



Risk & resilience in irrigated row crop systems: what is the role of technology?

Dr. Hannah E Birge, The Nature Conservancy in Nebraska
MOISST Conference 2018

Photo: M Forsberg

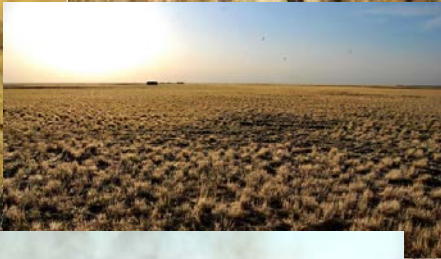
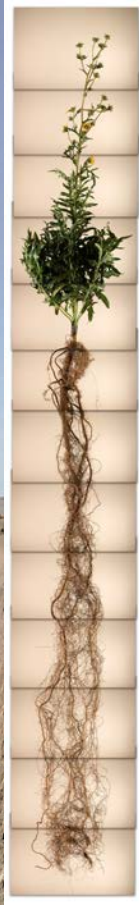


NEBRASKA

- 45.2 million acres of farm and ranch land – 91% of the state’s total land area.
- Abundant groundwater resources
- Nearly 24,000 miles of rivers and streams
- > 8 million irrigated acres
- Income from Nebraska’s farms in 2016 was \$21.5B

A close-up photograph of several stalks of grass with a reddish-brown hue. The stalks are thin and elongated, with some showing small, light-colored seed heads. The background is a clear, bright blue sky. The overall image has a soft, slightly blurred quality, suggesting a shallow depth of field.

1. NEBRASKA, B.C. (BEFORE CORN)



Mollisols are soils that have a dark colored surface horizon relatively high in content of organic matter. The soils are base rich throughout and therefore are quite fertile.

Mollisols characteristically form under grass in climates that have a moderate to pronounced seasonal moisture deficit. They are extensive soils on the steppes of Europe, Asia, North America, and South America.

MOLLISOLS MAKE UP ABOUT 7% OF THE WORLD'S ICE-FREE LAND SURFACE.

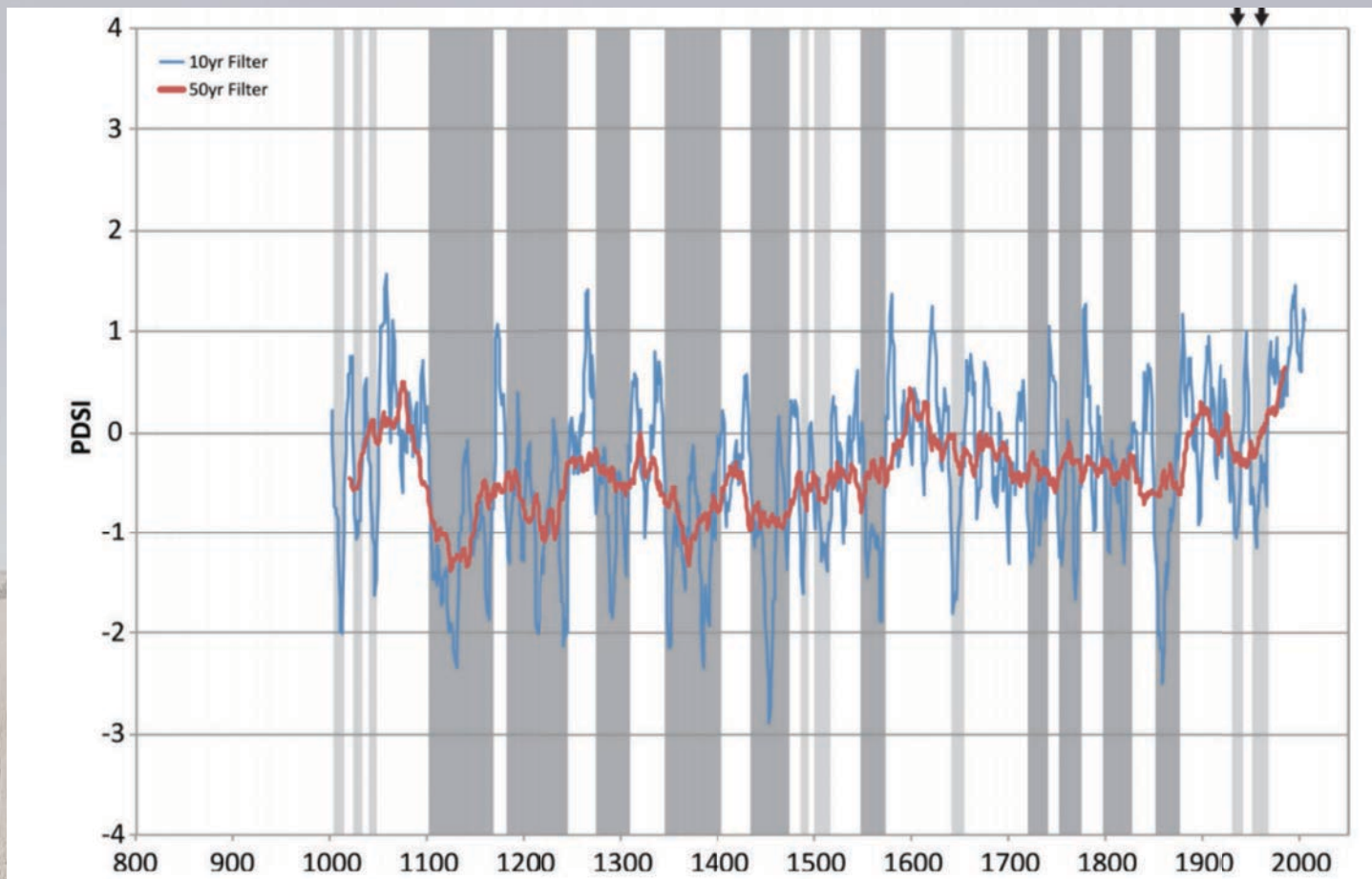


Figure. Palmer Drought Severity Index (PDSI) reconstructions for southeastern Kansas. (Layzell, 2012). PDSI values are from Cook and Krusic, 2004.

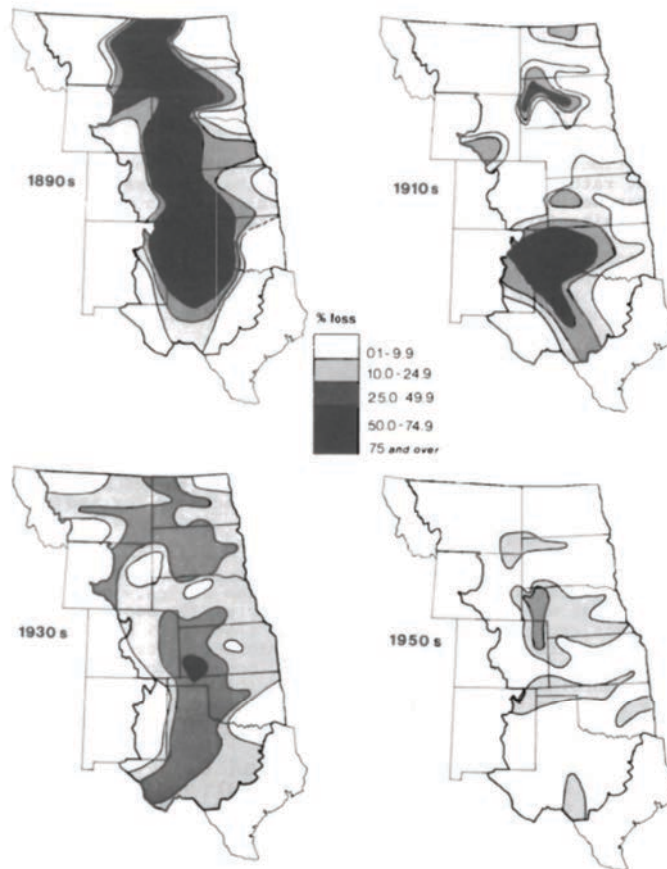


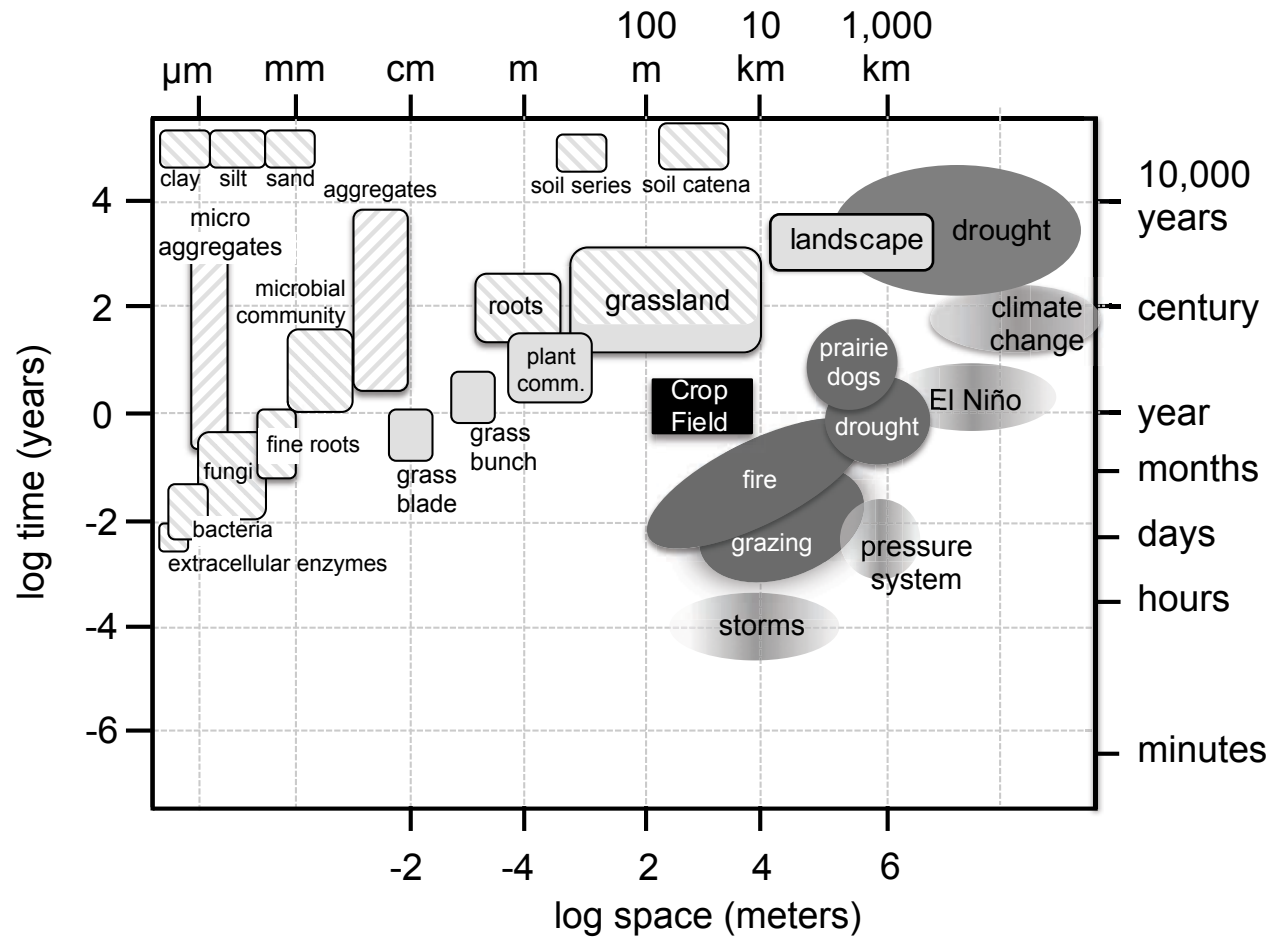
Figure 8 Population declines. (Data source: U.S. Bureau of the Census.)

Warrick, 1980



A wide, shallow river with multiple channels and sandbars, surrounded by green vegetation and a cloudy sky. The river flows from the background towards the foreground, with several channels and sandbars visible. The sky is filled with large, grey clouds, and the overall scene is captured from an elevated perspective. The text "2. How do we manage this uncertainty?" is overlaid on a semi-transparent white box in the center of the image.

2. How do we manage this uncertainty?

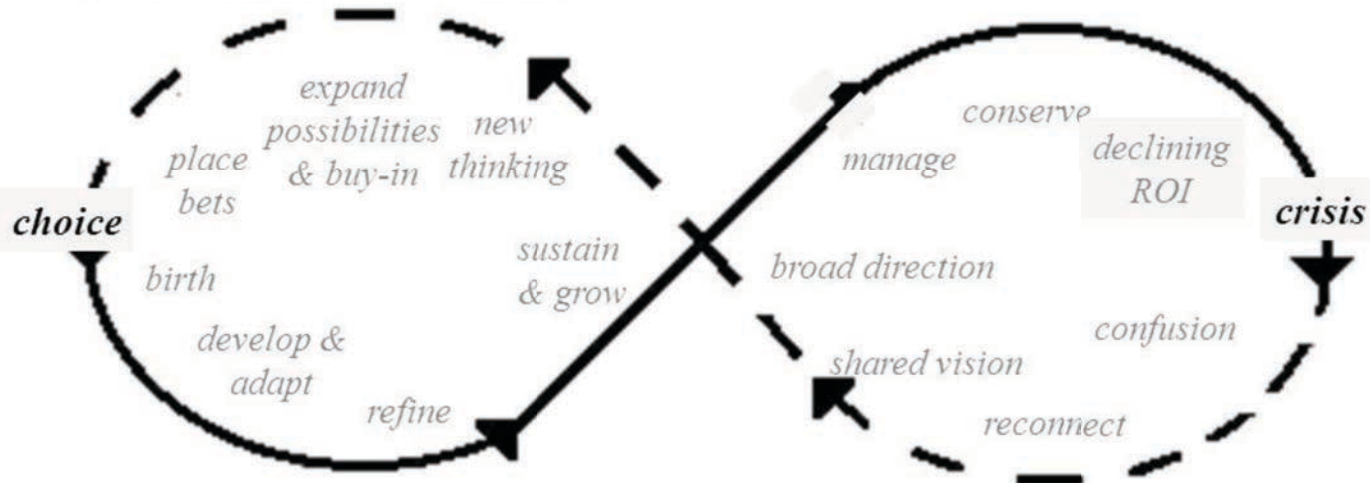


EXPLORATION

New Ideas: Creative * Messy * Uncertain *
First-hand insights * Outside ideas * Multiple
Perspectives * Flat structure & process *
Probes & Little Experiments * Options

MATURITY/CONSERVATION

Productivity: Efficiency * Certainty * Stability *
Hierarchical structure & process * Clear Tasks,
Rules, Policies & Procedures * Standardization
* Specialists * Fast Returns * Low Risk Tolerance



Effectiveness: Entrepreneurial * Generalists *
Roles * Adaptive structure and process *
Prototypes & Pilot Projects * Variation * Lag times
•Flexible funding * Flexible rules * Tolerance for
•Risk * Dead ends * Emerging Practice

Vision: Charismatic * Unraveling * Chaotic *
Loss, Anger, Blame, Conflict * Little structure
or process * Reflection * Relationships * Essence *
Values * Principles * New Energy & Urgency

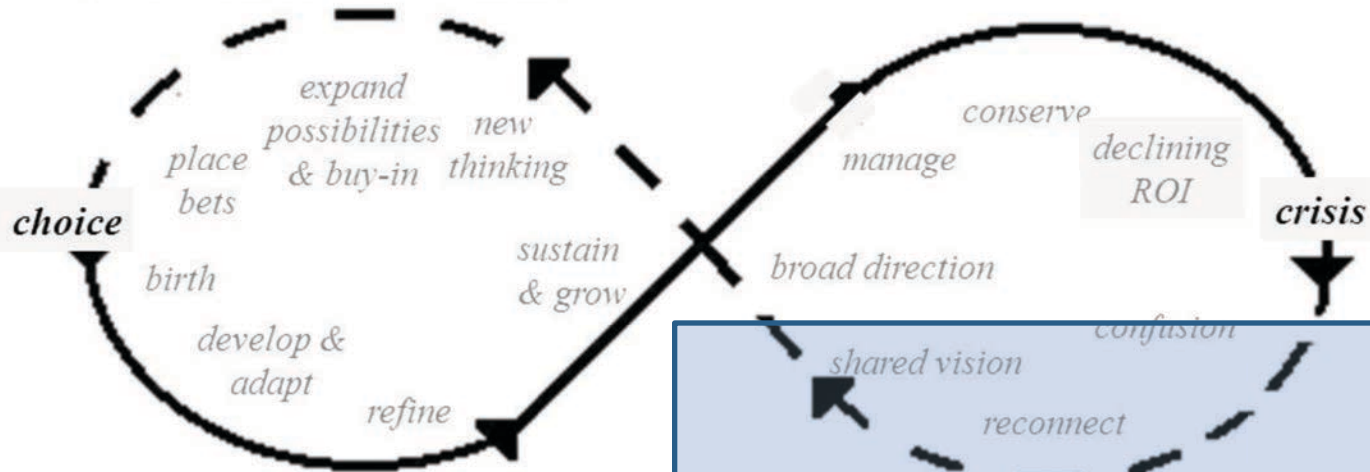
DEVELOPMENTAL

CREATIVE DESTRUCTION/RELEASE

From: Cabaj, M. *Network Death & Renewal in the Adaptive Cycle*, 2011.

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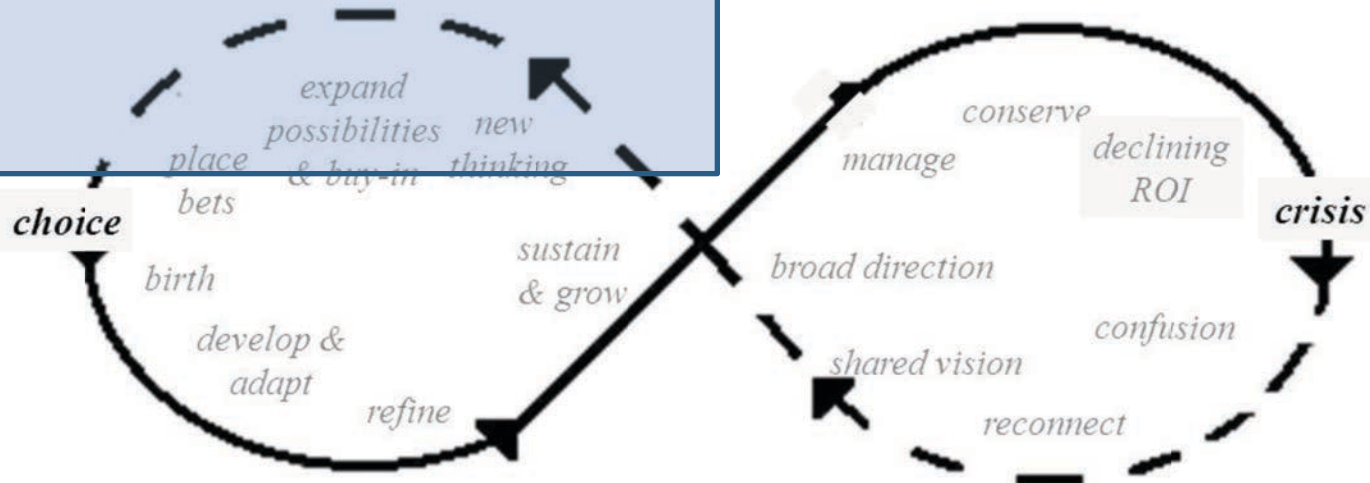
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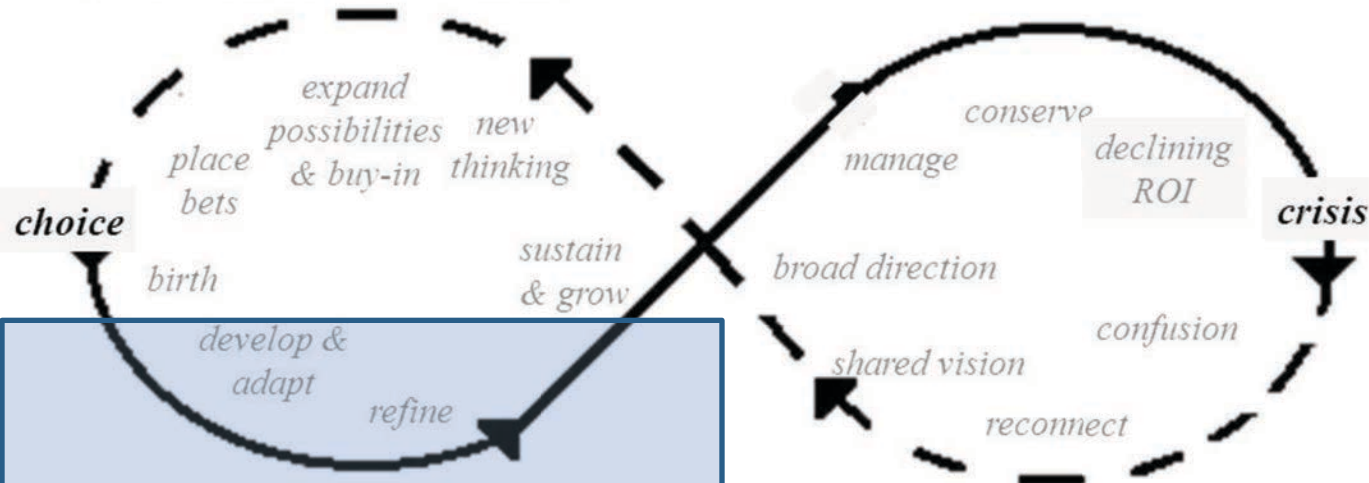
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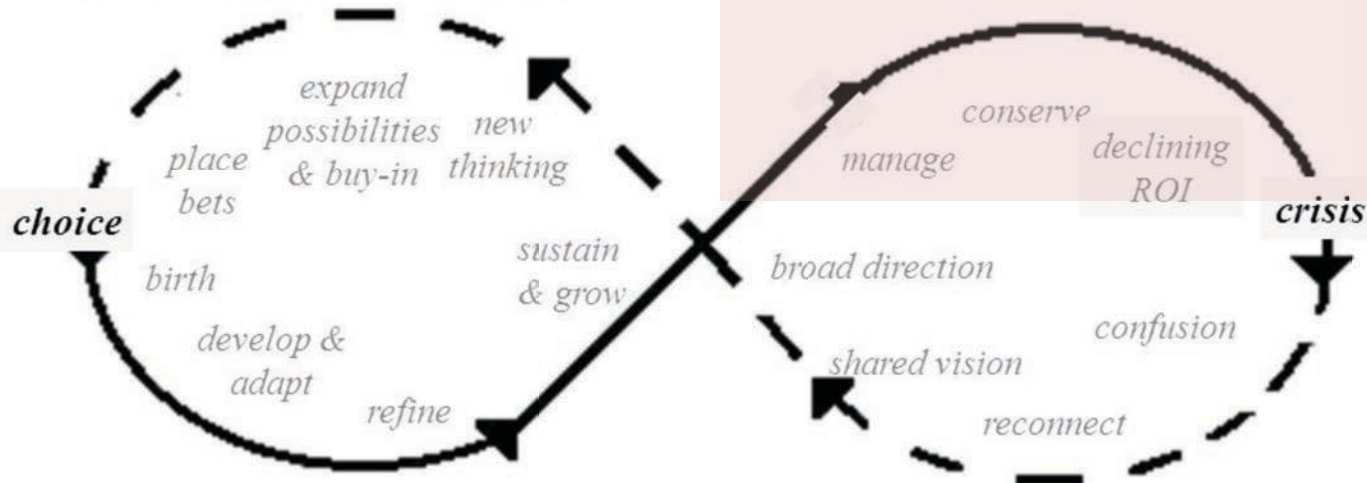
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As the system progresses to the K-phase... it is primed for collapse. The actual change is triggered by agents of disturbance (Holling 2001)."

"The essential paradox... is that we seek to preserve what must change (Pickett & White 1985)."

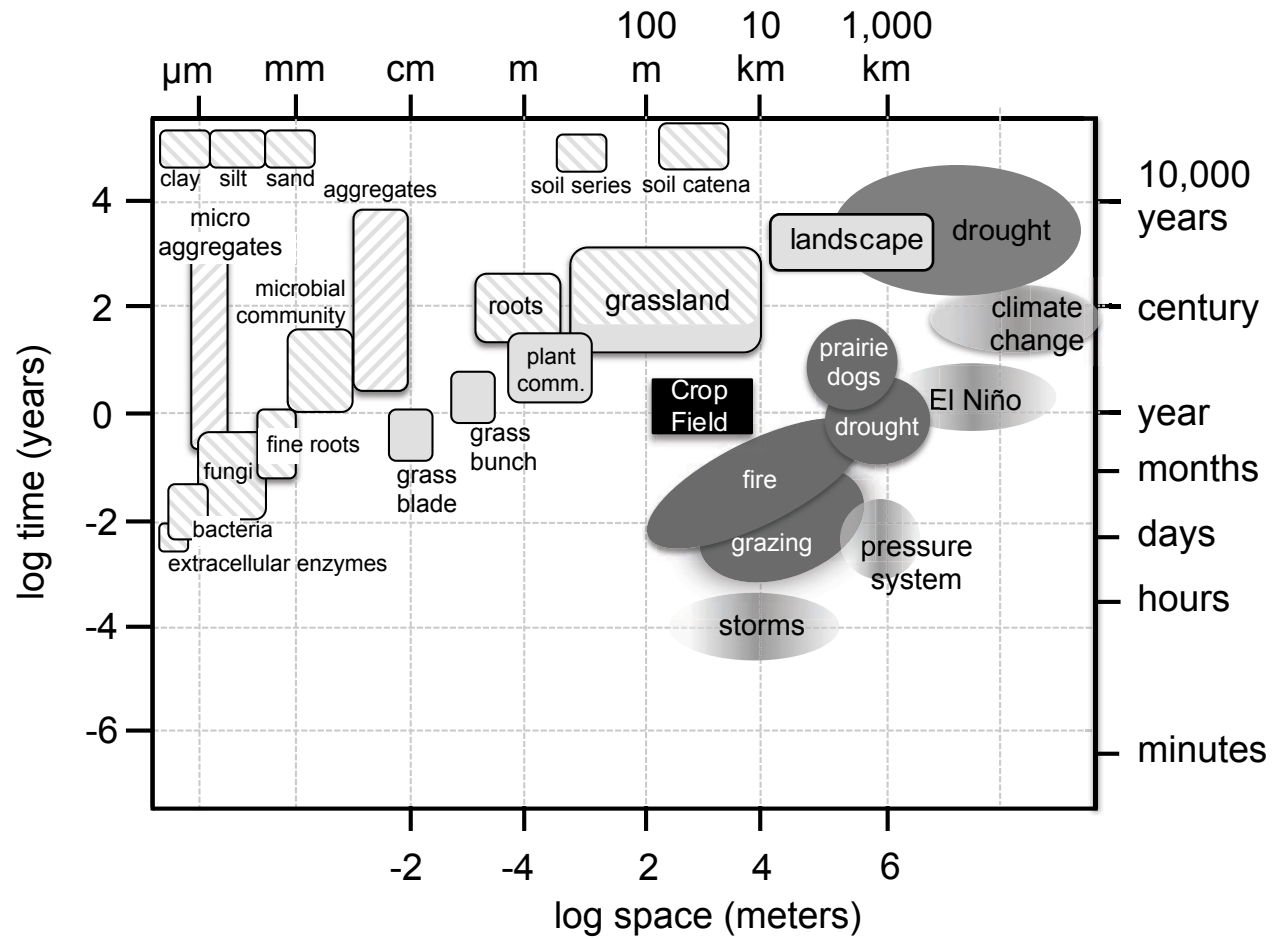
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A photograph of a sunset over a field. The sky is filled with soft, wispy clouds in shades of orange, yellow, and blue. In the foreground, several tall, thin stalks of grass are silhouetted against the bright light of the setting sun. The overall scene is peaceful and evocative of a rural landscape.

3. Does technology bolster row crop
resilience?

Central Nebraska Irrigation Project Technology

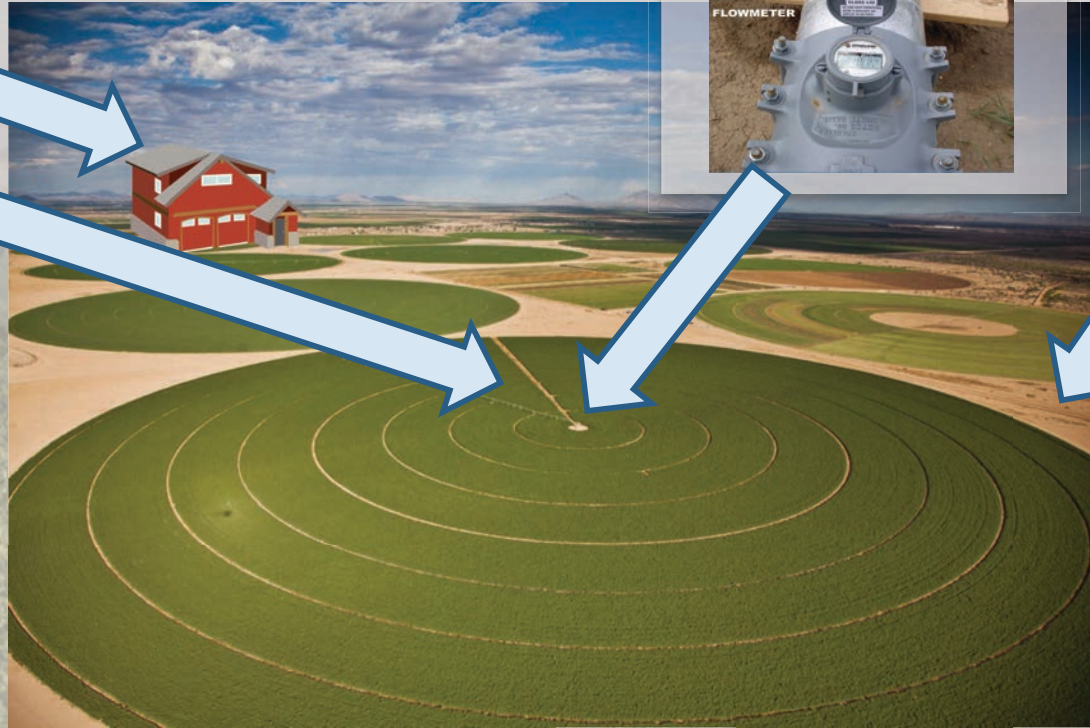
Pivot Telemetry



Flowmeter



Arable Mark





Technology in Row Crops: Bolstering Resilience?

NOW  NEW

▫Fail safe

▫Stationary view of
systems

▫We can manage
away surprise



▫Safe to fail

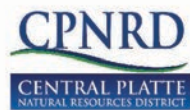
▫Dynamic view of
systems

▫Surprise is inevitable

ACKNOWLEDGMENTS

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Trenton Franz
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Jill Wells
Rich Walters
Justin Gibson



Thank you!



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