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Islands come in all shapes, sizes, and types, from tiny rocky outcrops to enormous continental landmasses. The true number of islands distributed in the planet's seas and oceans is still elusive. Recent efforts, bolstered by an abundance of detailed satellite imagery and the sophistication of geographic information systems (GIS), are bringing answers to those questions closer than ever.

Unlocking Ocean Intelligence—Lisa C. Wickliffe, Seth J. Theuerkauf, Jonathan A. Jossart, Mark A. Finkbeiner, David N. Stein, Christine M. Taylor, Kenneth L. Riley, and James A. Morris, Jr. 22

With a veritable deluge of new data sources for oceans coming online from satellites, shipboard surveys, and autonomous systems, transforming raw data into meaningful information has emerged as a crucial need for marine industries and management across a broad spectrum of communities. The National Oceanic and Atmospheric Administration and Bureau of Ocean Energy Management have successfully deployed an advanced geographic information systems platform to unleash the power of spatial analytics to unlock ocean intelligence.

The Geography of Ocean Plastics—Orhun Aydin and Shaun Walbridge, **Esri** 38

Since their invention in the 1950s, plastics have had an alarming and highly visible impact on the world's oceans that humanity certainly never anticipated. Modern scientific detectives are turning to big data and advanced GIS software to understand the major sources of plastic pollution in the world's oceans as a first step to reducing their presence.

Exploring Beneath the Basemap—Jennifer Bauer, Devin Justman, MacKenzie Mark-Moser, Lucy Romeo, C. Gabriel Creason, and Kelly Rose, **National Energy Technology Laboratory** 50

The majority of the world's energy and mineral resources are extracted from below ground. Subsurface geologists explore the world below land and sea through the lens of current and historical data. Using GIS and geoscience methods, scientists are redefining our knowledge of the subsurface.

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Researchers at Oak Ridge National Laboratory are mapping the global footprints of human activity with unprecedented spatiotemporal resolution. With a global population now approaching 8 billion people, this herculean effort demands advanced machine learning, artificial intelligence, and one of the world's fastest supercomputers.

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Facing the prospect of feeding an additional 2 billion people by the year 2050 has agricultural scientists scrambling for practical and sustainable solutions. Using data from a broad range of sources, geospatial innovations are creating breakthroughs.

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Using big geodata, researchers at the World Resources Institute are using advanced geospatial tools and data frameworks to better monitor and model the spatial patterns of human activity in the world's remaining tropical forest landscapes.

How to Feed the World—Daniel Roberts, Bruce Vandenberg, Steven Mirsky, Michael Buser, **USDA—Agricultural Research Service**; Chris Reberg-Horton, **North Carolina State University—Center for Environmental Farming Systems**; and Nick Short and Sudhir Shrestha, **Esri** 110

Agricultural science is searching for more efficient and sustainable farming practices in the face of an additional 2 billion mouths to feed by 2050. Big data from new innovations in sensors, delivered within the geospatial cloud, will in turn enable a new crop of precision farming techniques and analytics.

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Monitoring Air Quality in the United States—Liz Naess and Halil Cakir, **EPA**; and Alberto Nieto, **Esri** 126

Born in the midst of rising concern about harmful pollution in 1970, the US Environmental Protection Agency has since its inception focused considerable attention and resources on air quality. Using GIS, the agency's Office of Air Quality Planning and Standards compiles, synthesizes, and publishes data to guide policy that keeps the public safe and informed.

The Urban Tree Canopy—Jarlath O'Neil-Dunne, **University of Vermont**; Dexter Locke and J. Morgan Grove, **US Forest Service**; and Michael Galvin, **SavATree** 140

In dense urban centers, a city's treescapes (or lack thereof) have a big impact on the quality of life. A unique government and academic partnership uses lidar and GIS technology to help communities map, assess, and monitor their urban tree canopy.

Monitoring Disasters—Jeremy Kirkendall and Garrett Layne, **NASA Disasters Program** 150

Responding to major natural and human-caused hazards, the NASA Earth Applied Sciences Disasters Program collects, synthesizes, and shares data collected from dozens of Earth-orbiting satellites.

Environmental Monitoring with Drones and GeoAI—William Shuart, **Virginia Commonwealth University**; and Rohit Singh, Lain Graham, and Gerald Kinn, **Esri** 168

The blue catfish is an invasive species that is wreaking havoc in the Chesapeake Bay. Scientists are using drone imagery, artificial intelligence (AI), and GIS as they probe to understand the full scope of the problem.

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