



Understanding a New World of Water

SATELLITE DATA FOR
MANAGING WATER RESOURCES

PLANET.COM



See Change.
Change the World.

BY THE NUMBERS

10B
PROJECTED WORLD
POPULATION BY 2050

70%
ALL FRESHWATER
WITHDRAWALS USED
FOR AGRICULTURE

~33%
WATER THAT WILL NEED
TO BE REALLOCATED
TO MEET FOOD DEMAND

About 71 percent of the Earth is covered in water, making it one of the most powerful and dynamic natural elements. We use it for drinking, agriculture, energy, recreation, transportation, and 99 percent of global trade, and it exposes us to the dangers of floods and storm surge.

For thousands of years we've been looking for ways to shape the water landscape to suit our needs, but with accelerating climate change and increasing demand from a growing population, we're entering a new world of water with some of our biggest challenges still yet to come.

In this eBook we explore how satellite imagery is changing the way governments around the world, both large and small, monitor water to protect biodiversity and ensure the most equitable distribution of this precious resource.

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CLIMATE CHANGE: THE MAKINGS OF A MORE UNPREDICTABLE FUTURE

Local communities and policy makers have gone to great lengths to establish procedures for monitoring the quality and availability of water in their territories. But climate change is making for a more unpredictable world that is putting a great deal of strain on these systems.

- **Droughts and floods** are becoming more frequent, distressing the health and safety of whole communities and protected habitats
- **Warming waters** are reshaping aquatic ecosystems, impacting the fishing and tourism industries
- **Increasing demand for freshwater resources** is straining reservoirs, lakes, and groundwater sources, threatening the basis of much of our natural and socio-economic systems.

Our changing climate is forcing water management programs and emergency response organizations to be more creative about how to navigate and predict a new world of water where sustainable management practices and flood control are increasingly necessary to preserve the way we live.



Folsom Lake, Folsom, California, USA. Oct 10, 2021



In April 2021, California governor Gavin Newsom declared a state of emergency in the Russian River and Klamath Basin watersheds due to worsening drought conditions.

This map compares a measure of vegetation health - a Normalized Difference Vegetation Index - from early May 2020 compared to May 2021. Grasslands and agricultural areas have been hit particularly hard.

Planet's near-daily monitoring constellation provides the unique capability to rapidly map broad areas at 3-5m resolution.

BY THE NUMBERS

50%

The current capacity of California's 1,500 reservoirs in comparison to the levels they should be at during this time of year. State officials are concerned that if water levels continue to drop, which they are expected to do throughout the summer, power plants will need to be shut down and water supplies to farmers and households will be significantly or completely reduced.

SOURCE: [ASSOCIATED PRESS, JUNE 3, 2021](#)

NEW DATA FOR A NEW WORLD

Water conservation is a dynamic and overwhelming task, but the good news is that this is not an isolated issue and no organization has to tackle it alone. Public-private partnerships are becoming increasingly important for faster, more efficient policy decision-making and emergency response. Government bodies can acquire solutions from the private sector to take advantage of the latest innovations for the smarter allocation of limited resources.

And it all starts with the data.

You can't fix what you can't see, and reliable data is the key to understanding the full scope of the issue across any given region. Organizations across the world are turning to new, cloud-based data solutions to strategically manage water resources and transparently measure policy goals and outcomes.

Frequent Insights

Provide visibility over
broad areas, understand
historical events

Transparency

Measure and report on
policy impacts

Productivity

Know when to deploy resources
where they are needed most

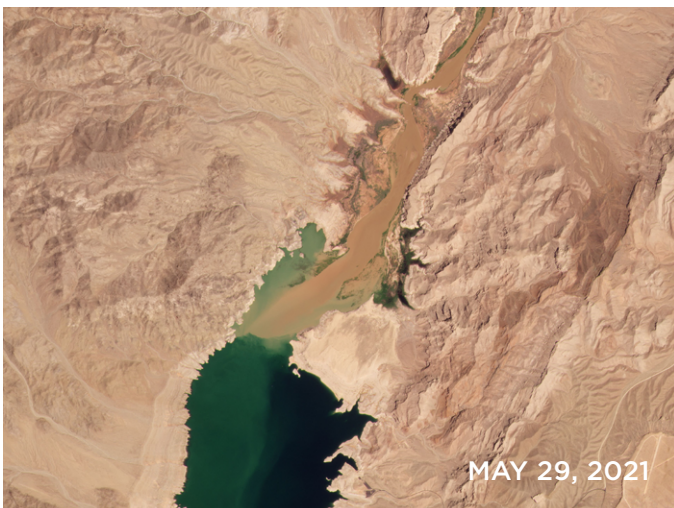
Innovation

Leverage modern, cloud
infrastructure for fast and
accessible insights

PERMITTING & WATER USE INFRACTIONS

Governments set regulations and guidelines around water use to ensure there are enough resources to support a healthy community. Issuing permits and monitoring water use infractions is challenging to do proactively. Often investigations will happen only when cases are reported by citizens or retroactively discovered during inspections.

Planet's reliable, high-frequency satellite imagery and archive can help regulators monitor water intake, catch illegal waste dumping from local industry, and track any construction that may disrupt natural vegetation that helps with erosion and flood control. A near-daily archive of medium resolution imagery allows officials to go back in time and discover how the area of interest looked before the event. This data is accessible in a simple platform that enables officials to create comprehensive reports that can support these investigations.



These images show the Colorado River where it flows into Lake Mead. From May 24, 2020 through June 12, 2021, the reservoir elevation dropped from 1,092 to 1,071 feet, reaching levels not seen since the 1930s. Planet's high-resolution, high-frequency data allows monitoring of vegetation as it re-colonizes the riverbanks and patterns of erosion in the newly-exposed sediments.

MONITORING COMPLIANCE WITH LOCAL WATER REGULATIONS

The Department of Planning, Industry and Environment (DPIE) in New South Wales, Australia is tasked with continually monitoring and assessing the use of water stored in thousands of on-farm water storages across the state. Water planning experts have to track changes in water storage capacity during compelling events such as drought and floods in order to make the best decisions regarding water restrictions and conservation. This includes monitoring whether agriculture and other users are taking more than they are entitled to.

For the most accurate information, NSW needed daily imagery and broad coverage for a large state where many of the environmental events may go unnoticed. With Planet, the department was able to access new and archive imagery with the resolution, cadence, and coverage needed to measure the drawing and filling of on-farm storages and off-take channels where water is taken from local rivers.

Learn more from Mustak and team:

<https://go.planet.com/explore-naturalresources>



Planning,
Industry &
Environment



DPIE uses medium-resolution satellite imagery to monitor water intake across their territory.

“Because Planet is high resolution and has daily images, we can detect minor differences in the water surface area. We’re integrating Planet with Lidar to combine surface area and storage capacity, which tells us about the changes in the volume of the water in storage. And throughout crop cycles, we can monitor how storage is filling up or when it’s drying out.”

–Mustak Shaikh,
Principal for Remote Sensing,
New South Wales

AQUATIC BIODIVERSITY AND CONSERVATION

We rely on freshwater and coastal marine ecosystems as a source of food, recreation, and transportation. The smallest impacts and changes to local biodiversity can cause a ripple effect of habitat loss which can take years to recover. High-frequency satellite imagery can serve as a steady dataset to help decision makers detect changes and adapt resource management strategies to mitigate risks.



This false-color PlanetScope image shows the South Slough Reserve in Coos Bay, Oregon, USA at low tide on April 13, 2020. Overlaid is the distribution of eelgrass in the reserve that enables tracking of key eelgrass habitats that support coastal fishing communities. Kelp and eelgrass beds provide one of the most productive marine ecosystems and are key to supporting Oregon's fisheries and habitat. Their decline along the Oregon coastline over the last several years has been difficult to quantify mainly due to cost-prohibited aerial surveys. High-frequency satellite imagery helps water resource management teams make data informed decisions to drive productive conservation initiatives.

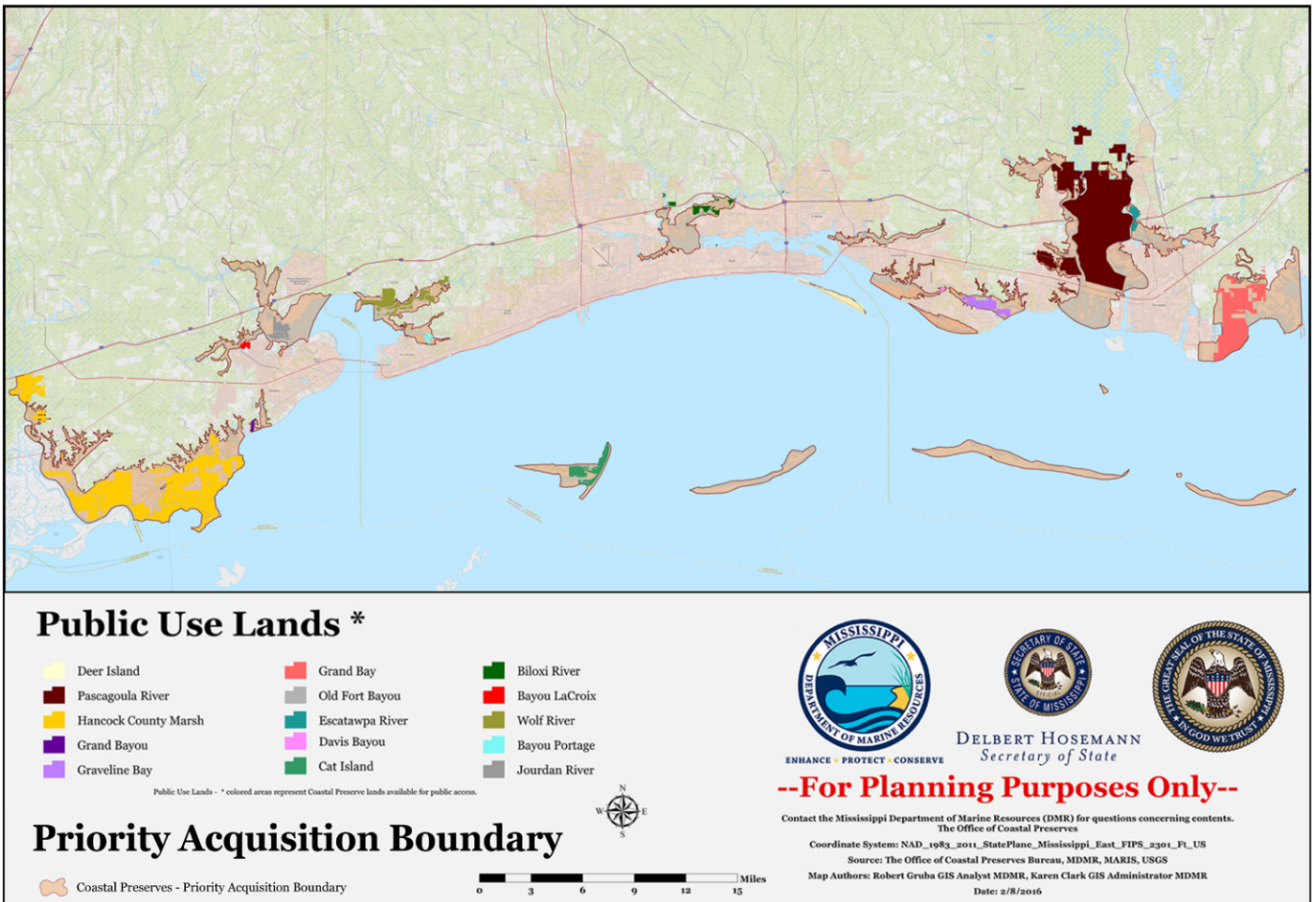
Mississippi Department of Marine Resources

BALANCING ECONOMIC GROWTH AND MARINE CONSERVATION



In the United States, the Mississippi Department of Marine Resources (MDMR) is tasked with the mission to enhance, protect, and conserve the state's marine interests. With territory along the US Gulf Coast, MDMR manages diverse marine life and wetlands to ensure equitable use for environmental, recreational, and economic interests.

Marine species, or "Submerged Aquatic Vegetation" (SAV), are protected under MDMR's Coastal Zone Enhancement Program. Companies engaging in development along these protected areas must apply for a permit and transplant any SAVs in the area to another location in order to mitigate environmental impacts.



Along the Mississippi Coast, 72,000 acres of tidal marsh, tidally influenced marsh, and wetlands are designated as "crucial coastal wetlands habitat" within 20 unique Coastal Preserve sites.

After conducting a second inspection of the project area, an applicant found there were no longer any SAVs in their project footprint, and requested an update to their original permit to remove any relevant environmental mitigation requirements. SAVs are transient and can disappear from both natural and manmade causes. MDMR had to verify that in the time from submitting the original proposal to requesting a revised permit, the company did not illegally remove the SAVs without transplanting.

In only one day, MDMR was able to pull Planet imagery over the area and time of interest to verify that there was no kind of barge or construction activities that would have served as evidence that there was human-made interference. If an applicant were to illegally destroy the protected habitat, MDMR would have been able to see that they violated local regulation.

MDMR was able to ensure permit compliance and the applicant saved more than \$100k in project costs.

In the future, MDMR is looking to use Planet data to evaluate tidal marsh health and quality over time—from monitoring biodiversity and identifying sedimentation issues to tracking highly transient sea grasses in bayous threatened by storms.

Watch how MDMR is keeping tabs on their wetlands: <https://go.planet.com/explore-wetlands>



Planet imagery captured August 22, 2020 (top) and August 31, 2021 (bottom) over the project footprint shows no signs of illegal development or unsanctioned activity that may have led to habitat loss.

WATER QUALITY MONITORING

It's imperative to monitor the quality of water bodies for a variety of uses, including drinking, transportation, recreation, and supporting aquaculture and marine habitats. Water quality can be affected by a number of factors including agricultural runoff, warm temperatures, industrial waste, and other natural or manmade pollutants.

Satellite imagery enables remote, broad-scale water quality monitoring using either visual inspection or deeper, spectral analysis. Planet's near-daily data, coupled with an extensive historical archive, allows analysts to perform simple, before-and-after comparisons of water bodies to monitor how quality has changed over time.



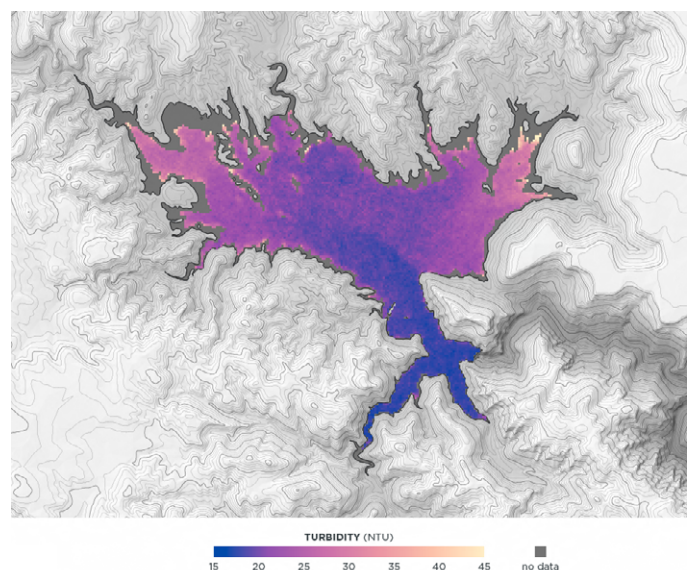
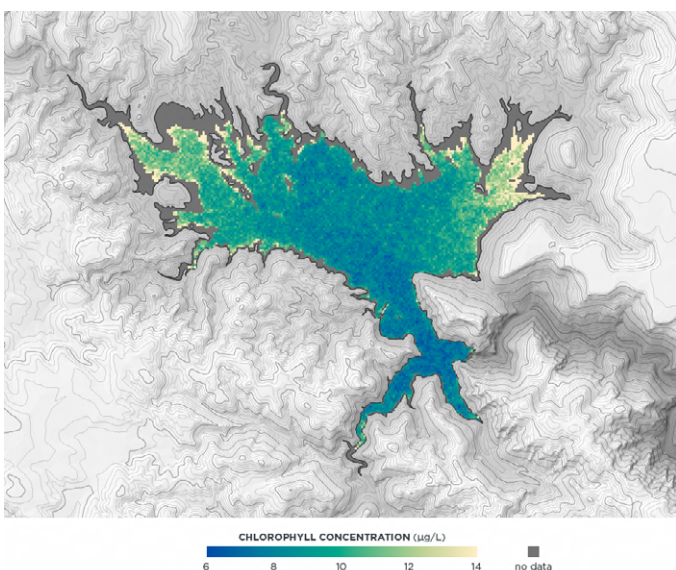
Pollution on Lake Maracaibo, Bachaquero, Venezuela. Oct 19, 2021. Source: Skysat

Black oil slicks and bright green algae mar the surface of Lake Maracaibo, a large lake in northern Venezuela that's suffered from decades of pollution from oil leaks and runoff. This high-resolution SkySat image shows a detailed view of the sources and impacts of pollution along the lake's shoreline near Bachaquero, and can even help determine the condition of aging infrastructure.

PRESERVING COMMUNITY DRINKING WATER



Medium resolution PlanetScope image of the Mulargia Reservoir in Sardinia, Italy. April 4, 2018



Analysis of Chlorophyll Concentration and Turbidity in the Mulargia Reservoir derived in part from PlanetScope data.

EOMap is a leading provider of optical remote sensing products for marine and freshwater environments based in Germany. The team supports both industry and government in the practical management of coastal zones and wetland ecosystems.

With the support of the EU Horizon 2020 Space-O project, EOMap looked to help the Water Authority of Sardinia, Italy (ENAS) track the water quality of the Mulargia reservoir, the source of drinking water for more than 700,000 people. The goal was to go about measuring and monitoring chlorophyll-a, turbidity, surface temperature, and harmful algae blooms to help inform local policy decisions.

The team needed higher spatial and temporal resolution satellite imagery than what existing public datasets could provide. Using near-daily imagery, they were able to deliver continuous reports to the appropriate decision-makers to protect their key water supply and the health of the surrounding communities.

From maritime navigation to water pollution monitoring, hear straight from our partners at EOMap about leveraging satellite data for water monitoring:

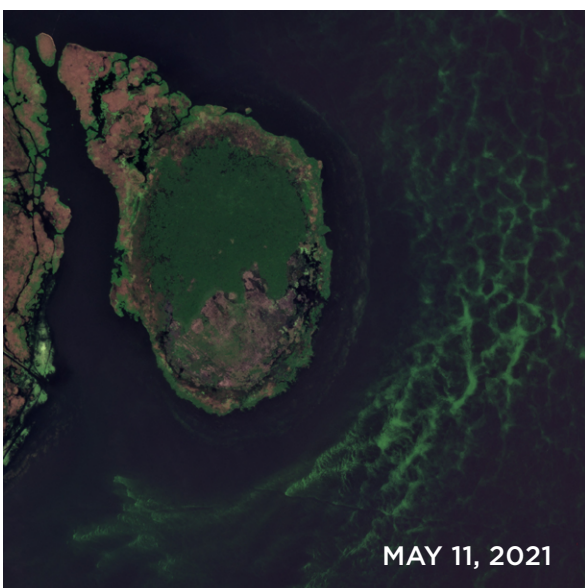
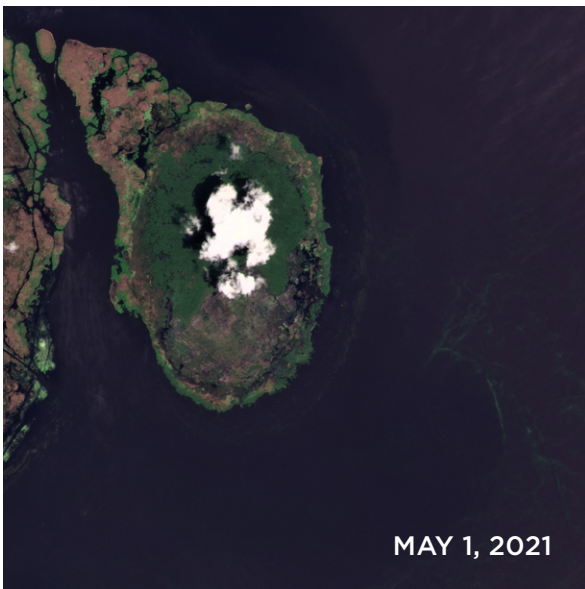
<https://go.planet.com/next-level-water-mon>

HARMFUL ALGAL BLOOMS — TAKE THE DIVE

With warming land and sea temperatures, outbreaks of harmful algal blooms (HABs) are becoming increasingly severe and difficult to manage. HABs can clog water intake pipes, degrade drinking water, and potentially sicken people and animals. Outbreaks can occur naturally, but “[nutrient pollution](#)” from unmitigated agricultural runoff and discharge from wastewater treatment facilities is spurring massive overgrowth of harmful algae and bacteria, and exacerbating the problem. They spread quickly and need to be detected early.

Maps derived from satellite data can show the location and extent of HABs and highlight where there is water quality and public health concern. With frequent, high-resolution satellite imagery, authorities will see:

- Earlier detection of HABs across water bodies to secure clean drinking water
- Time and cost savings from proactive versus reactive responses
- More up-to-date public safety information that is useful to fishermen, sailors, tourists, general public, and public water system managers
- Long-term sustained local revenue from local water-dependent industries



Early signs of an algae bloom outbreak can be seen at the North Shoal of Lake Okeechobee, Florida, USA. In a little over a week, Planet imagery shows how fast the outbreak is spreading and where.

MAKING WAVES: WHAT'S ON THE HORIZON

KEEPING A CLEAR EYE ON OUR COASTLINES

There is increasing interest and resources directed toward surveying the oceans and mapping our changing coastlines. We have entered a pivotal decade that the United Nations has declared the “Decade of Ocean Science for Sustainable Development (2021-2030).” From the International Seabed 2030 Project to official United States policy to map the Alaskan Coast, this interest is recognizing that historically, we have just not had the right data to understand our oceans and support all the biodiversity and services they provide.

This new decade calls for innovation.

TCarta is a US-based data services provider that specializes in satellite-based hydrospatial technologies. With a NOAA Small Business Research Grant, they're using high-frequency PlanetScope imagery to help field teams and aerial lidar surveyors map the biodiversity and water depth of the massive and remote US Alaskan coastline, often obscured by poor water clarity. Daily satellite imagery helps surveyors understand where and when they should fly for quality insights.

Hear from marine remote specialist Dave Flanagan about survey planning in Alaska.

<https://go.planet.com/mapping-alaska-coast>



This time series of PlanetScope imagery shows water clarity conditions over the mouth of the Egegik River in Alaska, USA.

RELIABLE INSIGHTS FOR AN UNCERTAIN FUTURE

Water is a broad, challenging topic, but new solutions are emerging that are helping officials scope and monitor local issues.

Planet offers comprehensive, cloud-based datasets that enable simple adoption, so new or existing GIS users don't have to set up new infrastructure or internal processes to adopt these solutions.

Spend less resources and time on data processing preparation, and invest in solutions for fast, yet informed, decision-making.



Phytoplankton in the Sea of Marmara, Turkey. Jun 10, 2021

UNDERSTANDING A NEW WORLD OF WATER

Find out more

Don't wait to discover how today's satellite data solutions can help build a more sustainable future for your community.

Hear More from the Planet Community

See Planet users demonstrate how satellite imagery is facilitating fast, accurate environmental monitoring
go.planet.com/environmentalmonitoring

Dive Deeper into Drought

Discover how climate change is remaking the Western US
go.planet.com/drought

Contact us

Tell us more about your specific challenges, and we'll work with you to find the right path to actionable insights
go.planet.com/getintouch



Pangong Tso, Ladakh, India. May 27, 2020



False-color of a receding Brahmaputra River, Guwahati, India
October 10, 2020

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