

Department of the Interior, U.S. Geological Survey

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USGS Ecosystems Mission Area



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USGS Mission and Vision

USGS Mission: Monitor, analyze, and predict current and evolving dynamics of complex human and natural Earth system interactions and to deliver actionable intelligence at scales and timeframes relevant to decision makers.

Vision Statement: Lead the Nation in 21st-century integrated research, assessments, and prediction of natural resources and processes to meet society's needs.



USGS Science Mission Areas



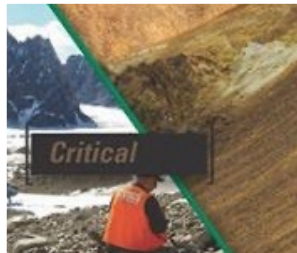
Core Science Systems

Delivers nationally focused Earth systems and information science that provides **fundamental research and data that underpins all Mission Areas of the USGS**



Ecosystems

Provides science to help America achieve sustainable **management and conservation of biological resources** in wild and urban spaces, and places in between



Energy & Minerals

Conducts research and assessments that focus on **the location, quantity, and quality of mineral and energy resources**, including the economic and environmental effects of resource extraction and use



Natural Hazards

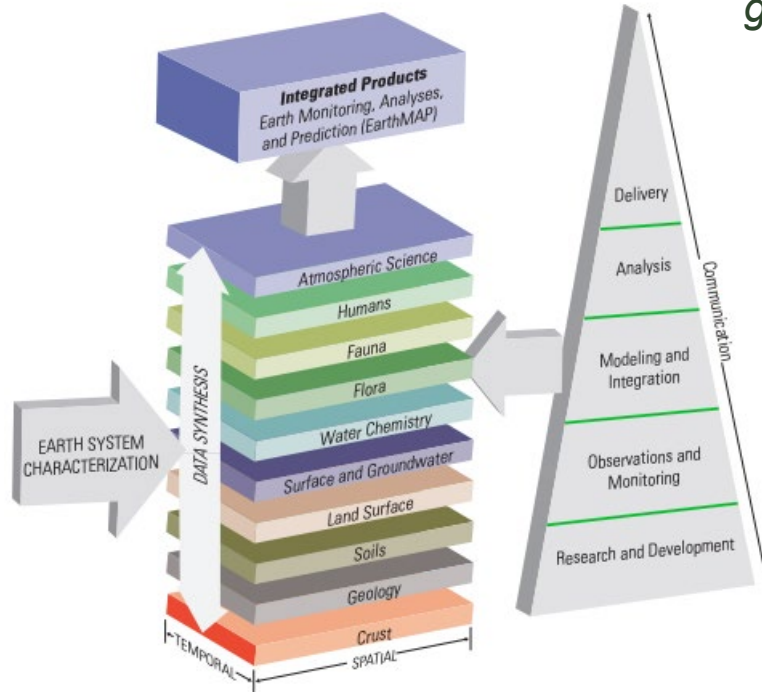
Works with many partners to monitor, assess, and **conduct targeted research on a wide range of natural hazards** so that policymakers and the public have the understanding they need to enhance preparedness, response, and resilience



Water Resources

Works with partners to **monitor, assess, conduct targeted research, and deliver information on a wide range of water resources and conditions** including streamflow, groundwater, water quality, and water use and availability

Top AI Successes



“Now is the time to take stock of where USGS science will go in the next decade to ensure that we respond to 21st-century challenges with 21st-century science and technology.”

- James F. Reilly II, USGS Director

- AI Strategy Developed!
- Ecological Monitoring & Research
- Derived Satellite Imagery Products
- Water Quality Prediction
- Intelligent Map Queries

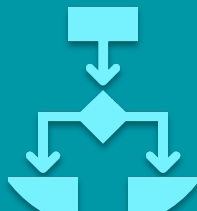
U.S. Geological Survey, 2021, U.S. Geological Survey 21st-Century Science Strategy 2020–2030: U.S. Geological Survey Circular 1476, 20 p., <https://doi.org/10.3133/cir1476>.

Draft AI Strategy



Develop a Strong AI Workforce

- Attract & Hire New Talent
- Train the Current Workforce
- Retain Talent



Optimize our Organizational Approach

- Adapt Policies & Procedures
- Communicate & Coordinate
- Govern Effectively



Ensure Responsible & Trustworthy AI

- Manage Risk Comprehensively
- Protect Scientific Integrity
- Ensure Equitable and Trustworthy AI



Modernize Technical Infrastructure

- Upgrade Foundational Infrastructure
- Facilitate Exploration & Discovery
- Share AI Advances



Accelerate AI Adoption & Innovation

- Prioritize and Incentivize AI Adoption
- Support AI Research & Development
- Collaborate with the AI Community

Using AI for Walrus Monitoring in AK



- The Pacific walrus is central to the cultural identity and food security of five linguistically distinct cultures across the Bering Strait.
- When sea ice is absent, walrus rest together on shore. When on shore, they are at risk from natural and human disturbances that can cause stampedes, killing large numbers of walrus and affect the population trajectory.
- Autonomous monitoring is critical to prevent disturbance and protect walrus populations



Run
Automated
Image
Classifier

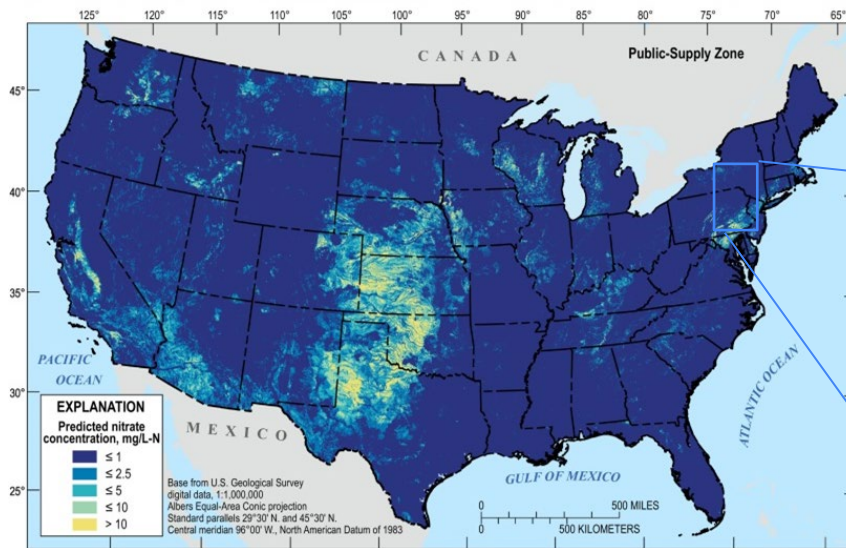


Notify
Managers

Walrus
present at
beach?
Yes or No

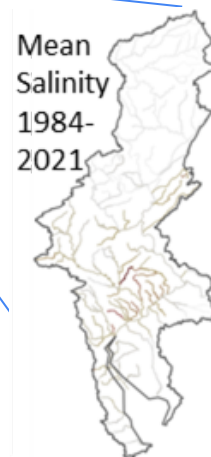
ML-Based Water Quality Prediction

- ML can predict nitrate and salinity contamination in groundwater at the depths of withdrawals for irrigation and domestic uses
- ML predictions of river salinity, temperature, and nutrients provide multi-decadal past and future projections of changing water suitability for humans & ecosystems
- ML with data assimilation can produce accurate short-term forecasts that support reservoir operations decisions



Groundwater nitrate: [Ransom et al. 2022](#)

Stream salinity:
[Smith et al. 2024](#)



Intelligent National Map Project

provide comprehensive answers to natural language prompts

include various types of information

Intelligent National Map Should

analyze and display 3D visualization

deliver direct access to data

show me the Houston area hospitals that might flood if the region received 12 inches of rain in a day



I don't have access to real-time flood risk assessments for specific Houston area hospitals based on predicted rainfall amounts. Determining which hospitals might flood during extreme weather events like receiving 12 inches of rain in a day involves detailed local knowledge of flood zones, drainage systems, and infrastructure vulnerabilities.

To obtain accurate information about hospitals at risk of flooding in the Houston area under such conditions, it's recommended to consult resources provided by local emergency management agencies, city planning departments, or healthcare organizations. These entities can provide insights into flood risk assessments and emergency preparedness plans specific to hospitals and healthcare facilities in the region.

Same prompt from the Intelligent National Map (now in Beta!)

Intelligent National Map (Demo Only)

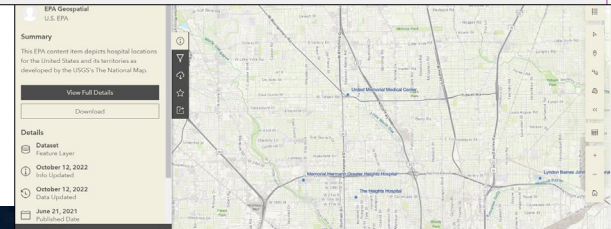


show me the Houston area hospitals that might flood if the region received 12 inches of rain in a day

Based on the data, the following hospitals in the Houston metro area might be affected by flooding due to their proximity to the location:

1. United Memorial Medical Center - 510 West Tidwell Road, Houston, TX 77091
2. University of Texas MD Anderson Cancer Center - 1515 Holcombe Boulevard, Houston, TX 77030
3. Quentin Mease Community Hospital - 3601 North MacGregor Way, Houston, TX 77004
4. Kindred Hospital - 1120 Business Center Drive, Houston, TX 77043
5. Texas Children's Hospital - 6621 Fannin Street, Houston, TX 77030

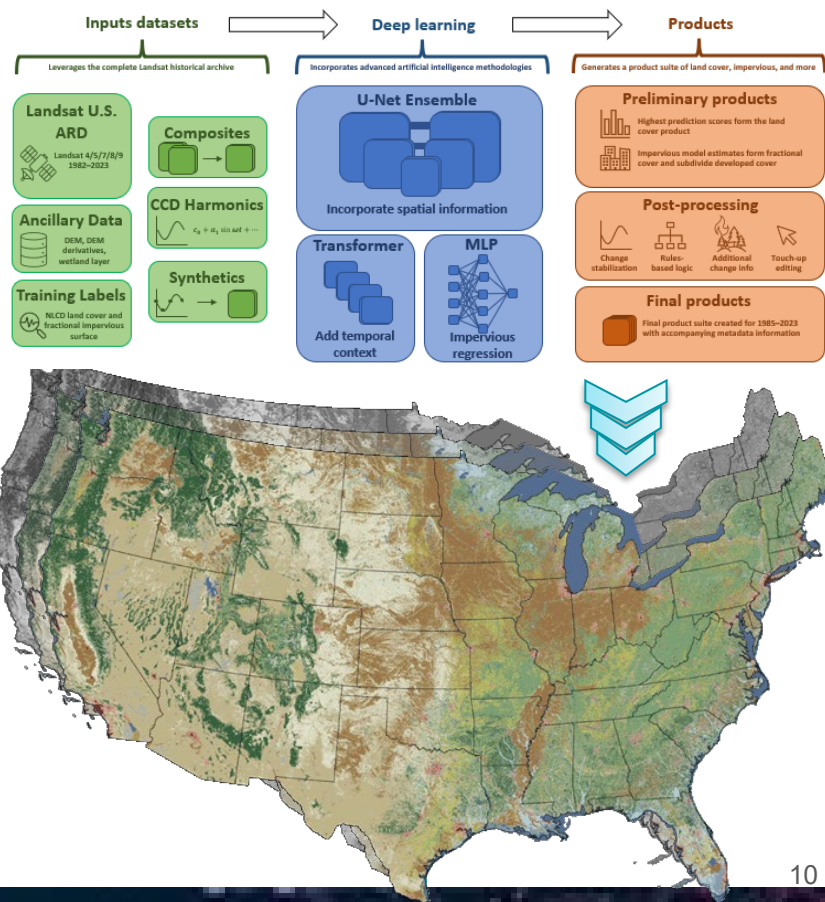
For more information about hospitals and medical centers in the dataset titled The National Map Hospitals & Medical Centers (USGS 2022), you can visit this link: [here](#).



Example natural language prompt with response from ChatGPT 4.0

National Land Cover Database

- Next generation National Land Cover Database (October 2024 release)
- Landsat-based, annual land cover for the Nation
- Based on hundreds of Landsat images from 1984 to present, detecting change and making land cover predictions, pixel by pixel
- Model informed by over 30 billion unique training cases



Top Challenges

- Balancing Innovation with Oversight
 - Generative AI for science
 - Leverage efficiencies, ensure or even enhance scientific integrity
- Training & Communication to Diverse Audiences
 - AI users; AI developers; science domain experts; information technology; acquisitions & contracts; leadership
- Government Keeping Up with Rapid Technological Advances
 - Technology adoption & acquisition, policies & procedures, workforce, and more

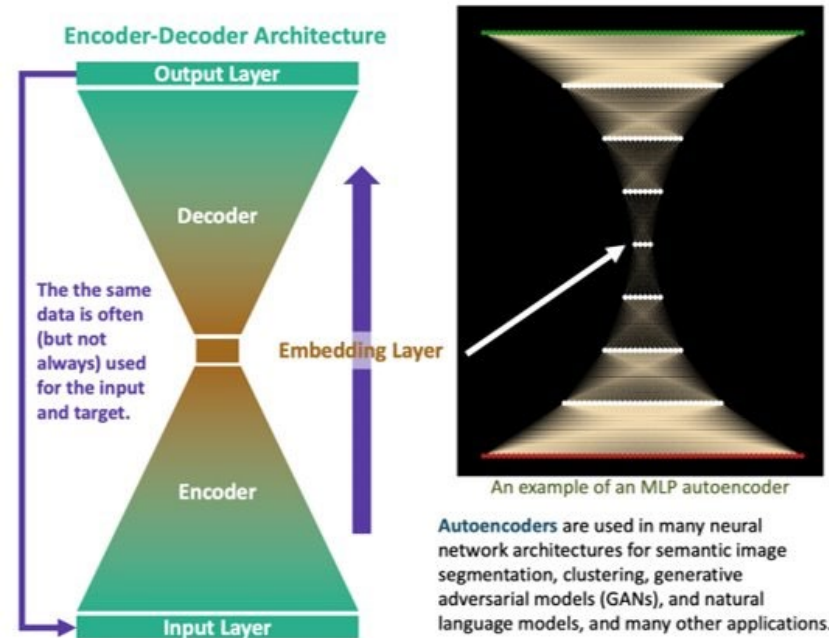


Figure used during Intro to Deep Learning Training Course for AI Developers (USGS Advanced Research Computing, Jeff Tracey)

Thank You!



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