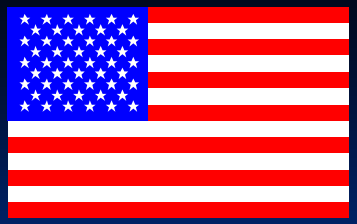


ARS Plans for Model Validation, Evaluation and Uncertainty Analysis (MVEUA)

Ron Bingner
ARS, Oxford, MS

The CEAP Watershed Assessment Study (WAS) is designed to provide:

- Detailed assessment of conservation programs on selected watersheds scales
- A framework for improving National Assessments

MVEUA OBJECTIVE

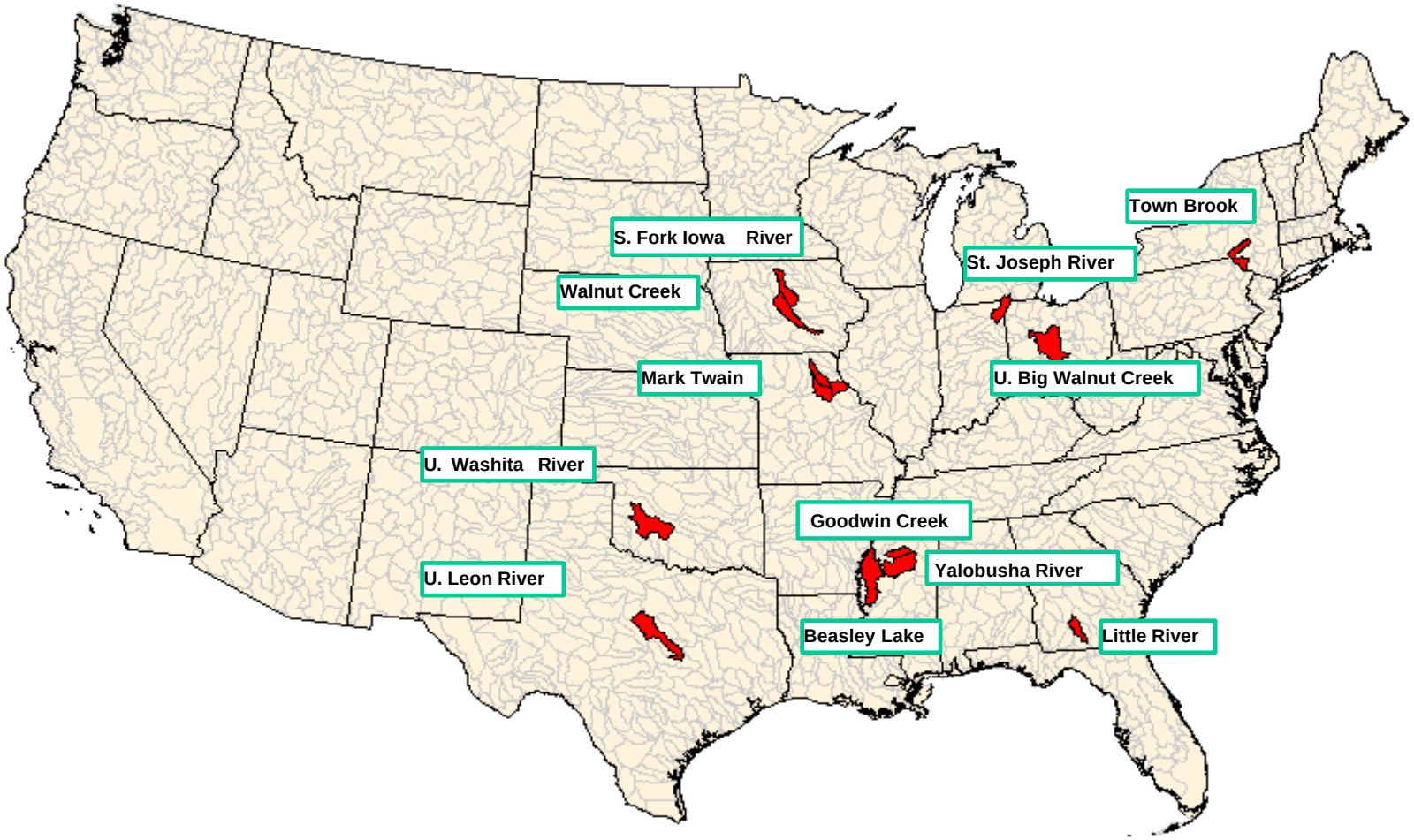
Validate models and quantify uncertainties of model predictions at multiple scales by comparing predictions of water quality to measured water, soil and land management effects of conservation practices.

MVEUA Will Consider NRCS CORE 4 Practice Categories

- Nutrient Management
- Tillage Management
- Conservation Buffers
- Pest Management

There are over 250 USDA-NRCS conservation practices described

ARS CEAP WAS WATERSHEDS



Utilize the extensive data histories collected within ARS watersheds to determine from measured data the impact of conservation practices

Use models to provide an analysis and comparison of the effectiveness of existing and alternative conservation practices

Model Process Components

Loadings by source

- Fields (land areas) ¾ water, sediment, & chemicals.
- Feedlots ¾ soluble nutrients.
- Gullies ¾ sediment & chemicals.
- Point Sources ¾ water & chemicals.
- Reaches ¾ sediment yield & chemical transport.
- Impoundments ¾ sediment deposition.

The National Assessment utilizes SWAT and the WAS will use SWAT for direct comparison

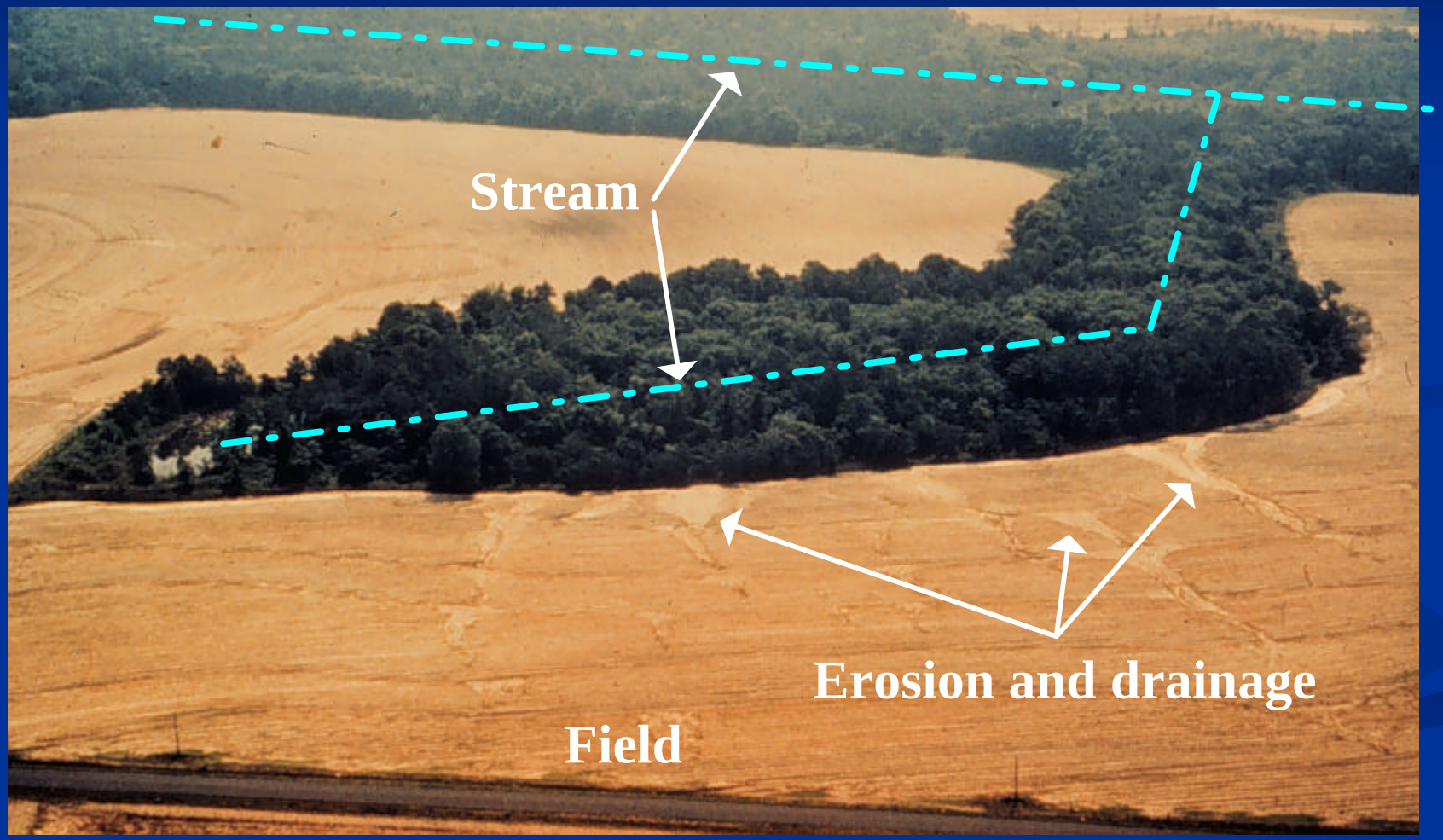
The other USDA watershed model, AnnAGNPS, will also be applied on the watersheds to provide a comparison of conservation practices and to the analyses from SWAT

Specific USDA models will be utilized in the watershed analysis when appropriate for:

- Riparian filters – REMM
- Channel evolution - CONCEPTS

REMM

Riparian Buffer System



Reach Processes

CONCEPTS is best suited:

- **When a significant portion of sediment originates from channel sources.**

- **When hydrodynamic & channel morphological process simulations are needed.**

MVEUA will provide an analysis of the uncertainty of model predictions at multiple scales and the sensitivity of model input parameters

MVEUA will work closely with the Experimental Design & Data Management teams to:

- **Develop**
- **Measure**
- **Quantify**

the effects of conservation practices and to develop model input data, including data needed for model validation

Close cooperation with the Economic Analysis team will help provide an economic assessment of conservation practices on the watershed

MVEUA team members will work closely with the Regional Watershed Model Development team in the development and verification of regional watershed models

- **Ultimately, the information determined from this effort will be utilized to add confidence in the CEAP National Assessment**
- **Will provide the basis for future model improvements**

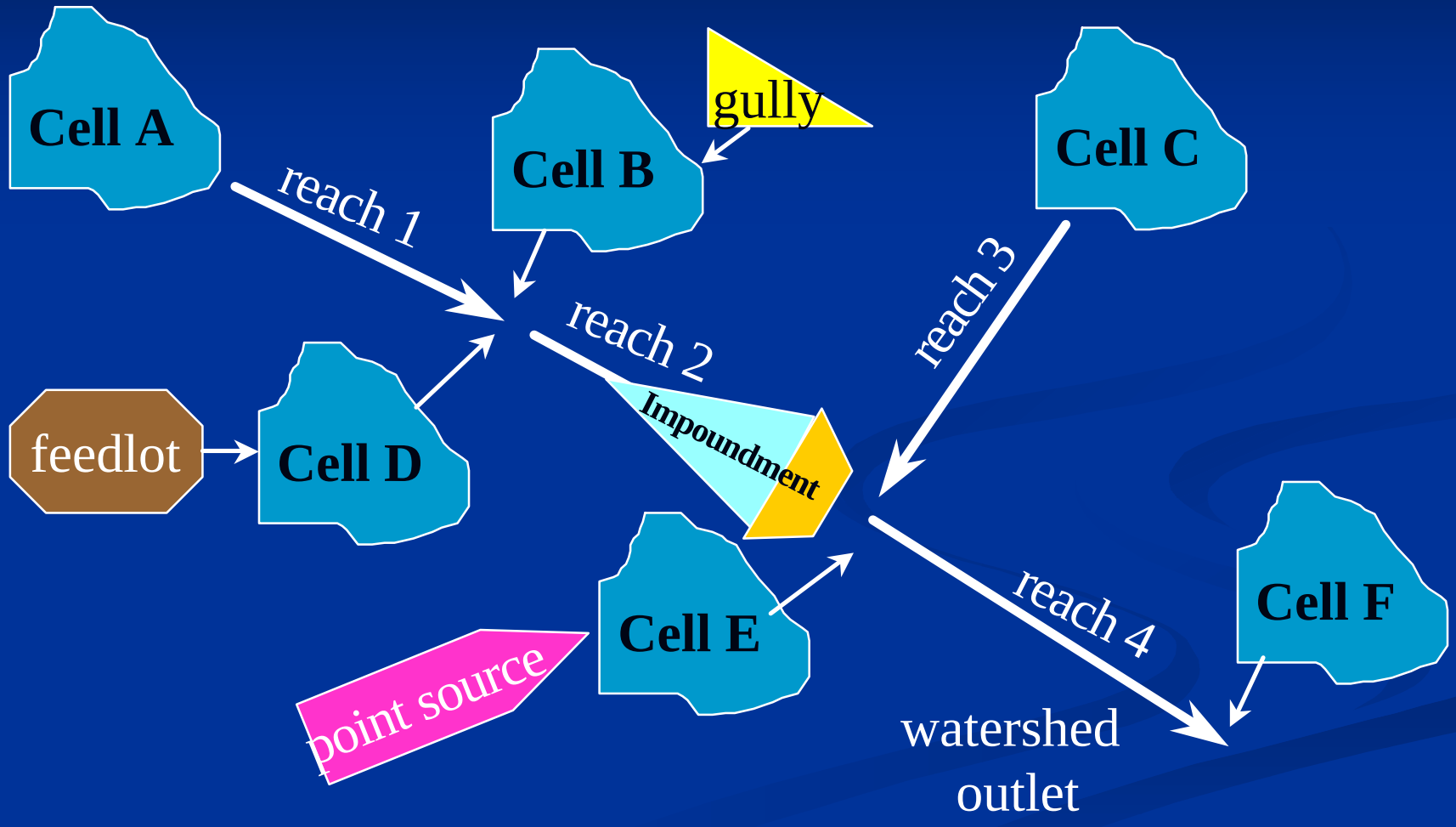

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Thank you

SUBOBJECTIVES

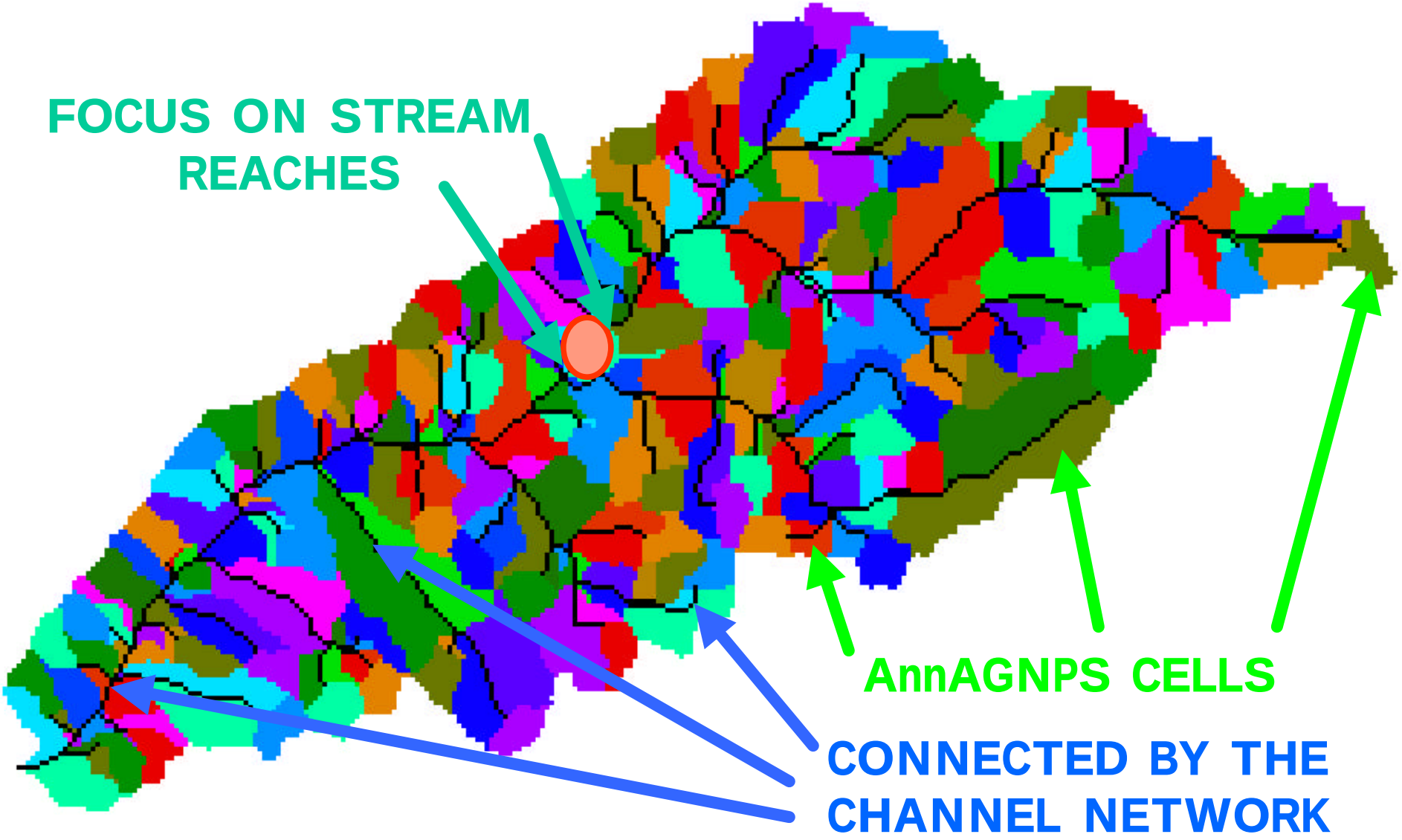
- Develop a model validation standard for systematic quantification of accuracy in CEAP-WAS simulations.
- Validate models using water quantity and water quality databases from the 12 ARS Benchmark watersheds and make recommendations for further model enhancement and development.
- Estimate uncertainty in model predictions resulting from calibration parameter identification and ranges of input data resolution and quality.
- Estimate the sensitivity of water quality responses to targeted placement of conservation practices within individual watersheds.
- Develop tools to identify watersheds and/or sub-watersheds most likely to respond to conservation practice implementation.
- Develop tools to estimate the temporal resolution (timing and magnitude) of conservation practice effects within watersheds.

Water, Sediment, & Chemical Sources

Tracks loadings by source throughout the transport process



Automatically Determined Watershed Delineation



Runoff Processes

- **Weather** — Temporal & spatially-variable precipitation, air temperature, relative humidity, solar radiation, wind speed.
  - **Precipitation** ¾ Rainfall, snowfall, & irrigation-(manual, automated).
- **Soil moisture** ¾ Precipitation, infiltration, percolation, ET & lateral subsurface flow.
- **Runoff** ¾ SCS Curve number, adapts SCS NEH-4 unit hydrograph generation methodology (Extended TR55)
- **Tile drains** ¾ Affects antecedent soil moisture conditions & quick return flow.

Pollutant Transport Processes

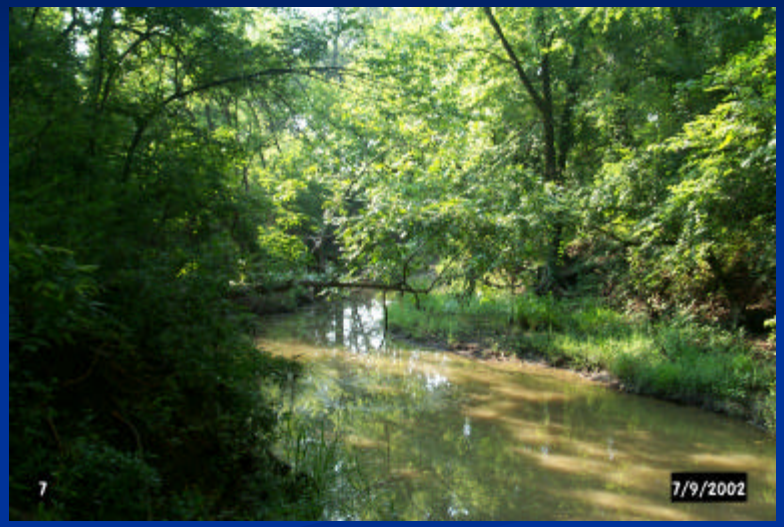
- **Sediment yield** ¾ **RUSLE to HUSLE to modified Einstein**
- **Nutrient yield** ¾ **Application, transport & decay; attached & dissolved.**
- **Pesticide yield** ¾ **Application, transport & decay; attached & dissolved.**
- **Impact of conservation management** ¾ **crops, rotation, fertilizer, etc.**

Reach Processes

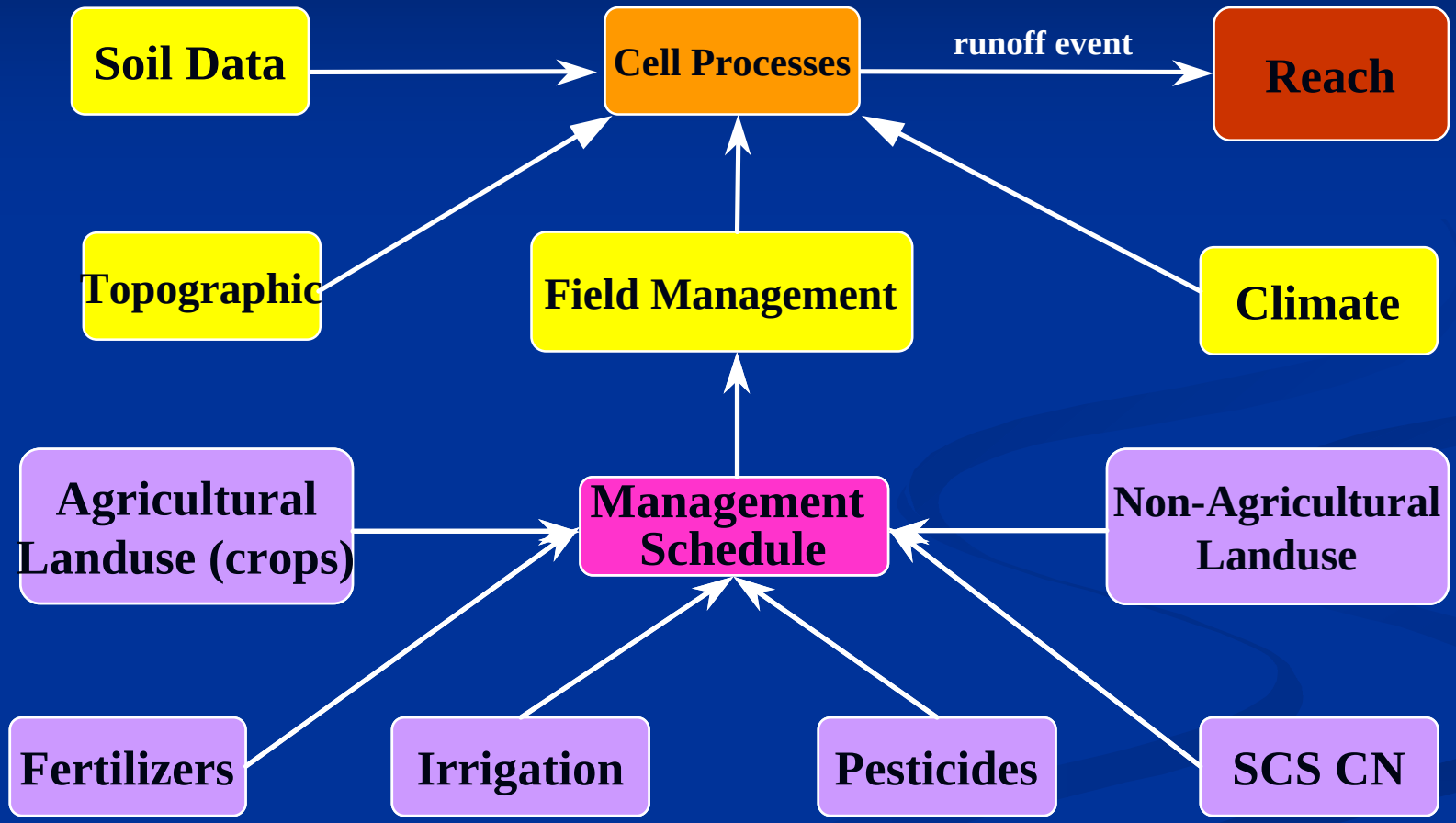
AnnAGNPS

- Incorporates simple channel erosion & reach routing processes.

- There is no memory between runoff events.



Data Requirements

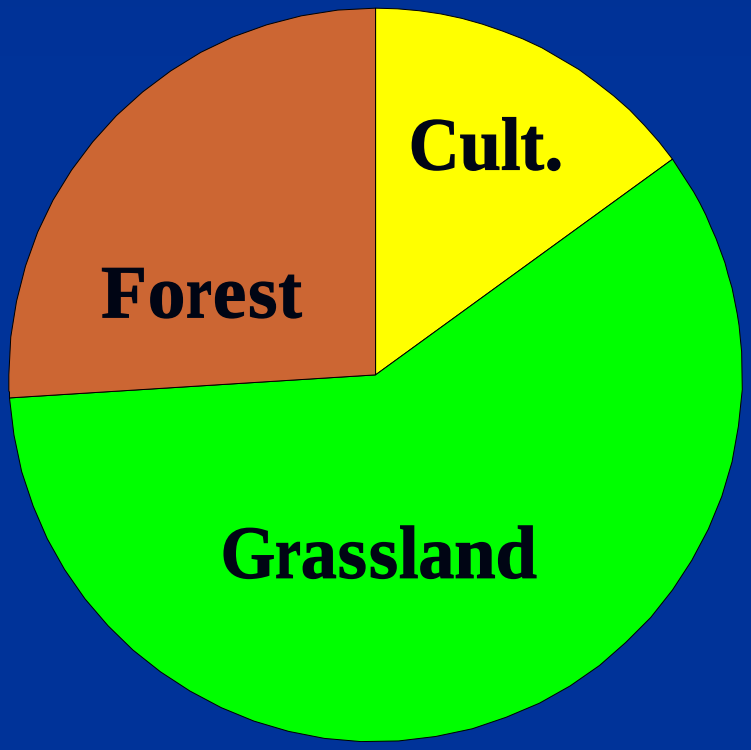


Data Availability

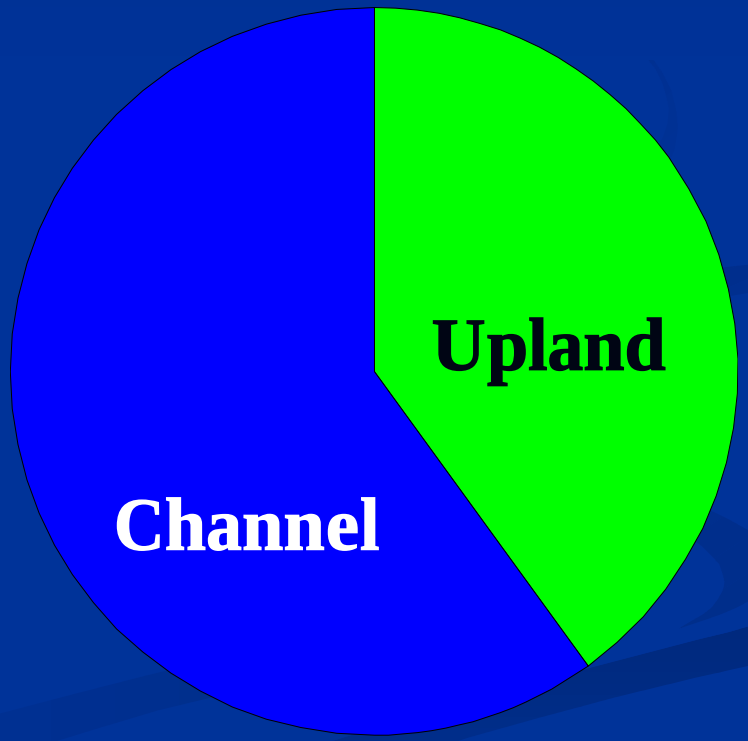
- **Climate** – From historical databases or weather generators
- **Topographic** – From DEMs used with TOPAGNPS
- **Soil Data** – Spatial representation from GIS layers & soil input database from NASIS.
- **Field Management** – Spatial representation from GIS layers & erosion management databases from RUSLE

AnnAGNPS Applied with CONCEPTS at Various Spatial Watershed Scales

- Goodwin Creek Watershed (MS) ¾ 21 km^2



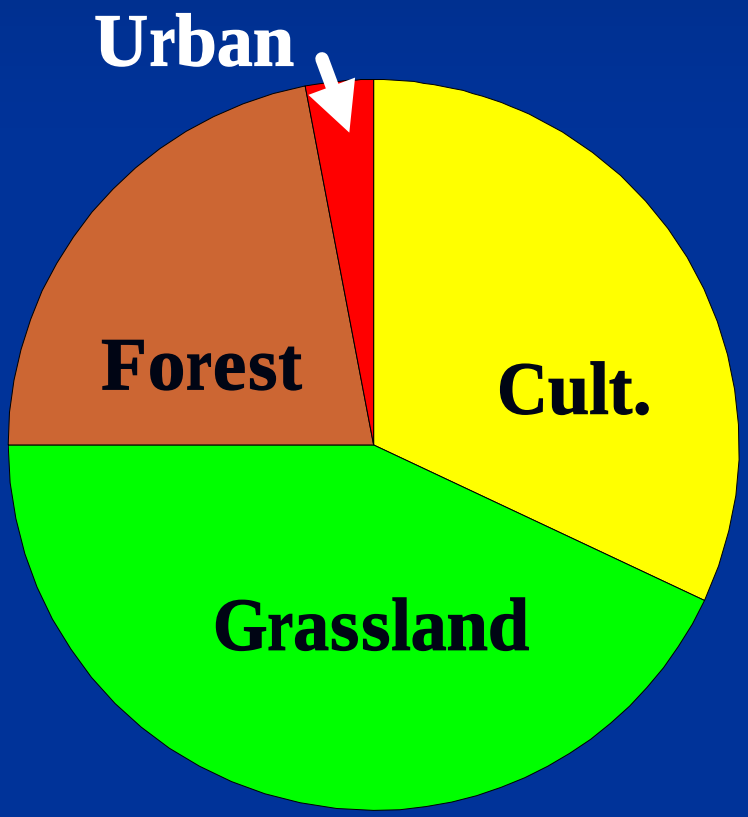
Landuse



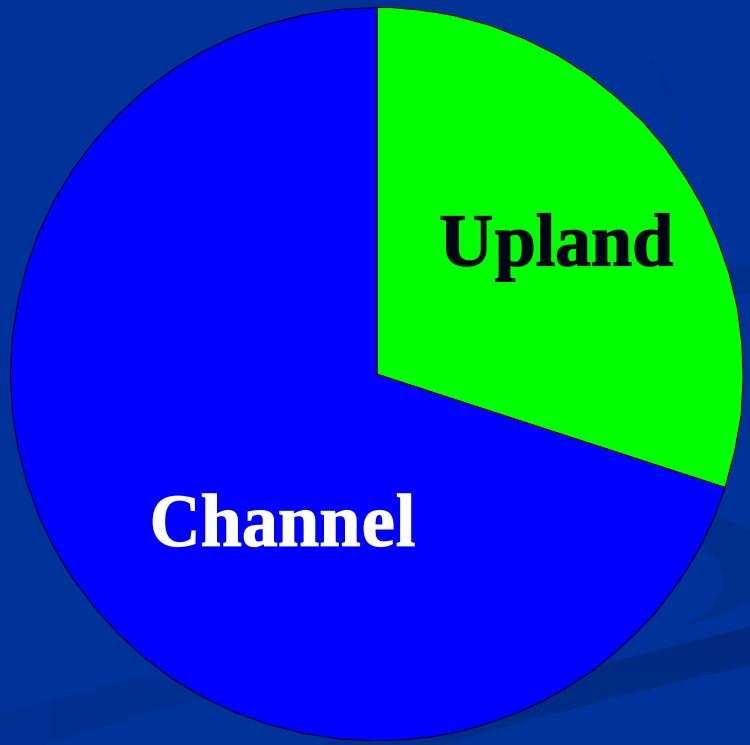
Sediment Loadings

AnnAGNPS Applied with CONCEPTS at Various Spatial Watershed Scales

- James Creek Watershed (MS) ¾ 109 km^2



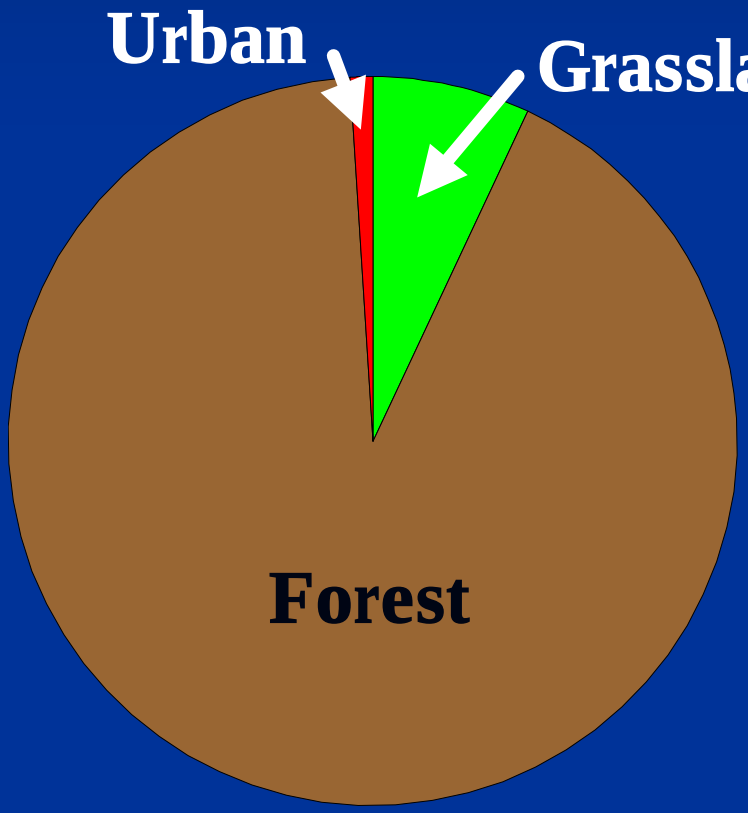
Landuse



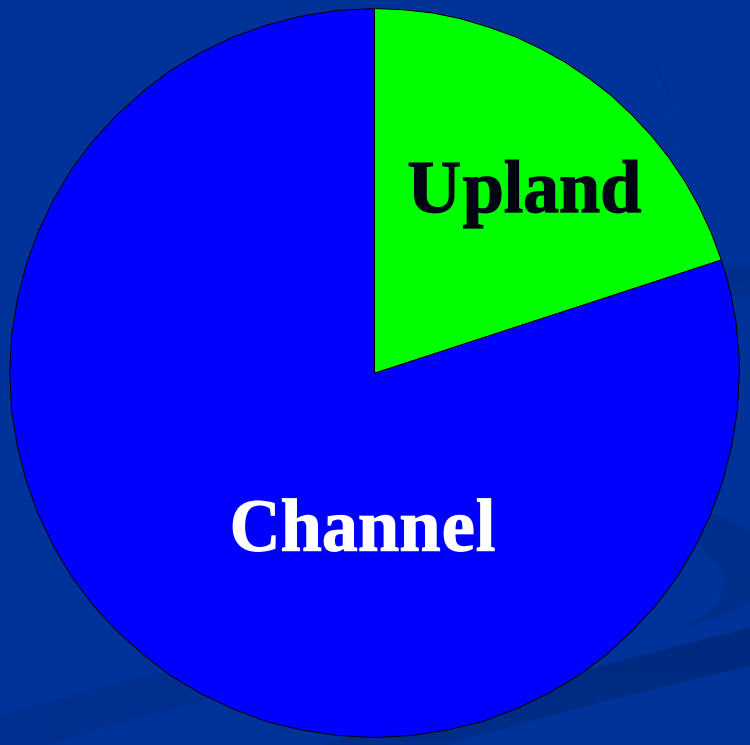
Sediment Loadings

AnnAGNPS Applied with CONCEPTS at Various Spatial Watershed Scales

- Lake Tahoe Basin (CA) ¾ 150 km^2



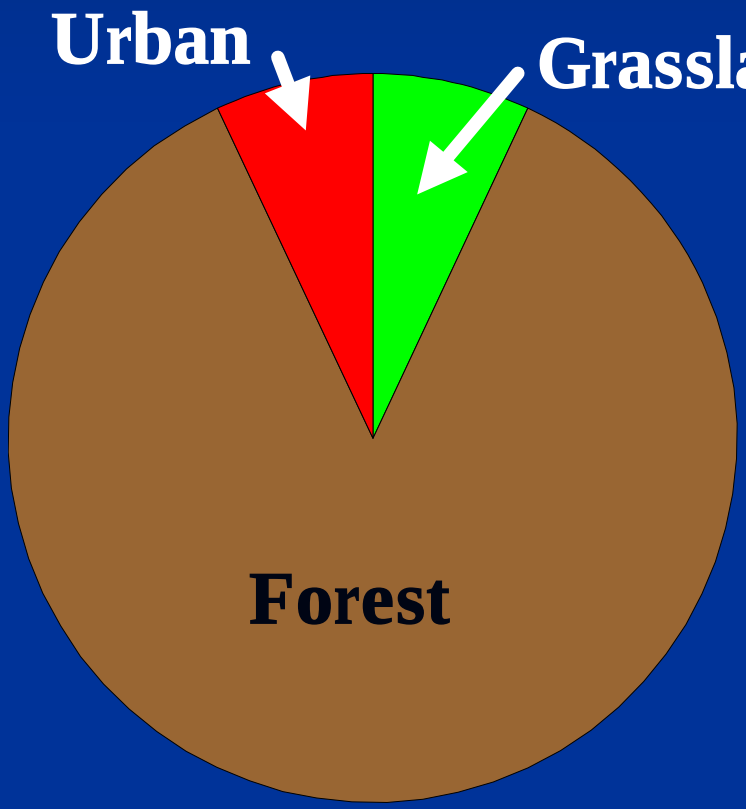
Landuse



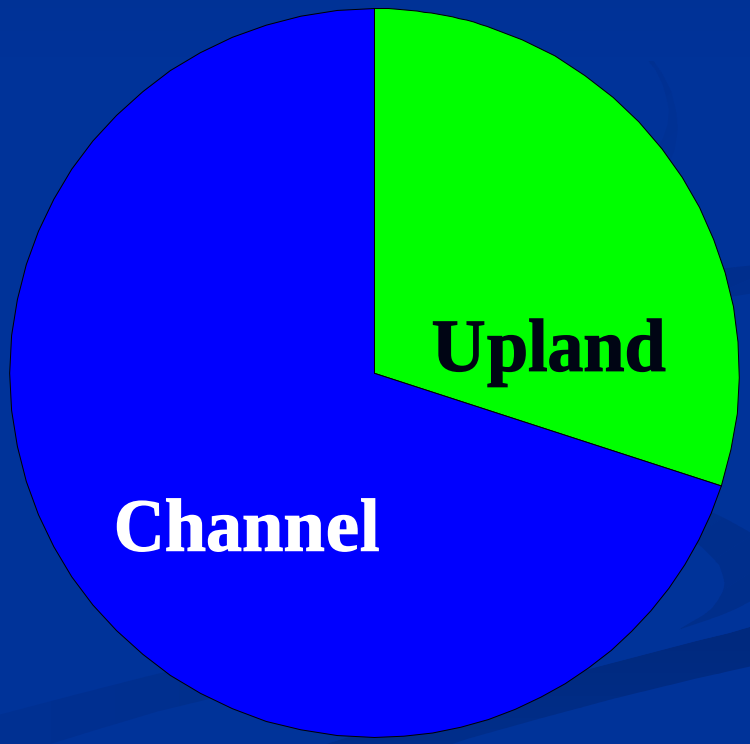
Sediment Loadings

AnnAGNPS Applied with CONCEPTS at Various Spatial Watershed Scales

- Shades Creek Watershed (AL) ¾ 360 km²



Landuse



Sediment Loadings