



# Google Cloud Geospatial

## New Launches and Sustainability

*DA Customer Council, August 2022*

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Google Cloud

# Vision

Enable geospatial insights and innovations to solve  
real-world problems at unprecedented scale,  
driven by Google Cloud services and data

Sustainability is a data challenge  
that requires radical  
collaboration, rapid innovation,  
& commercial flexibility



# Geospatial workloads have two primary categories of data

## Vector (Tabular)



Geography:

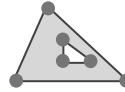
Point



Linestring



Polygon



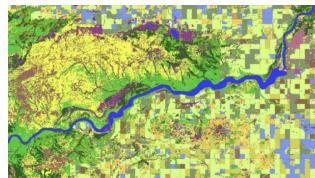
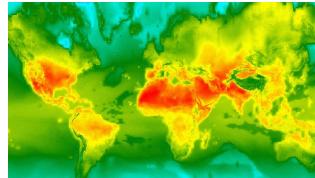
Multi-polygon



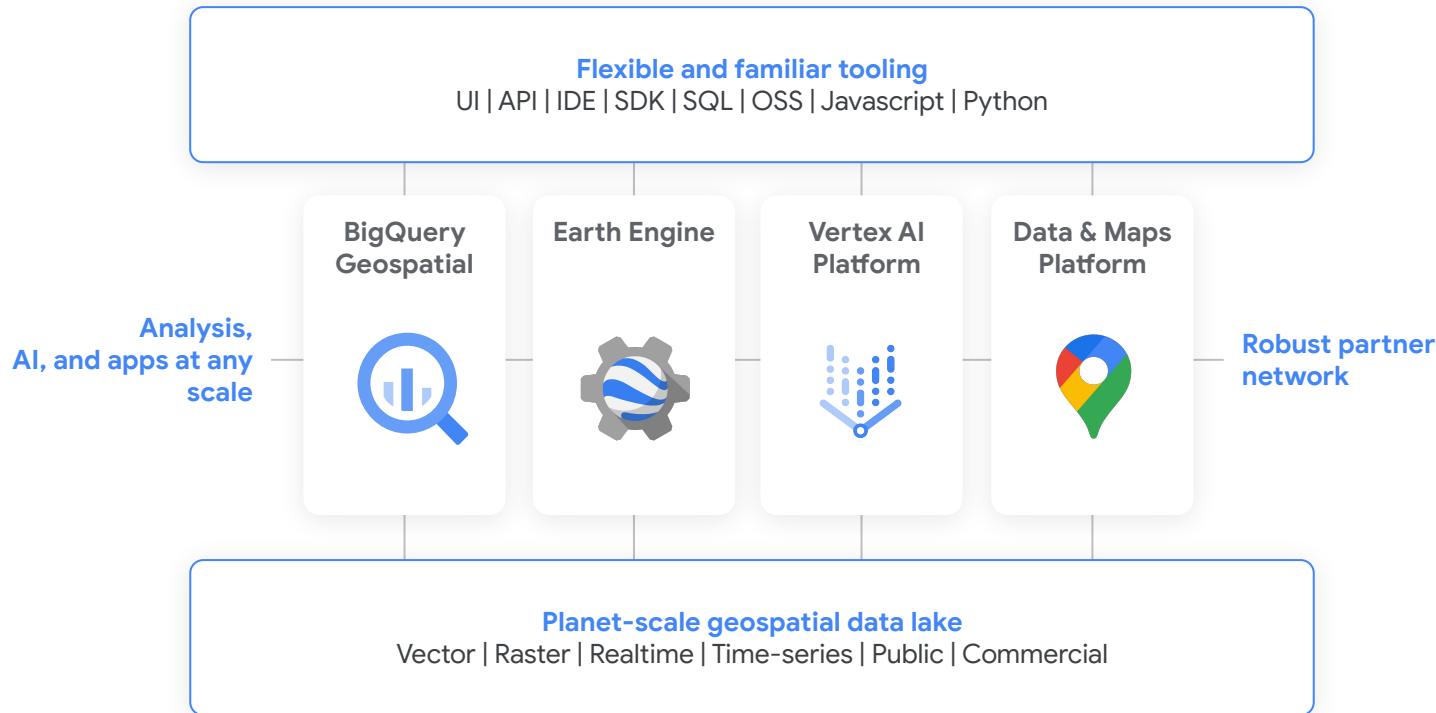
Collections



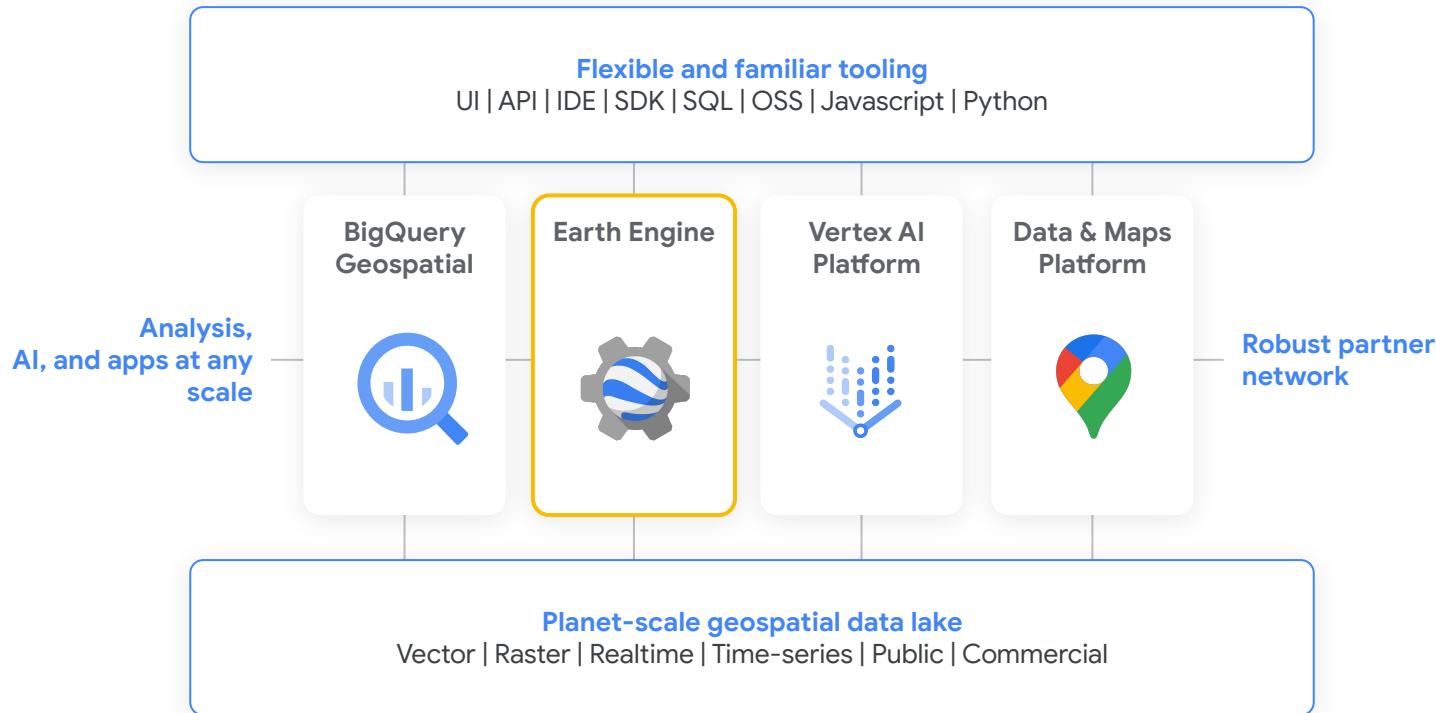
## Raster (Imagery)



# Integrated View of Google Geospatial Cloud



# Integrated View of Google Geospatial Cloud





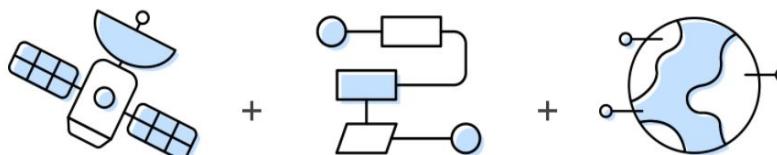
# A planetary-scale platform for Earth science data & analysis

Powered by Google's cloud infrastructure

▶ Watch Video

## Meet Earth Engine

Google Earth Engine combines a multi-petabyte catalog of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface.



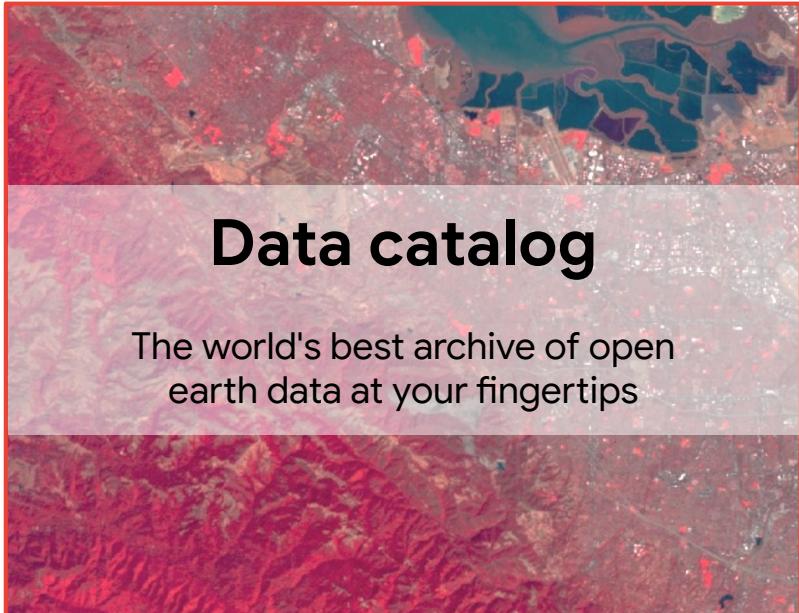
Satellite Imagery

Your Algorithms

Real World Applications



# Google Earth Engine



**Data catalog**

The world's best archive of open earth data at your fingertips



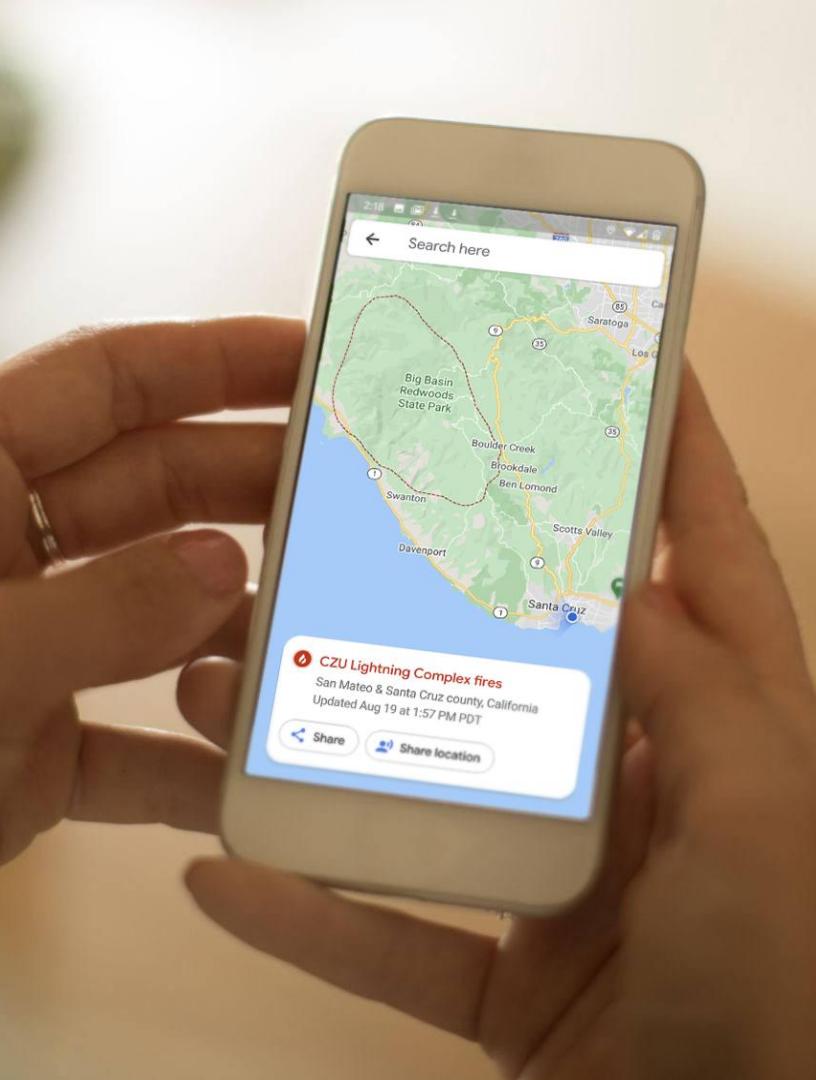
**Computation platform**

A revolutionary tool to analyze and visualize earth data at scale

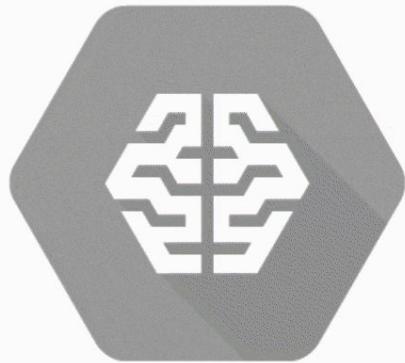
# An explosion of satellite data



Source: NASA



# Automatic classification with Cloud AI





GOOGLE EARTH

# Introducing Earth Engine for governments and businesses

Jun 28, 2022 · 4 min read

# Climate Risk | Customer Use Case

## Rail customer mitigates environmental risks

**Problem statement:** Severe weather, environmental change and climate-risks can be detrimental to rail business. Today it is difficult to predict and manage near-term risks and impacts to assets.

**Opportunity statement:** Develop a Climate Risk Predictor capability which is embedded into operational/risk management routines and automatically alerts the appropriate stakeholders between 1 day to 8 weeks out of key risks.



# Climate Risk | Customer Use Case

## Predicting and managing wildfire risk

1. Government mandates reduced speeds on all trains to minimize risk of track sparks starting fires

2. Wildfire risk is a mixture of:

- **Fuel load:** Vegetation, grass, and trees measured from satellite imagery
- **Environmental conditions:** Temperature, wind, & precipitation from historic data and recent forecasts

3. Proactively forecast wildfire risk to make operational and scheduling decisions at 1 day to 2 month horizons of when and where to take preventive measures or slow trains



A circular image showing two salmon swimming in the water. The fish have vibrant green and blue heads, with reddish-orange bodies. They are shown from different angles, one facing forward and one slightly behind it. The background is dark and slightly blurred.

# Saving Salmon with Geospatial Analytics

Christian Nilsen

Geosyntec Consultants

*Google DA Customer Council, August 2022*

# Welcome to Seattle!

We really love salmon

Supports **16,000** jobs

**\$1.1 billion** annual GDP contribution

**134** other species depend on salmon for food.

Center of cultural identity for native tribes and others

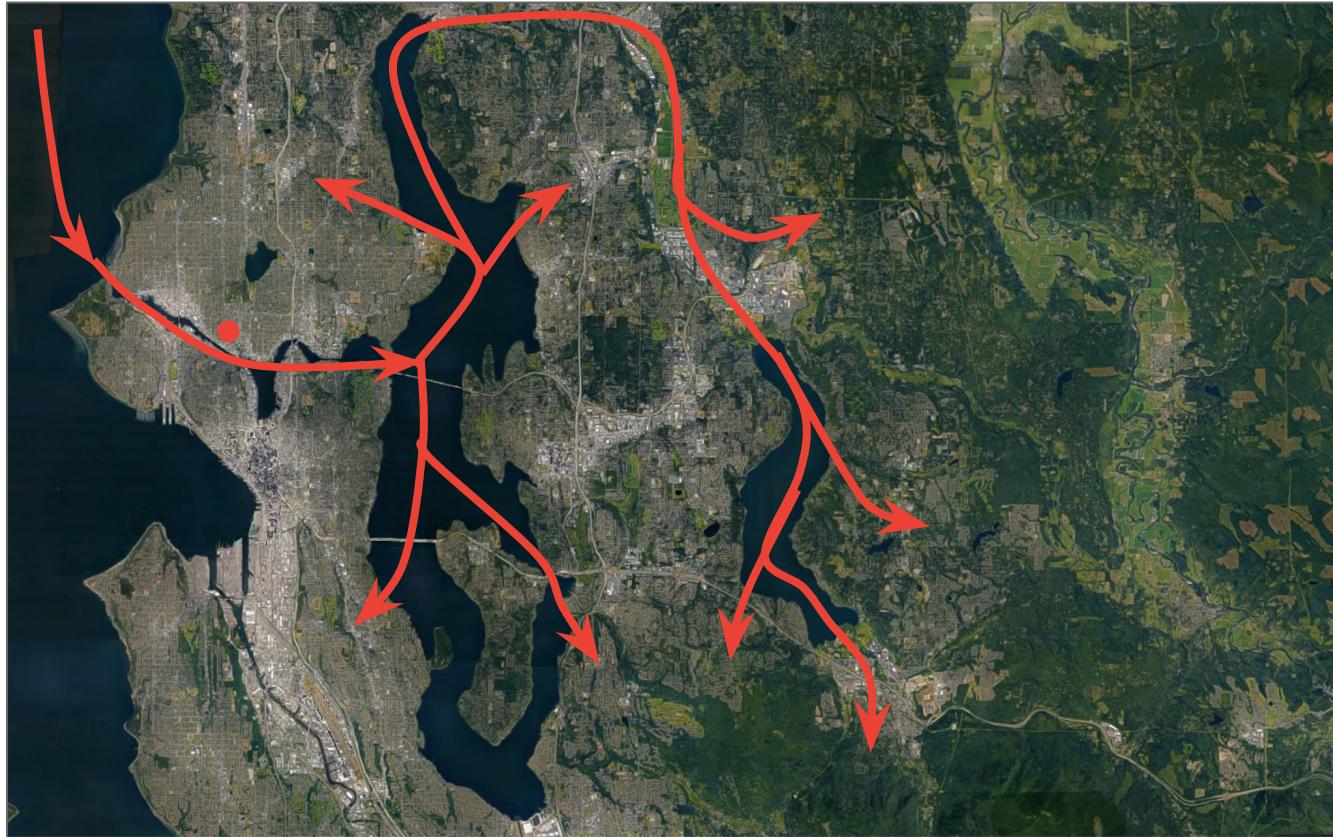


# One type of spatial data

## Treaty Tribes and Ceded Lands of Washington



# Geospatial data from a Salmon's perspective





# Migration barriers reduce salmon survival

Public agencies obligated to address

**2001**

21 tribes sue Washington State in Federal Court over fish blocking culverts.

**2018**

Supreme Court reaffirms treaty rights. State must remove fish barriers.

**2030**

Court ordered deadline to fix high-priority sites.

The New York Times

***'This Ruling Gives Us Hope': Supreme Court Sides With Tribe in Salmon Case***



[nytimes.com, June 11, 2018](https://www.nytimes.com/2018/06/11/us/supreme-court-washington-salmon.html)

# Fish passage barrier replacement

\$1 million - \$4 million per crossing



# King County Fish Passage Restoration Program

2,500+ county-owned stream crossings

## Needs

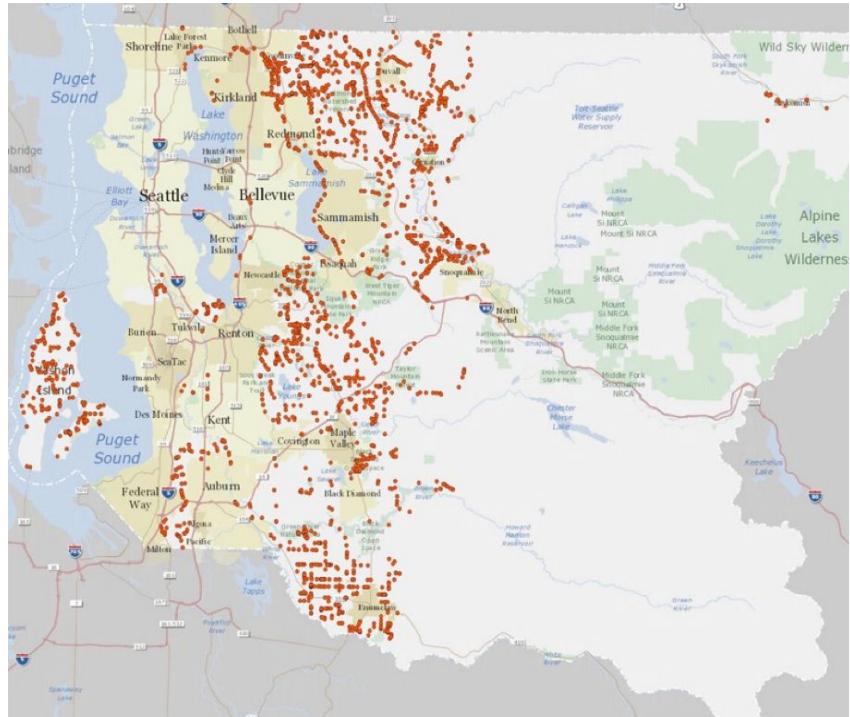
Rapid identification of presence of barriers

Flow statistics at each location to determine if barrier exists

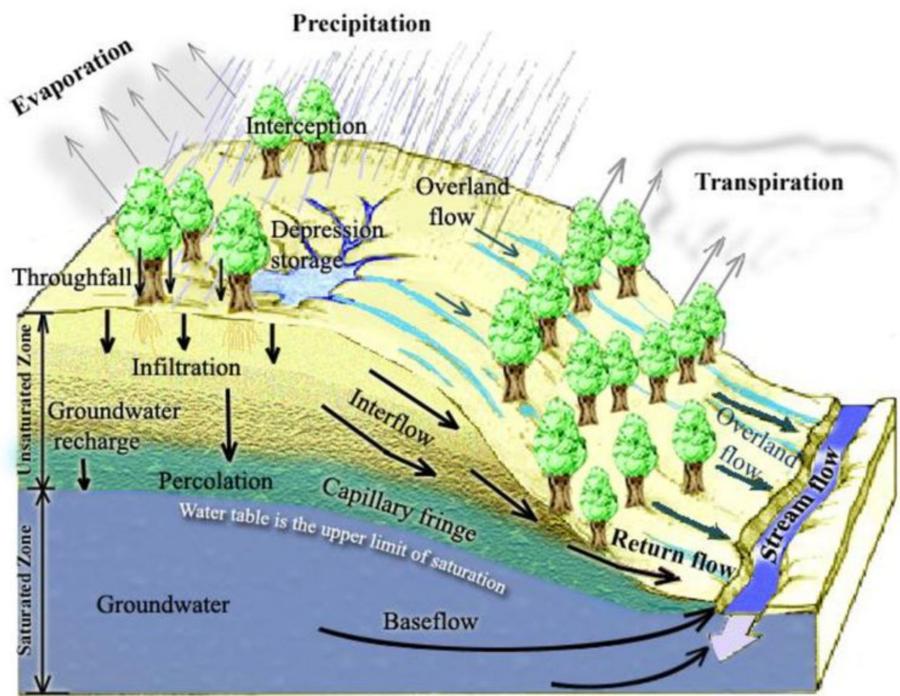
## Constraints

New locations continually discovered

Typical approaches slow and resource intensive



# Watershed Modeling



Current practices not suited for big data



One watershed  
at a time



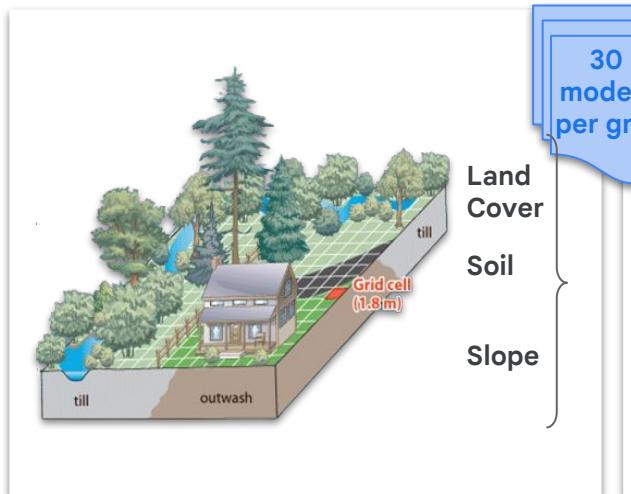
No integration between  
modeling and analysis



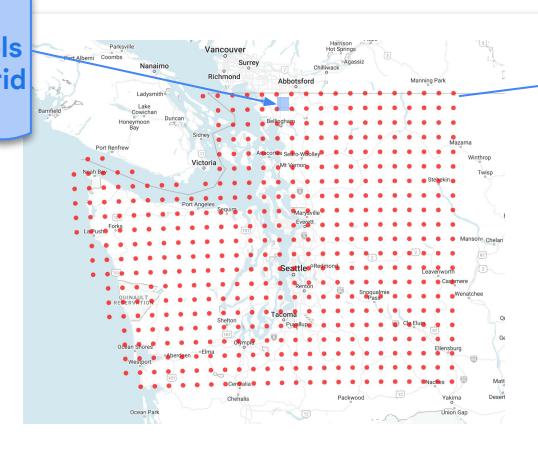
Fortran based models

# A modeling approach built for cloud

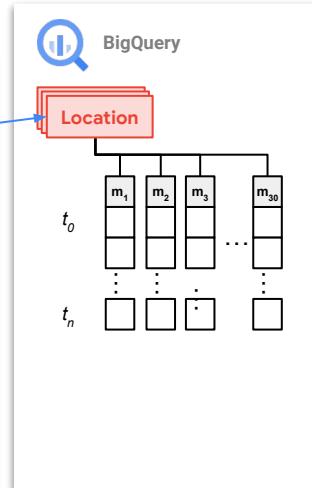
Split parameters to primary components



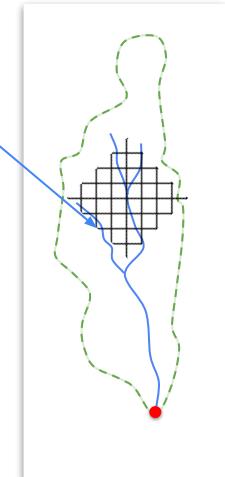
Model all possible combinations for each rainfall location



Store model results



Assemble results for each watershed



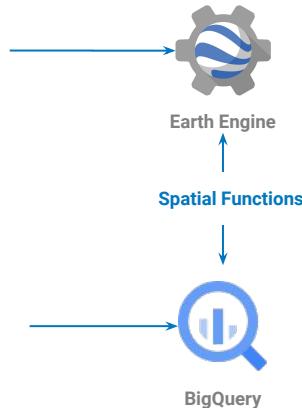
# Need for integrated spatial and time series analysis

## Spatial data

Rainfall grid location  
Watershed geometry  
Landscape data

## Tabular data (time series)

Rainfall record  
Runoff time series  
Migration window  
Flow metrics



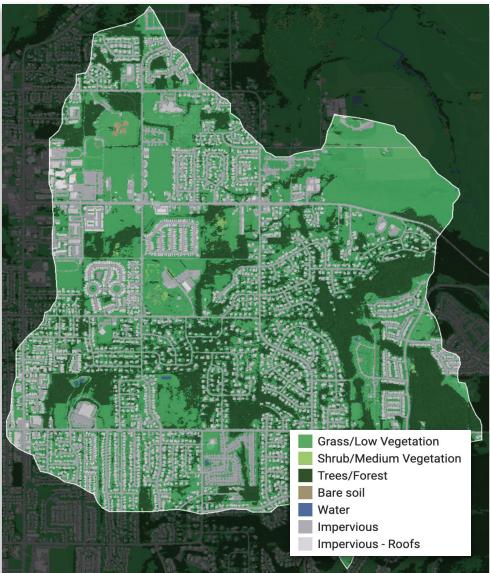
# Watershed spatial data

Google Cloud

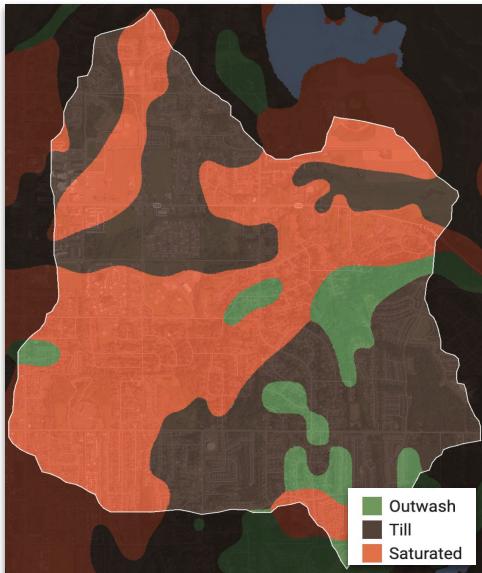


Earth Engine

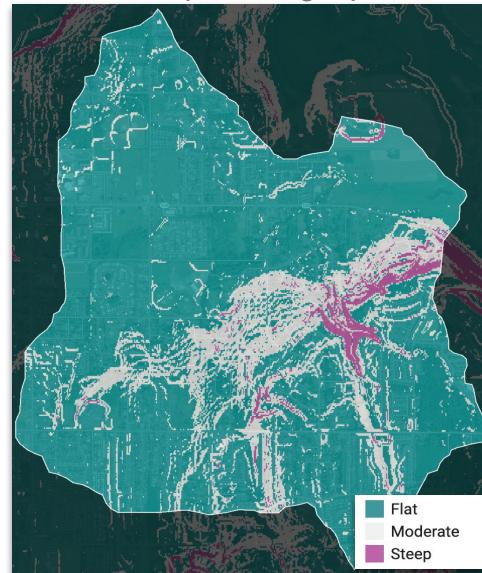
Land Cover



Soil Type



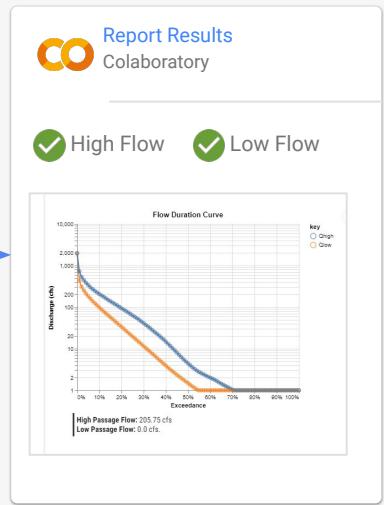
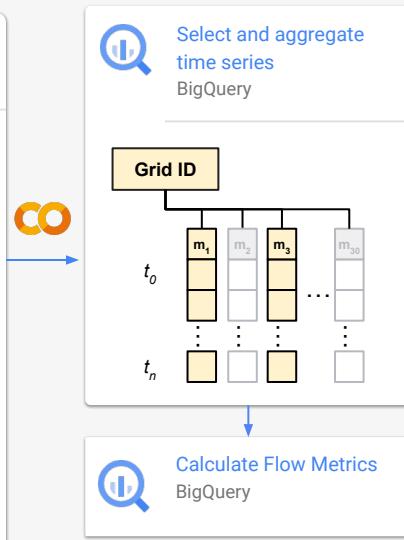
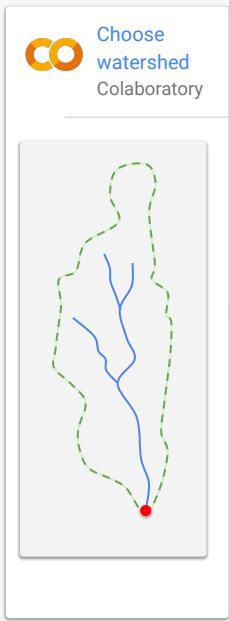
Slope Category



# Workflow

## Combining spatial and time series data

Google Cloud



# Results

## Accelerated action



**2 years** of work compressed to **2 months**

**First** large agency in region to complete assessments

**10** projects currently underway



"Thanks to outstanding work by our team of leading experts, **we know precisely where we can produce the best results for the most salmon habitat as quickly as possible.** ...making our region one of the most shovel ready in the country for new federal infrastructure investments."

*Dow Constantine, King County Executive*

## Visible progress

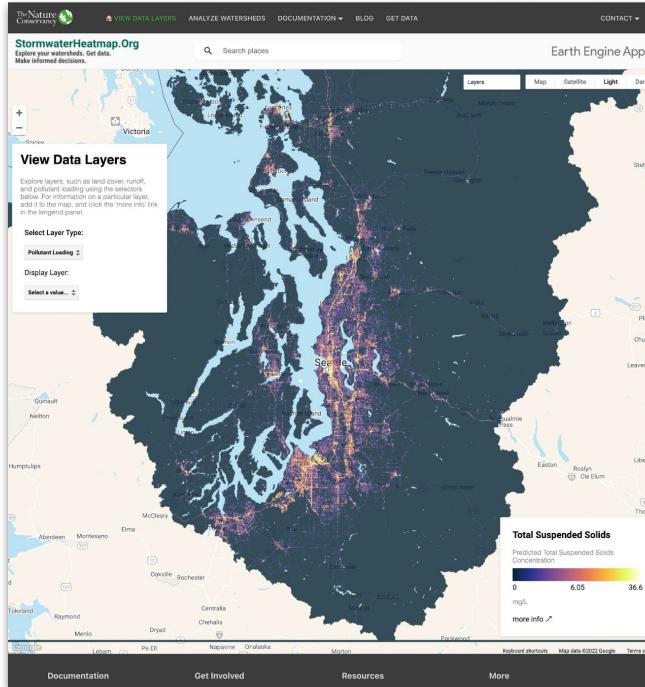
### The Seattle Times

King County's culvert hunters – and a \$9 billion plan to save salmon habitat



# Building a community for water solutions

[StormwaterHeatmap.org](http://StormwaterHeatmap.org)



OUR GREEN  
DUWAMISH



The Nature  
Conservancy



## **Today's environmental challenges are:**

- Complex
- Cross sector
- Time critical

**Cloud can meet these challenges!**



# Thank you!

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## Funders & Collaborators

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