The Application of SWAT to a Small, Forested Watershed on the Canadian Boreal Plain

Ruth McKeown[1], Gord Putz[1] & Jeff Arnold[2]

1 Forested Watershed and Riparian Disturbance Group, University of Saskatchewan, SK, Canada
2 United States Department of Agriculture, Temple. TX, USA

Outline

- FORWARD Project Description
- Methodology
- Results
- Conclusions

FORWARD Project Description

- FORWARD - Forested Watershed and Riparian Disturbance Group
  - Impact of disturbance on water quality and quantity
  - Mitigating effect of buffer riparian zones
  - Compare effect of fire and harvesting
  - Provide a management tool for industry

FORWARD Project Description cont'd

- Group Members
  - University
  - Industry
  - Government
- Other Group Affiliations
  - SWAT group
  - Marcell Experimental Forest

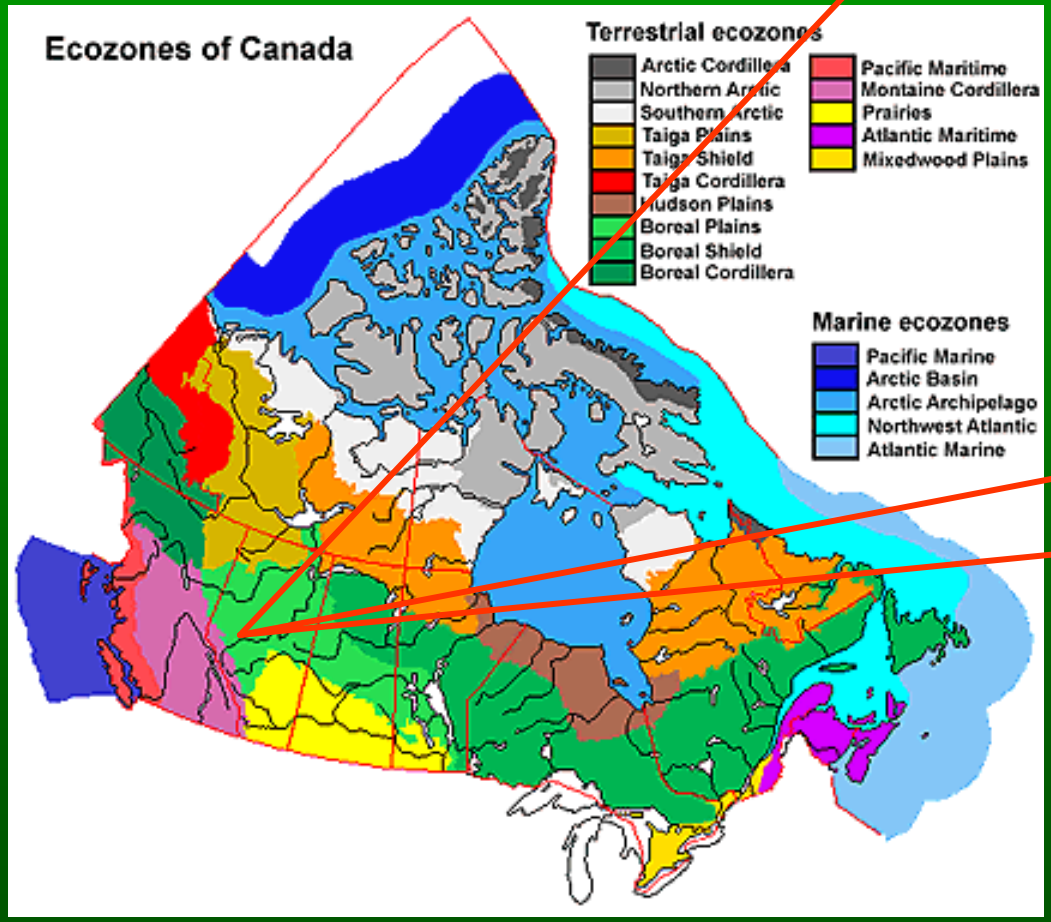
Methodology

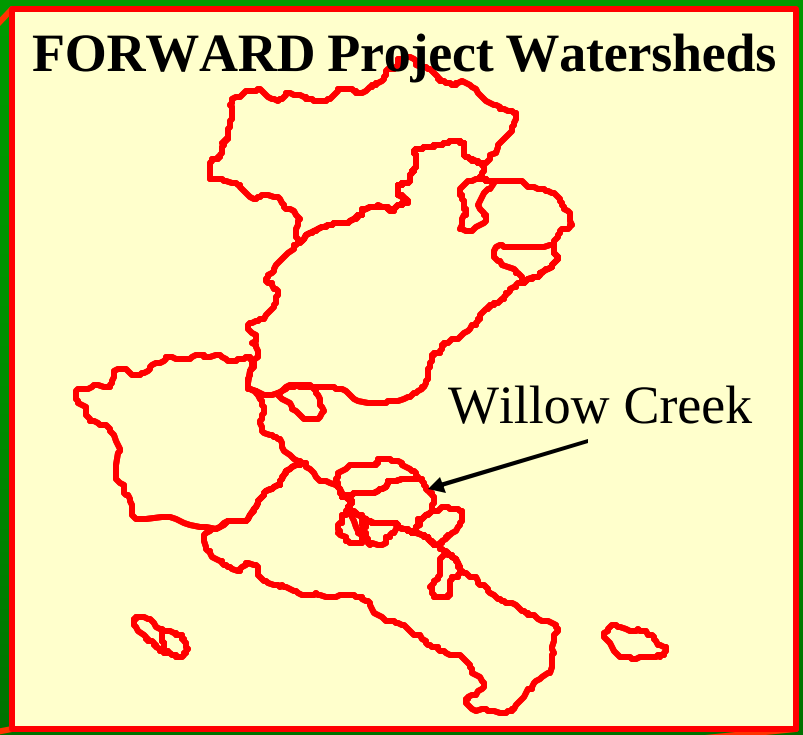
- Model Selection
- Study Site
- Source Data
- Model Setup

Model Selection

- Physically based
- Spatially distributed
- Model basins from 5 km^2 to 250 km^2
- Model both water quantity and quality
- SWAT 2000 in BASINS environment

Study Site


Ecozones of Canada
Terrestrial ecozones
Arctic Cordillera
Northern Arctic
Southern Arctic
Taiga Plains
Taiga Shield
Taiga Cordillera
Hudson Plains
Boreal Plains
Boreal Shield
Boreal Cordillera
Pacific Maritime
Montaine Cordillera
Prairies
Atlantic Maritime
Mixedwood Plains
Marine ecozones
Pacific Marine
Arctic Basin
Arctic Archipelago
Northwest Atlantic
Atlantic Marine

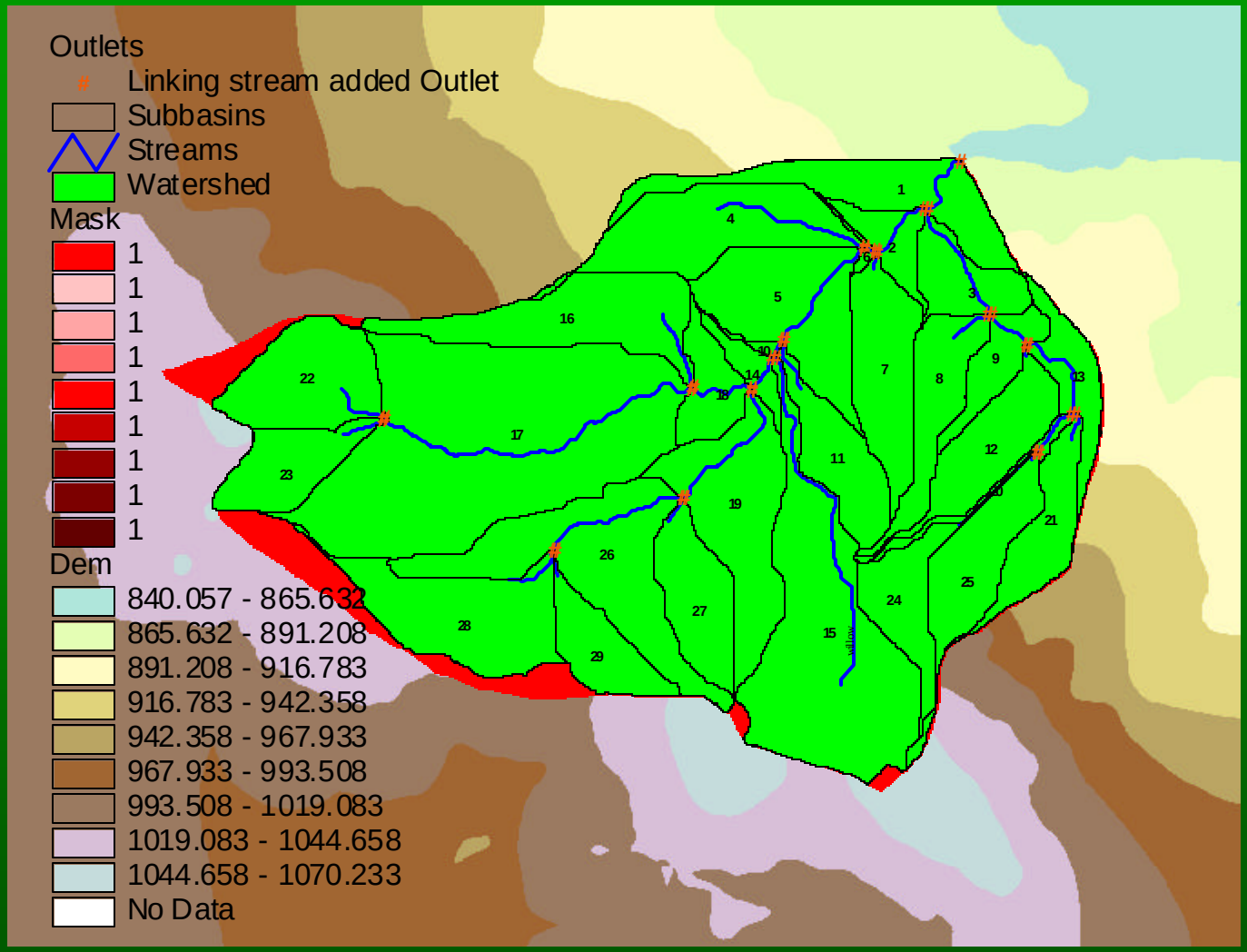

FORWARD Project Watersheds
Willow Creek

Source Data

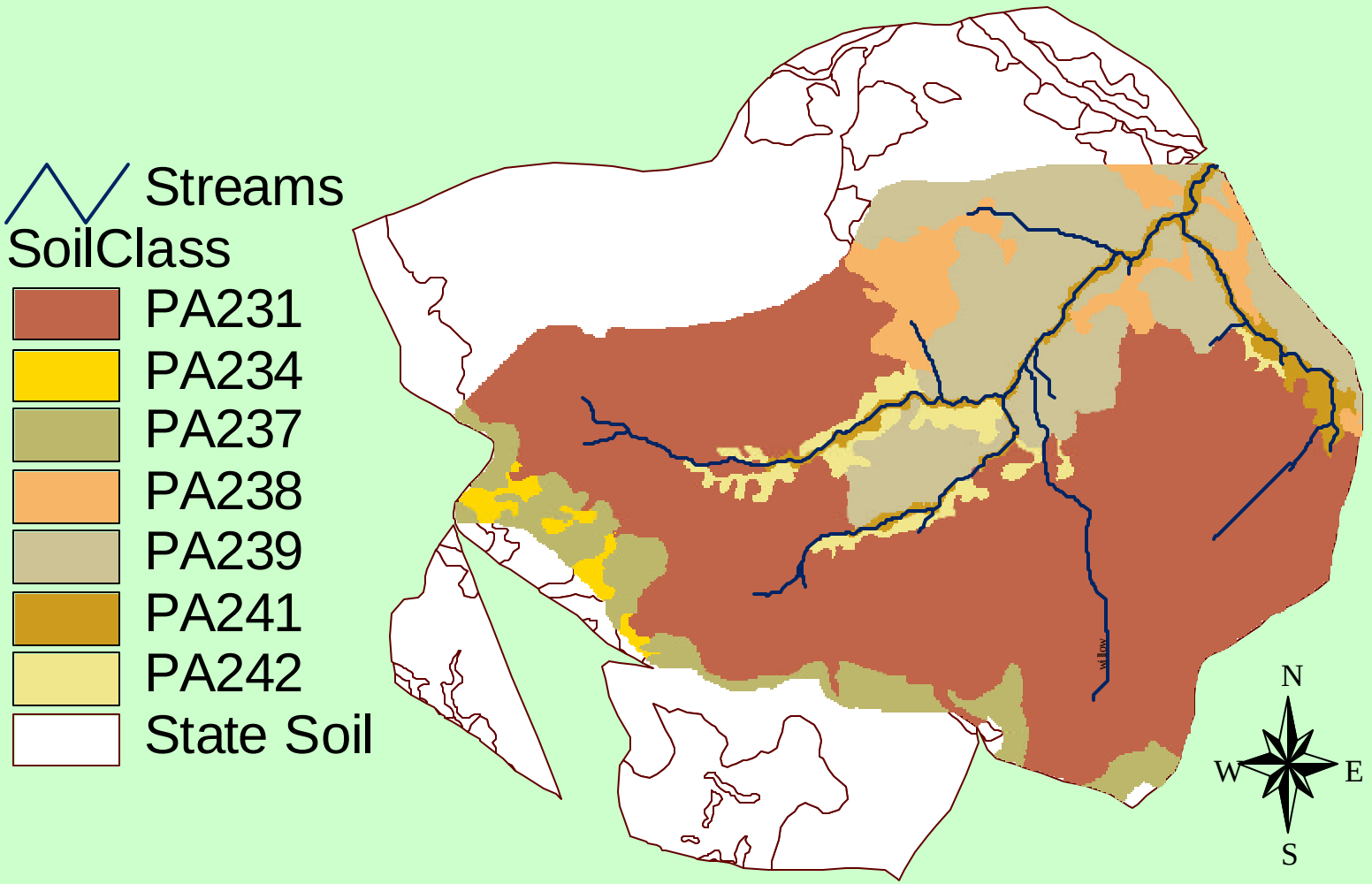
- Soil Cover
  - AGRASID
  - Field dataset
- Land Cover
  - Forest industry avi dataset
- Reach Cover
  - Forest industry avi dataset
- Meteorology

Source Data cont'd

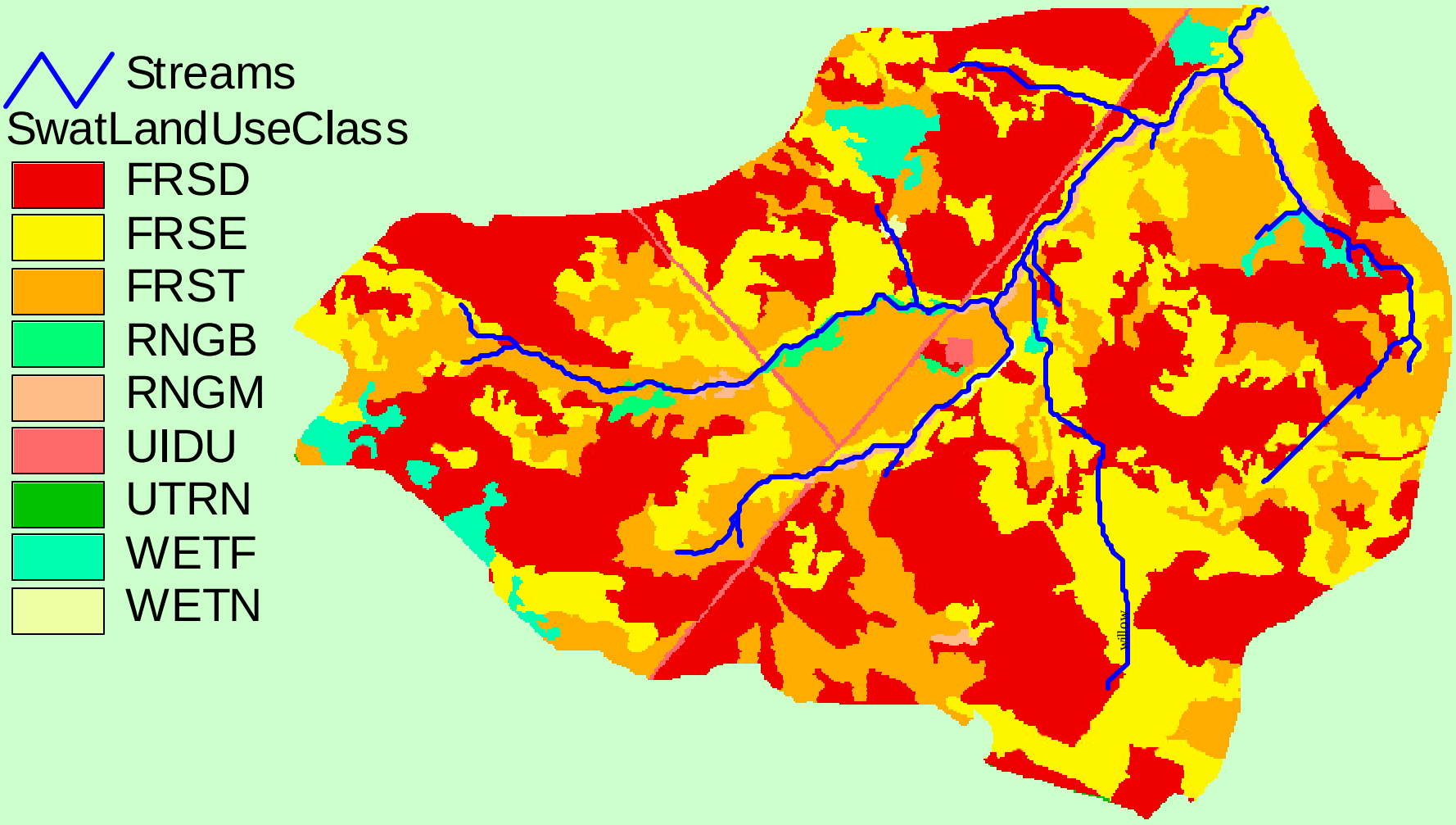
Model Setup: Delineation



Model Setup: Soils



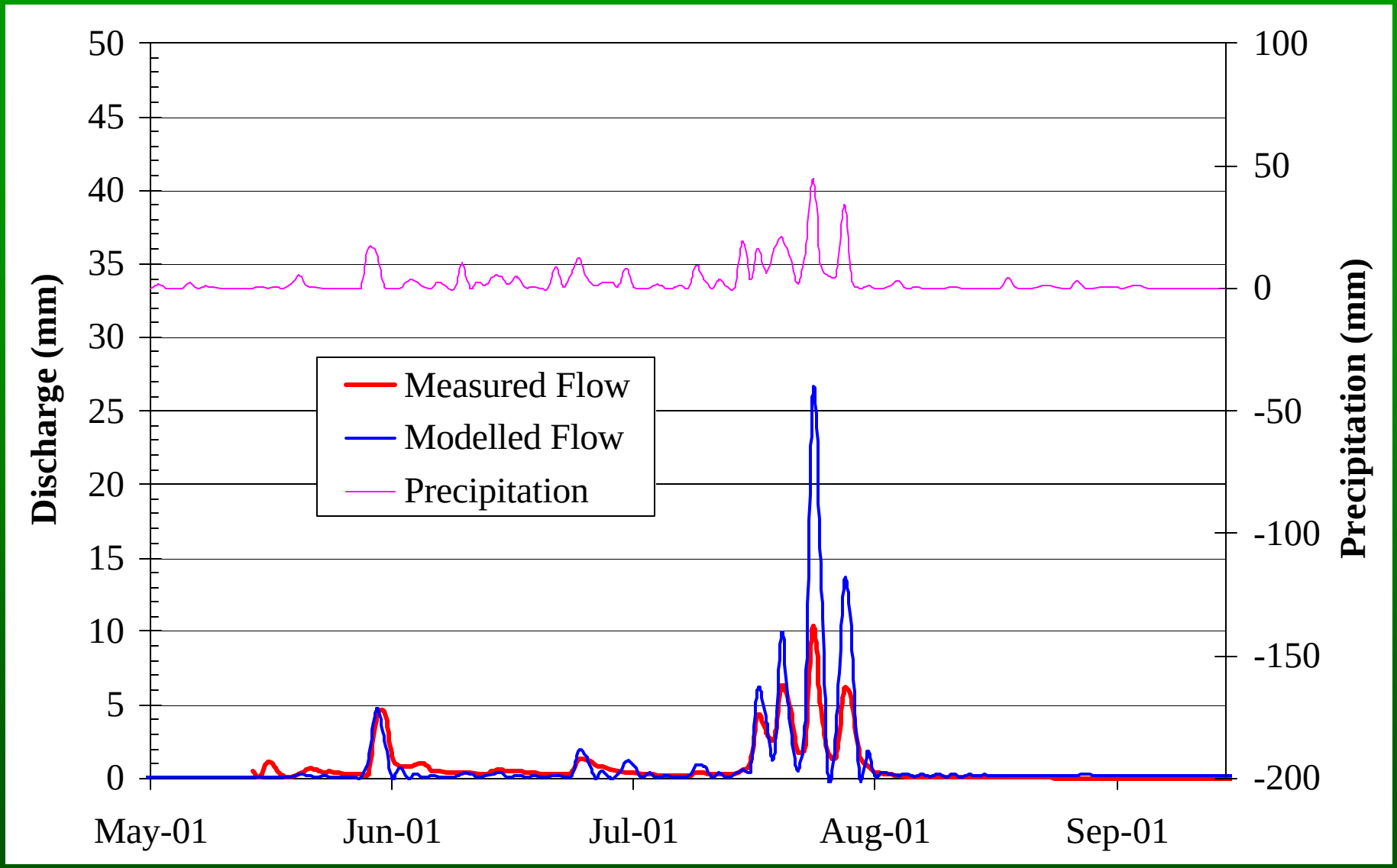
Model Setup: Land Cover



Model Setup

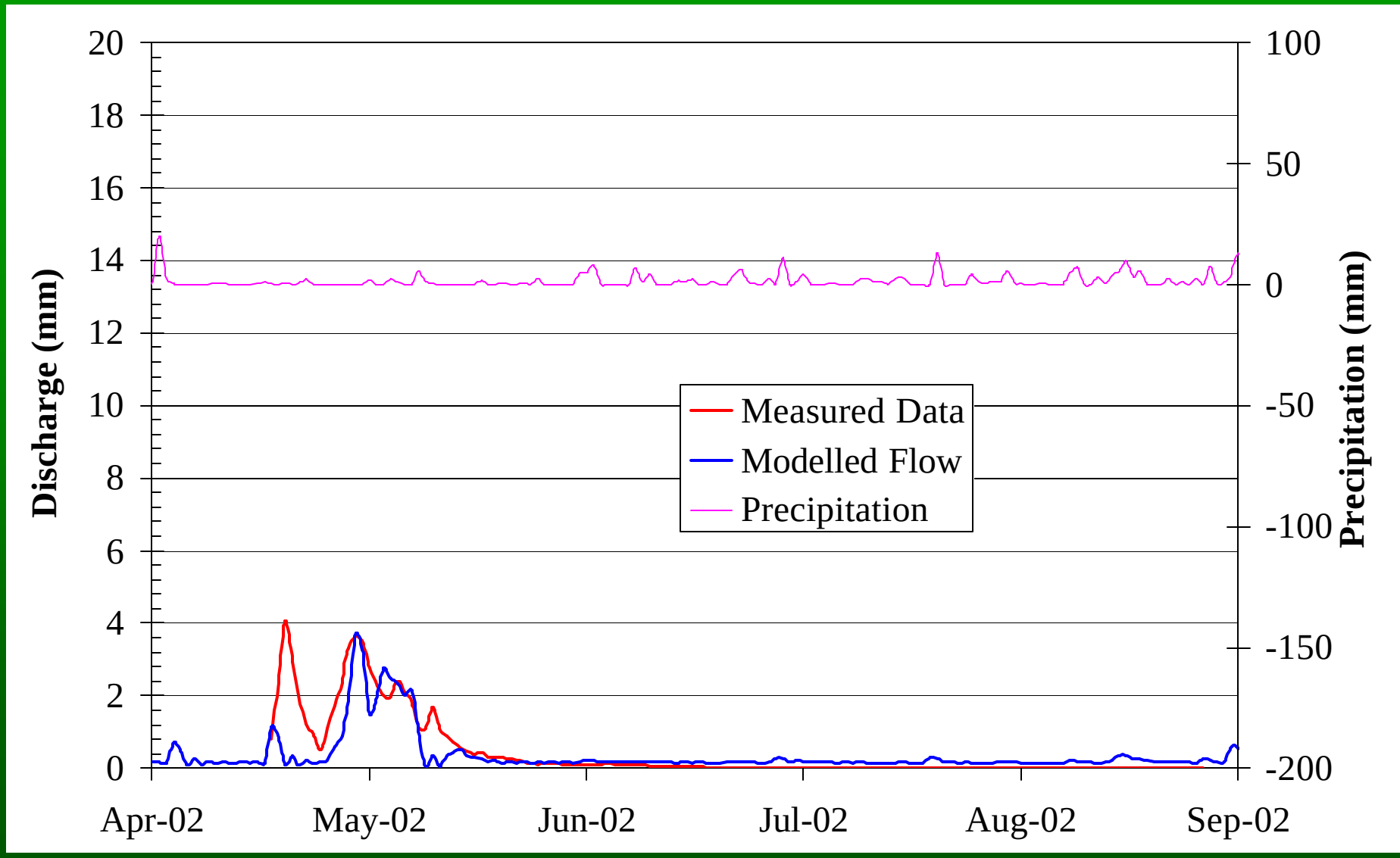
- Modified SWAT 2000 to refer to a lower soil layer in order to better simulate the spring melt
- Modeled 1997 through 2002 and calibrated to 2001 – 2002 measured flow data
- Simulation Characteristics
  - Hargreaves ET method
  - SCS curve number method
  - Muskingham flow routing

Results: Daily Flow 2001



Meteorological Station – Precipitation Variation

Results: Daily Flow 2002



Conclusions

- The modified SWAT2000 model provides reasonable simulations of Willow Creek stream flow
- Representative meteorological data is essential for calibration
- An effort is under way to improve and expand SWAT2000 for forested watersheds

Precipitation Variation