

Use of Remote Sensing for Water Conservation

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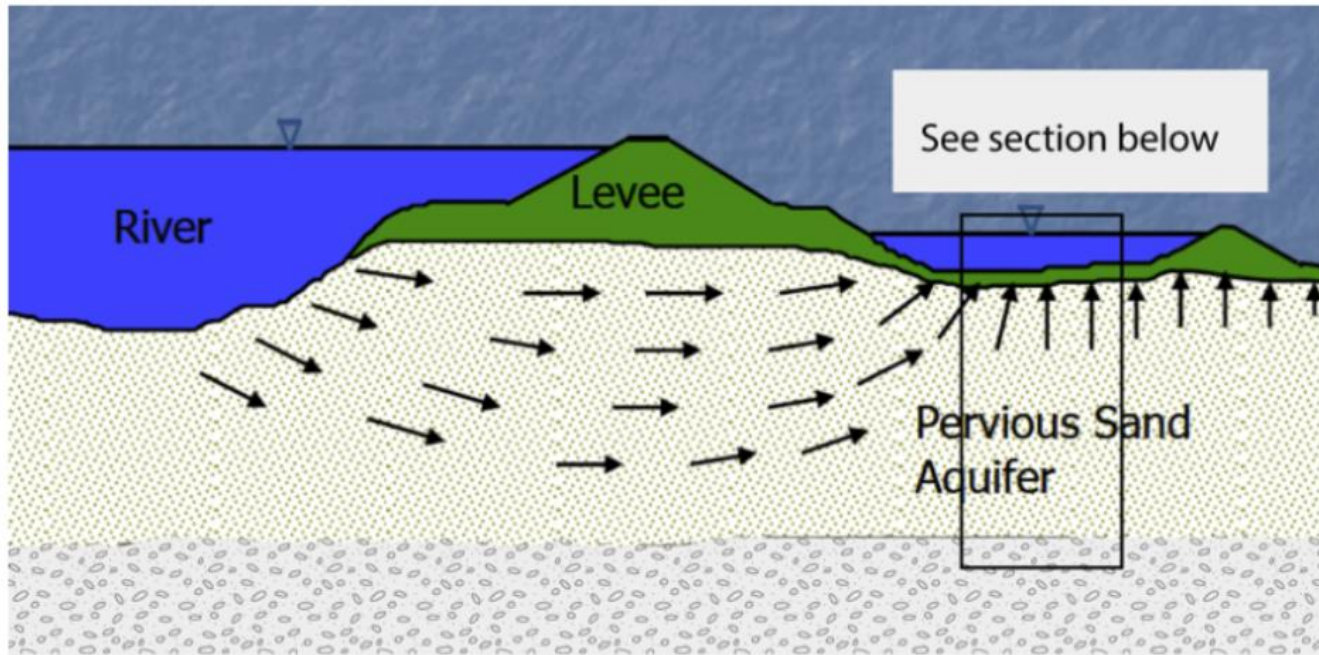
Challenge

- Climate change is altering global rainfall patterns
- Drought in agricultural regions due to these pattern changes poses a threat to the stability of government
 - Drought is a disaster in slow motion
 - As with other disaster types, risk reduction offers the greatest return on investment
- Water conservation is the best means of reducing the consequences of drought

Uses of Remote Sensing for Drought

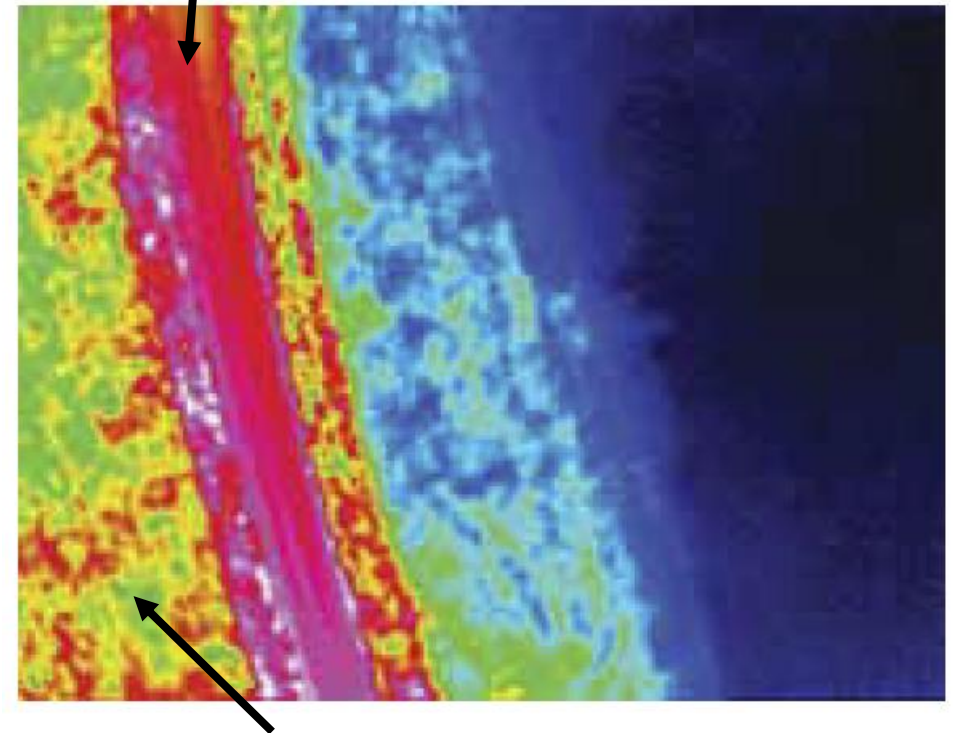
- Remote sensing techniques may be used to monitor crop health through measures such as NDVI, relative greenness, and similar
 - Failing crop health coupled with weather station data is an effective means for early detection of drought
- Early detection of drought is important because it enables an early response
- **HOWEVER**, preparedness through risk reduction activities reduces the risk of negative impacts
- Using remote sensing to improve water use efficiency – to prevent waste and loss – has a great impact on risk reduction

Thermal Remote Sensing



**Levee
Bare soil – hot!**

**River
Cool water**



**Crops
Warmer than river, cooler than
bare soil**

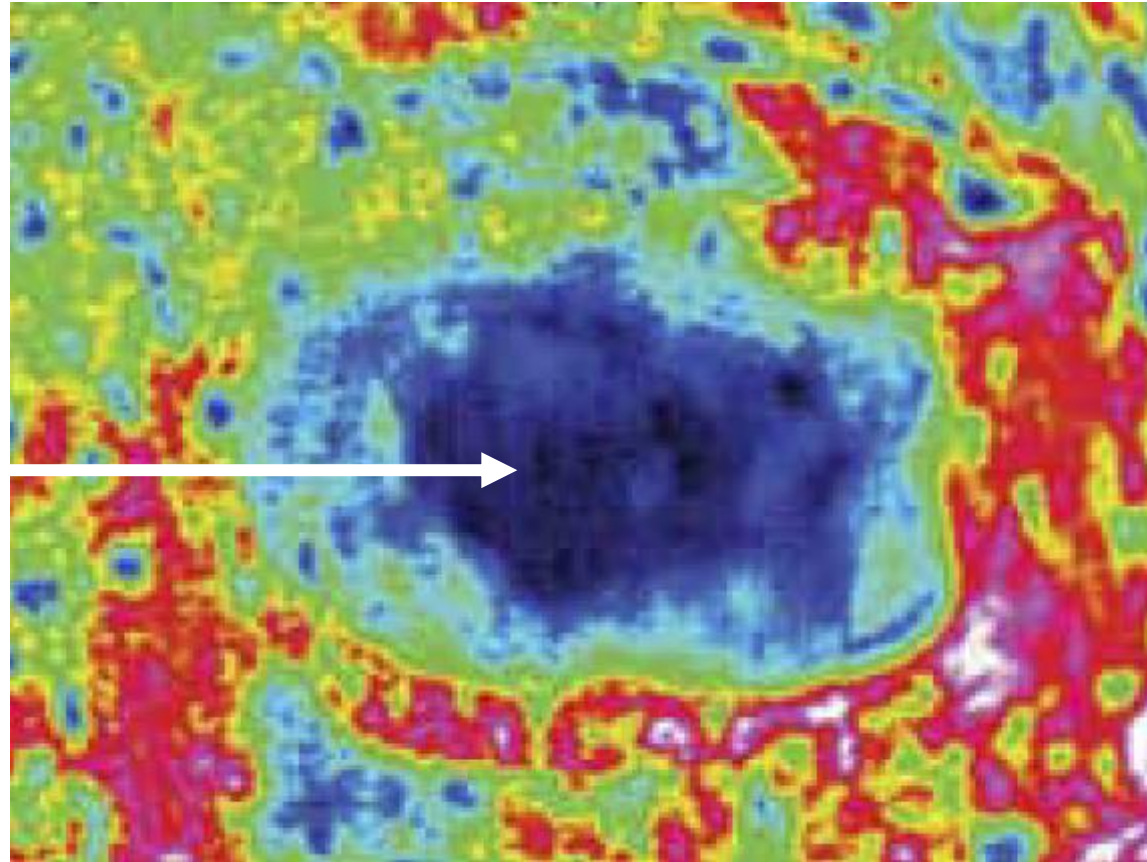
Early Detection of Leaks Needed

- Vegetation hides leaks until it is too late!



Using Thermal Remote Sensing for Drought

Water leaking under the levee is cold and easy to detect with thermal sensors – colder than surrounding vegetation

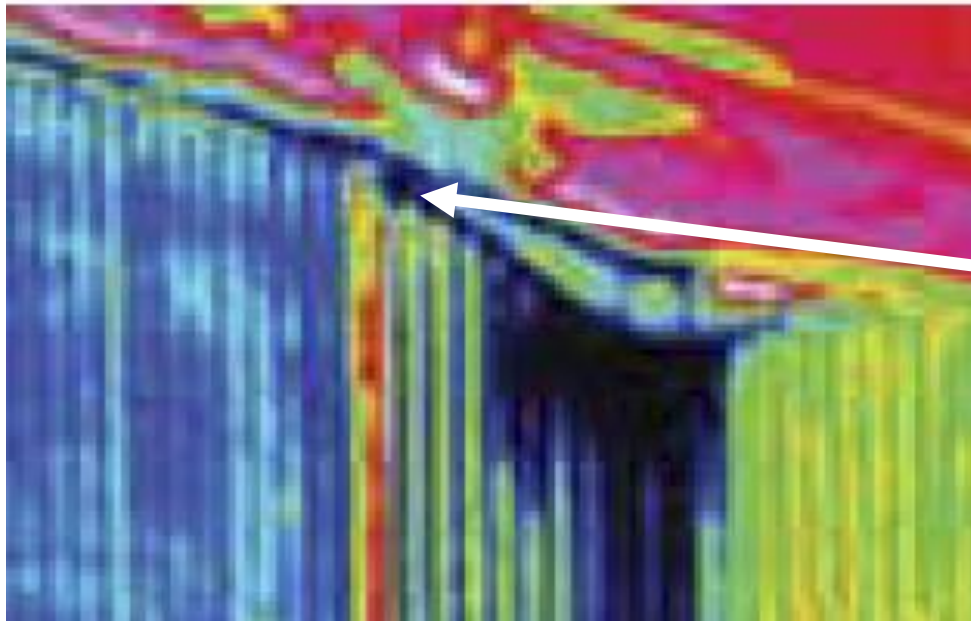


River-Levee Systems are Similar to Irrigation



Thermal Remote Sensing Applications

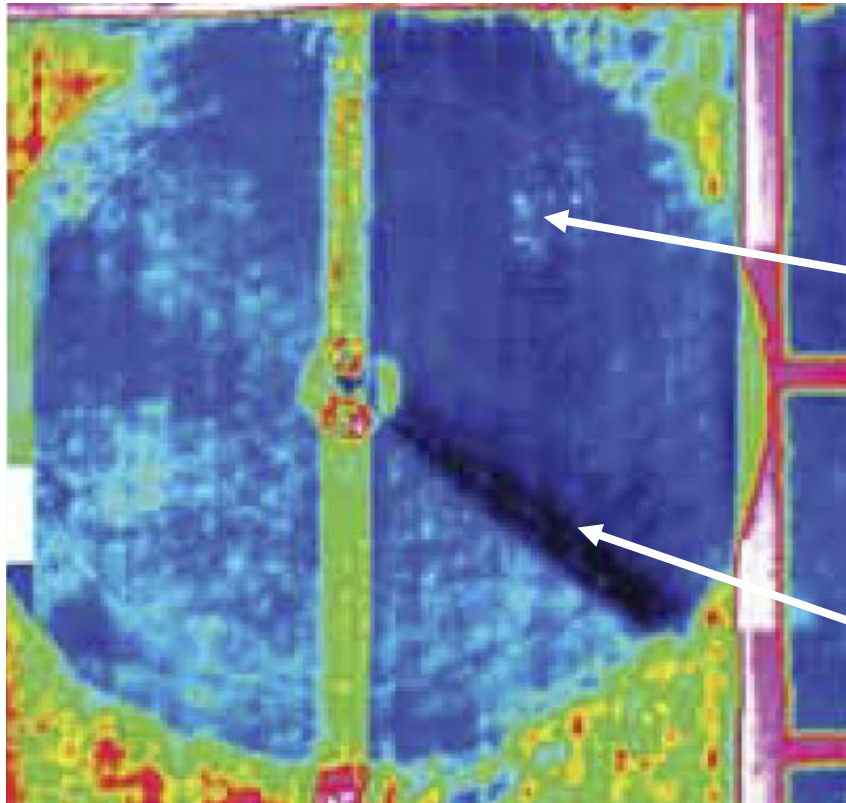
- Leak detection in irrigation systems work in the same way as leak detection in river levee systems
 - Early detection of leaks in irrigation systems saves water – needed repairs may be identified quickly and repairs made sooner



Leak in Irrigation Canal

Detection of Delivery Efficiency

- Is water going where it should and at the rate and quantity needed?



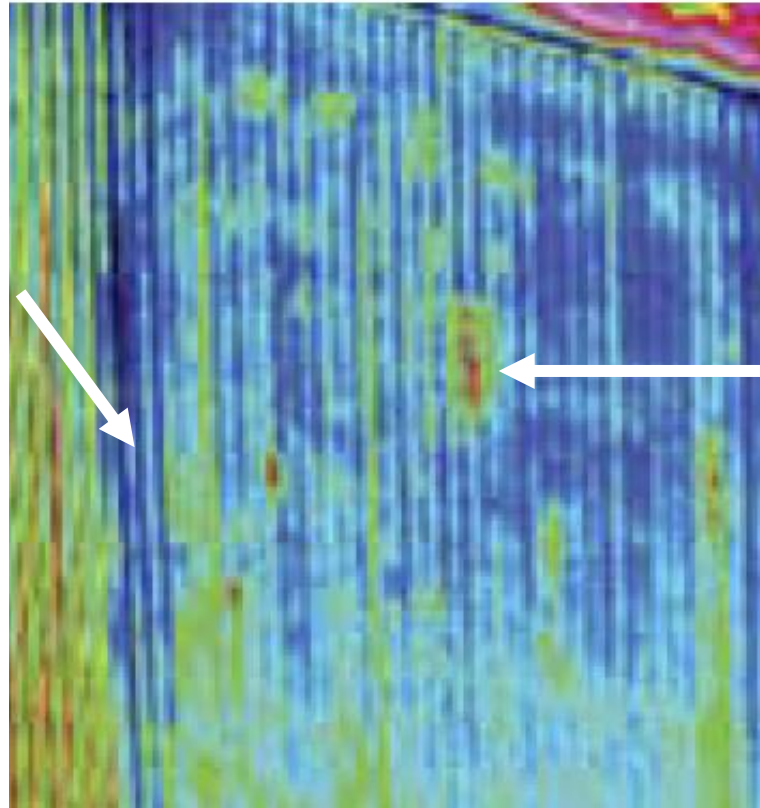
Uneven absorption –
area for remediation
(add organic material)

Even flow and distribution
from a center-pivot
irrigation system

Detection of Delivery Efficiency

- Uneven flow across a level-basin/furrow irrigation system

Compacted/compressed soil making water run across field too fast



High point in the field –
Leveling needed

Resources for Thermal Data

- UAV's (drones) provide cost effective monitoring of small areas – basic system (less than \$500)
- Space-based thermal data may be used for larger areas – <http://earthexplorer.usgs.gov>
 - LandSat (Free) – Band 6 in LandSat 7 and band 10 or 11 in LandSat 8
 - <https://landsat.gsfc.nasa.gov/article/landsat-imagery-sheds-light-agricultural-water-use>

Summary

- Risk reduction activities are the most effective means of reducing the consequences of disasters
- Low cost and free thermal remote sensing data are accessible and easy to use (precise temperature is not needed – only relative differences)
- Thermal remote sensing may be used to improve the efficiency of water delivery systems