Joint Fire Science Program Project

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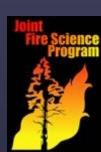**Ginger Paige, Hydrologist, University of Wyoming**

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Outline

- **Joint Fire Science Program**

- **Problem Statement**

- **The Ryan Fire**

- **Research objectives**
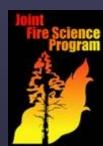
- **Approach & Methods**

Joint Fire Science Program (JFSP)

- **Established in 1998 to provide scientific information and support for wildland fuel and fire management programs**

- **Partnership of six federal agencies:**
  - **Forest Service (USDA & BIA)**
  - **Bureau of Land Management**
  - **National Park Service**
  - **U.S. Fish and Wildlife Service**
  - **U.S. Geological Survey**
  - http://jfsp.nifc.gov/JFSP_About_JFSP.htm

Joint Fire Science Program

- **Direction from Congress to address four areas:**
  - fuels inventory and mapping
  - evaluation of fuels treatments
  - development of protocols for monitoring and evaluation

- **2001, Congress expanded JFSP to**
  - post-fire rehabilitation and stabilization
  - local assistance
  - aircraft-based remote sensing

- **JFSP also examines other fire related issues**
  - air quality and smoke management
  - social aspects of fire and fuels management.

➢ **Purpose of JFSP is to provide wildland fire and fuels information and tools to specialists and managers, helping them to make the best possible decisions and develop sound, scientifically valid plans.**

Problem Statement

- Wildfires in the semiarid regions of the SW usually occur in the months preceding the onset of summer monsoon rains.

- Loss of cover coupled with high intensity convective thunderstorms can lead to significant increases in runoff and erosion.

➢ Little or no research has been done to evaluate/quantify the hydrologic and erosion effects from grassland wildfires in semiarid areas.

Post Wildfire Hydrology & Erosion

KEY FACTORS

- Fire Characteristics
  - Severity/Extent
  - Timing
- Site Characteristics
  - Slope
  - Soils
  - Vegetation
  - Climate
- Risk
  - Flooding (on and off site)
  - Increases in erosion & soil loss

Post Wildfire Hydrology & Erosion

- BAER teams and land managers
  - estimate the potential risks increases in runoff and soil loss after fires
  - determine appropriate mitigation techniques to prevent downstream flooding and minimize soil loss.

- TR55 and USLE at the watershed scale to estimate the potential increases in runoff and erosion,
  - may not be applicable in the southwest where high intensity thunderstorm rainfall dominates the runoff and erosion processes.

Joint
Fire Science
Program

Quantification of Runoff and Erosion Processes on a Semi-arid Grassland after a Wildfire

Ryan Fire (May 2002)

- 17,000 ha of semi-arid grassland and oak woodland in SE Arizona
- Low (70%) to moderate (30%) burn severity

7000 ha – National Forest Service

4000 ha –BLM

5000 ha – private

770 ha – State Lands

The Audubon Research Ranch:

➢ 1997: USDA –ARS established two grassland ecological research sites for runoff and erosion research.

Ecological Sites

- **Basic management, planning and evaluation unit for NRCS, BLM, Arizona State Lands**

- **Soil vegetation associations determined by soil type, topography, and climate**

- **Hillslope scale**

➤ **An ecological site in a given condition should have a specific hydrologic and erosion response.**

Research Objectives

- **Quantify runoff and erosion from the two ecological sites immediately following the wildfire using rainfall simulator measurements.**

- **Measure the runoff and erosion processes during the "recovery" period.**
  - **Compare results from similar unburned ecological sites.**

- **Develop model input parameters for semi-arid grasslands for ERMiT from the runoff and erosion measurements.**

Research Approach

- **Variable intensity rainfall simulator experiments on the 2 burned ecological sites (2 - 4 plots/site).**
  - **Measure infiltration, runoff, and erosion for a range of rainfall intensities (25 – 180 mm/hr).**

- **Compare results from those at similar unburned ecological sites at the USDA- ARS Walnut Gulch Experimental Watershed.**

➢ **Results from three years of simulation on the original Ryan Fire and unburned sites.**

➢ **Results from additional wildfire sites.**

Walnut Gulch Rainfall Simulator

Variable Intensity Rainfall Simulator

- Computer Controlled
- Intensities:
  13 – 178 mm/hr
- 2m by 6m plot
- Oscillating boom
- 4 VeeJet nozzles
- Rainfall energy close to natural rainfall

Measurements

➤ Runoff

- Measured at end of plot using pressure depth gauge and precalibrated flume.
- Each intensity applied until steady state is observed.
- Infiltration is calculated as: (Intensity – Runoff).

➤ Sediment

- Grab samples were taken during the rise of the hydrograph and at steady state.

➤ Plot and site characteristics

- Point frame measurements of Canopy cover, ground cover and microtopography (400pts/plot).

Simulator setup at the Post Canyon site: year 1 (2002)

Next Steps

- Develop input parameters for WEPP and ERMiT from rainfall simulator experiment data and site characteristics

- Hydrology & erosion processes
- Hydrology & erosion – oak woodlands
- Data from rainfall simulator experiments
- BAER Team Technology
- Hydrologic & erosion model overview