WATER QUALITY PROCESSES AND PROTECTION

MAJOR OBJECTIVES AND WRITING ASSIGNMENTS

Problem Statement *(Bryant, University Park; Dabney, Oxford)*

I. Quantify and predict in-stream processes *(Kuhnle, Oxford; Moorman, Ames; Hanson, Stillwater)*

A. Contaminant transport and transformation
B. Erosion processes and sediment transport

II. Field scale processes controlling contaminant fate and transport *(Nearing, Tucson; Lerch, Columbia; Kleinman, University Park)*

A. Sediment delivery processes
B. Measurement and prediction of erodibility of soil and soil-based materials (good linkage with NP 212)
C. Identification and prediction of concentrated flow pathways and gully erosion
D. Dissolved phase delivery processes from agriculture, urban and turf systems
E. Relating field management to differential fate and transport of contaminants

III. Development and testing of cost-effective control measures for agriculture, urban and turf systems *(Evans, Ft. Pierce; Allred, Columbus; Lerch, Columbia; Hanson, Stillwater; Wren, Oxford; Mooreman, Ames)*

A. Farm and field management practices
B. Water treatment technologies

C. Includes within field, edge-of field and in-stream processes
D. Development of value added products
E. Erosion and Sediment control practices

IV. Ecological response to improved water quality
(Smiley, Columbus; Moore, Oxford)

A. Tools for aquatic system assessment
B. Channel and embankment characteristics and habitat structure
C. Aquatic response to sediment and contaminants

Irrigation and Drainage

Work for today and next few weeks:
Paragraph on research needs (by major topic – irrigation, drainage, water re-use and salinity)
Action Plan items (short)
    Objectives
    Products
    Outcomes
    Locations/People
Decide on writing teams (straw house suggestions)
    Irrigation – Evett/Bjorneberg
    Drainage – Fausey/Ayars
    Water re-use/salinity – Suarez/Yates

PA1: Water Management

A rationale/overarching (unreachable) goal:
Overall Water Management Tool – work on components for a comprehensive tool.

1.1 Irrigation

- Scheduling/control (humid to arid regions) (*old 2.1: Irrigation Scheduling for Water Use Efficiency*)
    - incorporating weather forecasting with irrigation scheduling (Mauget-Lubbock; Baker-St Paul; Hunsaker-Maricopa; Stone-Florence; Wang-Parlier)
    - crop coefficients that are valid across regions (Ayars, Wang-Parlier, Fisher-Stoneville, Evett,

Howell-Bushland; Hunsaker-Maricopa, Bausch, Trout-Fort Collins)
    - plant & soil feedback for irrigation scheduling (with standardized wireless communication) (Evett, O'Shaugnessy, Colaizzi-Bushland, French-Maricopa, Sui, Fisher, Thomson-Stoneville; Wang-Parlier; Vories-Columbia; Stone-Florence, Bausch-Fort Collins)
    - deficit irrigation management tools (Bautista, Thorp-Maricopa; Trout, Bausch, Shaner, vacancy-Fort Collins; Wang, Ayars-Parlier; Gitz, Baker, Lascano-Lubbock; Howell, Colaizzi, Tolk, Evett, O'Shaugnessy-Bushland)
    - site specific irrigation management tools (Sui, Fisher, Thomson-Stoneville; Vories-Columbia; Evans-Sidney; Skaggs-Riverside; Hunsaker, Bronson, French, Thorp-Maricopa; Stone-Florence)
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- Water productivity & requirements
    - landscape water requirements, zero leach (trees & shrubs) (Albano-Ft Pierce, Grieve-Riverside)
    - water requirements for biofuel crops (Acosta-Martinez-Lubbock, Schwartz-Bushland; Hunsaker-Maricopa; Wang, Gao, Banuelos-Parlier; Baker-St. Paul)
    - agronomic/horticultures crop water productivity/ quality - water-yield relationships (King-Kimberly; Riverside; Sui-Stoneville; Thorp, Bronson-Maricopa; Vories-Columbia; Albano-Ft Pierce; Ayars, Wang, Gao, Banuelos-Parlier; Fort Collins, Bushland)
      Is deficit a subset of this?

    - remote sensing tools for ET estimation (Kustas, Anderson-Beltsville, French-Maricopa; Gowda, Colaizzi-Bushland; Bausch-Fort Collins; Weslaco)
    - quantify water conservation (King-Kimberly, Bautista-Maricopa)
    - Nutrient management/Fertigation (Bronson, Strelkoff,-Maricopa)

- Irrigation application method
    - Method comparisons (water use, WUE, nutrient use efficiency) (Albano-Ft Pierce; Bronson-Maricopa)
    - decision tools for irrigation method tied to NRCS soils database (Thorp-Maricopa)

- Dryland/rainfed water management (*old 2.4: Cropping and Tillage Strategies to Best Use Limited Water Supplies*)
    - Limited/no-tillage effects on water availability, plant establishment, yield, WUE
    - Soil water availability/crop selection
    - Supplemental irrigation value

1.2 Drainage

- controlled drainage management guidelines
- bioreactor design and management criteria for water treatment
- design recommendations for wetland basins
- cover crop recommendations for nutrient capture

- evaluation of treatment filter media
- evaluation of two stage ditch design for water quality
- regional assessment of drainage water quality
- tailwater and drainage water management (Fausey, Allred, Van Toai-Columbus, Bjorneberg-Kimberly, Feyereisen-St. Paul, Vories, Lerch-Columbia, Ayars-Palier, Smith-West L, Oxford vacancy, Jaynes-Ames, Orono, Albano-Ft Pierce, Stone-Florence, White, Fouss-Houma)

1.3 Use of degraded waters (old 2.3: Improved Irrigation and Cropping for Reuse of Degraded Waters)

- identify presence of emerging contaminants in waters and soils (Williams, McClain-Maricopa; Yates-Riverside)
- assess persistence of emerging contaminants (Williams, McClain-Maricopa; Yates, Ibekwe, Bradford-Riverside; Dungan-Kimberly)
- identify indicator compounds for emerging contaminants (Williams, McClain-Maricopa; Yates-Riverside)
- plant selection & breeding for salt tolerance and toxic ions (Grieve, vacant-Riverside, Banuelos-Parlier)
- management guide for leaching requirements (Suarez, Goldberg-Riverside)
- Assessment…
- guidelines for irrigation application method and management/scheduling for degraded waters (Bautista, Hunsaker, Williams, French-Maricopa, Albano-Ft Pierce, Ayars, Wang-Parlier; Corwin, Skaggs, Suarez, vacancy-Riverside)

- nutrient management of reuse water (Strelkoff, Bautista, Bronson-Maricopa; Albano-Ft Pierce)
- CAFO wastewater (Ibkwe-Riverside, Baker-St. Paul, Dungan-Kimberly)

Conservation Practices Development and Assessment, Breakout Session 2

Can CP be scaled up? Develop tools and technologies to scale individual conservation practices from field to larger scales

Develop selection tools

Develop targeting tools

Assess impact of conservation practices on ecosystem services

- Quantification
- Processes
- Environmental trading markets

Evaluate conservation practice effects as a function of changes in land use and climate

Evaluate and optimize practices for target and potential non-target concerns, including lag and legacy of practices

Provide information required for cost-benefit analysis of new practices and existing conservation programs

- Value on water conservation practices.
- Better ways to quantify water quantity/quality throughout entire systems

Potential sub-objectives under other main objectives:

- What processes are involved?
- Modeling? Validate and quantify uncertainties of model predictions.

Watershed/Landscape Processes and Management

Products:

1. Best management practices (BMPs), assessment tools, and decision support systems for managing water quantity and quality within agricultural and urban landscapes for multiple end-points (ecosystem services, agricultural productivity, etc).

2. Integrated tools for better multi-scale (watershed- to national-scale) decision support for management practices.

3. Improved long-term watershed characterization and data access services.

4. Improved watershed simulation, plant growth, weather generators and data assimilation tools for water budget, water quality assessment, and flood and drought risk and impact [in the context of global change/warming?].

5. New measurement tools (including in situ and remote sensing) for terrain, ET, soil moisture, vegetation characterization and data interpretation methods for agricultural and rangeland environments.

6. Synthesize information and observations into appropriate (i.e. policy-friendly) formats.

Very relevant programmatic issue from customers: Lack of support for model maintenance and support.