

From Research to Decisions: How does NASA support Food Security?



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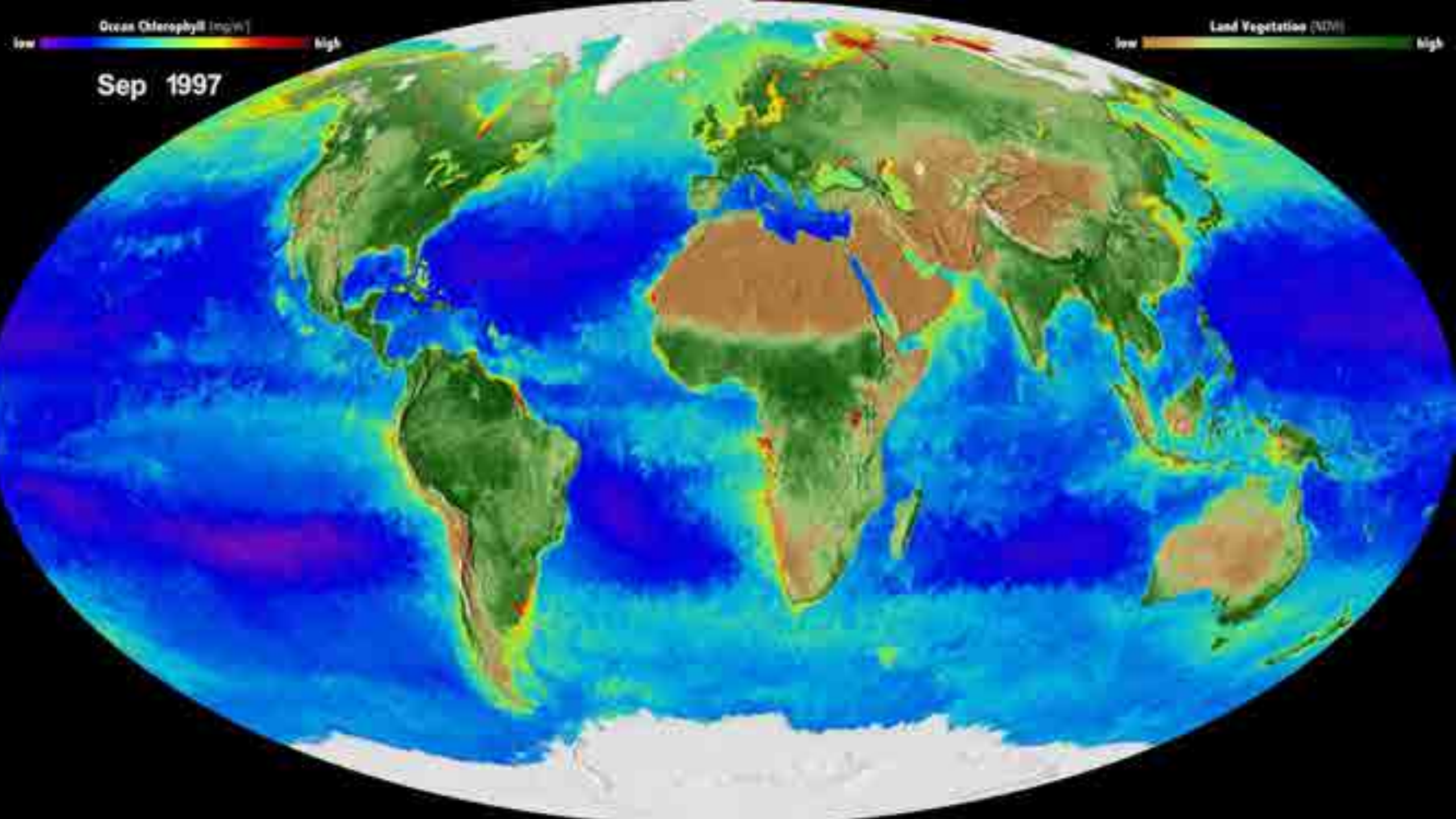
Ocean Chlorophyll [mg/m³]

low high

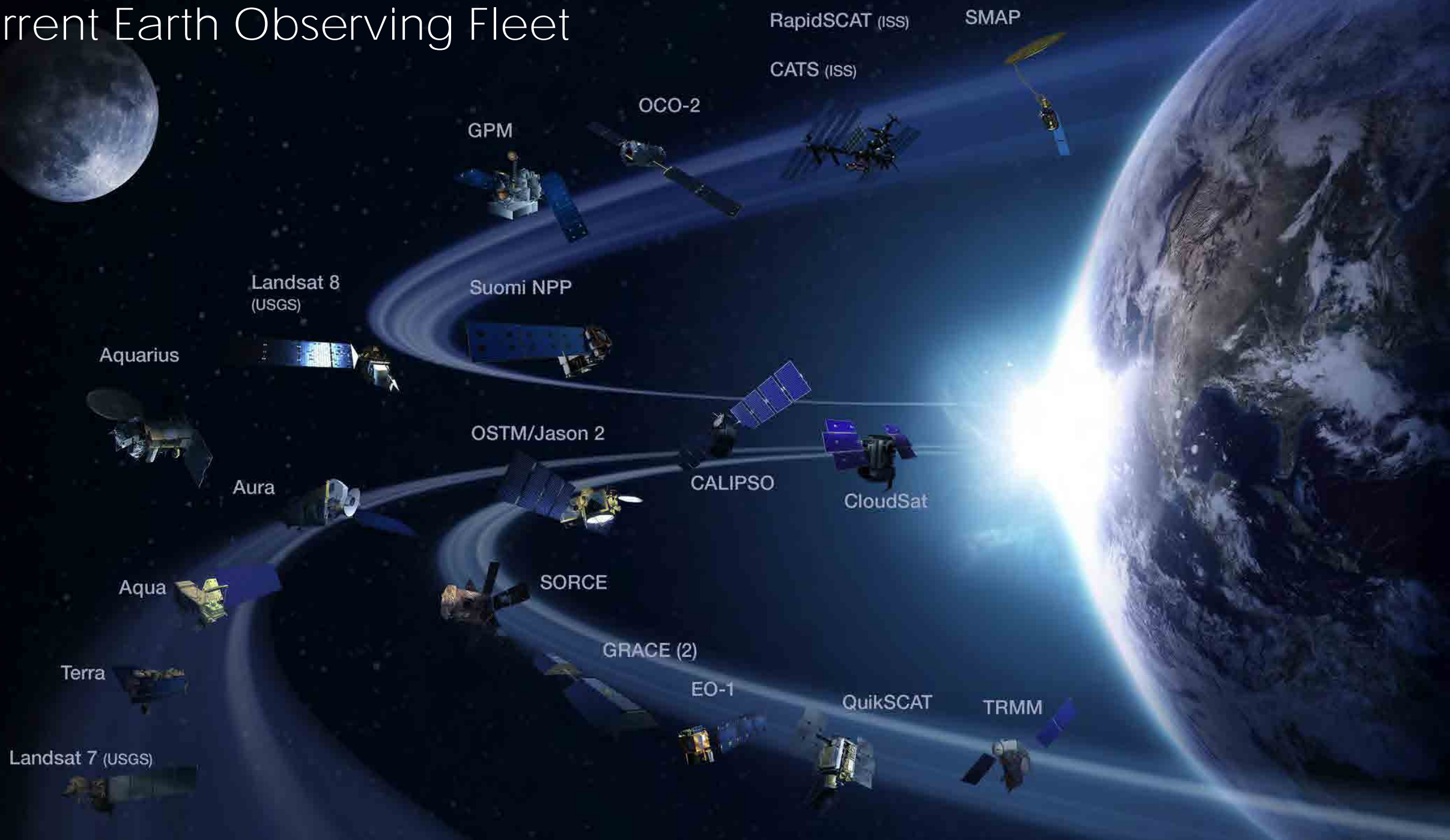
Land Vegetation (NDVI)

low high

Sep 1997



Current Earth Observing Fleet



Planned for Launch in 2020

NASA-ISRO
Synthetic
Aperture
Radar (NISAR)

NISAR



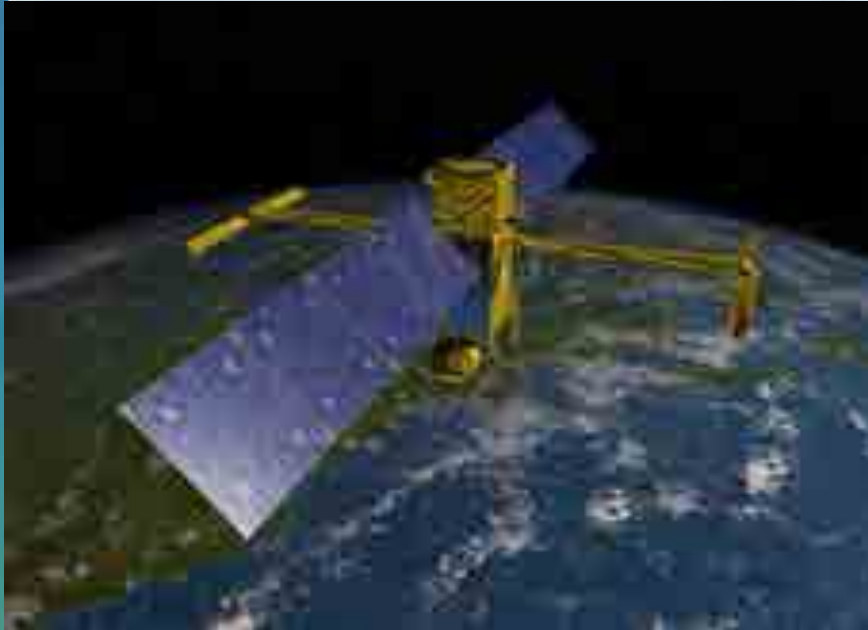
2020

Designed to observe and take measurements of ecosystem disturbances, ice-sheet collapse, and earthquakes, tsunamis, volcanoes and landslides

Planned for Launch in 2021

Surface Water
and Ocean
Topography
(SWOT)

SWOT



2021

Joint international mission will make the first global survey of Earth's surface water, observe the ocean's surface topography, and measure how water bodies change.

Planned for Launch in 2022

Plankton,
Aerosol, Cloud,
ocean Ecosystem
(PACE)

PACE



2022

Understand and quantify global biogeochemical cycling and ecosystem function in response to anthropogenic and natural environmental variability and change

Four Designated Observable Studies Underway

2017-2027 Decadal Survey for Earth Science & Applications from Space:



Surface Biology and Geology (SBG)



Aerosols, Clouds, Convection and Precipitation (A-CCP)



Mass Change (MC)



Surface Deformation and Change (SDC)

Applied Science at NASA Goddard

We develop interagency and external partnerships to accelerate broader adoption of NASA data and science for societal benefit



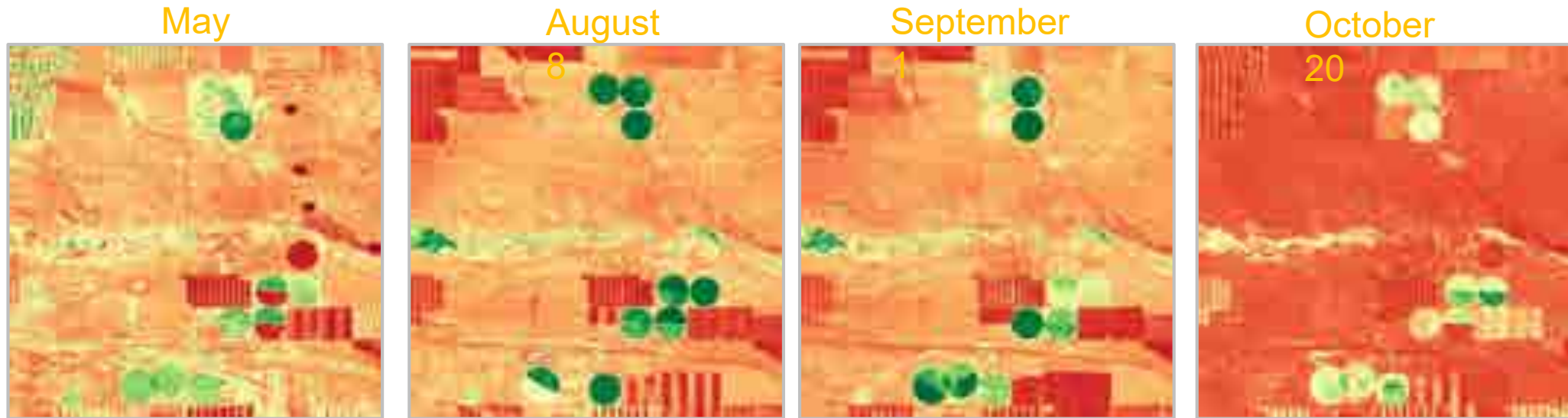
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Vegetation Index Informs Global Crop Models

Four decades of support to U.S. Department of Agriculture (USDA) Foreign Agricultural Services putting NDVI in its crop forecast. Now Harmonized Landsat/Sentinel data are applied (30m, 3.7 day repeat).



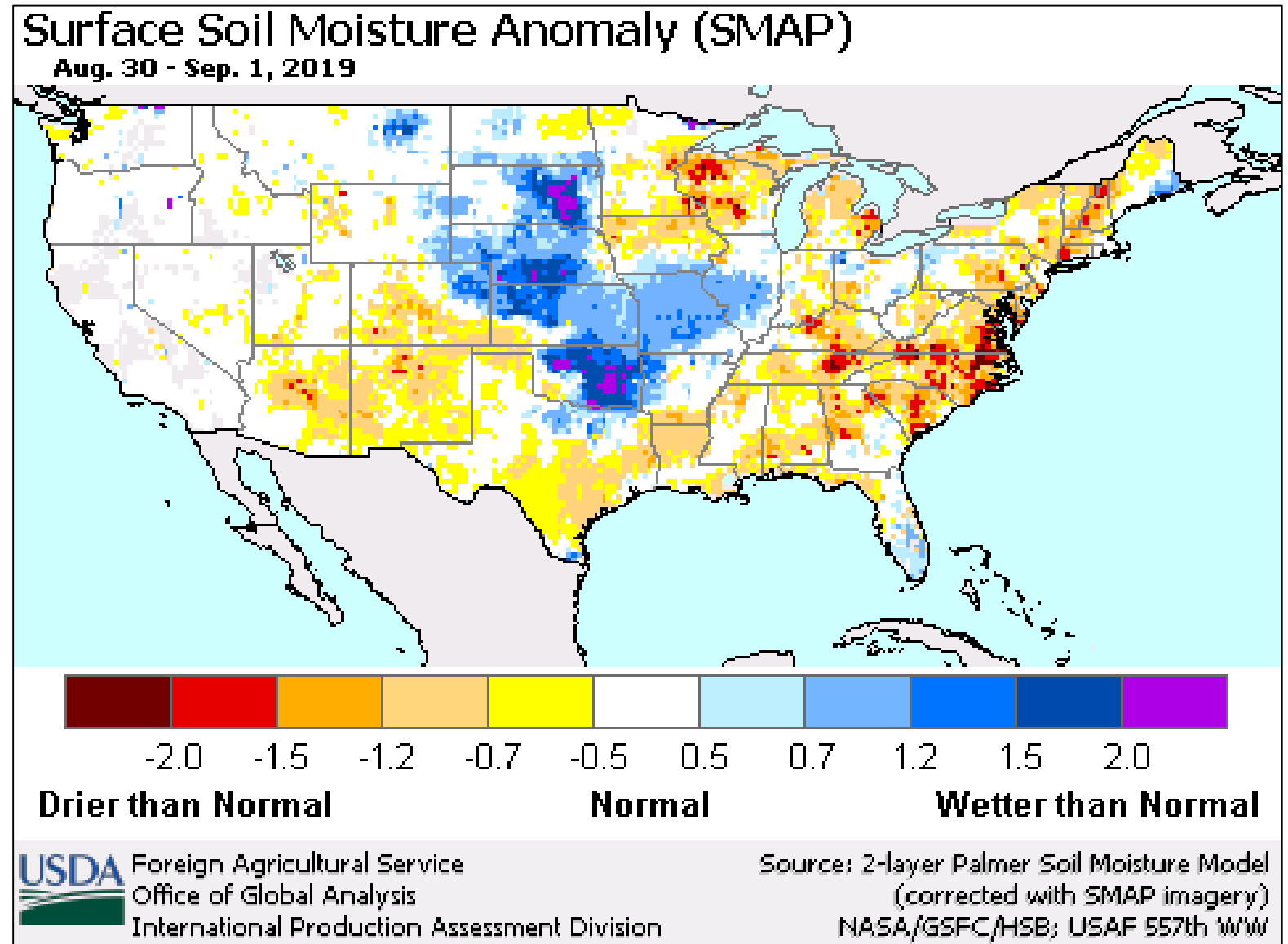
Grassland & alfalfa fields in Cheyenne, Wyoming. Resolution fine enough to detect mowing events!



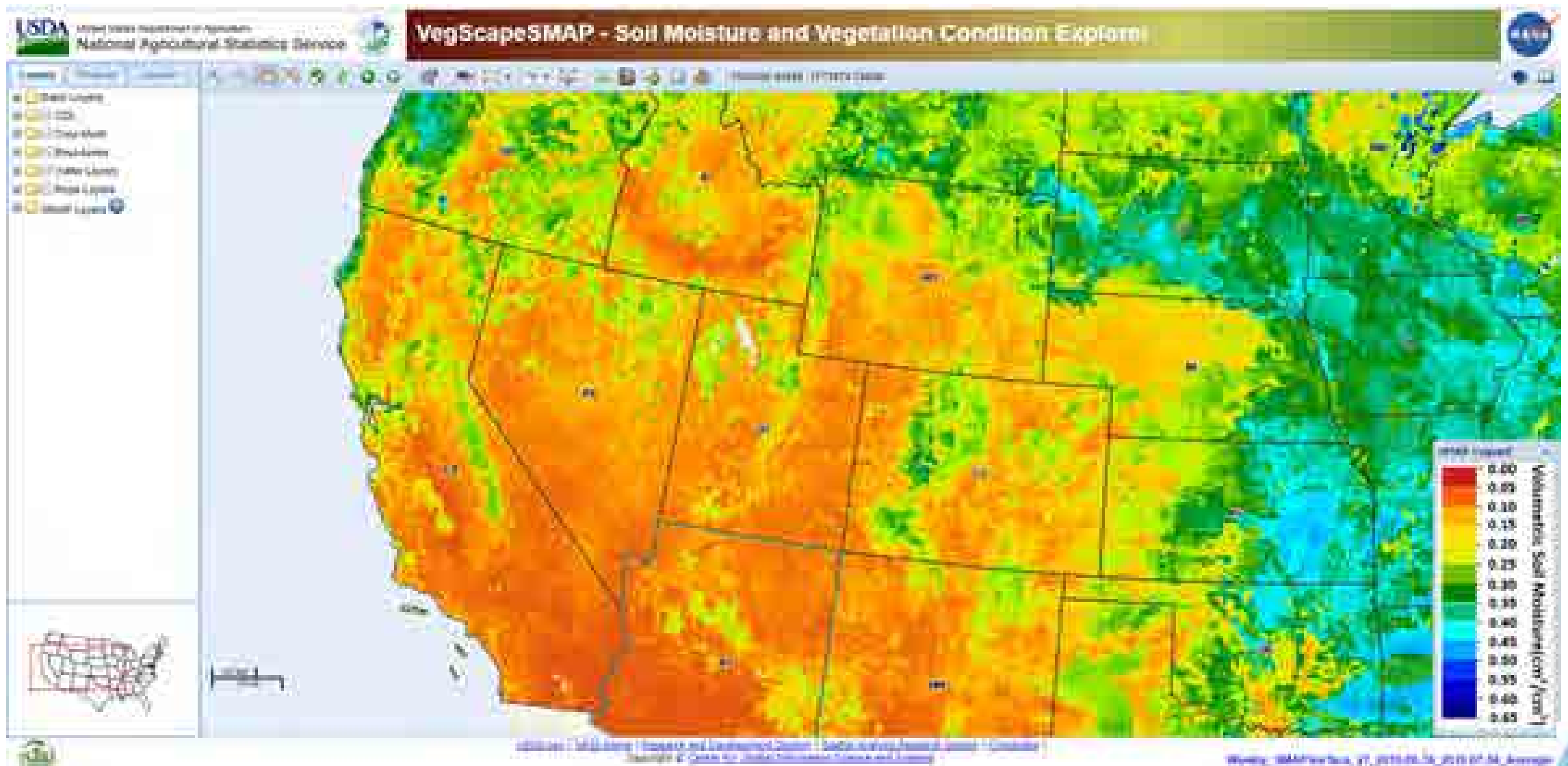
Improved USDA-FAS Crop Forecasts with NASA Soil Moisture

Integrating SMAP soil moisture improves global crop forecasts.

Right: SMAP Surface Soil Moisture Anomaly from Aug. 30-Sep. 1, 2019 shows the drought conditions on the U.S. East Coast, with wetter than normal conditions on the Great Plains.



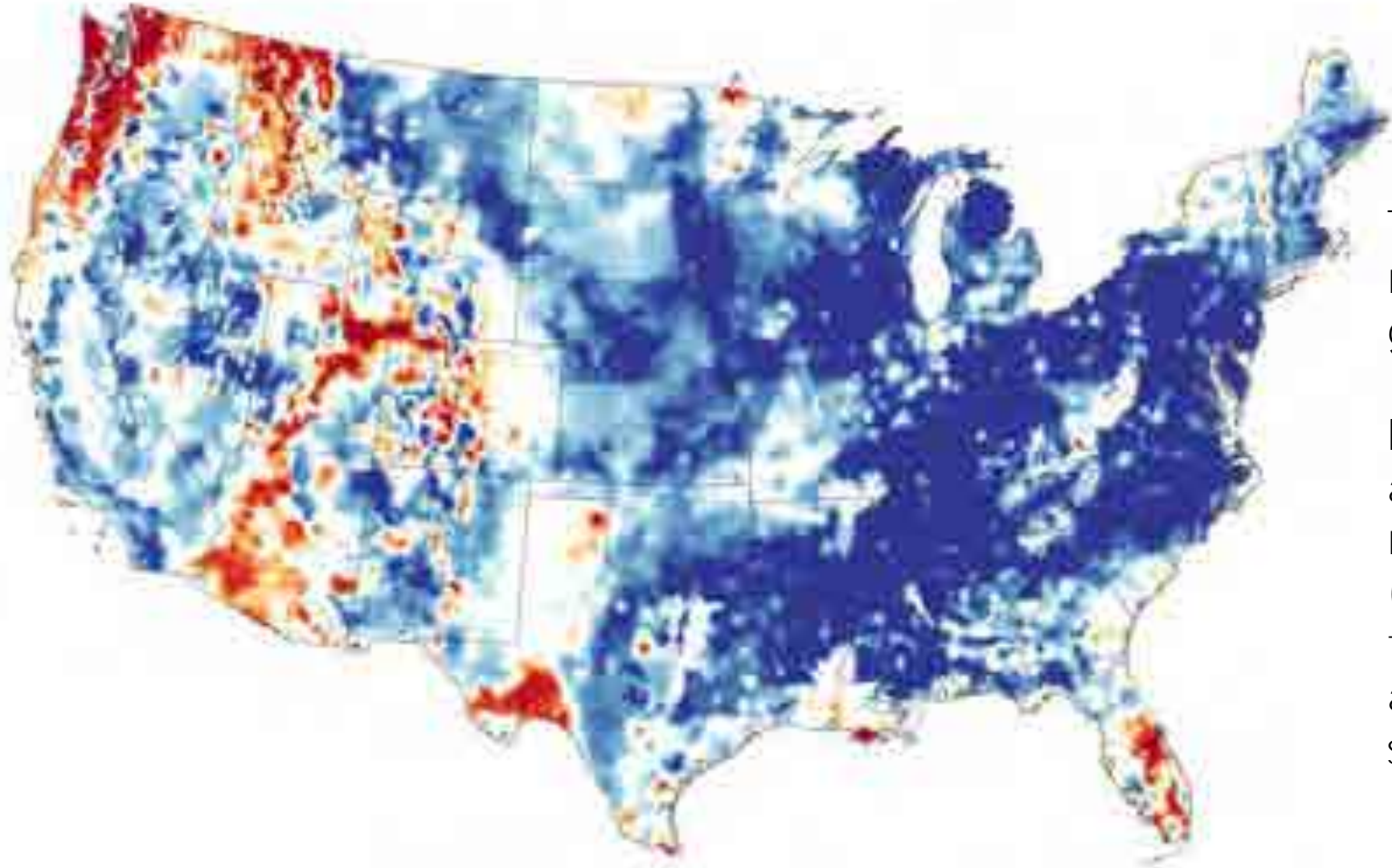
High resolution soil moisture for USDA NASS



R. Bindlish, P.-W. Liu (NASA/SSAI), Z. Yang (USDA NASS), V. Lakshmi (UVA)
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Record-Setting Precipitation Leaves U.S. Soils Soggy



Shallow Groundwater Wetness Percentile (relative to 1948-2012)



The wettest 12-months in 124 years of modern recordkeeping, shown in groundwater response on May 13, 2019.

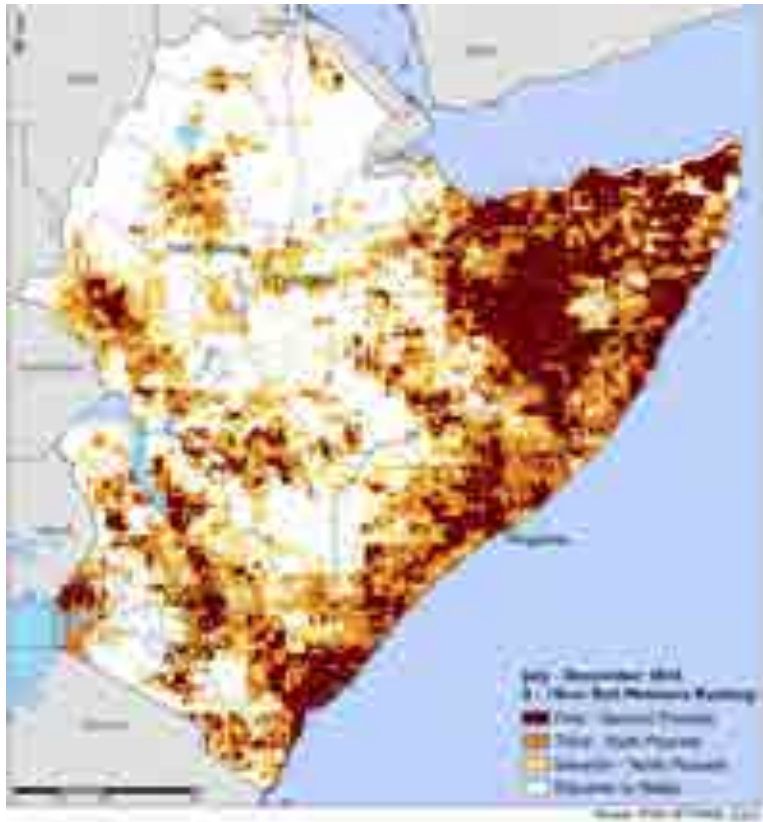
Blue indicates more groundwater than average for the month; red, less. The map includes multiple types of data (GRACE groundwater, precipitation, temperature, etc.) integrated within an advanced computer model by scientists at NASA Goddard.

NASA Earth Observatory Image of the Day for May 29, 2019
M. Rodell (NASA), J. Bolten (NASA), N. Sazib (NASA/SAIC) and I. Mladenova (NASA/UMD)

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Soil Moisture Model Provides Famine Early Warning

The Famine Early Warning Systems Network (FEWS NET) uses NASA satellite data within the Land Information System (LIS) to monitor agricultural and water resources in 34 countries to plan humanitarian aid. FEWS NET members include USAID, NASA, NOAA, USDA, USGS.



“Somalia is facing a “very real risk” of famine, with more than 6 million people, half its population, facing acute food insecurity in the country, three UN agencies warned.”
-The Guardian, 3 February 2017

Cyanobacteria Assessment Network (CyAN)

Using NASA and ESA satellite data to detect toxic algal blooms in U.S. freshwater systems to aid federal, state, and local authorities with assessing water quality to protect aquatic and human health. *CyAN members include EPA, NASA, NOAA, USGS*



Schaeffer (EPA), Werdell (NASA), Seegers (USRA), Stumpf (NOAA), Loftin (USGS), et al.

Chesapeake Bay water quality initiative

Working with MDE shellfish division, DNR, VDH, UMD, NOAA, USDA-ARS: combine in situ sampling of biology, chemistry, optical measurements (in water, above water, satellite)



- Oyster aquaculture is a growing industry around the Chesapeake
- Elevated runoff causes closures
- Remote sensing may provide early warning poor water quality
- Optical proxies are being explored
- New project to develop Artificial Intelligence/Machine Learning
- Oyster health by Northrup Grumman, Chesapeake Bay Foundation

Food Security Team integrates relevant NASA capabilities



Vegetation Health



Water Availability



Water Quality

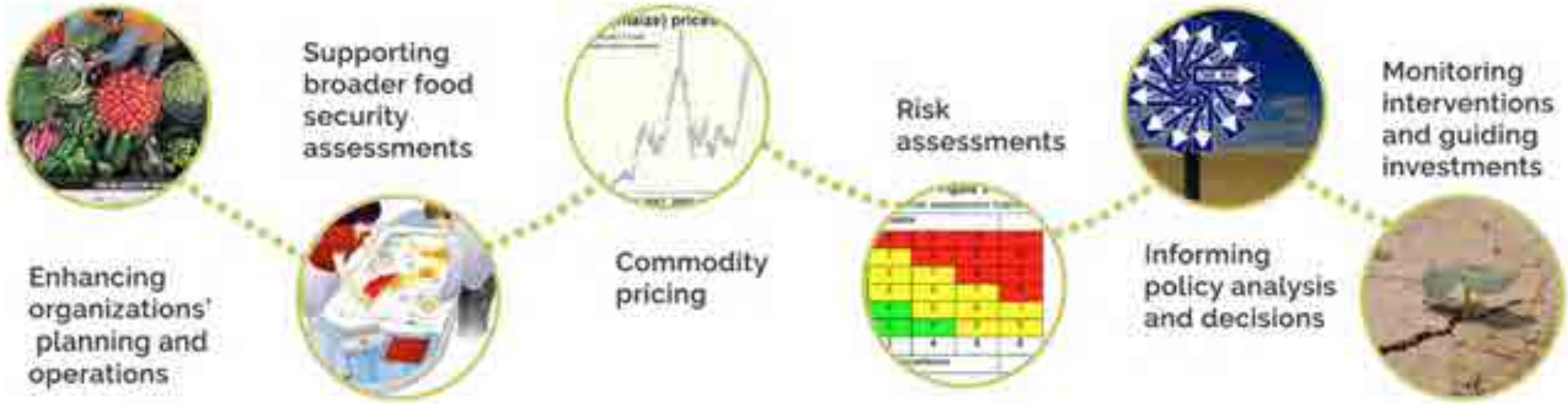


Air Quality

Schollaert Uz, Duncan, Bindlish, Birkett, Bolten, Butcher, Ellenburg, Holmes, Huffman, McNally, Mladenova, Osmanoğlu, Peters-Lidard, Puma, Ruane, Rodell, Tucker, Vermote, Yuen

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Food Security Team supports NASA Harvest Consortium





Western Water Applications Office

WWAO established to solve important and pressing water-resource problems in the Western United States.

WWAO:

- **Equips water decision-makers** with actionable remote-sensing products.
- **Develops targeted solutions** through applications projects.
- **Helps move applications** into operations.
- **Leverages decades of investment** in science and technology.
- One Goddard-led project, two more in formulation

More information: wwao.jpl.nasa.gov

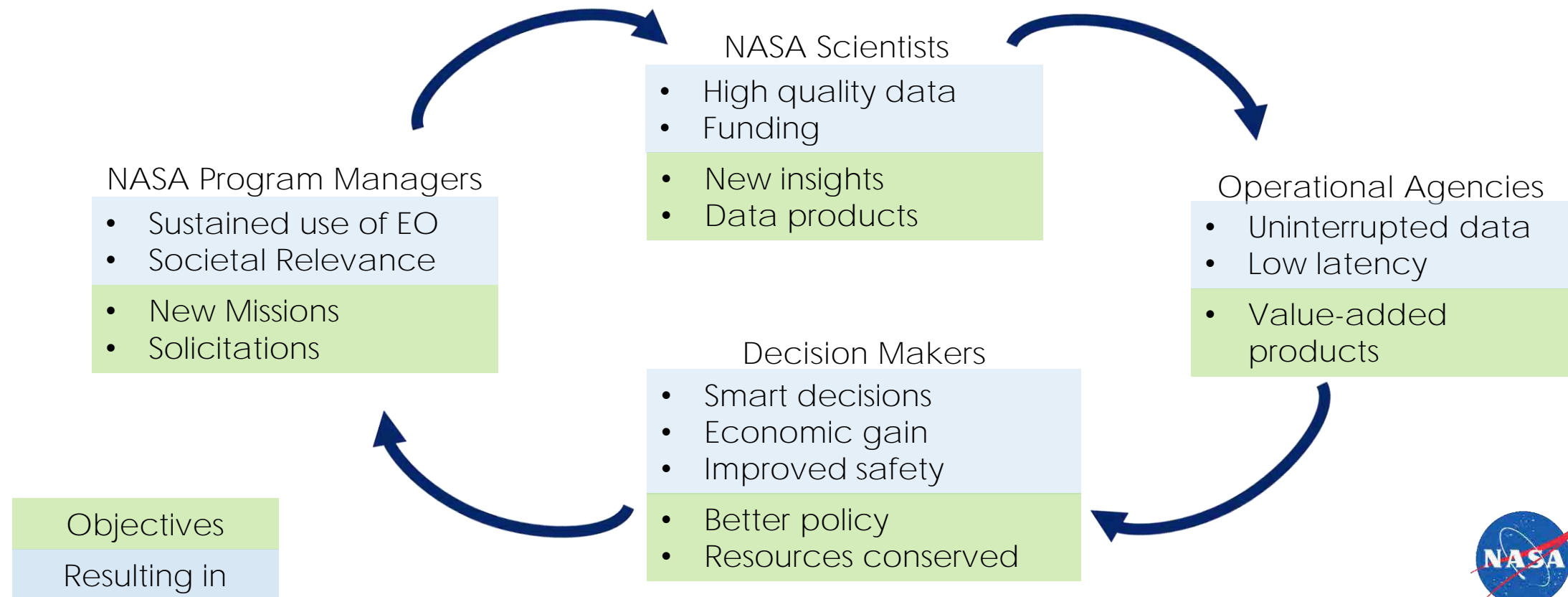


Focus Areas



Identify a new problem that could be improved with satellite data and find a scientist with expertise in that area

Connect around an environmental challenge, iterate early and often

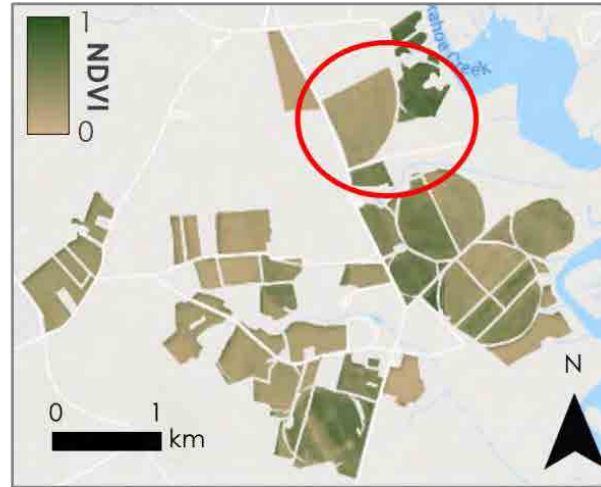


DEVELOP Chesapeake Bay Cover Crop Distribution

NDVI values calculated over winter and spring via CCROP can be used to verify cover crop termination dates.

In Kent County, the percentage of low NDVI fields (< 0.3) grew from 8% to 22% between December 21, 2017 and March 18, 2018, a trend which indicates possible termination prior to the MDA's March 15th cutoff date.

December 21, 2017



March 18, 2018

