



Considering Rural Enhancements: Innovations and Challenges for Sustainable Agriculture in the Basin

Perry Cabot¹, Troy Bauder², Eugene Kelly², Raj Khosla³, Dipankar Mandal³, Paul Bruchez⁴, Aaron Derwingson⁵, Mely Whiting⁶, Hannah Holm⁷, Tessa Peters⁸, Hunter Doyle⁸, Jose Chavez⁹, ¹⁰Jessica Davis

¹Colorado Water Center and Agricultural Experiment Station, ²Agricultural Experiment Station and Department of Soil and Crop Sciences, ³Department of Agronomy, Kansas State University, ⁴Reeder Creek Ranch, ⁵The Nature Conservancy, ⁶Trout Unlimited, ⁷American Rivers, ⁸The Land Institute, ⁹CSU Civil and Environmental Engineering, ¹⁰CSU Soil and Crop Sciences



COLORADO
WATER CENTER
COLORADO STATE UNIVERSITY



COLLEGE OF
AGRICULTURAL SCIENCES
COLORADO STATE UNIVERSITY

WCRC-GV

Research Areas

Irrigation Technology

Consumptive Use Evaluation/Modeling

Alternative Cropping Systems



COLLEGE OF
AGRICULTURAL SCIENCES
COLORADO STATE UNIVERSITY

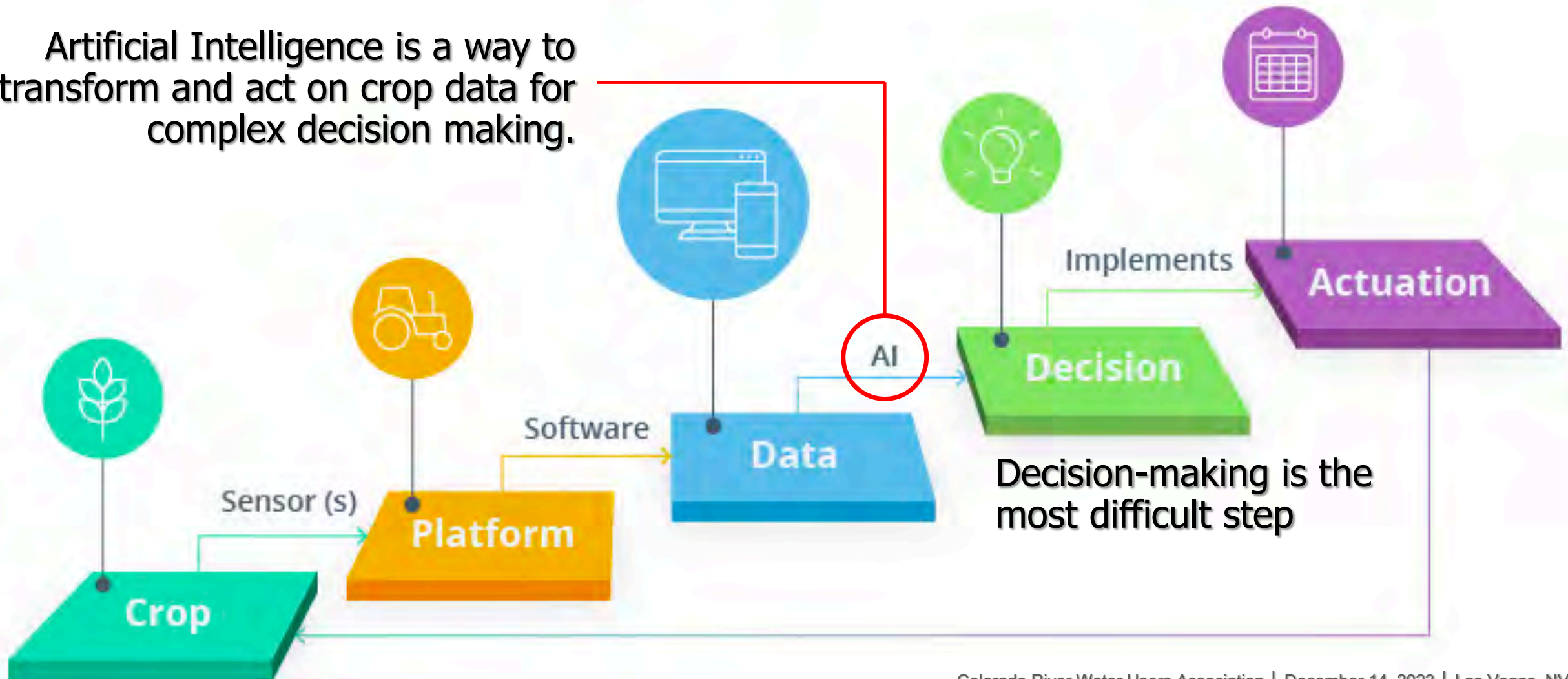
Western Colorado Research Center Grand Valley (Fruita, CO)

Engaged Farmer and Stakeholder Advisory Group



Principles for Using Artificial Intelligence for Sustainable Agricultural Water Management

Artificial Intelligence is a way to transform and act on crop data for complex decision making.



UAV-based precision chemical spraying



plant health identification



Agricultural
Sustainability and
Artificial
Intelligence

weed locating



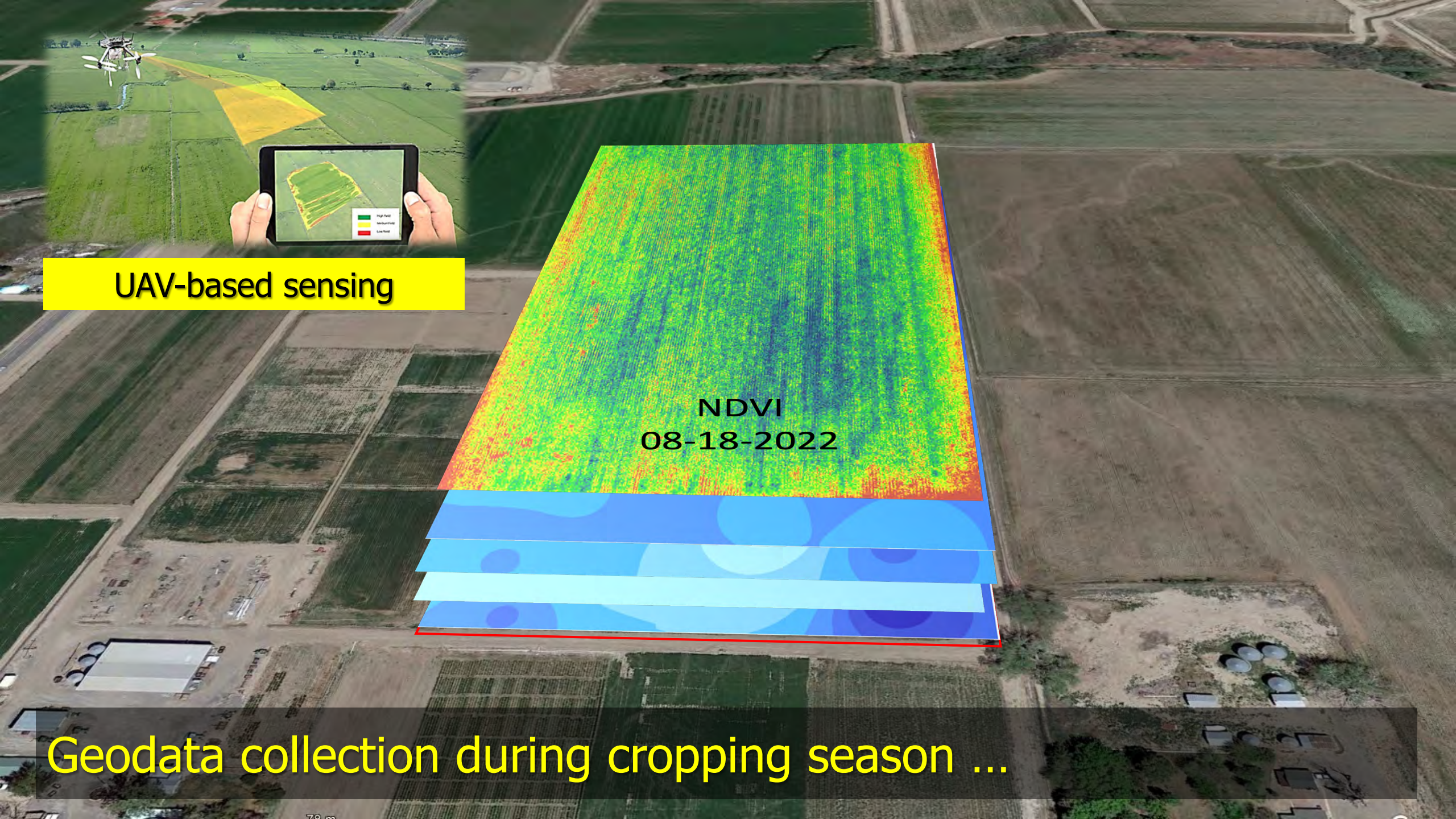
harvest evaluation



VRI-Capable Overhead Linear Move Irrigation System



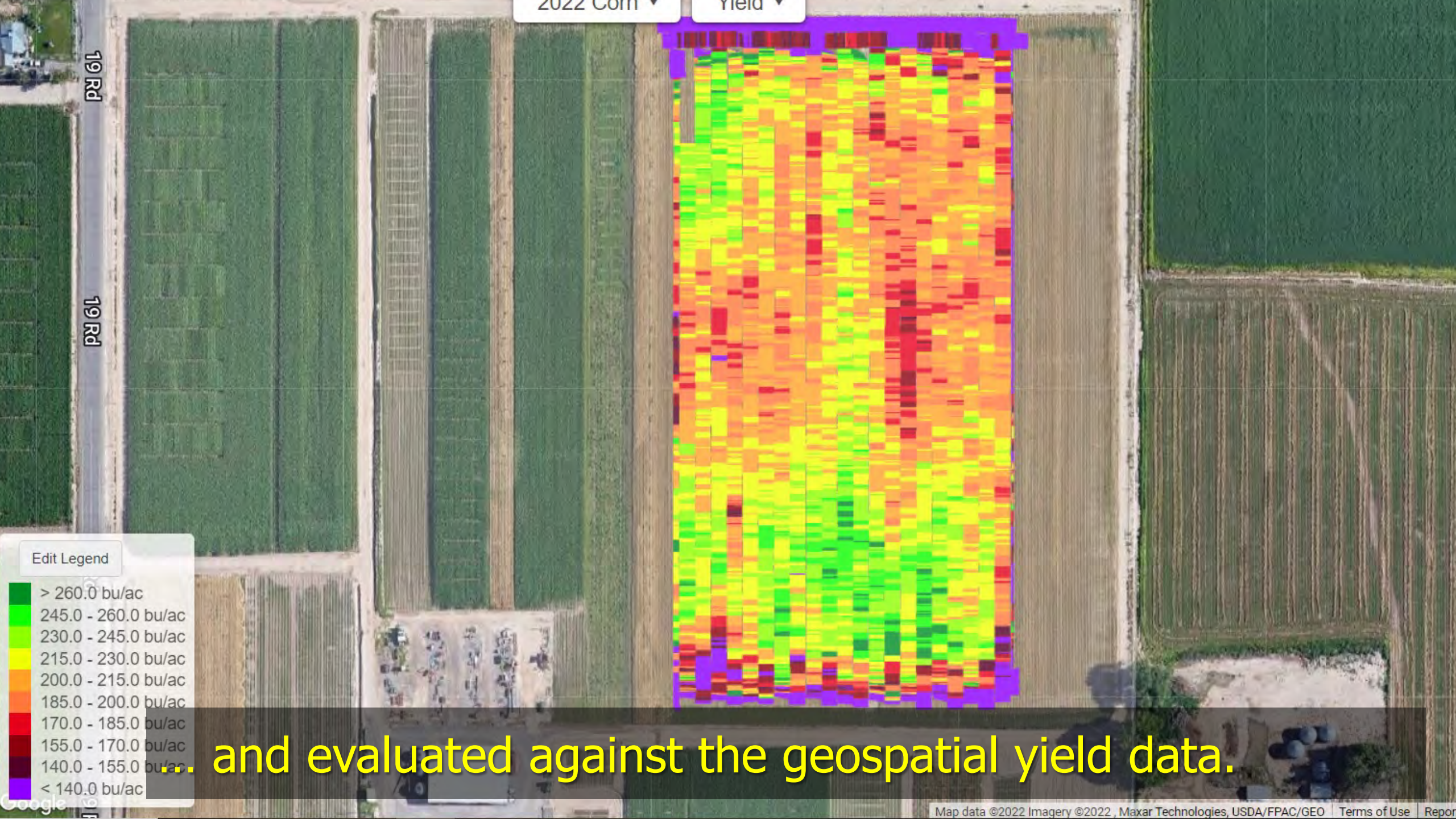
Goal is to use supervised AI algorithms by 2025 to develop and execute irrigation prescriptions



UAV-based sensing

NDVI
08-18-2022

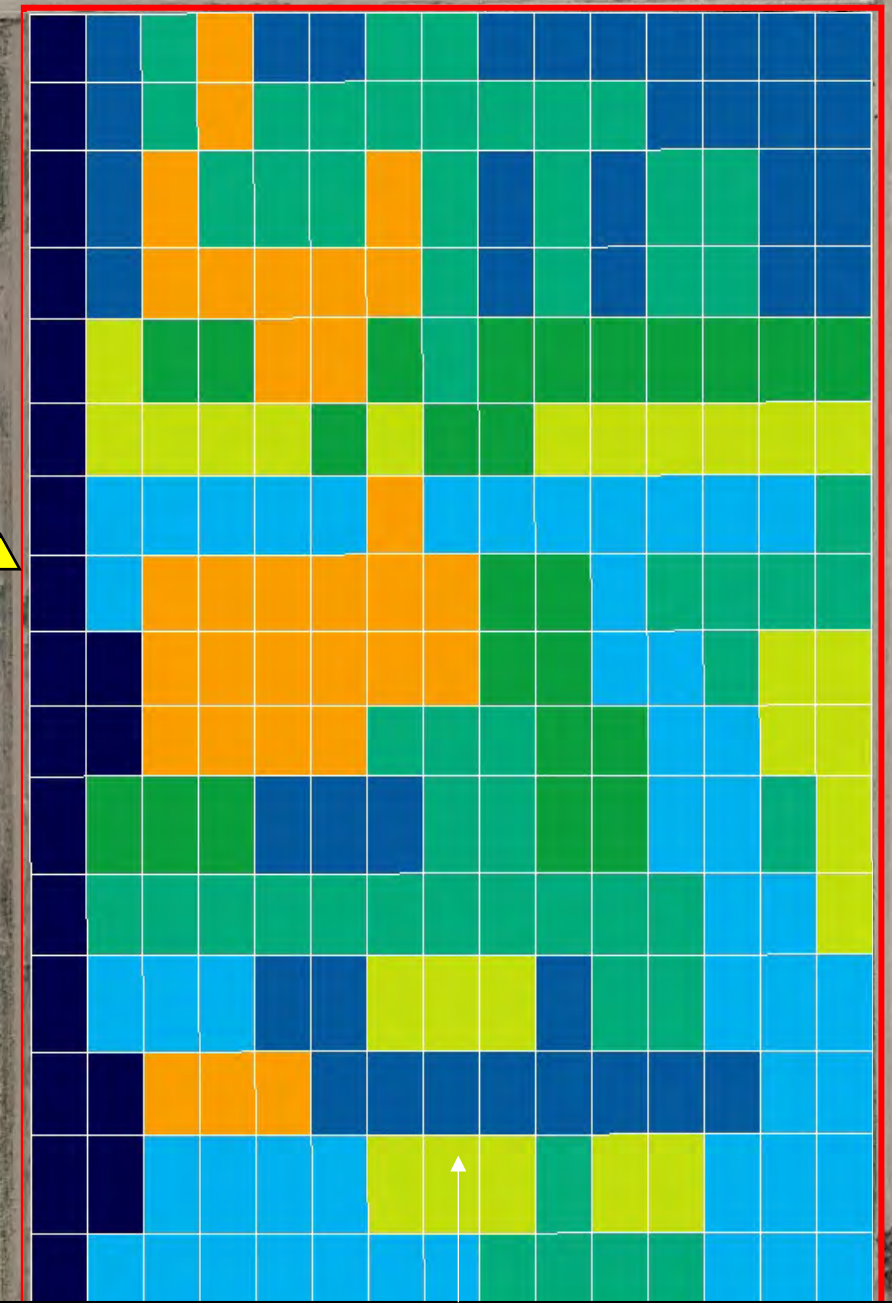
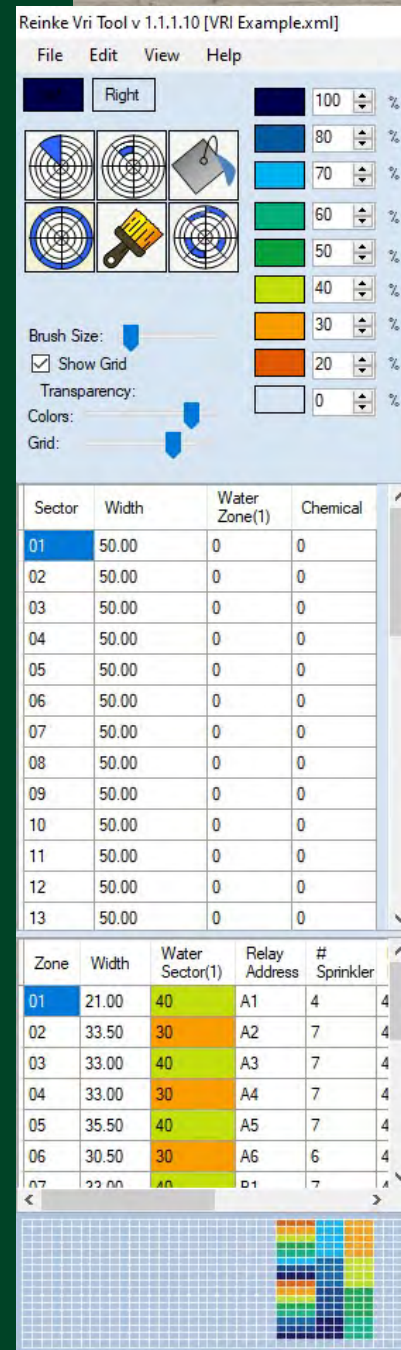
Geodata collection during cropping season ...



Acting on Data

Supervised AI algorithms to develop and execute irrigation prescriptions.

Variable rate irrigation (VRI) to spatially vary water application and improve upon the inherent efficiencies of sprinklers.

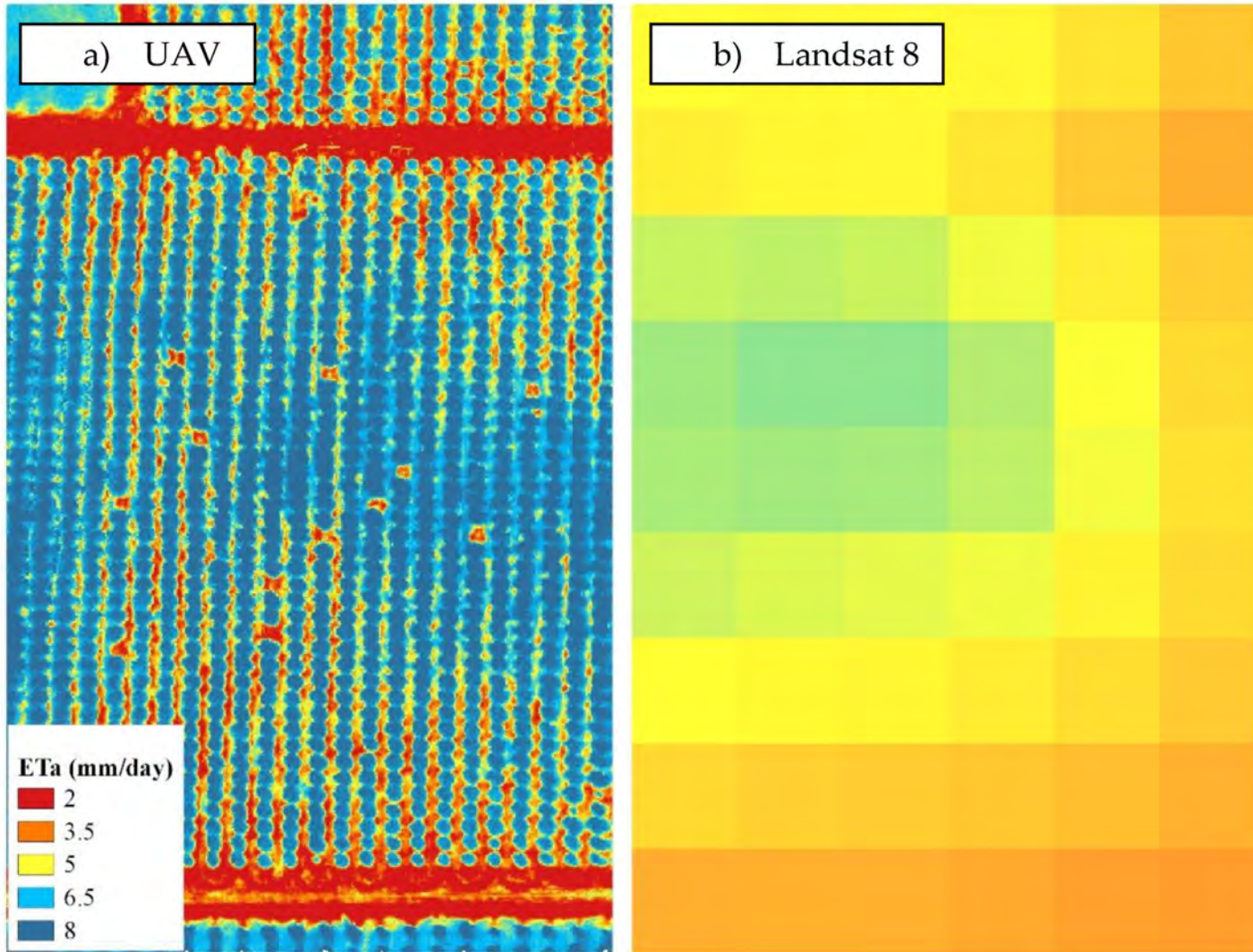


Principles for Using CU Evaluation and Modeling in Sustainable Agricultural Water Management

- Regardless of the program arrangements, **conserving agricultural water** involves **lowering consumptive use**.
- Producers want to understand high-elevation **forage water use** to **sustain livestock agriculture** while also participating meaningfully in conservation programs.



Consumptive Use Evaluation and Modeling with High-Resolution UAVs



High Resolution Geospatial Evapotranspiration Modeling and Plant Health Monitoring of Irrigated Crops, Orchards and Vineyards Using Multispectral and Thermal Imagery



Mokhtari et al. (2021). Actual Evapotranspiration from UAV Images: A Multi-Sensor Data Fusion Approach. Remote Sens. 2021, 13(12)

Principles for Alternative Cropping Systems in Sustainable Agricultural Water Management

- **Market-takers or Market-makers?** Farmers are sensible people, preferring existing markets over experimental alternatives.
- **Engagement with farmers** established sites to estimate ET rates and study performance of Kernza[®] IWG, sainfoin, silphium as a **conservation practice and dual water-forage market.**
- Interest by farmers to use **regenerative agriculture** and soil health practices.





Transforming Agriculture, Perennially

ABOUT US OUR WORK LEARN NEWS & EVENTS JOIN US VISIT US



Perry Cabot¹, Paul Bruchez⁴, Aaron Derwingson⁵, Mely Whiting⁶, Hannah Holm⁷, Tessa Peters⁸, Hunter Doyle⁸, Jessica Davis⁹

¹Colorado Water Center and Agricultural Experiment Station, ²Reeder Creek Ranch, ³The Nature Conservancy, ⁴Trout Unlimited, ⁵American Rivers, ⁶The Land Institute, ⁷CSU Soil and Crop Sciences



Agricultural Water Management and Regenerative Agriculture



Kurtwood winter peas



Morton lentils



March-planted chickpeas





Thank you!



COLLEGE OF
AGRICULTURAL SCIENCES
COLORADO STATE UNIVERSITY