

## *Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande*

Dr. Kelly Burks-Copes

### Problem

- ▶ Three constructed projects on the Middle Rio Grande:
  - Ecosystem Revitalization @ Route 66 Project
  - Middle Rio Grande Bosque Ecosystem Restoration Project
  - Albuquerque Biological Park Wetland Restoration Project
- ▶ All 3 deployed EWN strategies
- ▶ Ops needs an approach that promotes **transparency** and **collaboration** to adaptively monitor, evaluate and enhance the returns on these investments as well as a means to tactically and strategically capture the broad range of **ecological, social and economic benefits** arising from these features



### Objectives

- **Develop** a series of ecosystem production functions to characterize the EGS produced by the MRG studies;
- **Devise** a methodology to integrate these new metrics into the current operation and management paradigm; and
- **Explore** adaptive management strategies to maximize return on investment (ROI) based on system goals and objectives.

### Approach

- Kickoff Workshop** (FY13)
- Develop** list of EGS and crosswalk to EWN Features (FY14-15)
- Generate** landscape-level metrics (FY15-16)
- Evaluate** system performance (FY16)
- Formulate** adaptive management measures (FY16)



## *Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande*

Dr. Kelly Burks-Copes

### Project Funding by Year

- ▶ FY13: \$50K
- ▶ FY14: \$102K
- ▶ FY15: \$118K
- ▶ **FY16: \$150K\***

*Original SOW: \$420K over 3 yrs (FY13-15)*

### Major Project Deliverables

- **Structured approach and framework** that can be used elsewhere (FY 13-14)
- **List of EGS** associated with commonly utilized EWN Features in the arid landscape (FY 14-15)
- **Series of EGS metrics** to assess EWN performance that can be ported to other studies – Las Cruces, NM & Bottomless Lakes (Pecos River); but also inland waterways and coastal zones (FY 16)
- **Formulate adaptive management measures** to maximize a full array of benefits
- **Series of TNs** detailing the process and outcomes (FY15-16)



### Value Statement

Provide a defensible, quantifiable means to characterize the full array of ecosystem goods and services generated via the effective and efficient operation and management of the Middle Rio Grande system with an eye towards maximizing the returns on investment through holistic adaptive management.



# EWN FY15 IPR



## *Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande*

Dr. Kelly Burks-Copes

### TN #1 – Introduction to the EWN Features

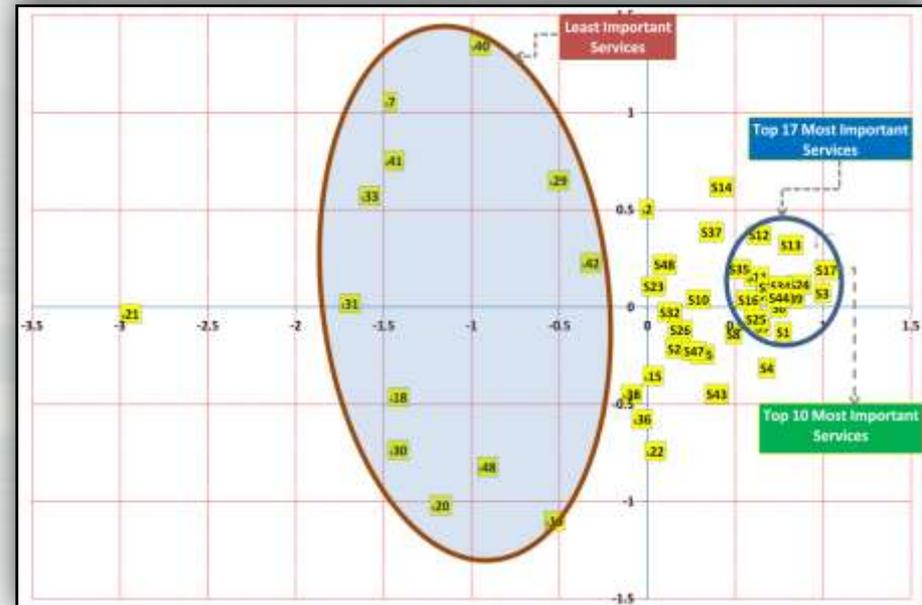


## Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande

Dr. Kelly Burks-Copes

### TN #2 – Workshop & EGS List

ECOSYSTEM GOOD OR SERVICE	PRIORITY
Biological diversity (biodiversity)	95.3
Community building and involvement (partnership and collaboration)	86.8
Water supply for environmental flows	84.4
Clean water provisioning (sediment, nutrients, pathogens, other pollutants)	83.5
Science, research	83.3
Education, interpretation, demonstration value	81.0
Open space and protection from land use change (conservation)	81.0
Network connectivity (storm drainage, trail networks, wildlife corridors, etc.)	79.4
Groundwater recharge and soil moisture retention	79.3
Flood disturbance regime restoration	76.7
Cultural heritage and identity - sense of place and belonging	73.3
Fire hazard mitigation	72.4
Water supply for human consumption - municipal	68.6
Water harvesting (rainwater capture)	67.7
Water supply for legal compacts, water rights	65.4
Erosion protection and control	65.0
Carbon sequestration	64.0
Micro- and Macroclimate regulation	63.5
Physical protection against flooding (flood attenuation, diversion, etc.)	63.5
Aesthetics - appreciation of natural scenery	62.1
Recreation - opportunities for local recreational activities	61.2
Nutrient cycling	61.1
Flood hazard mitigation, flood regulation and control	59.6



# EWN FY15 IPR

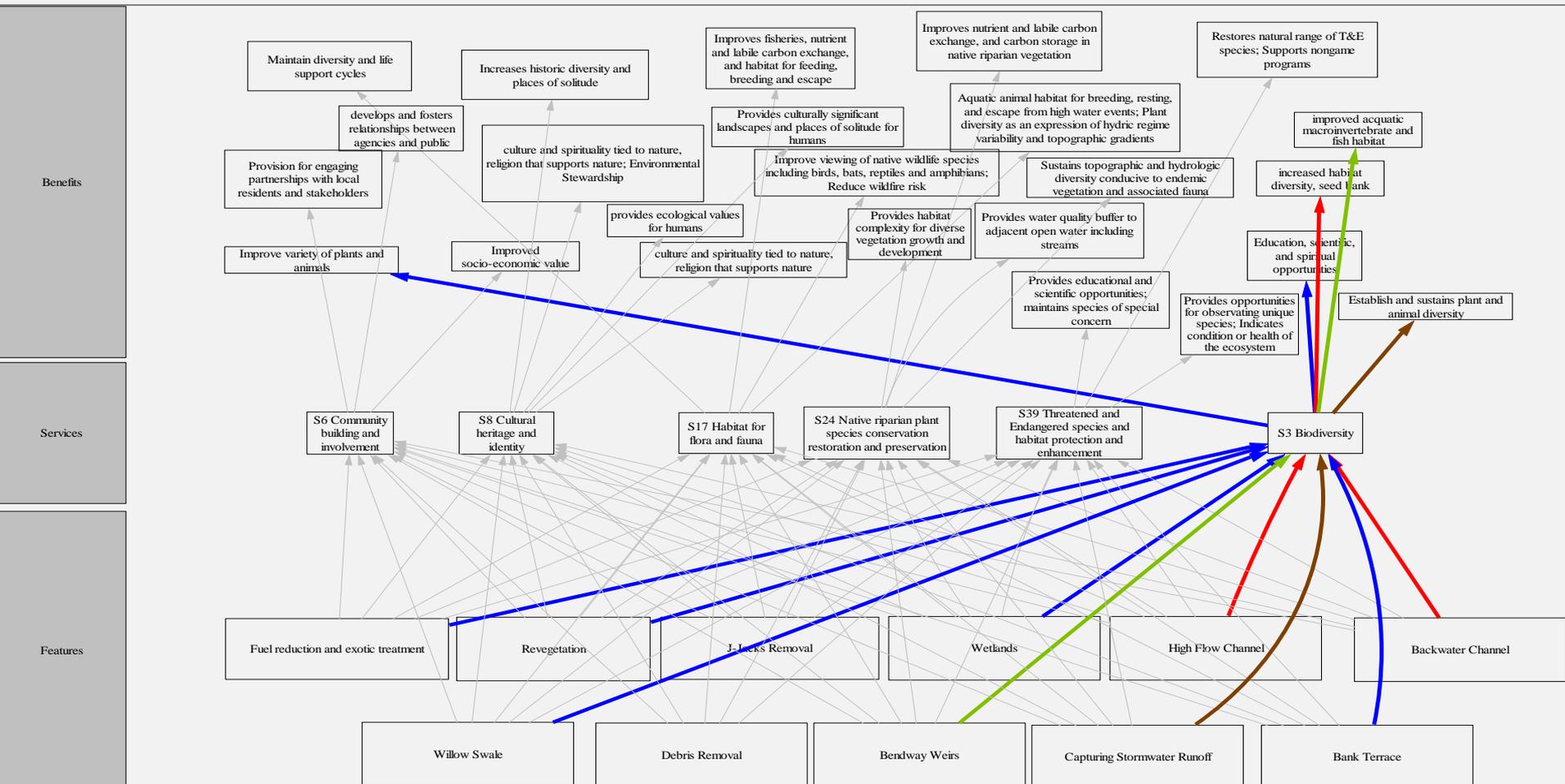


## Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande

Dr. Kelly Burks-Copes

### TN 3 & 4 – Matrix & Causal Maps

#### Economic Benefits



## *Realizing a Triple Win in the Desert: Systems-level Engineering With Nature on the Rio Grande*

Dr. Kelly Burks-Copes

### FY14-16 Products

- **Stakeholder Workshop** (FY14)
- **Technical Notes**
  - **TN #1:** Intro studies & EWN features (FY15)
  - **TN #2:** Workshop Results (FY16)
  - **TN #3:** Service Matrix and Decomposition (FY16)
  - **TN #4:** Causal Mapping (FY16)
  - **TN #5:** Metrics Development (FY16)
  - **TN #6:** System Performance and Adaptive Management (FY16)
- **Journal Articles (newly added)**
  - **JA #1:** Features and EGS List (FY16)
  - **JA #2:** EGS Matrix and Causal Mapping (FY16)
  - **JA #3:** Adaptive Management Using a Full Array of EGS Indicators (FY17)
- **Factsheet & Web Materials**
- **Conferences & Meetings**
  - **Oral presentation** given by Dr. David Koran, (USACE-HQ) at the Desert Fishes Council, Flagstaff, AZ (November 2013)
  - **Poster** presented at the *Flood Risk Management (FRM) and EWN Collaborative Meeting* held in Vicksburg, MS (10-11 June 2014)
  - **Oral presentation** given by Dr. Todd Bridges at the PIANC Meetings in London, England (May 20115)
- **Collaborations**
  - **CEQ** has invited ERDC to assist in the development of case studies demonstrating EGS metrics for planning and adaptive management (\$300K from CEQ has been offered)

