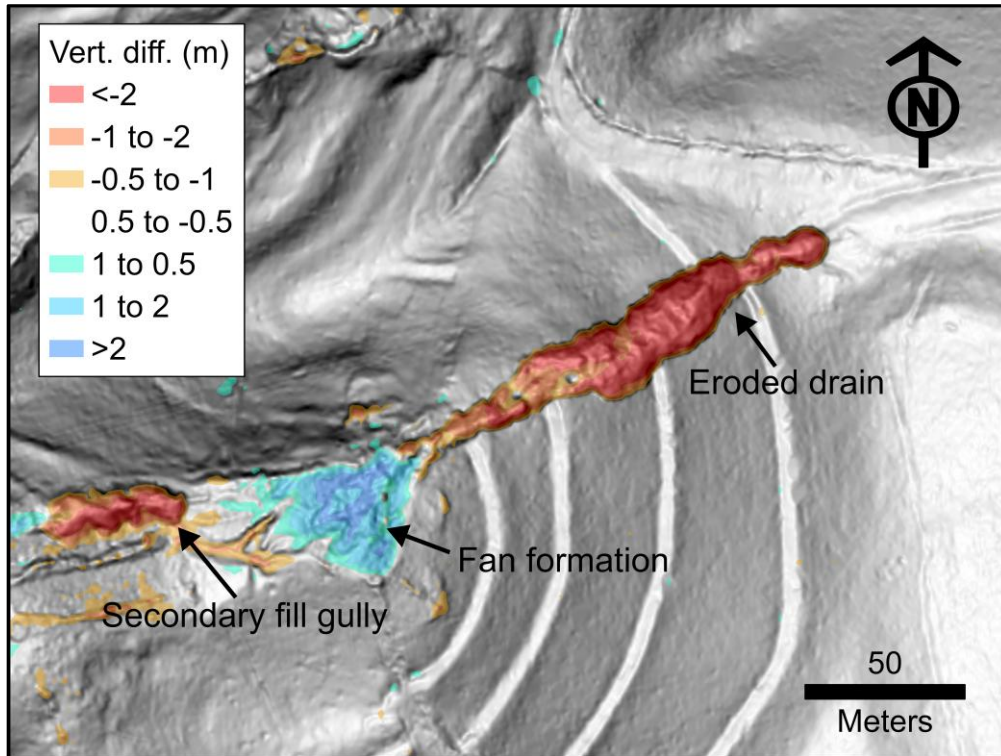


Miles Reed, PhD

Geospatial Scientist | Terrain Change | Deep Learning | Numerical Modeling

I develop geospatial, remote sensing, deep learning, and numerical modeling workflows for mapping features, quantifying terrain change, and interpreting geomorphic processes.



Repeat lidar reveals terrain change on a reclaimed coal mine in Kentucky.

Technical Case Studies

Mapping and classifying 13,000+ erosional features

Regional inventory of gullies and landslides across reclaimed mined landscapes.

Quantifying erosion and deposition from repeat lidar

High-resolution erosion/deposition mapping, terrain-class comparison, and rate of change estimation.

Deep-learning geomorphic feature extraction from terrain data

Geomorphic feature extraction from lidar-derived terrain using semantic segmentation workflows.

Landscape-evolution modeling with soils and tracers

Novel model with climate-sensitive processes and testable outputs.

Geospatial database construction

Converted fragmented permit and geology records into analysis-ready spatial data.

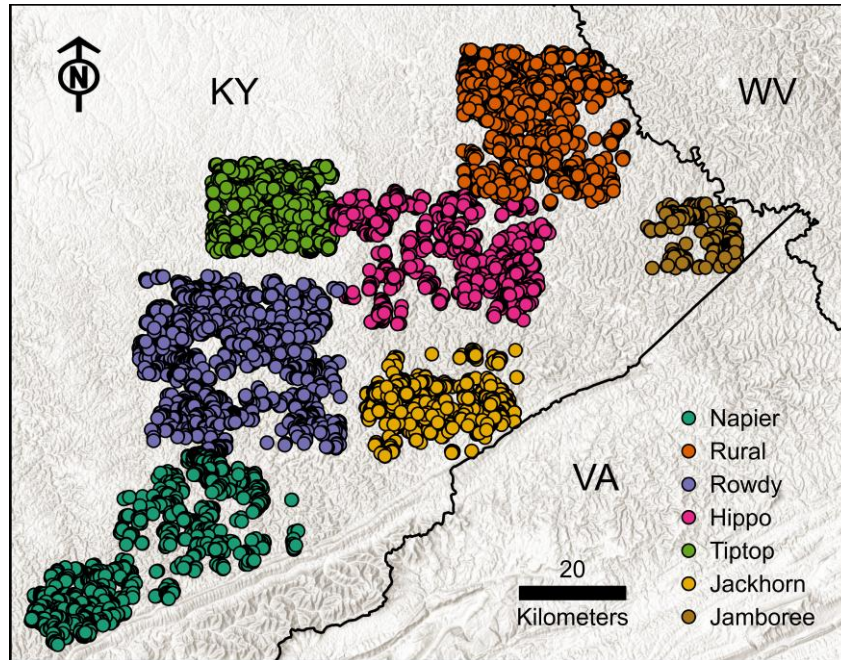
Observe · Extract · Quantify · Model

Miles Reed, PhD

Geospatial Scientist | Terrain Change | Deep Learning | Numerical Modeling

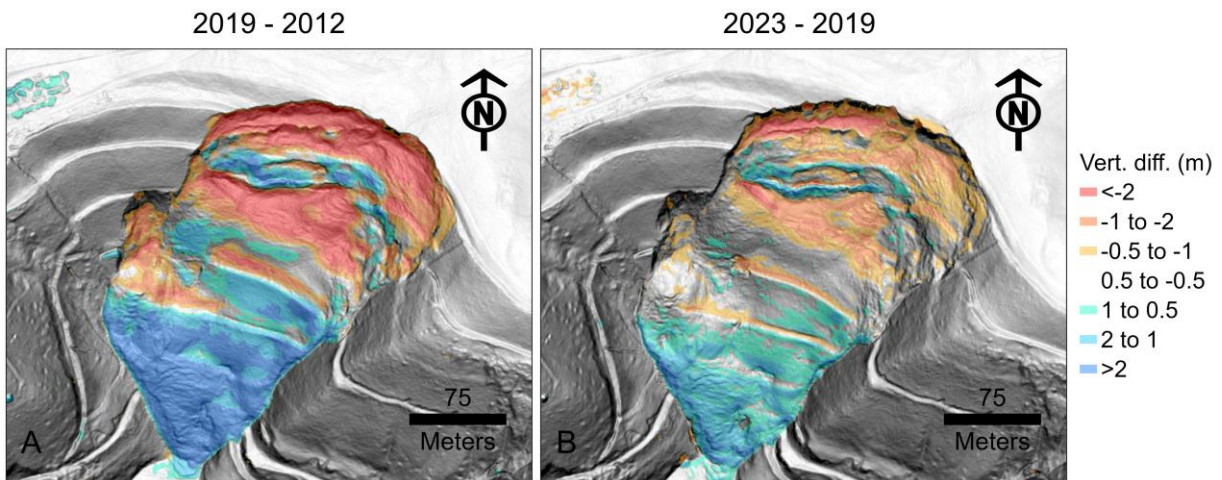
Mapping and classifying 13,000+ erosional features

Built a regional inventory of gullies and landslides on reclaimed mountaintop coal mines across ~5900 km² of eastern Kentucky. Work in review at *Earth's Future* journal.



13,134 mapped erosional features: 6,993 gullies + 6,141 landslides

I interpreted lidar slopeshades and digital elevation models (DEMs) of difference to identify gullies and landslides, classify their geomorphic setting, and determine whether they showed evidence of recent terrain change.



Terrain change between three lidar epochs (2012, 2019, and 2023).

Takeaway: I can curate large, research-grade geospatial datasets.

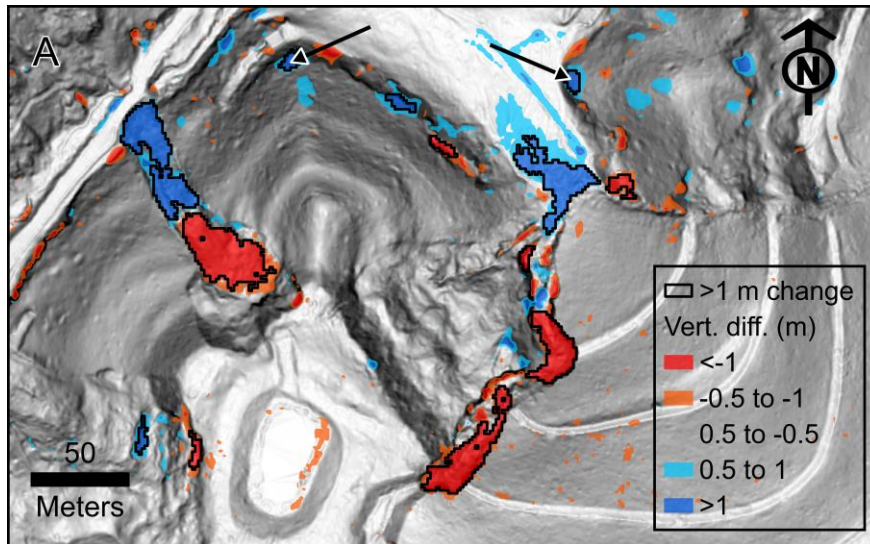
Observe · Extract · Quantify · Model

Miles Reed, PhD

Geospatial Scientist | Terrain Change | Deep Learning | Numerical Modeling

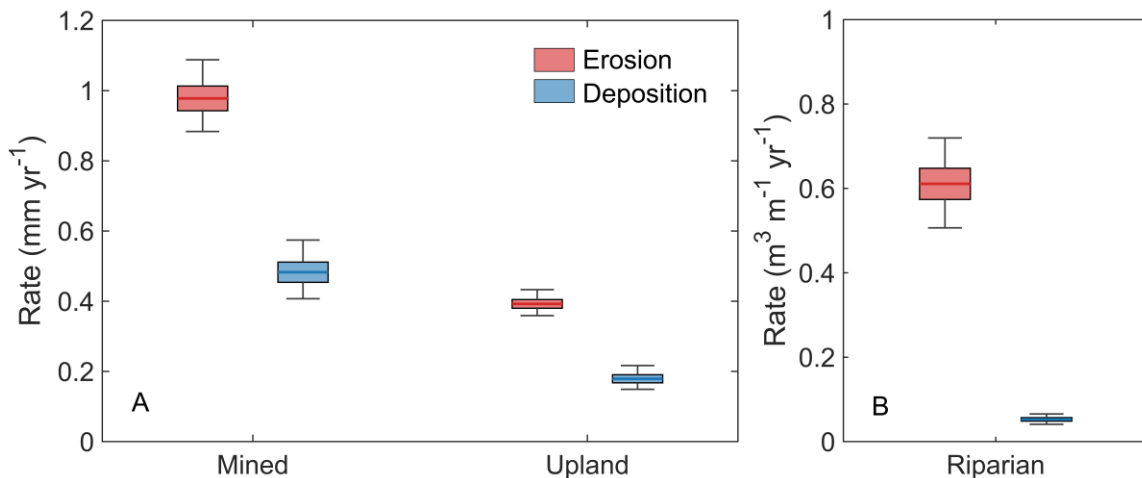
Quantifying erosion and deposition from repeat lidar

Across ~630 km², I used repeat lidar to extract high-magnitude terrain-change patches and compare erosion/deposition rates across mined land, less-disturbed uplands, and large stream corridors. Work in review at *Earth's Future* journal.



Example patches of >1-m absolute vertical difference between 2019 and 2012. Arrows show spurious patches removed during QA/QC.

Python (ArcPy) Workflow: DEM differencing → ±1 m thresholding → connected-patch extraction → slope/area/point-density filtering → manual QA/QC → terrain-class rate estimates → bootstrap uncertainty. ~7,000 total patches.



Rates of change on mined land, less-disturbed uplands, and stream corridors.

Takeaway: I can convert messy remote sensing data into defensible, uncertainty-aware metrics.

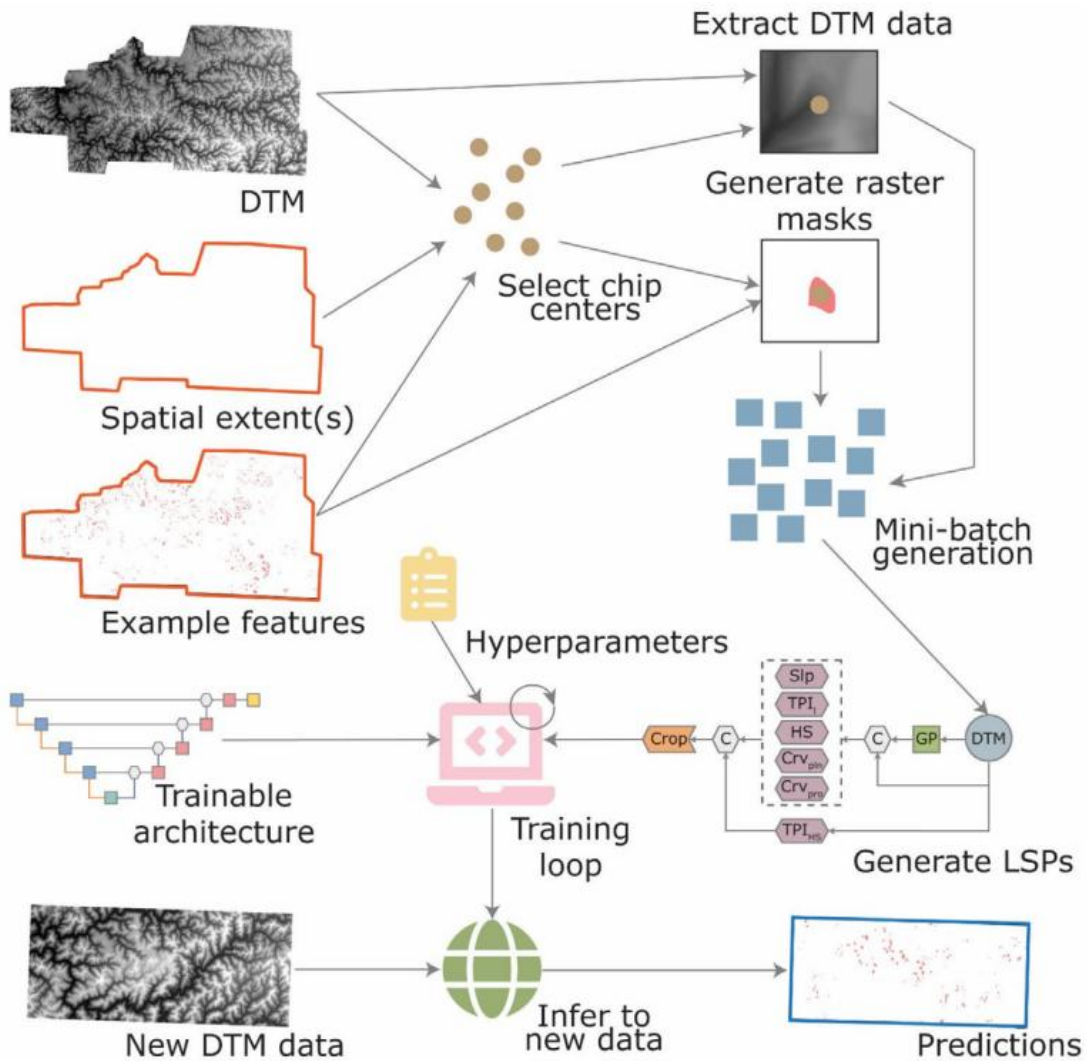
Observe · Extract · Quantify · Model

Miles Reed, PhD

Geospatial Scientist | Terrain Change | Deep Learning | Numerical Modeling

Deep-learning geomorphic feature extraction from terrain data

Workflow for extracting geomorphic features from DEMs using land-surface parameters (LSPs) and semantic segmentation. Work published in *Earth Surface Processes and Landforms* journal.



Schematic of deep-learning workflow. From Maxwell et al. (2026).

The Python-based workflow takes DEMs as input, derives terrain parameters, generates training chips and masks, trains segmentation models all in one go, saving disk space and memory on large-scale projects like the region-scale prediction of karst sinkholes.

Takeaway: I can operationalize deep-learning terrain workflows without treating the them as a black box.

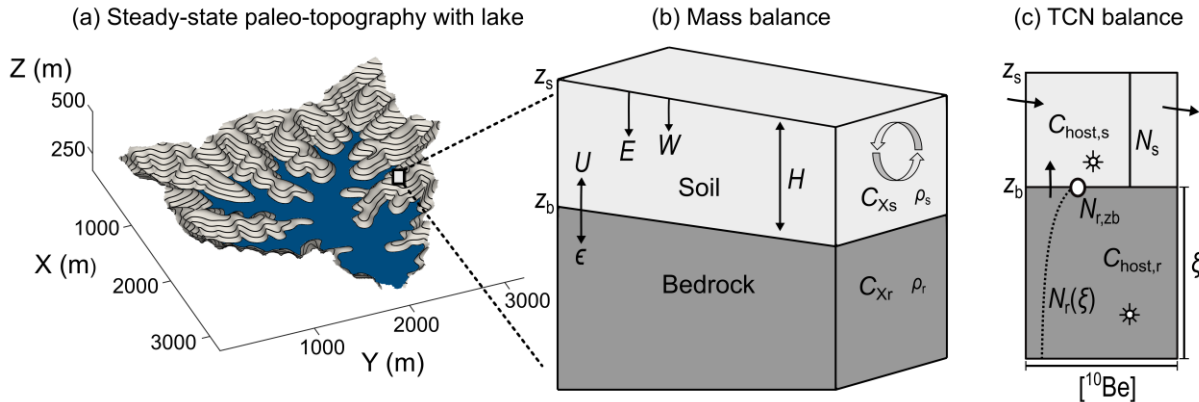
Observe · Extract · Quantify · Model

Miles Reed, PhD

Geospatial Scientist | Terrain Change | Deep Learning | Numerical Modeling

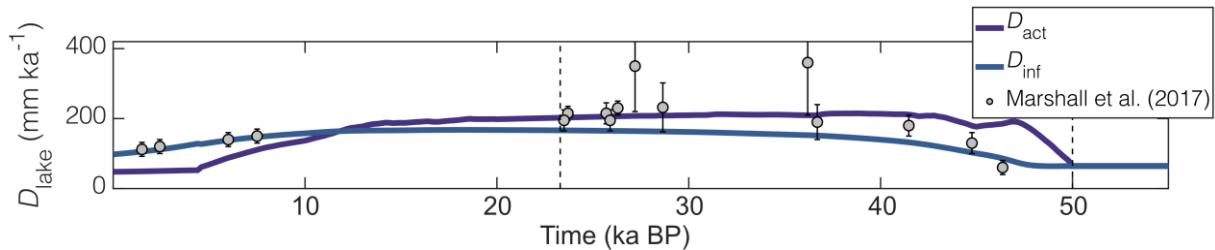
Landscape-evolution modeling with soils and tracers

Extended and applied a process-based landscape-evolution model to test how climate-sensitive erosion, soil transport, weathering, and tracer signals respond to glacial-interglacial forcing. Work published in *Earth Surface Processes and Landforms*.



Schematic of landscape evolution model's mass and tracer balance at each cell. From Reed et al. (2025).

Implemented in MATLAB, I used the model to test how climate-sensitive process changes could explain detected changes in physical and chemical erosion rates in a unique sediment core from Little Lake, Oregon.



Modeled actual (D_{act}) and estimated rates from tracer (D_{inf}) compared to sediment core data. From Reed et al. (2025).

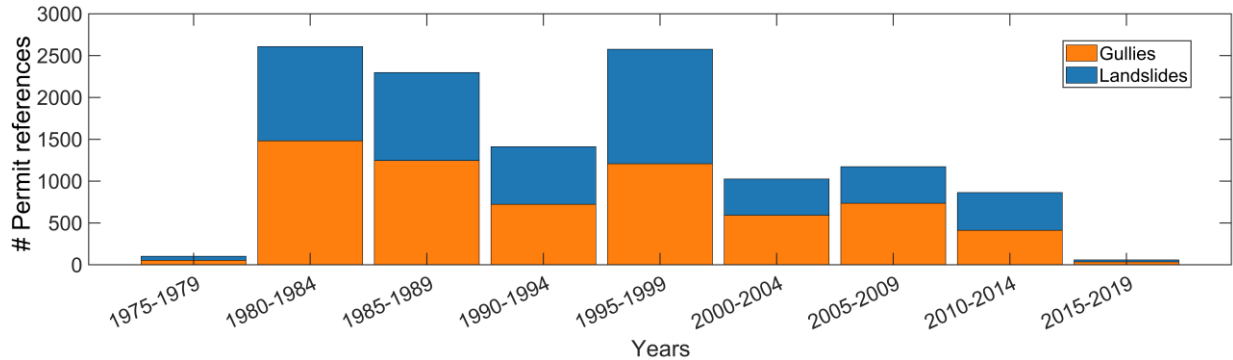
I work comfortably at the level of governing equations, state-variable updates, numerical experiments, and model-data comparison. Rather than treating computer models as fixed software tools, I create or modify them as needed for specific research questions.

Takeaway: I can translate environmental hypotheses into numerical experiments that produce testable, field-comparable outputs.

Observe · Extract · Quantify · Model

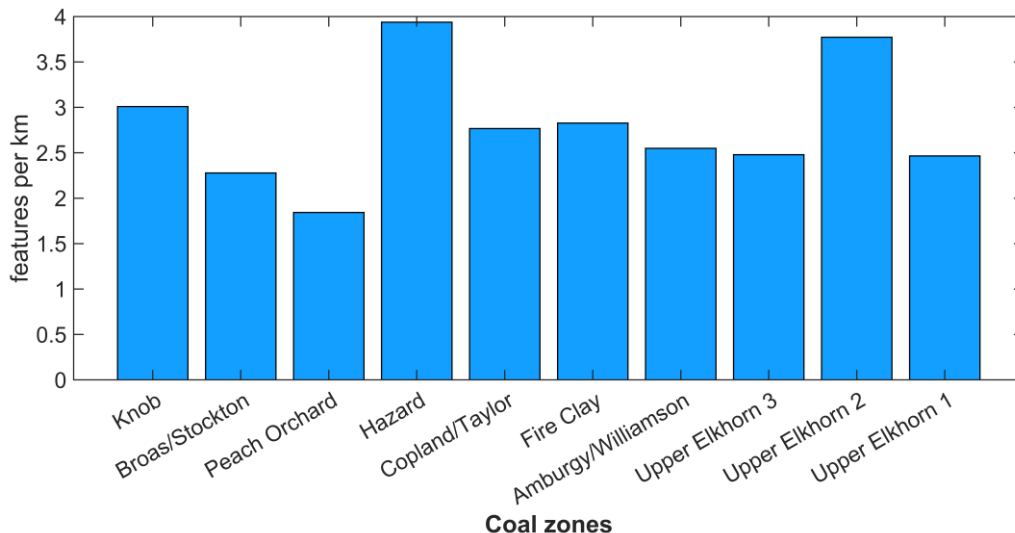
Geospatial database construction

Linked mapped gullies and landslides to mine permit boundaries, coal seams, operating history, and company-level attributes to support regional analysis of reclaimed mined landscapes. Work in review at *Earth's Future*.



Histogram of mining permit references arranged by type of erosional feature across mining start dates.

My Python workflow combined GIS spatial joins, public permit-record retrieval, HTML parsing, JSON database construction, geologic attribution, and the construction of summary metrics. This connected observations to real-world administrative and geologic units rather than leaving them as isolated mapped features.



Number of erosional features per kilometer of coal seam(s) within coal zones.

Takeaway: I can turn fragmented geospatial records into coherent datasets that make terrain observations more useful.

Observe · Extract · Quantify · Model