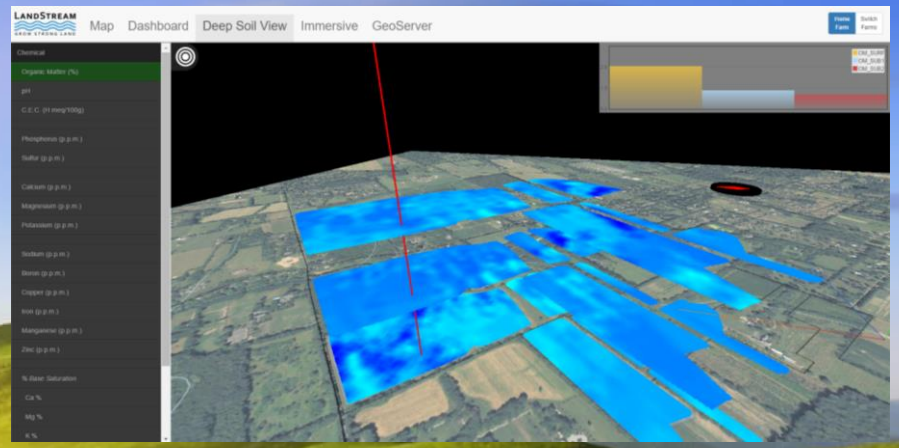
Growing Deep Soil Watersheds



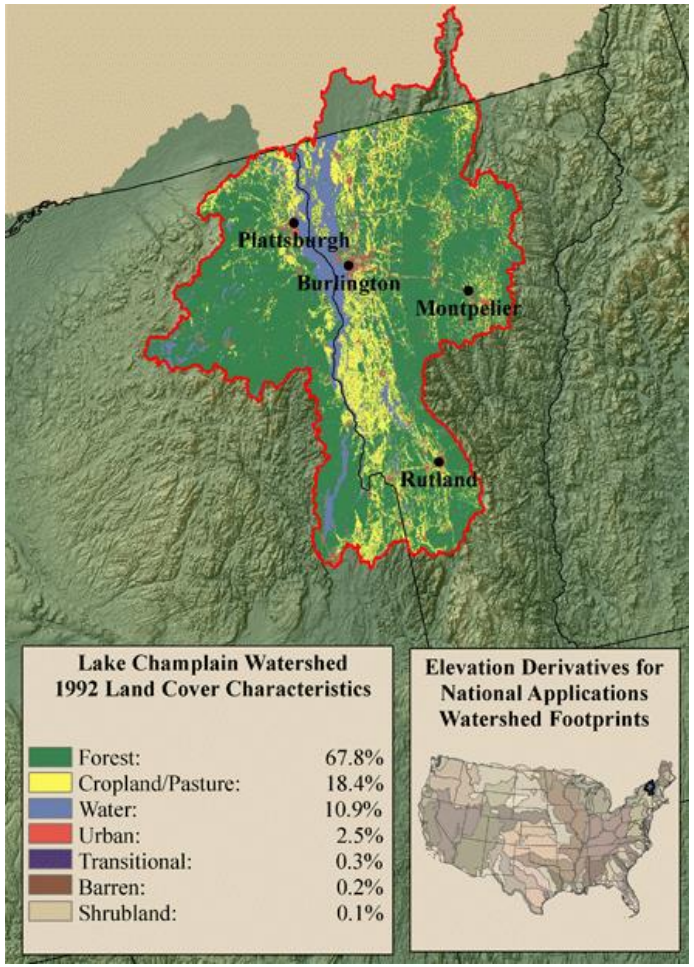
LANDSTREAM
GROW STRONG LAND

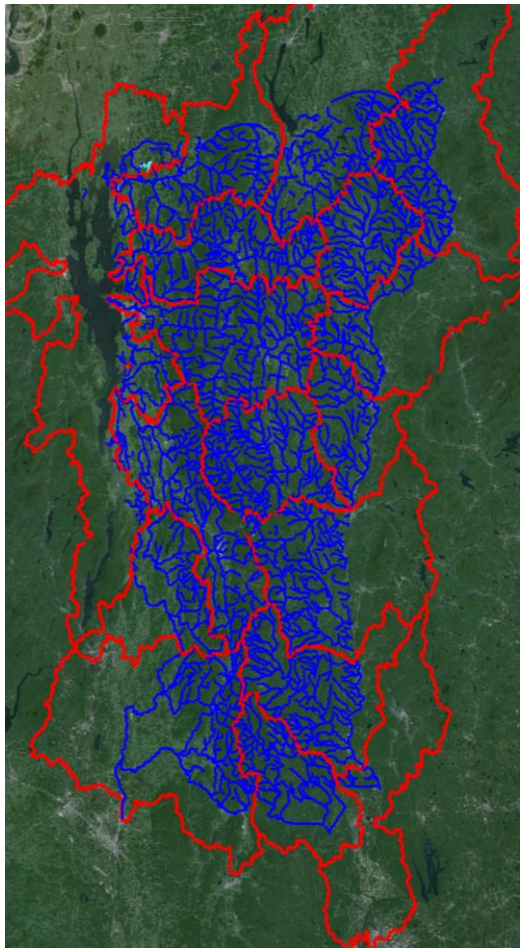
Abe Collins abenewsoil@gmail.com (802) 782-1883

Lake Champlain Basin

~ 5.3 million acres

Can we grow deep-topsoil, water-secure catchments in a decade?





Regenerative farmers and ranchers have learned how to grow new topsoil

Multiply farm-scale solutions to achieve water security

Increased biodiversity, soil health and solar harvest

→

More landscape work

→

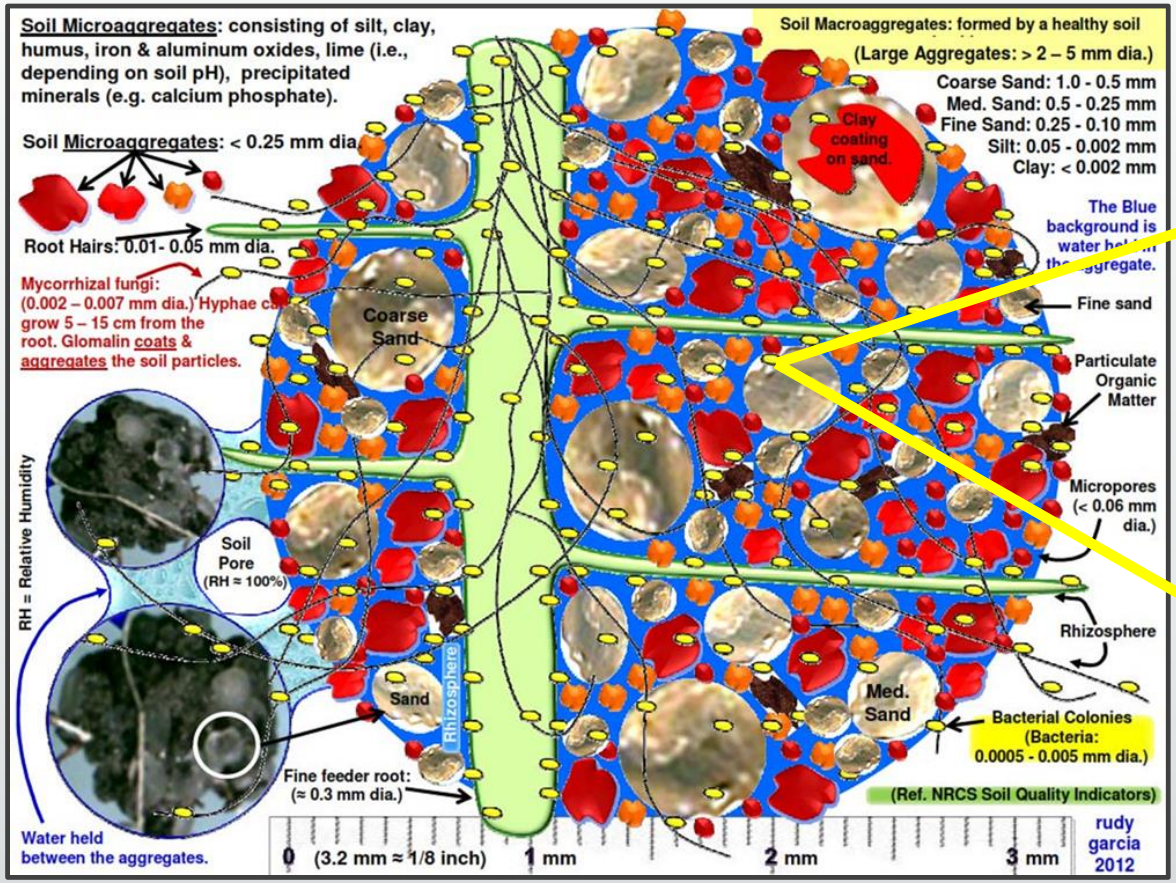
More, regular, cleaner water

Working Watersheds. Avoided Costs. Stronger economies.

Scaling a 16X increase in infiltration

- Brown's Ranch: 5,400 acres in Bismarck, North Dakota:
  - 265% increase in organic matter in 13 years
  - 16-fold increase in water infiltration: ½"/hour to 8"/hour
  - 13.6" of rain in 22 hours: zero erosion, little runoff
  - Current home farm inputs: Zero fertilizer and herbicide use
  - 127 bushel corn yield compared to 100 bushel county average

The Soil Aggregate is Primary Infrastructure



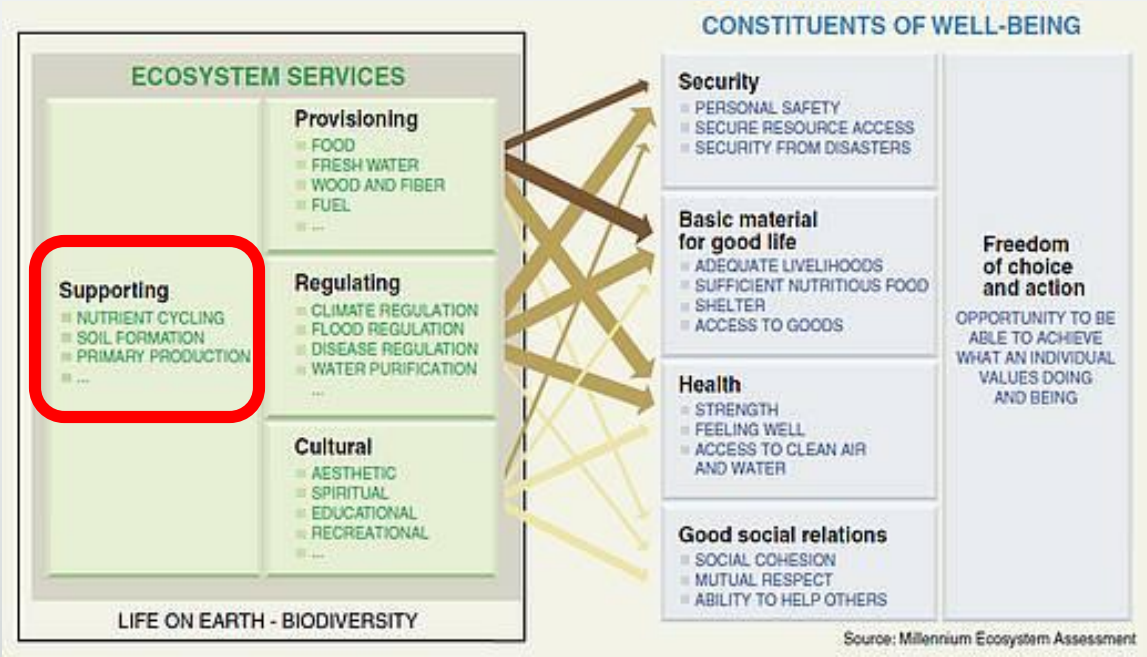
Grow Topsoil to Grow Clean, Available Water

- "Every era has been shaped by its response to the great water challenge of its time….those societies that find the most innovative responses to the crisis are most likely to come out as winners."

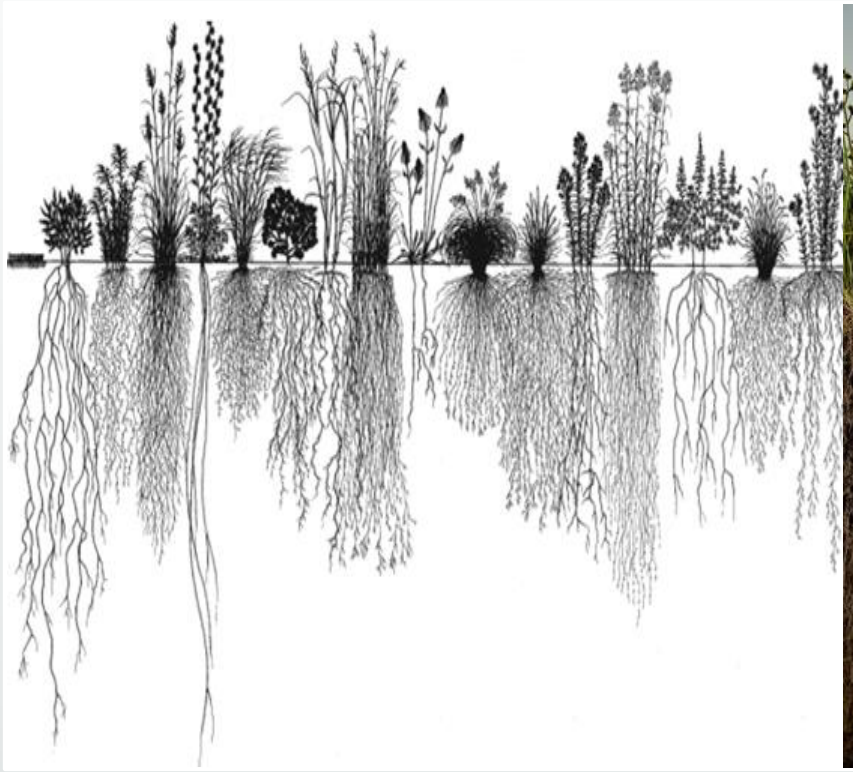
-- *Steven Solomon, Water - The Epic Struggle for Wealth, Power and Civilization*

Healthy topsoil and plants yield

clean water, groundwater recharge, improved base flow, flooding regulation, drought regulation, avoided damage to infrastructure, etc.



Infiltrate, Hold, Purify, Slowly Release

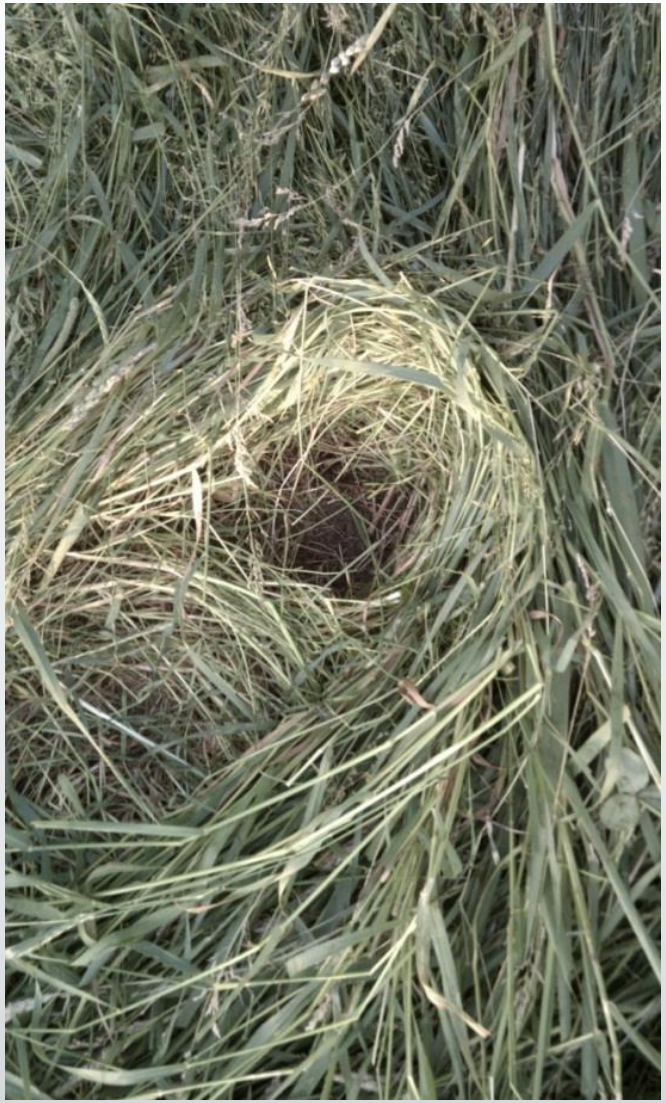


Two Perspectives, Two Futures

Topsoil is non-renewable	Topsoil is renewable
Conserve what's left. Continually solve the problems that are symptoms of degraded soil.	Grow new topsoil in our watersheds. Pay soil-growers for outcomes. Monitor to complete the feedback loop. Be creative. Cooperate. Get to work.

Deep-rooted

Covered



Subsoil to A-Horizon Topsoil:
8” in a year

Clean, Regulated Water as A Crop

- Forbes: The $8 Billion Bargain: How Watershed Payments Save Cities, Support Farms And Combat Climate Change

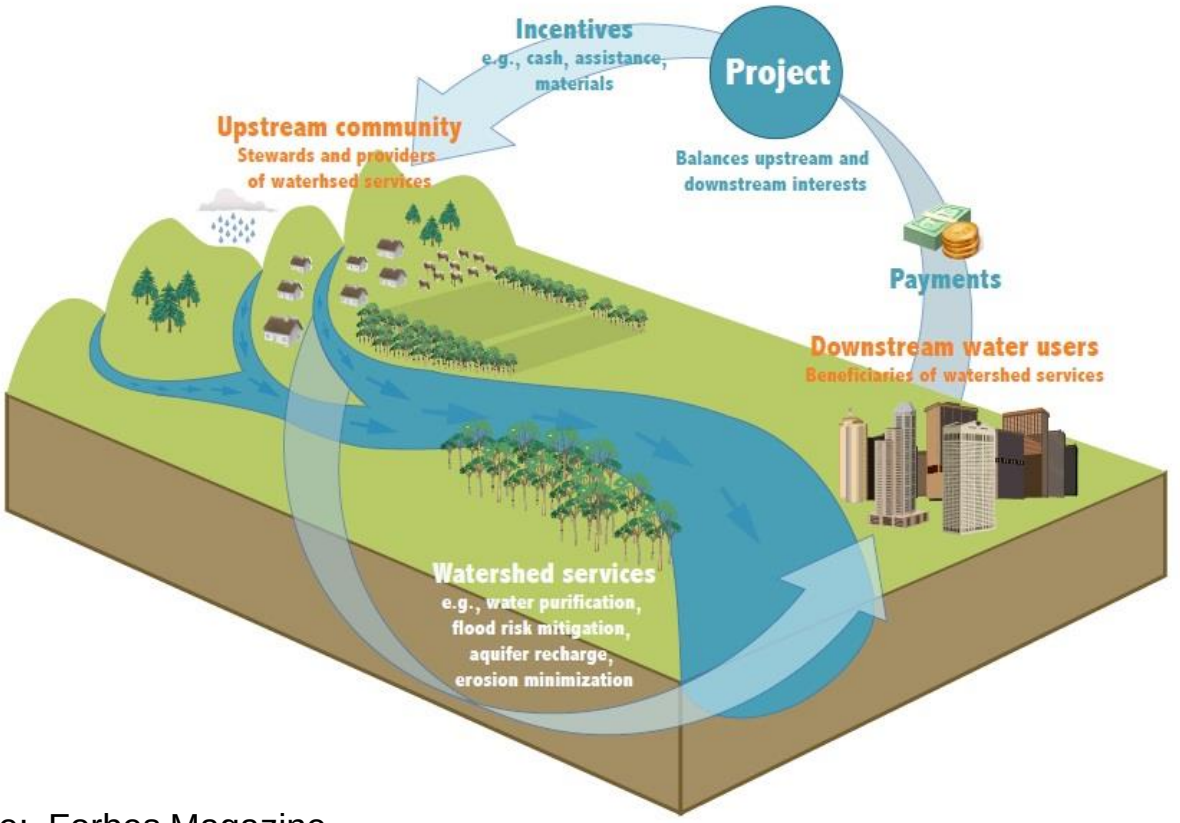
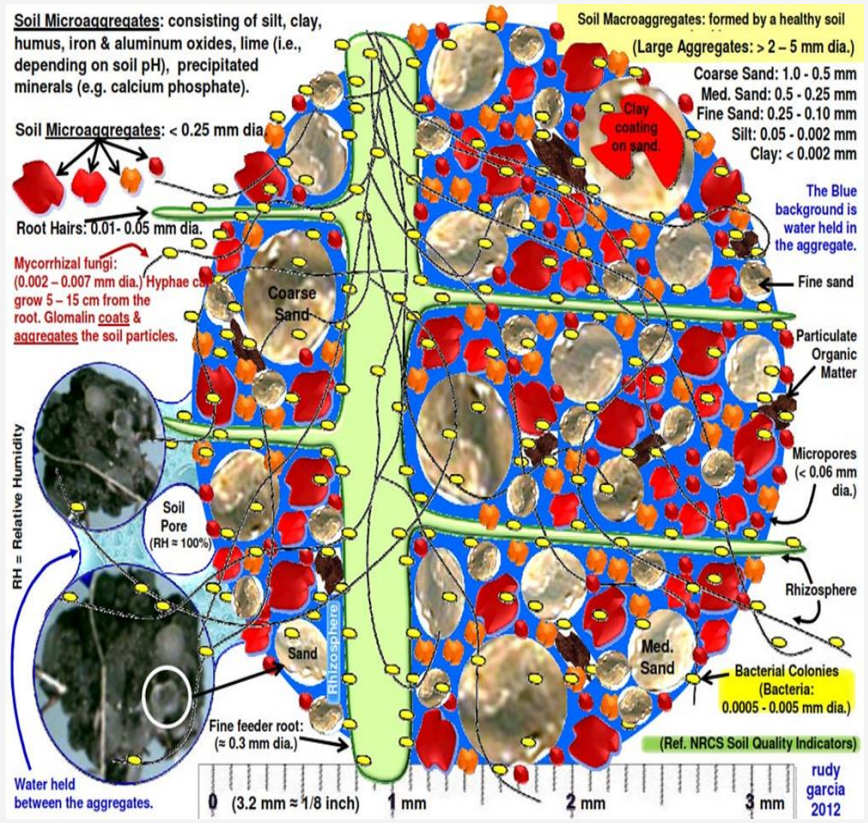


Image: Forbes Magazine

Deep Topsoil Watershed Needs



- Envision, plan and manage for the future we want for our place
- Land managers who can produce
- Environmental monitoring: for feedback, for performance economics
- Supportive citizens

Infrastructure: Old and New. From Runoff to Infiltration.

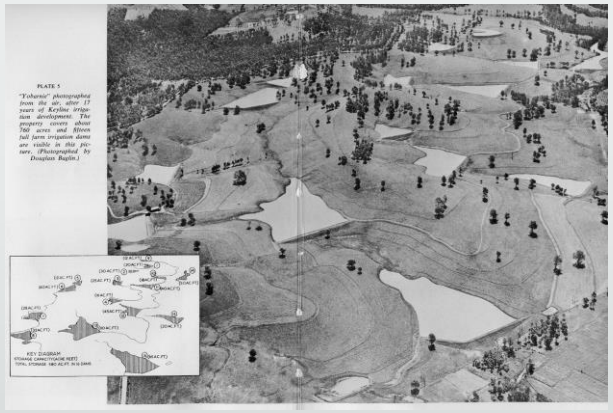
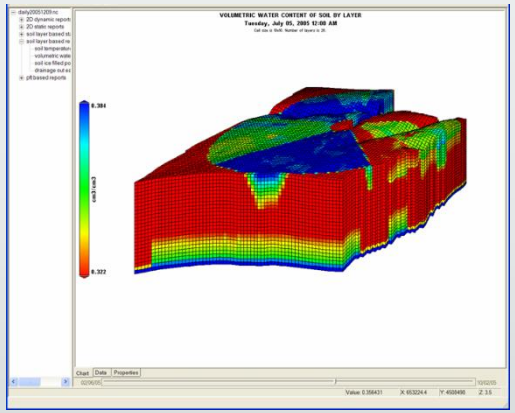


PLATE 5

"Fotamic" photographed from the air, after 15 years of Keyline irrigation development. The property covers about 760 acres and fifteen full farm irrigation dams are visible in this picture. (Photographed by Douglas Baglin.)



LandStream Monitoring

Producer Feedback for Accelerated Regeneration and Watershed Benefit Quantification

Soil Information System

(SIS)

MycoNet

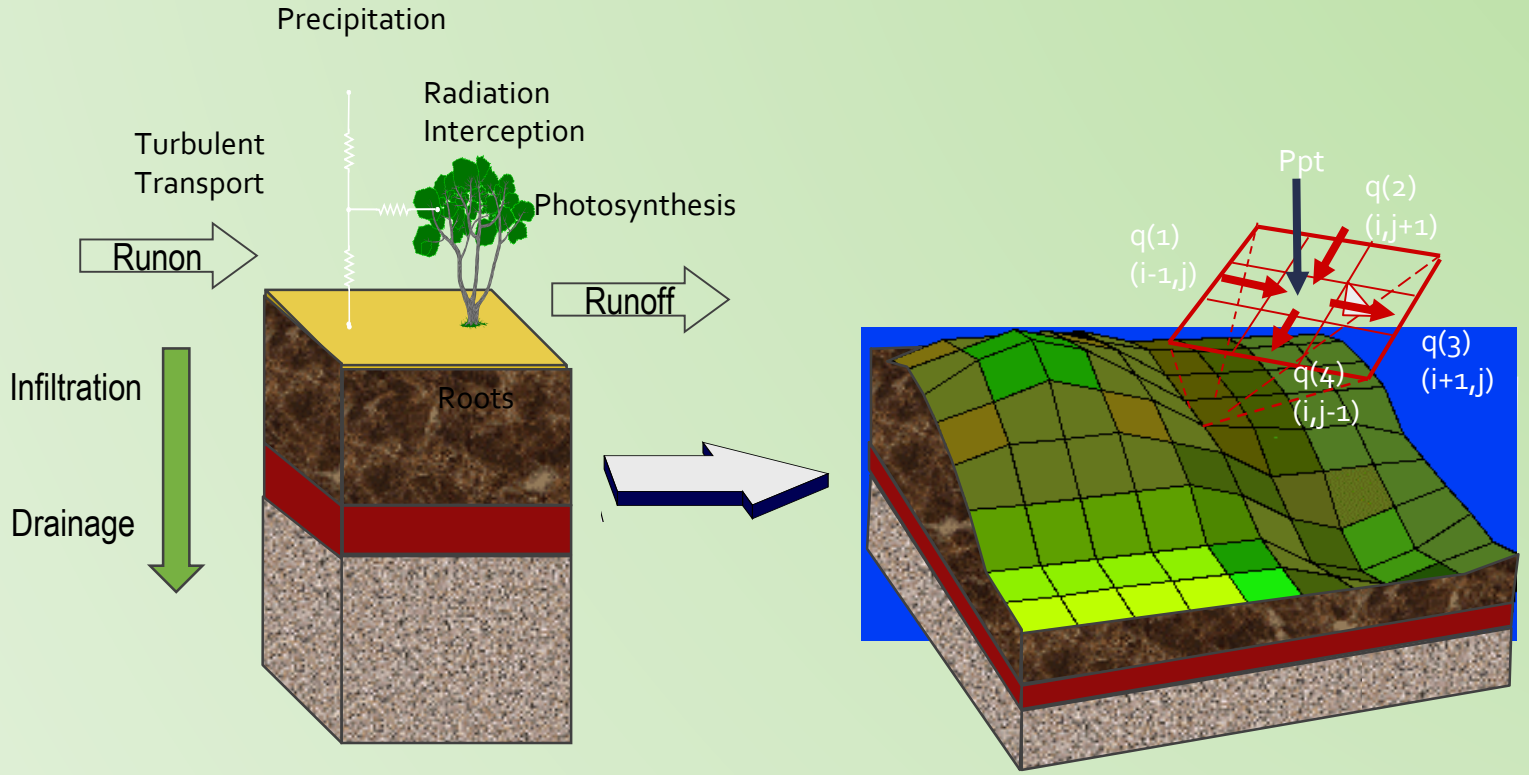
Networked Sensors

SkyView

Aerial Sensing

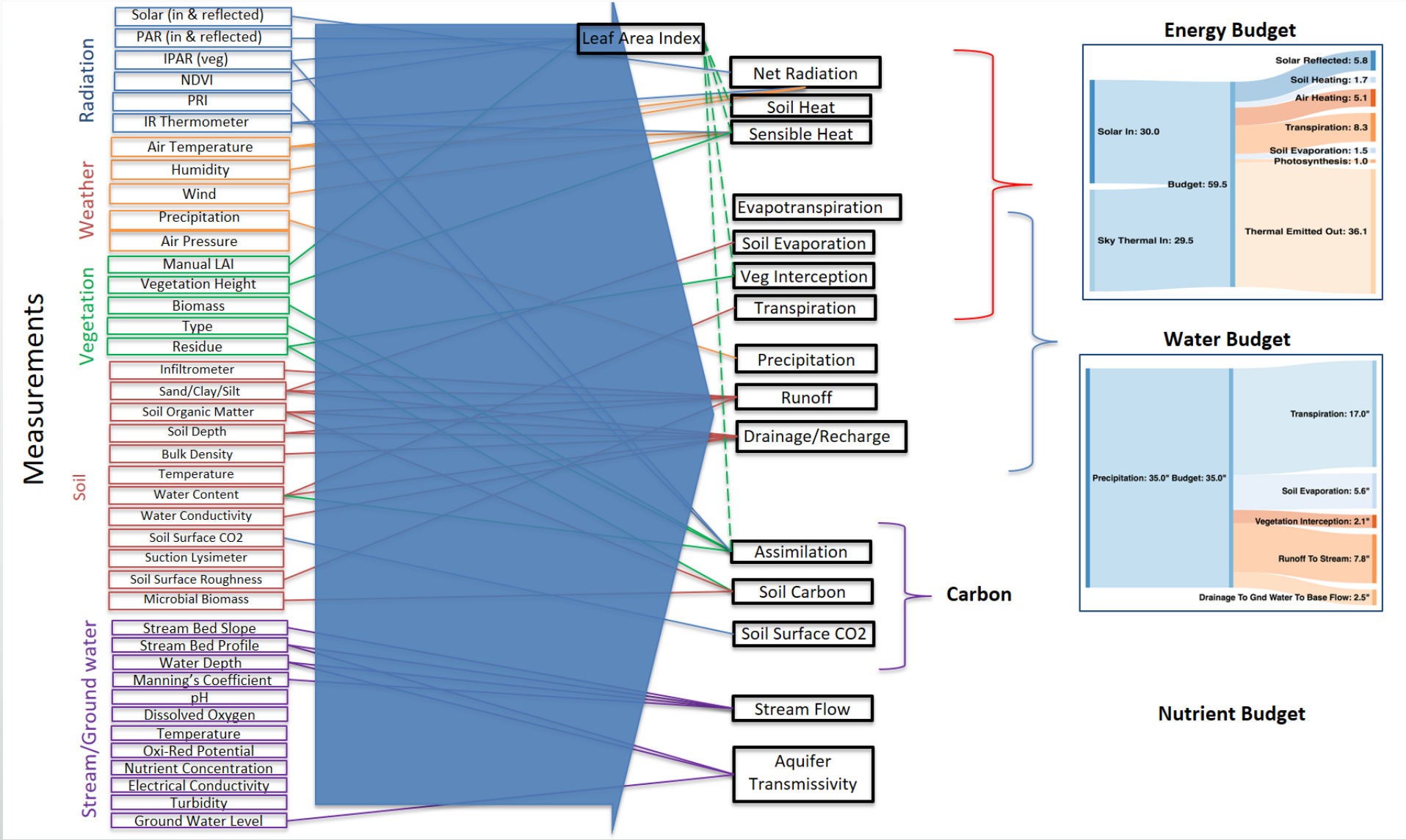
LandStream Models Enable Understanding of Field, Farm and Catchment

Quantify landscape function from field to farm to catchment wholes
Streaming, real-time management ←→landscape feedback
Models obey laws of conservation of energy and mass and are bounded by sensor measurements
Trustworthy basis for accelerated regeneration and watershed economics

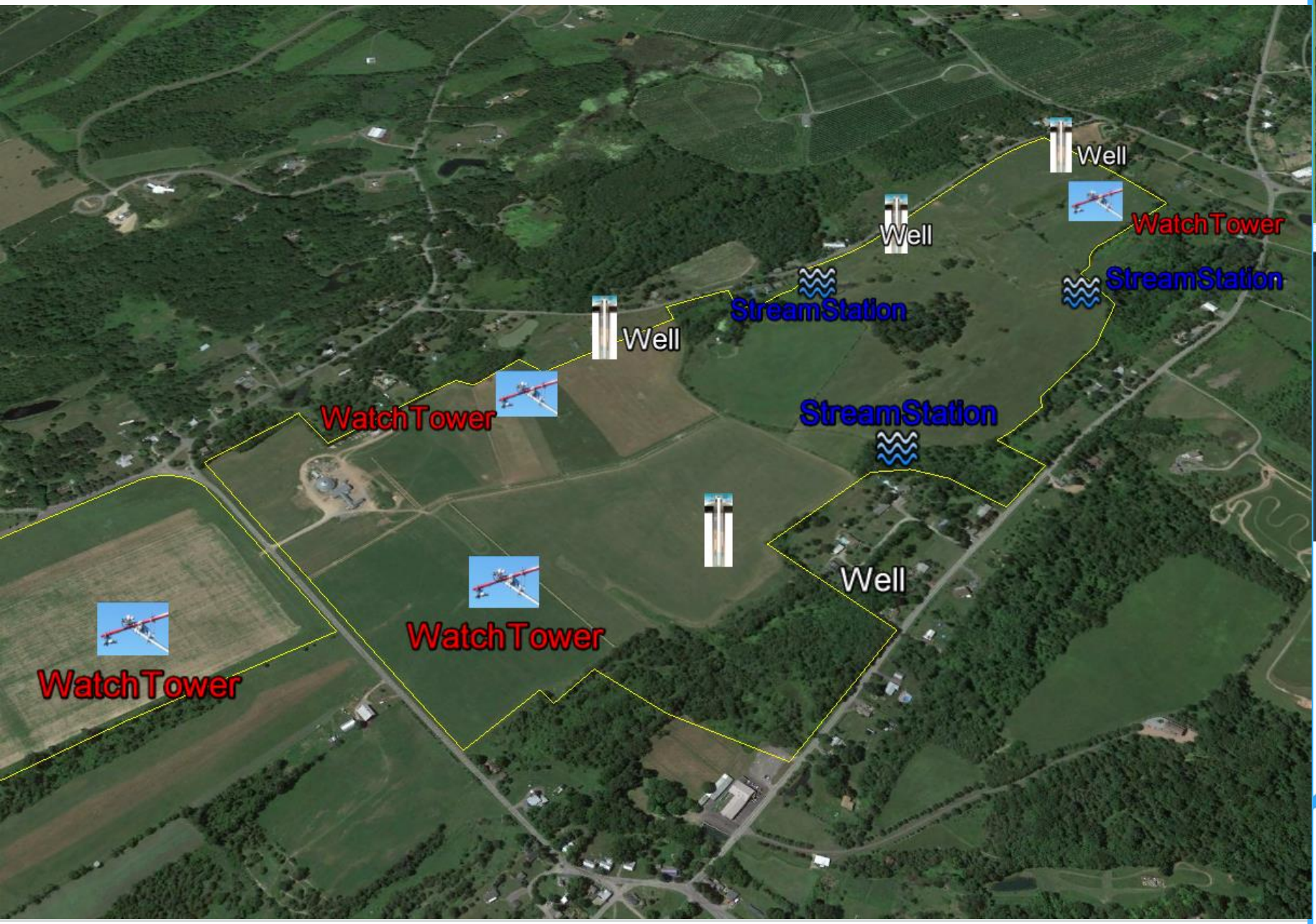


Critical Zone←→Groundwater←→Streamflow

From Dozens of Measurements to Understandable, Actionable Landscape Feedback and Benefit Quantification



Small Dairy Core Ground-Level Monitoring Hardware

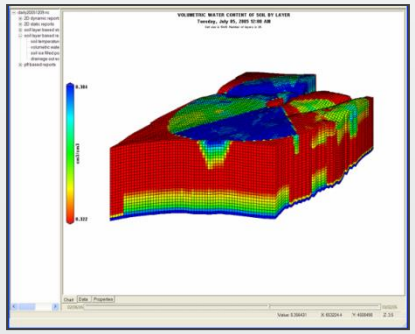


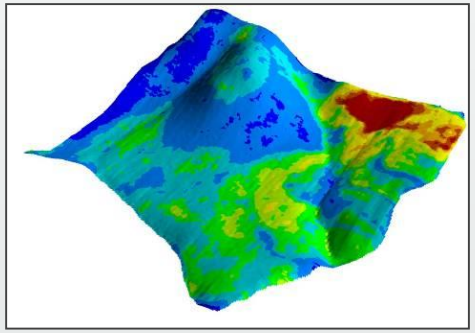
Infiltration/Saturated Hydraulic Conductivity

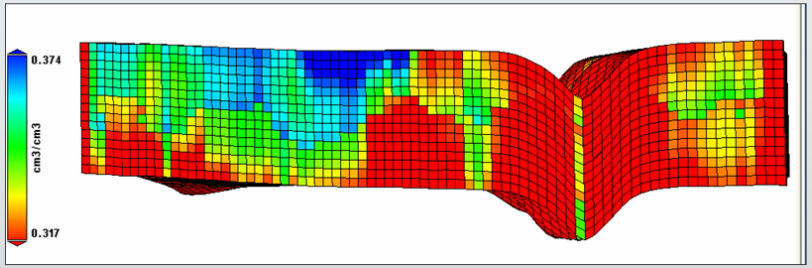
Advanced Soil Monitoring

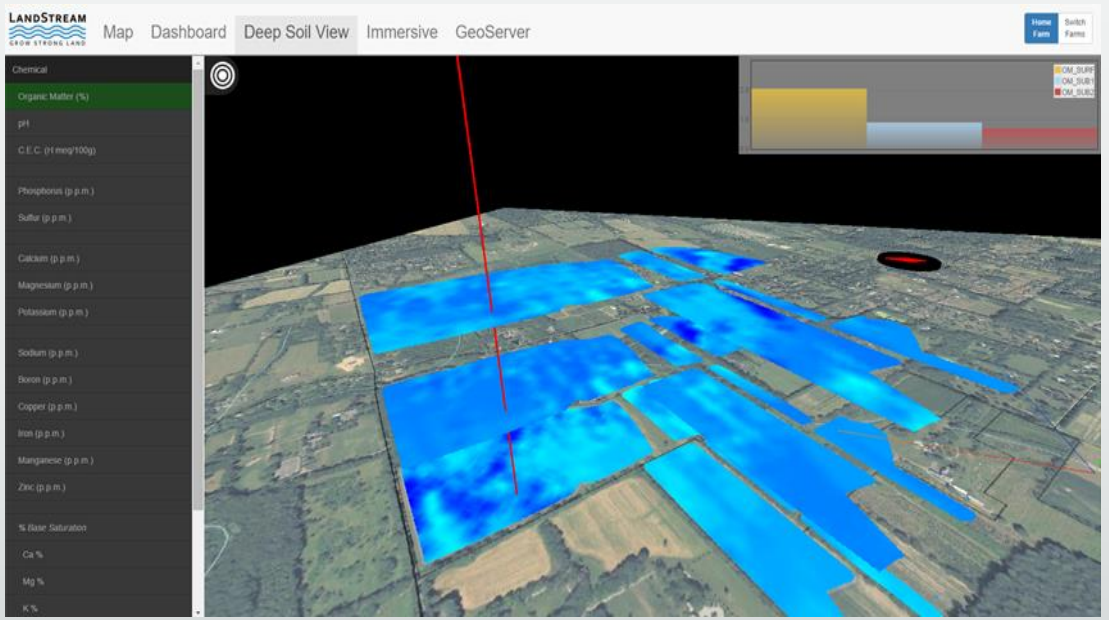
Accurate, Precise Mapping of All Soil Properties to 4’ +

- The Soil Information System
- Track change in the fundamental resource
- Improve management
- Quantify environmental services benefits
- Enable quality modeling of whole-watershed function





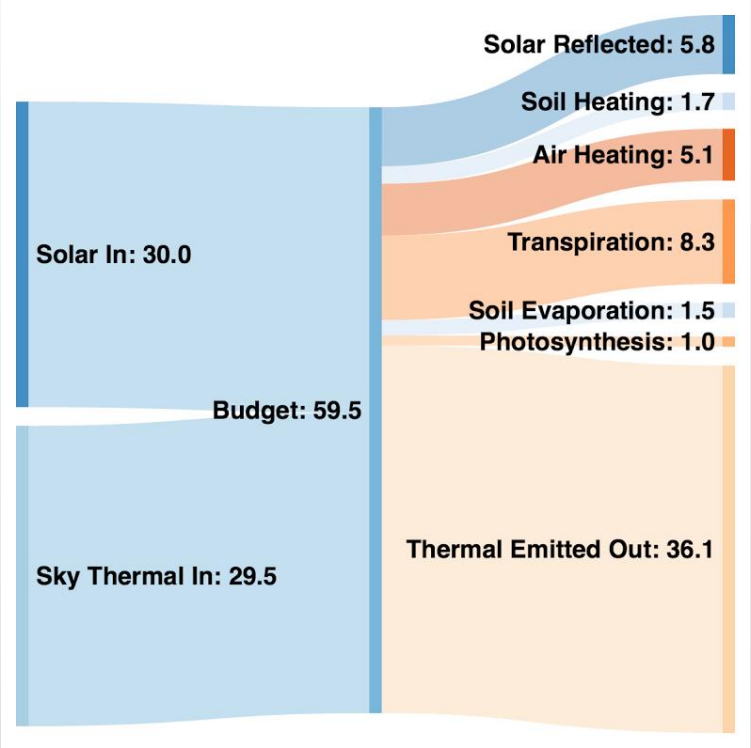




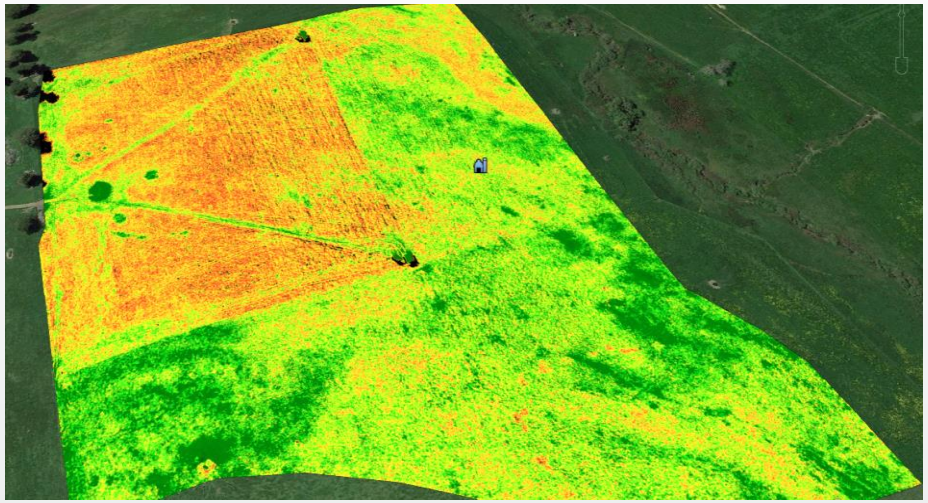
WatchTowers

Monitor Weather, Energy and Water Flux and Soil Moisture

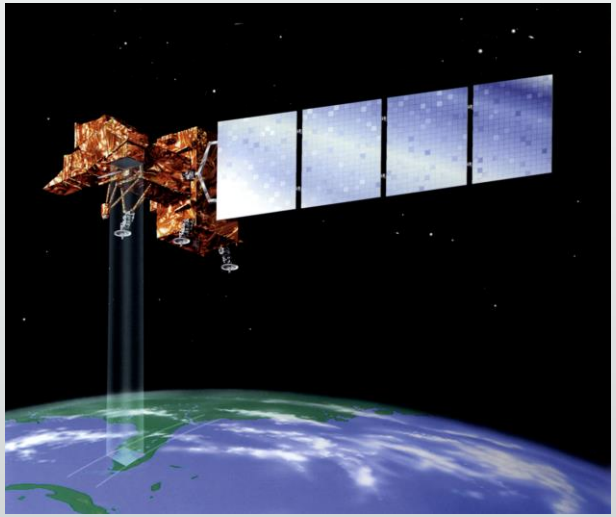
Investigate and scale energy flow, plant growth and water cycling from representative locations.

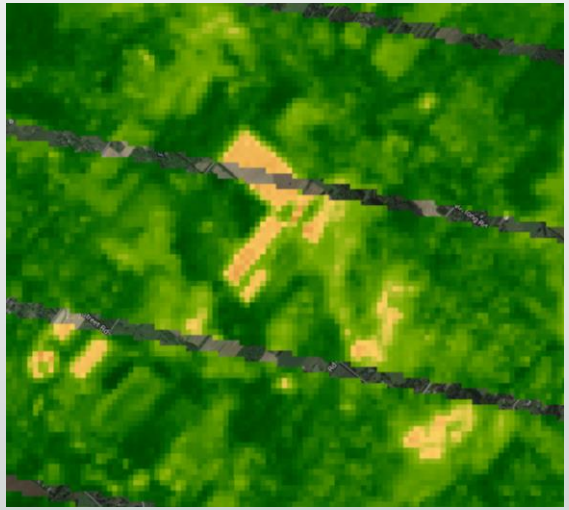


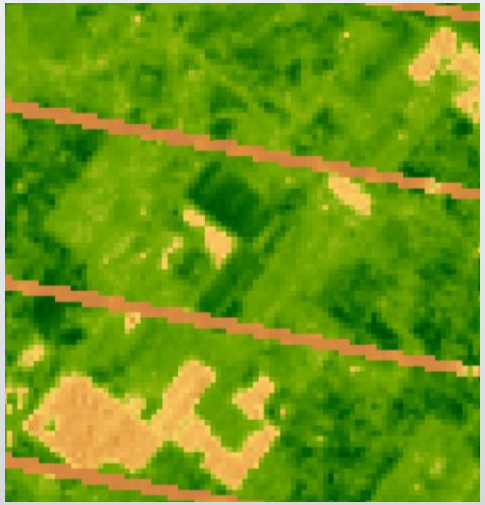
SkyView Scaling Quantifies:
Photosynthesis, Energy Flow, Biomass Production, Evapotranspiration

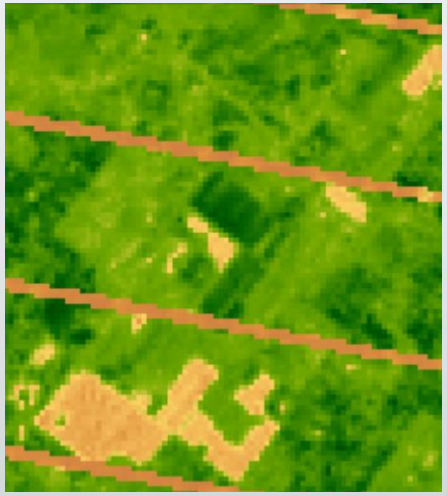


Precise, continuous field measurement → farm → catchment

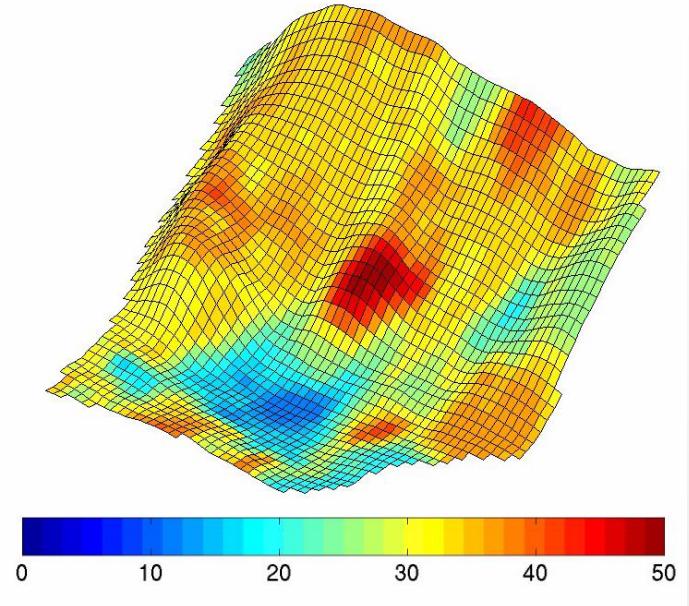


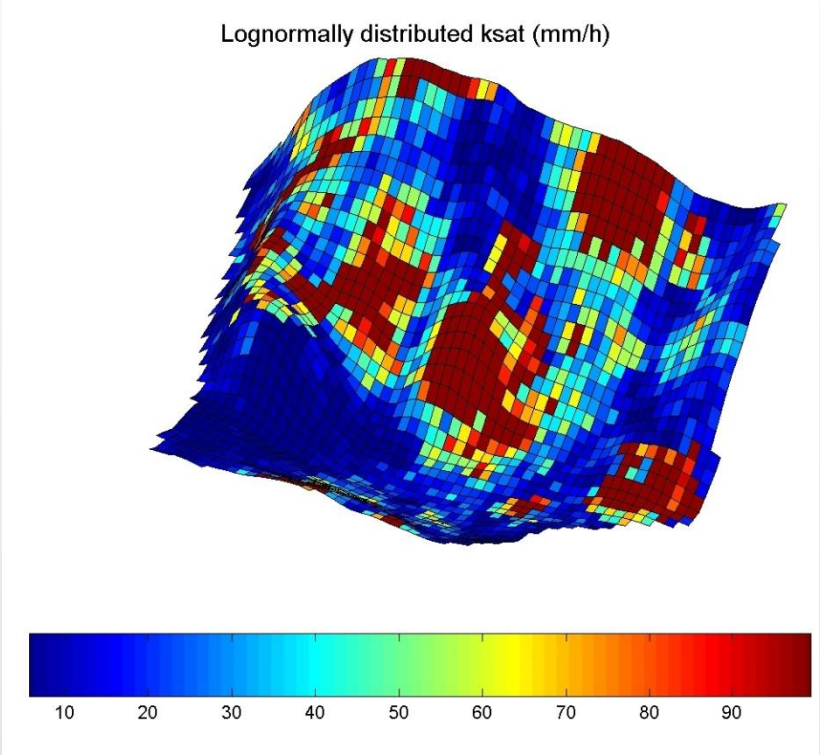




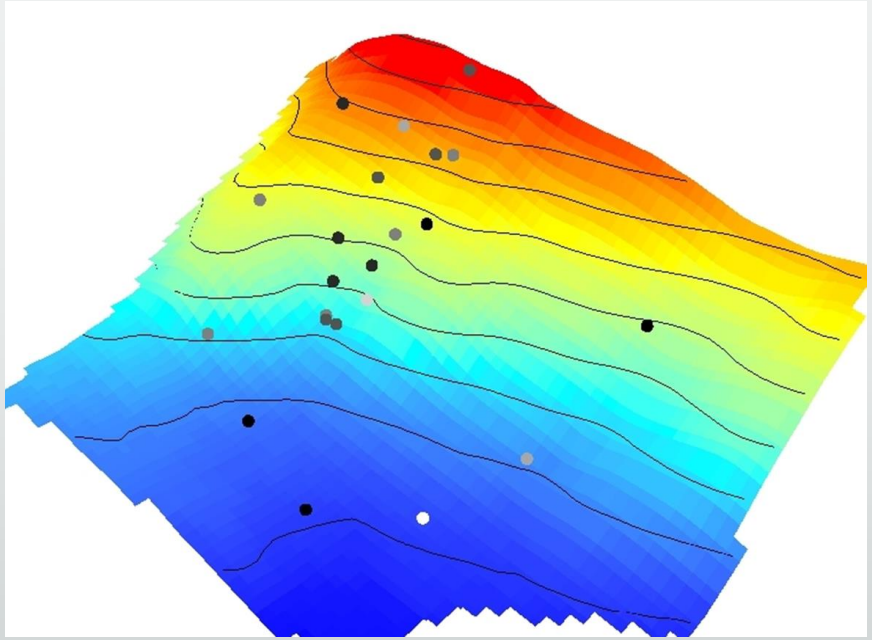


Infiltration





Locations of measurements determined by Soil Information System



LandStream Stations

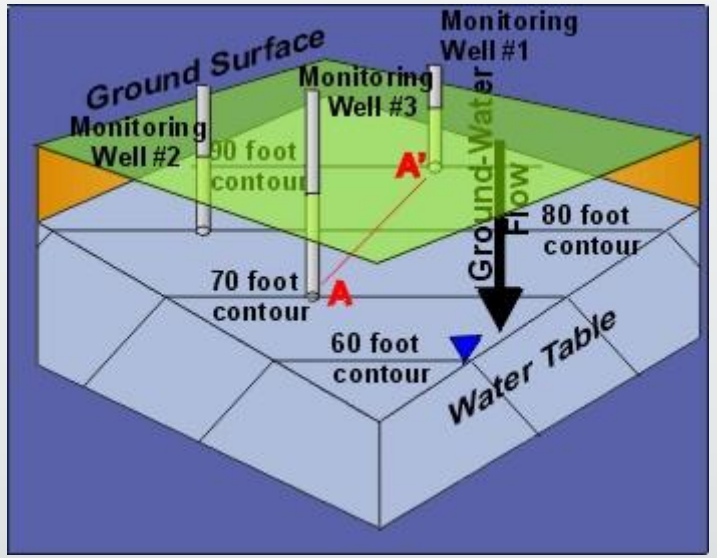
Stream Flow and Water Quality

Groundwater Level Monitoring

Stream Stations

- Non-contact level sensors
- Water-level with stream cross-sections yields flow
- Storm water samplers

Groundwater Monitoring Wells



5-Ranch Catchment Pilots

Deep insight on leading farms and ranches to seed and scale accelerated regeneration.

Instrument, support and network leadership ranches. Connect them with each other and the public. Provide:

- Management decision-support and landscape feedback to land managers
- Practical demonstration of the timing and economics of growing deep-soil water security at ranch and catchment scales
- Shared monitoring data and modeling to inspire and teach
- Quantification of farm/ranch contribution to whole-catchment function
- Scalable lessons within the catchment and to other catchments

What will you do in your place to grow a deep topsoil watershed?

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