooding of the Mesopotamian Marshes: 1988 - 2015

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Purpose: To determine the amount of land cover change of the Mesopotamian Marshes in Iraq, as effected by the draining of the marshes during the 1990s and their subsequent re-flooding in the early 2000s.

Background: The Mesopotamian Marshlands lie within the Tigris-Euphrates river system, located mainly within Iraq. The marshes support a diverse ecosystem and the Marsh Arab society, but over the last three decades have undergone drastic changes. Dams were constructed along the rivers during the 1980s. Former Iraqi leader Saddam Hussein then ordered the marshes to be drained in the 1990s as a means of exacting political power over the residing Marsh Arabs.   The end of Saddam Hussein's reign in 2003 allowed for an initiative to re-flood the marshes. The draining of the marshes significantly altered the richness of the land in terms of sustaining a marsh environment, however, and it is questionable whether or not the marshes can be restored to their original size.

### Methodology | Classification

1. Retrieve two Landsat images [Path 166, Row 038 and Path 166, Row 039] from USGS GloVis taken during Iraq's rainy Feb-May season for each of the following years: 1988; 2000; 2004; 2015
2. Complete a layer stack of all available layers 1-7
3. Create five AOIs of each image: marsh vegetation, agriculture/light vegetation, water, dried marshland, and barren land
4. Perform supervised classification
5. Recode supervised images
6. Mosaic together two images for each year
7. Complete accuracy assessment

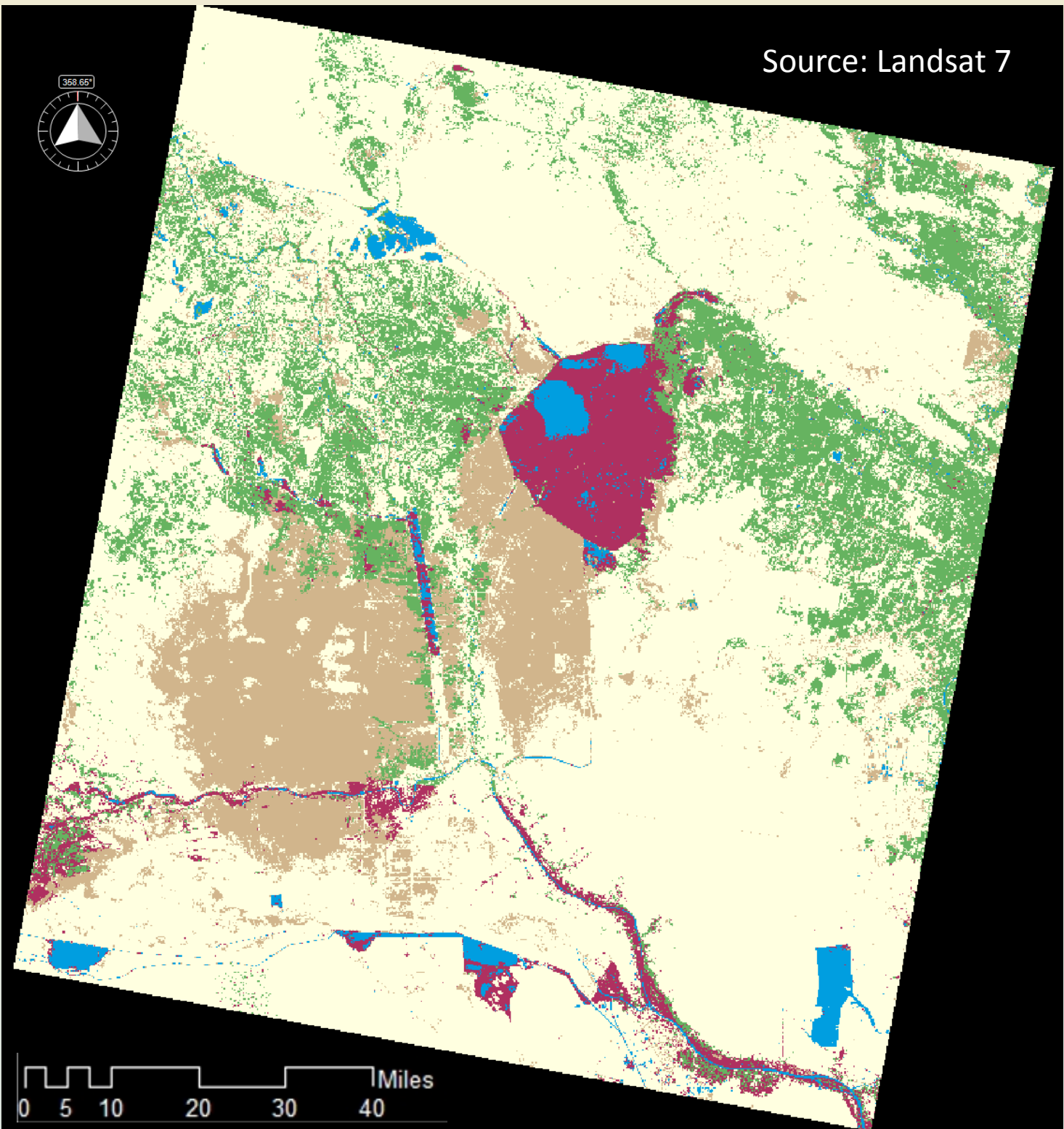### Methodology | TerrSet Land Change Modeler

1. Convert ERDAS file to Idrisi file
2. Adjust categories of new files (eliminate unclassified, rows 6-99)
3. Create new project
4. Input earlier & later images (same resolutions & legends)
5. Harmonize legends
6. Produce & analyze change maps & charts
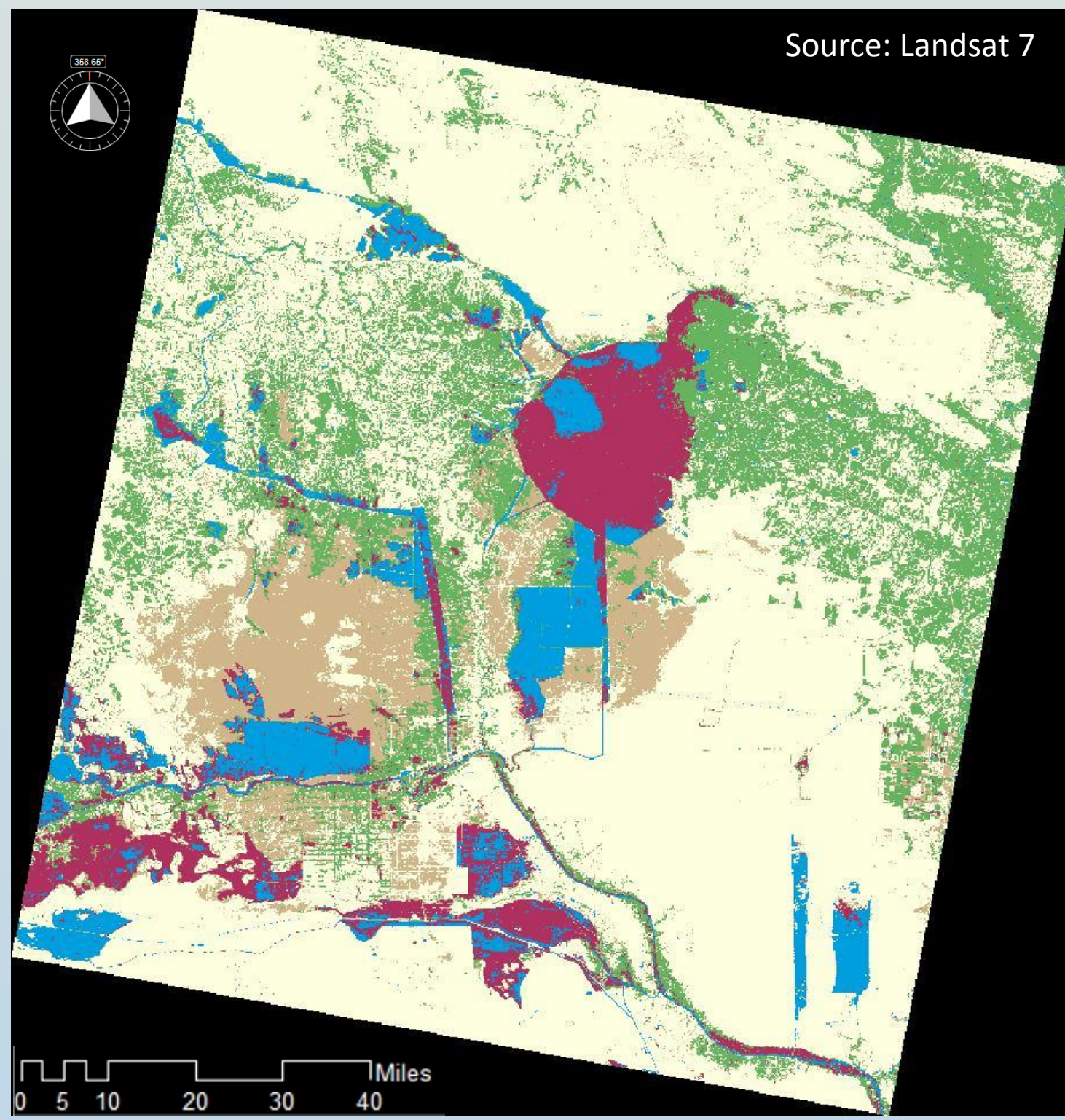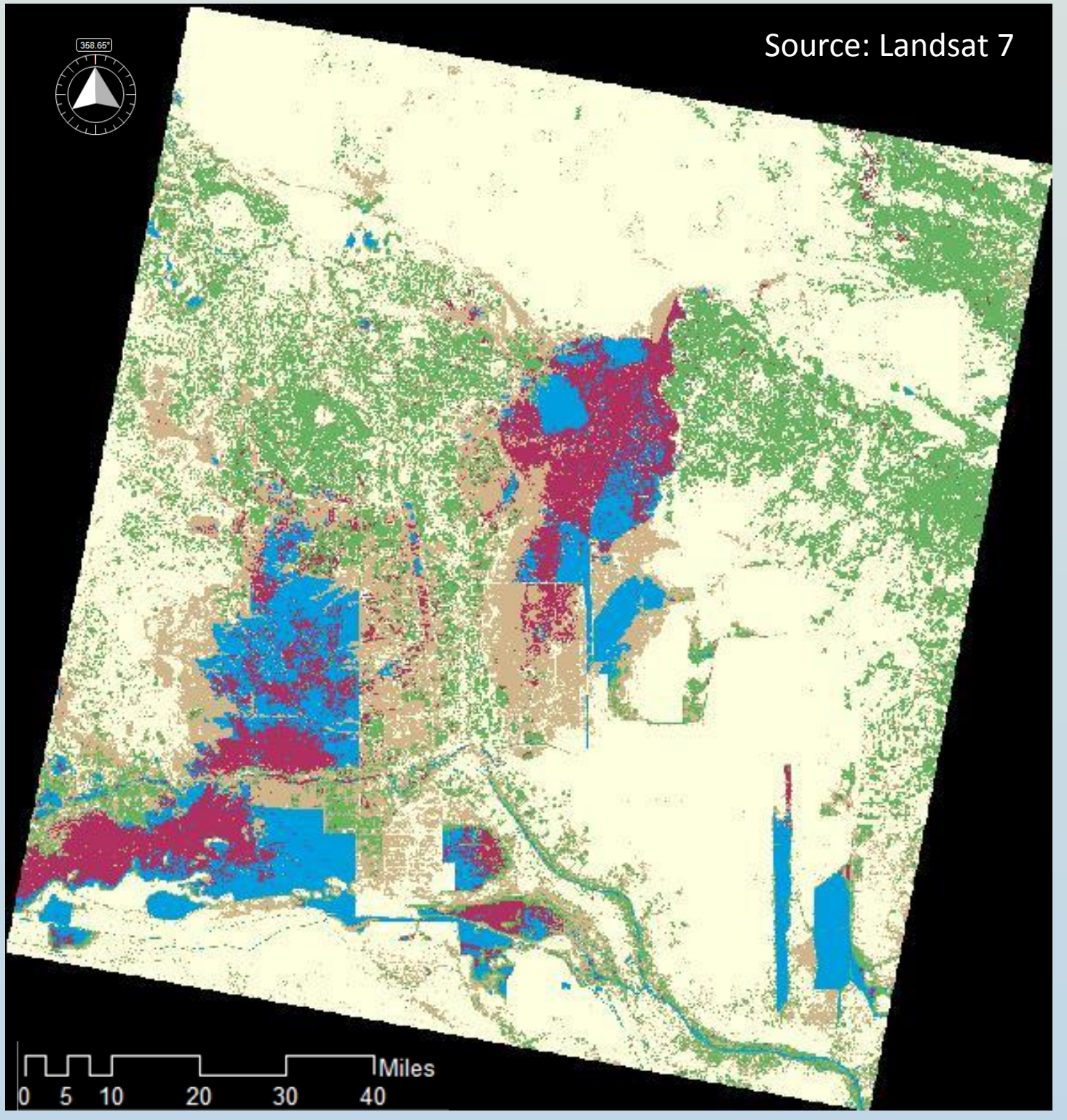
Supervised Classification Results

1988: Pre-draining
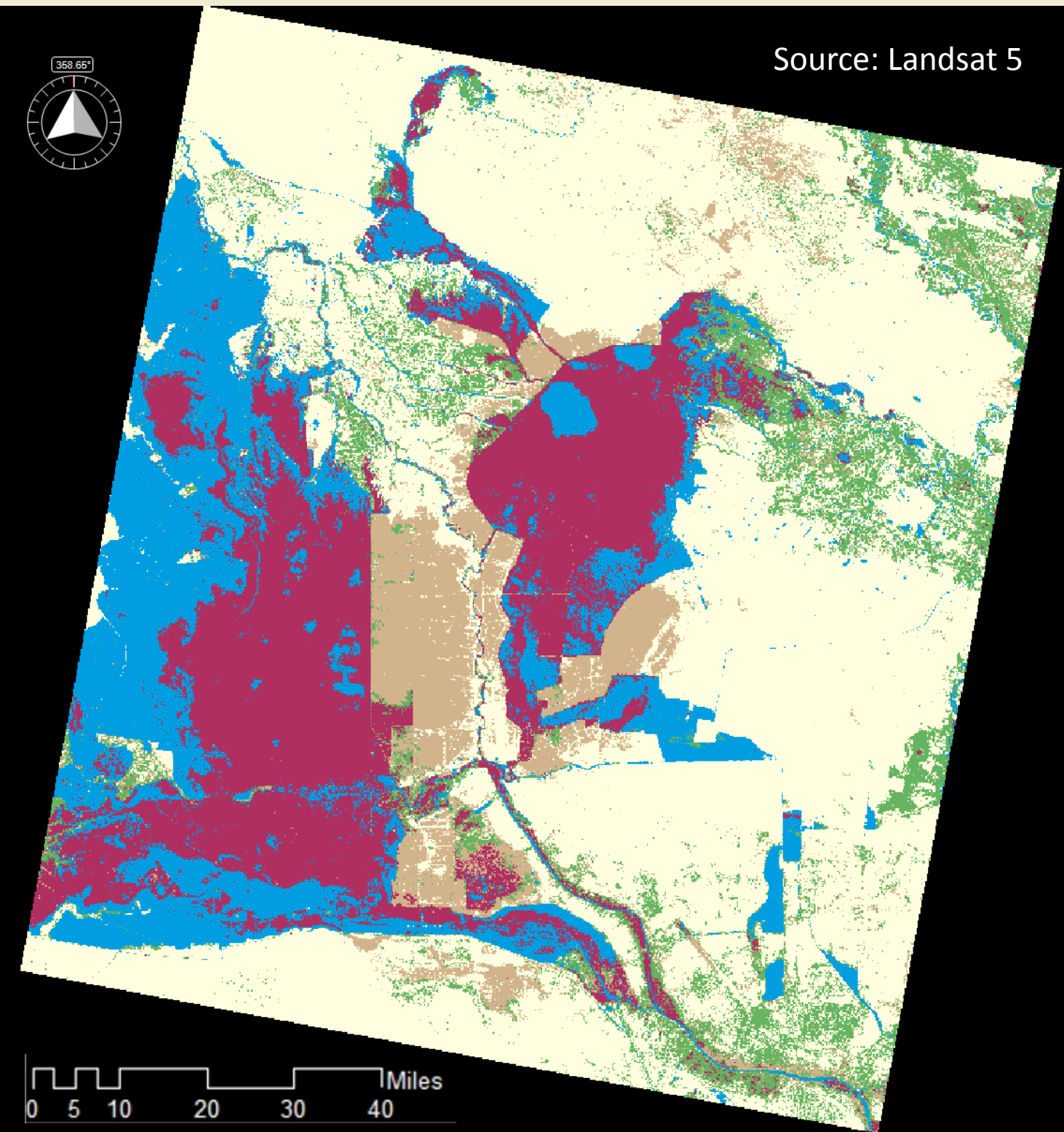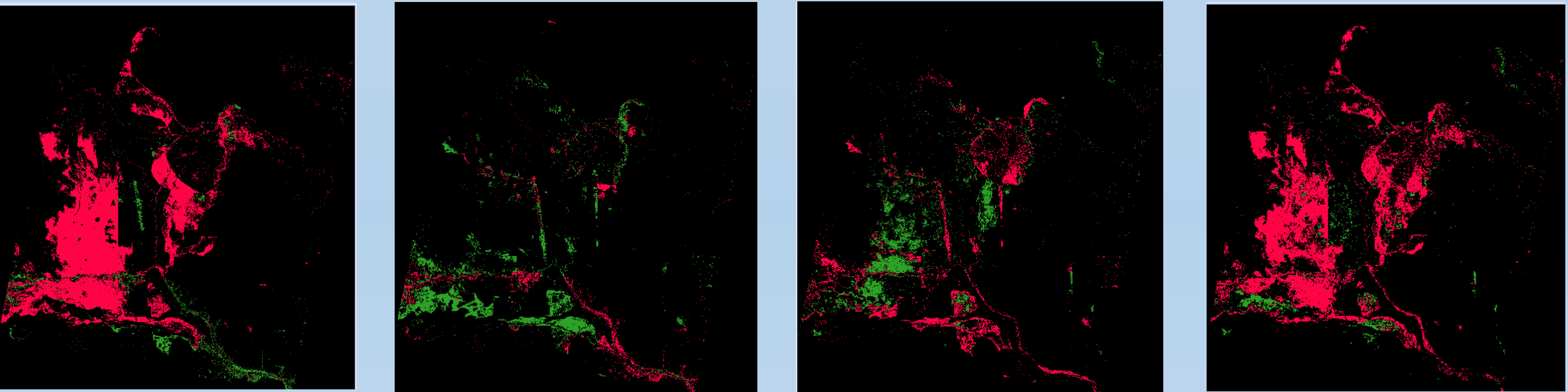

2000: Post-draining

2004: Post-flooding

2015: Current

Legend: Water | Marshland | Dried Marshland | Barren Land | Agriculture & Light Vegetation

TerrSet Gains & Losses: Marshland

Losses / Gains

1988-2000 | 2000-2004 | 2004-2015 | 1998-2015

TerrSet Land Change Modeler Results

Gains and losses between 1988 and 2015

Net Change between 1988 and 2015

Contributions to Net Change in Marsh

Contributions to Net Change in Water

Results: The square mileage of marsh vegetation decreased drastically from 1988-2000. Over this twelve-year period, the amount of marshland land cover decreased by 73%. Even after restoration efforts, the marshes are only 36% of their original size. The majority of the marshland has converted to dried marshland. The square mileage of water has also decreased significantly, transitioning for the majority to barren land.

Conclusion: The Mesopotamian Marshes today represent only a fraction of what they once were. Even after re-flooding, much of the old marshland remains as barren land and salt deposits. The vegetation necessary to restore the marshes has a difficult time growing in an environment with such an amount of salt, which results in a slow regenerative process. The farming that resulted from the drainage will most likely not forfeit the land now cultivated in order to restore the land to marshes. Current dam projects also currently or soon will impede the flow of water from the Tigris and Euphrates rivers into the marsh region.

Discussion: An analysis of the current infrastructure being constructed along the Euphrates and Tigris rivers should be conducted to determine how they will impact the flow of water to the Mesopotamian Marshes in the future. As it stands, it is unlikely that the marshes will return to their pre-draining size if dams and other mechanisms continue to draw water from the marshes' source.

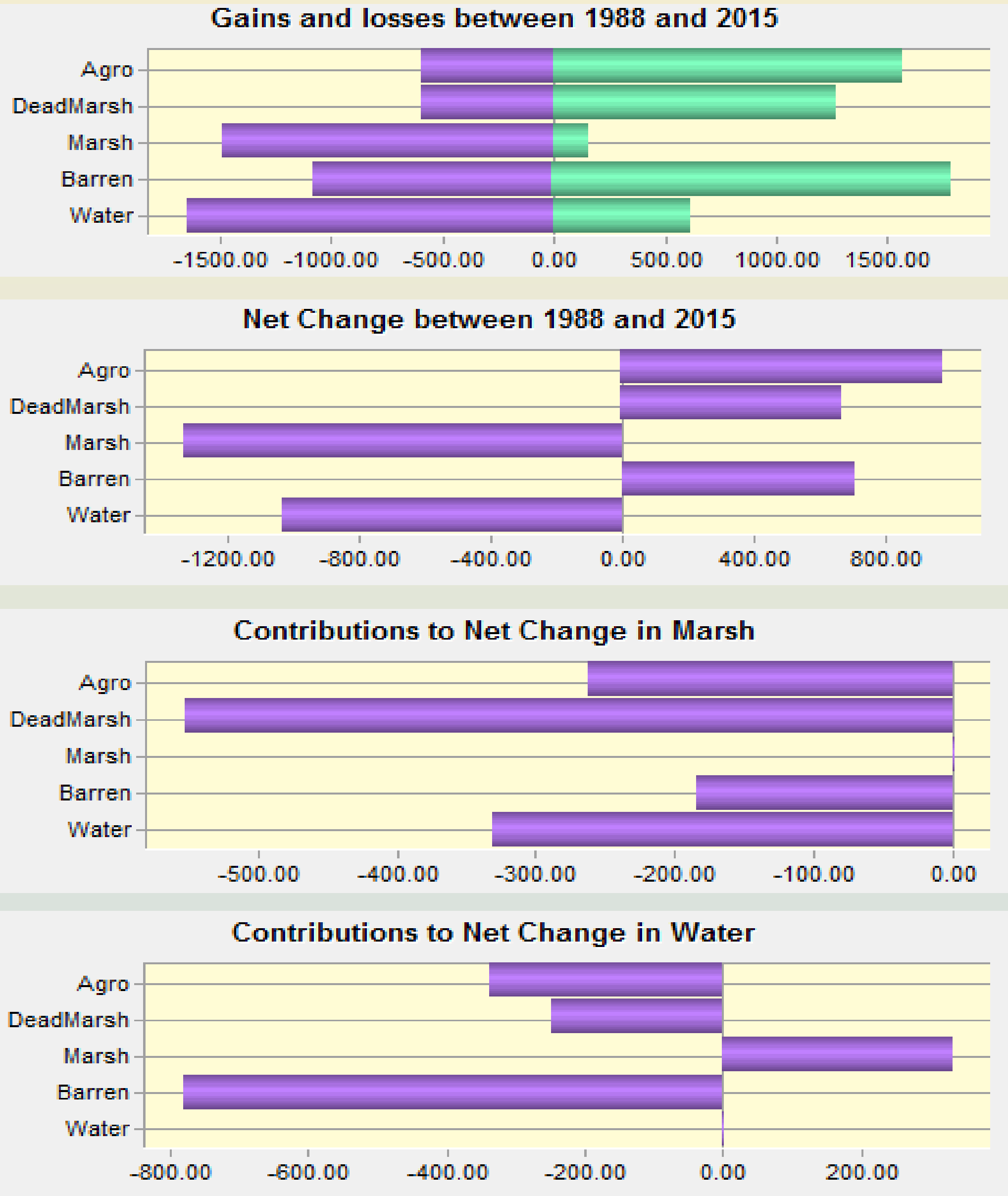**References**

"World of Change: Mesopotamia Marshes : Feature Articles." *NASA Earth Observatory*. NASA, n.d.

Jabbar, Mawahib F. Abdul, Ahmed F. Al-Ma'amar, and Ahmed T. Shebab. "Change Detections in Marsh Areas, South Iraq, Using Remote Sensing and GIS Applications." *Iraqi Bulletin of Geology and Mining* 6.2 (2010): 17-39. Web.

UNEP (2001). Partow, H. "The Mesopotamian Marshlands: Demise of an Ecosystem." Division of Early Warning and Assessment. United Nations Environment Programme. Nairobi, Kenya.

USGS Global Visualization Viewer