Hydrologic and water quality modeling for the Boise River Watershed

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Treasure Valley Modeling Technical Advisory Committee (MTAC)
IDWR, Boise, Idaho

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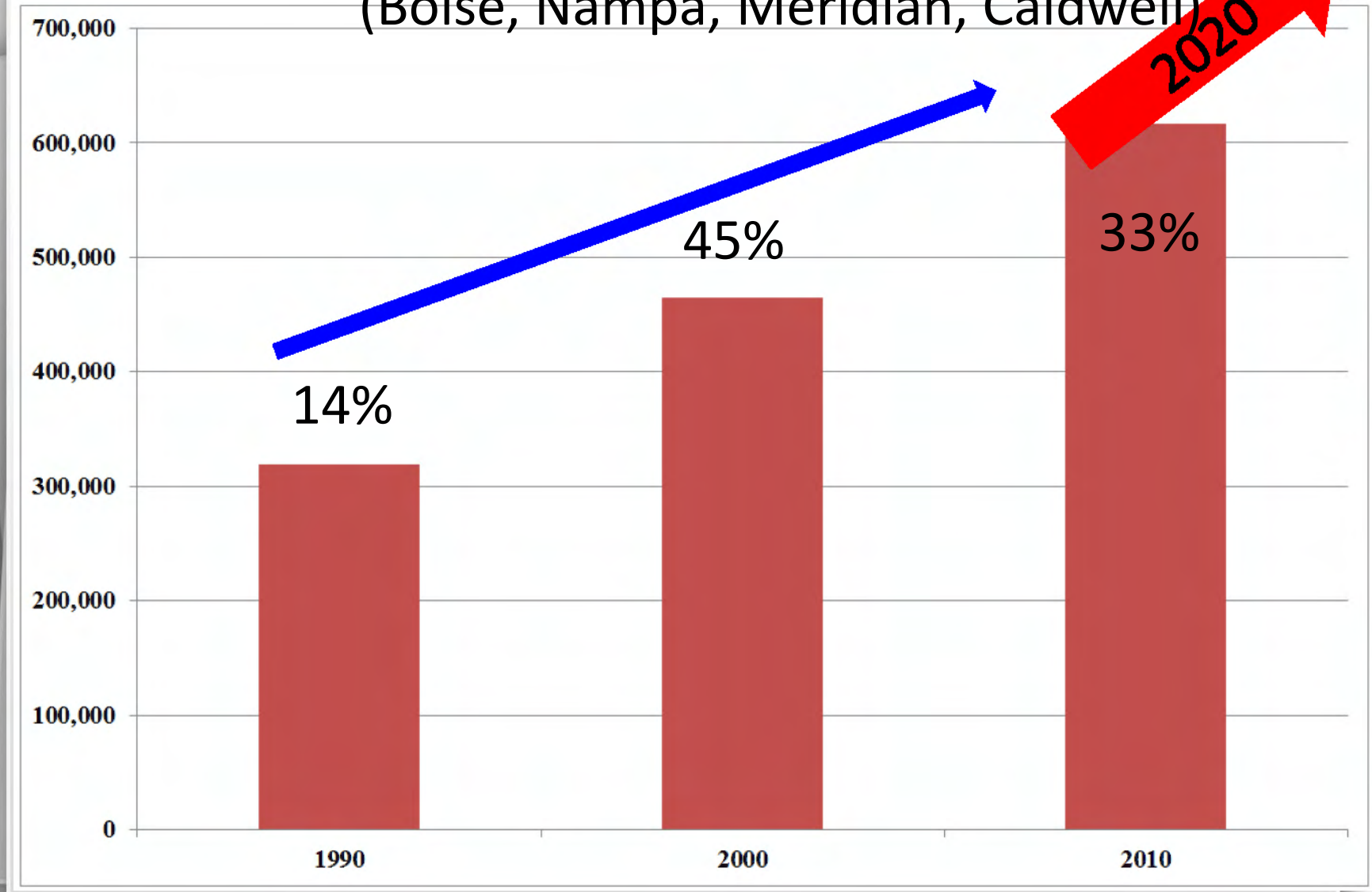
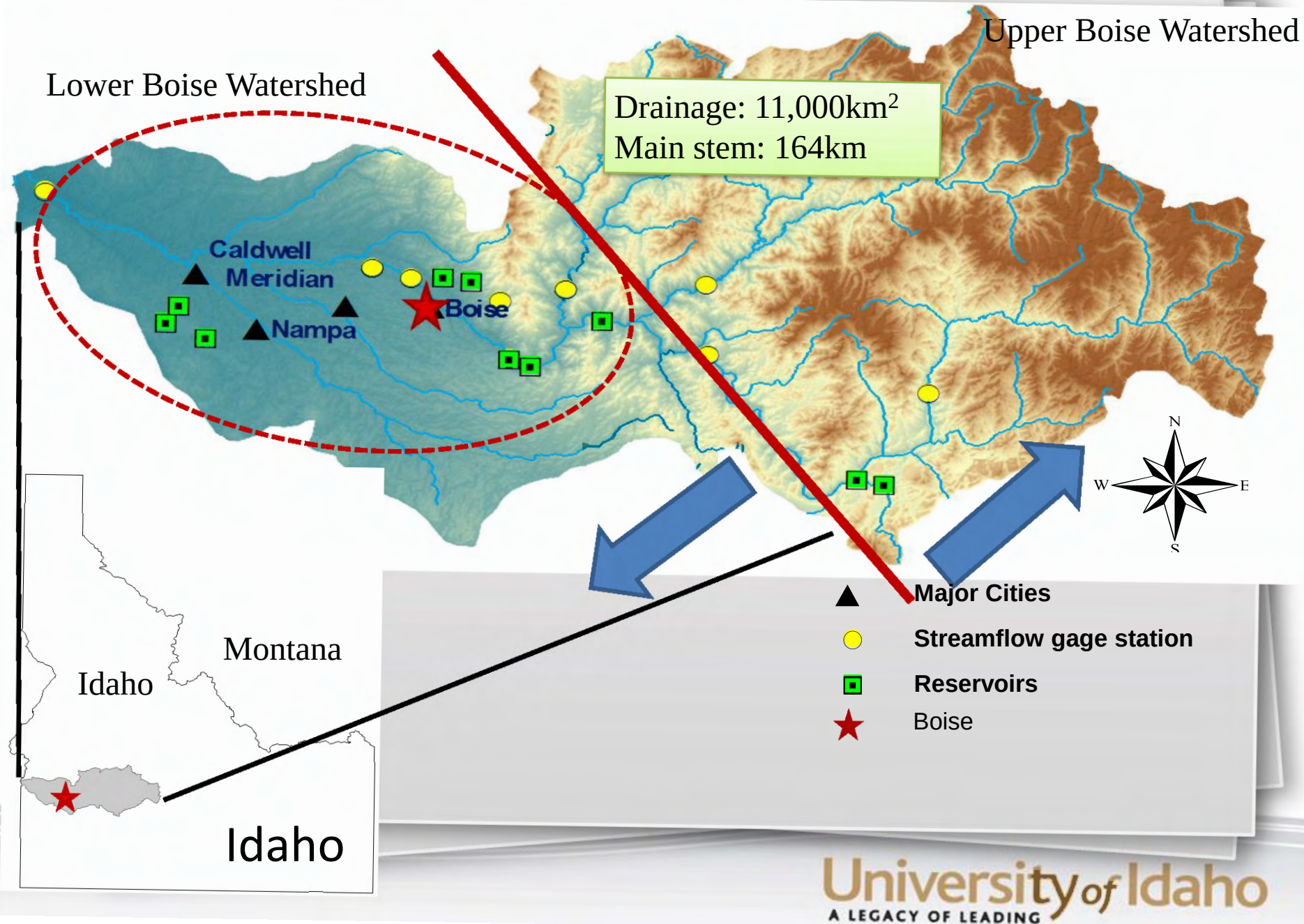
Boise Metropolitan Population
(Boise, Nampa, Meridian, Caldwell)



Boise Watershed



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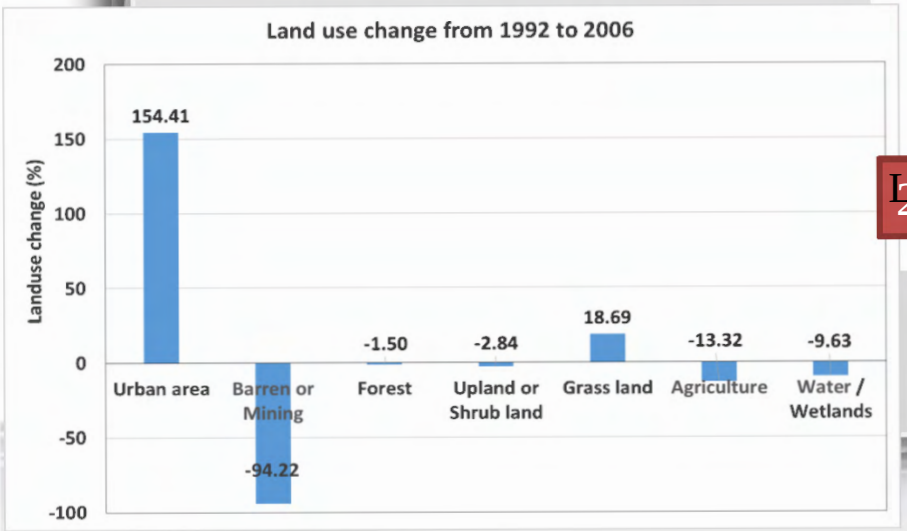
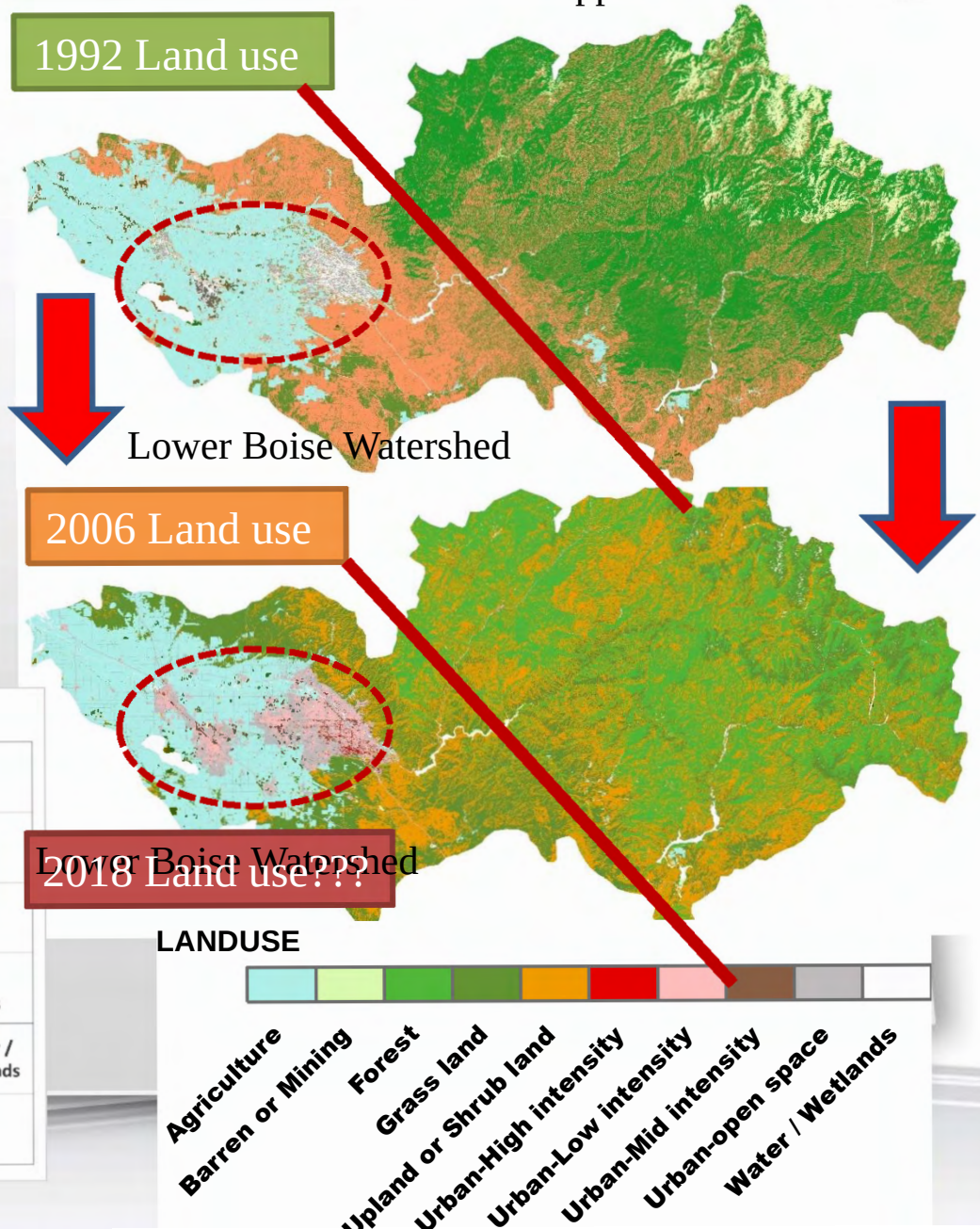
Boise Watershed

❑Land use changes

land use	Land use (km^2)		Land use change	
	1992	2006	(km^2)	(%)
Urban area	215	547	332	154.41
Barren/Mining	391	22	-368	-94.22
Forest	3055	3009	-48	-1.50
Upland or Shrub land	3121	3032	-88	-2.84
Grass land	2041	2423	381	18.69
Agriculture	1492	1293	-198	-13.22
Water/Wetlands	121	110	-11	-9.63





Research Questions

- **How much does urbanization affect local hydrology?**
- **How hydrological models can characterize urbanization effects in rainfall-runoff simulations?**
- **Land use change did contribute to water pollution in the river downstream?**
- **Low Impact Development with BMP can help non-point source (NPS) control in waterways?**
- **How to evaluate alternatives if LID/BMPs applicable for NPS control in the study area**

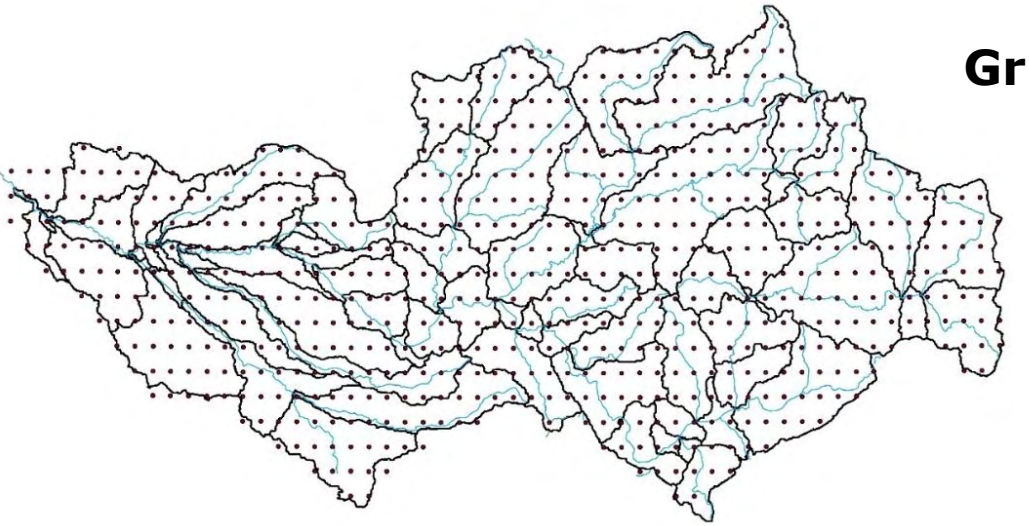
HSPF

- Hydrological Simulation Program-Fortran (HSPF)-Stanford Watershed Model (Crawford and Linsley 1966)
- Lumped model-homogeneous land segments in each delineated sub-basins
- Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) – EPA 1996
- GIS capability- Semi-distributed model (hspf)

Data Input

- Gridded Weather Data: 4km by 4km spatial resolution (NLDAS: North American Land Data Assimilation System)
- Daily time steps
- Data Periods: January 1979 – December 2013 (25 years)
- Data used: Precipitation, Minimum Temp, Maximum Temp, Mean Temp, Wind Speed, Humidity for Penmann-Monteith ET

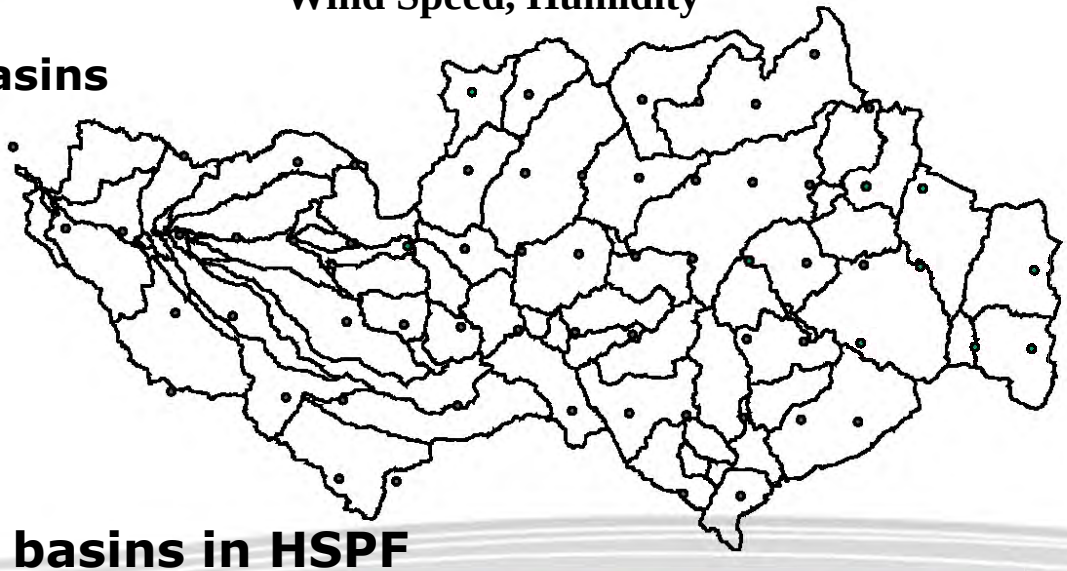
Watershed Delineation



About 70 subbasins

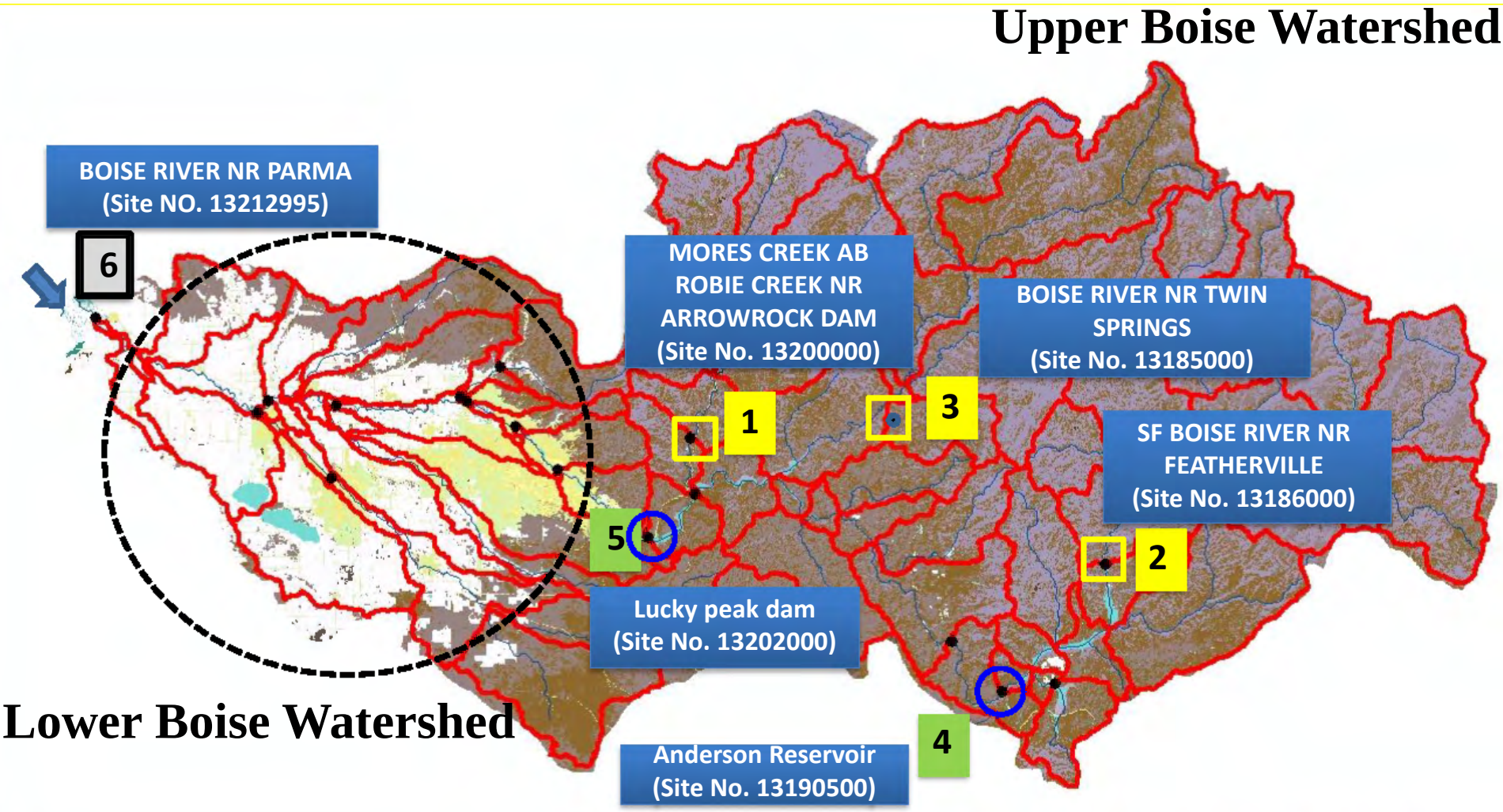
Gridded Weather Data Locations

- **Gridded Weather Data: 4km by 4km spatial resolution**
- **Daily time steps**
- **Data Periods: 1979 – 2013 (25 years)**
- **Data used: Precipitation, Minimum Temp, Maximum Temp, Mean Temp, Wind Speed, Humidity**



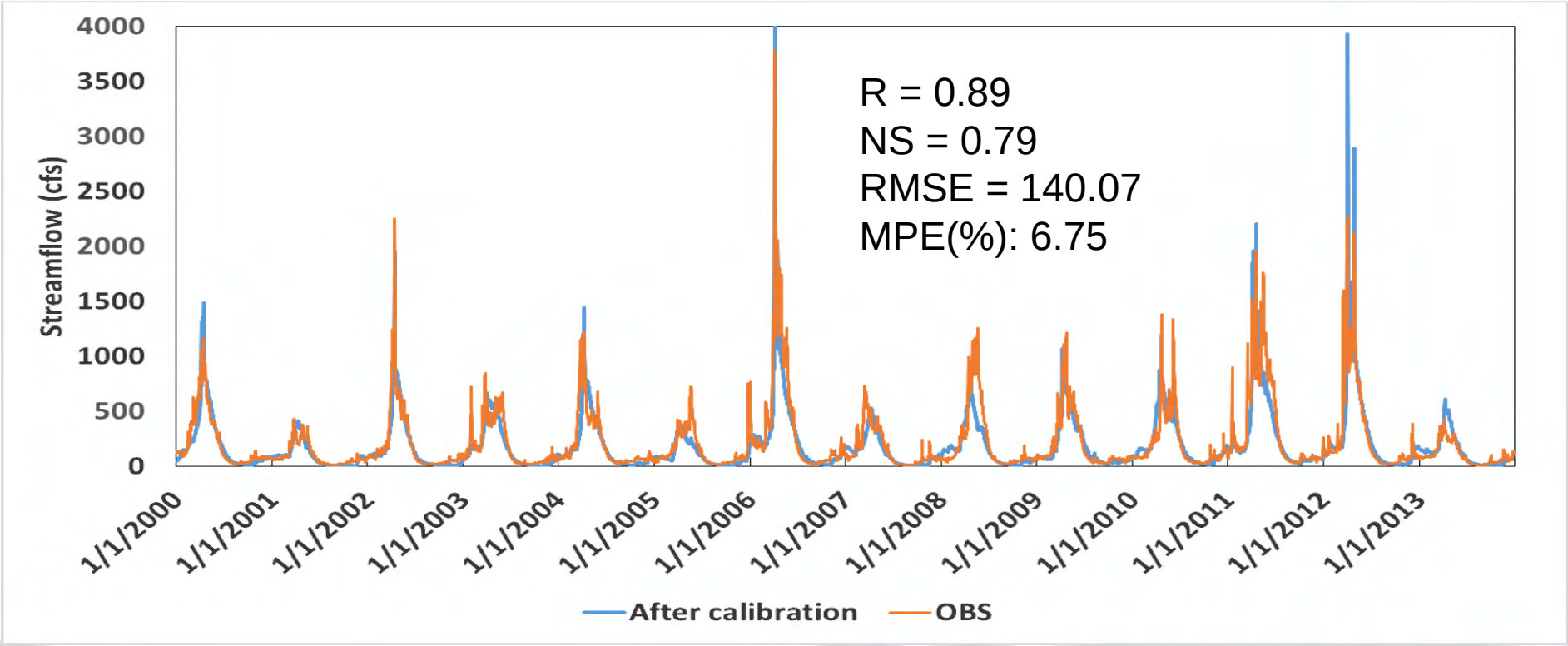
Weather Data Used for Sub basins in HSPF

Hydrological Simulations



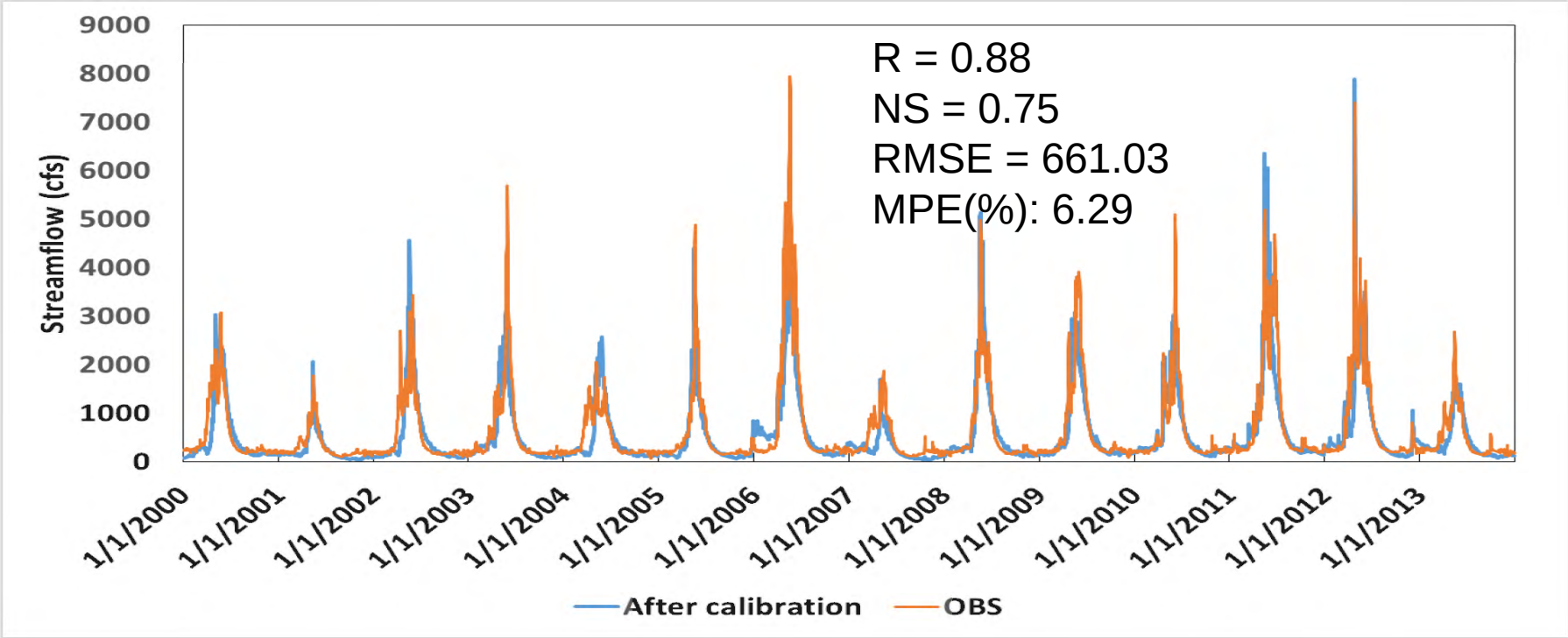
Hydrological Simulations (Above Reservoir)

- Station 1: Mores Creek near Arrow Rock Dam, USGS#: 13200000



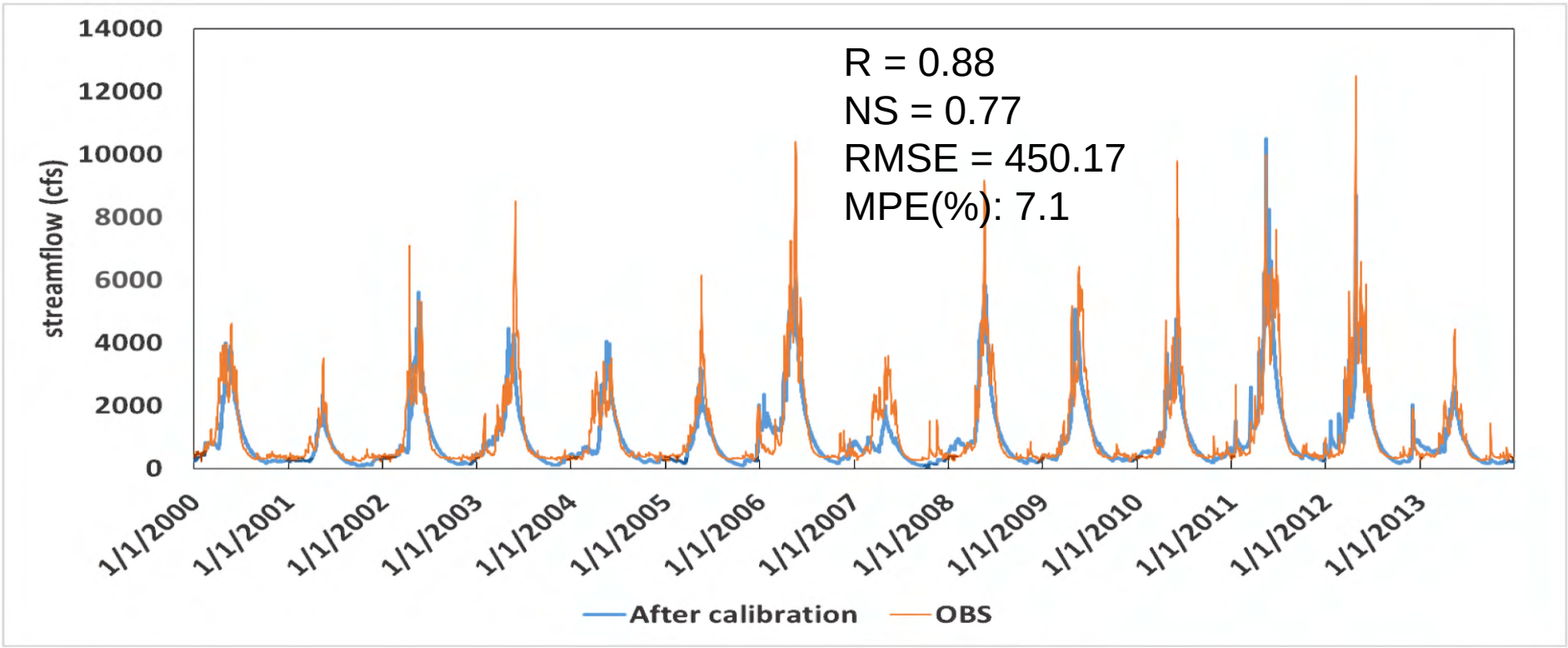
Hydrological Simulations (Above Reservoir)

- Station 2: South Fork Boise River near Feathervilee, Above Anderson Ranch Dam, USGS#: 13186000



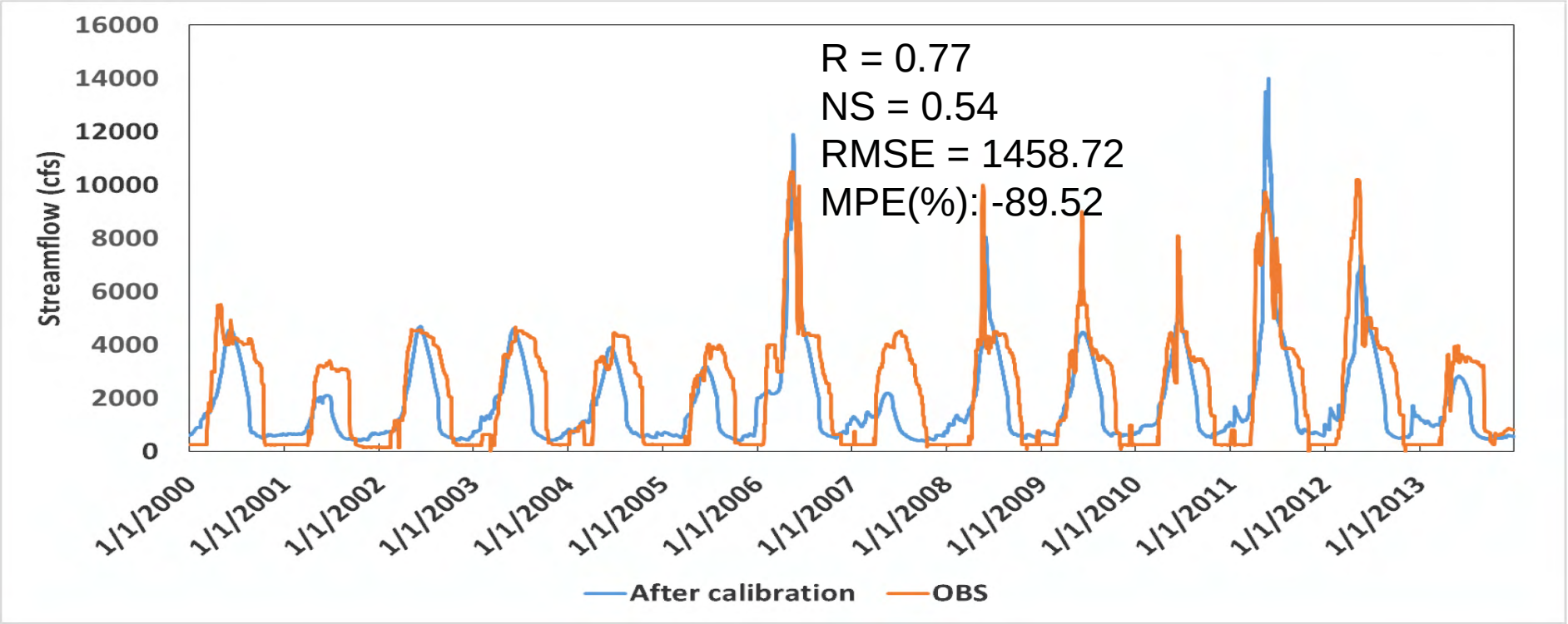
Hydrological Simulations (Above Reservoir)

- Station 3: Boise River near Twin Springs above Arrow Rock Dam, USGS#: 13185000



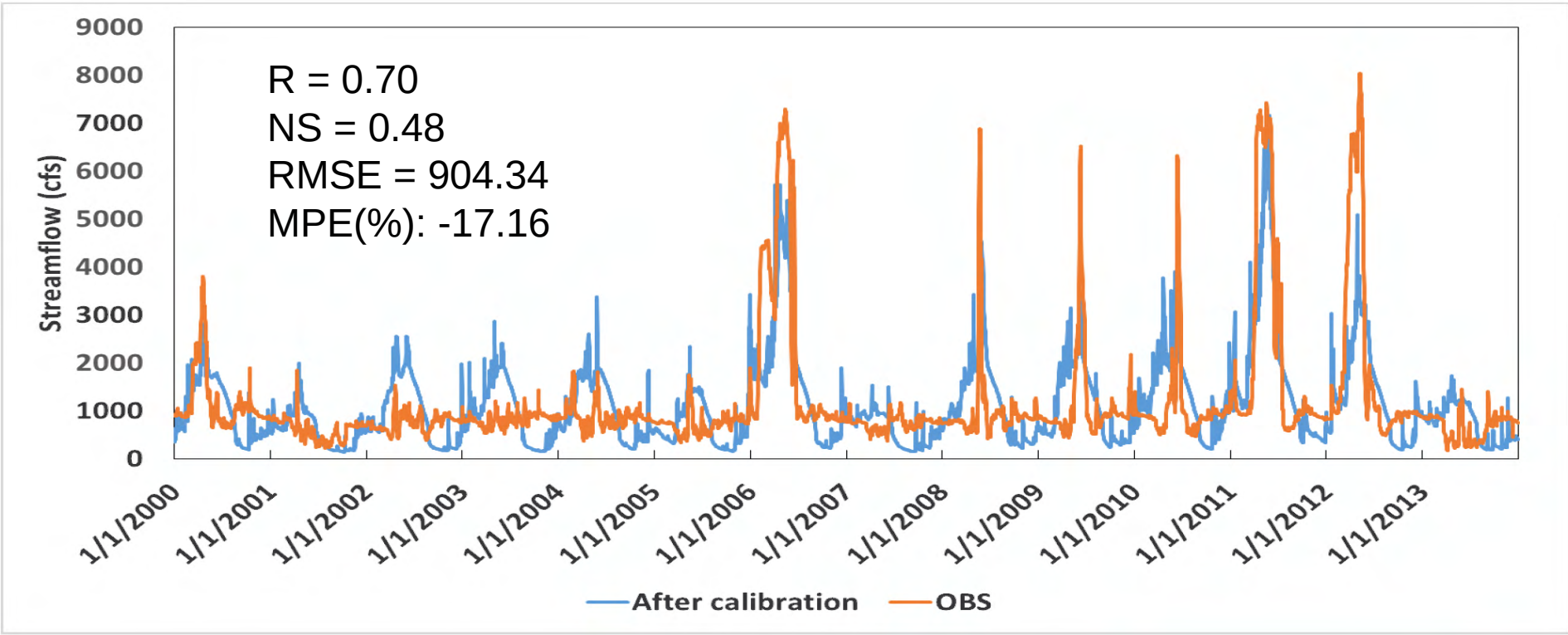
Hydrological Simulations (Below Reservoir)

- Station 5: Right below Lucky Peak Reservoir, USGS#: 13202000



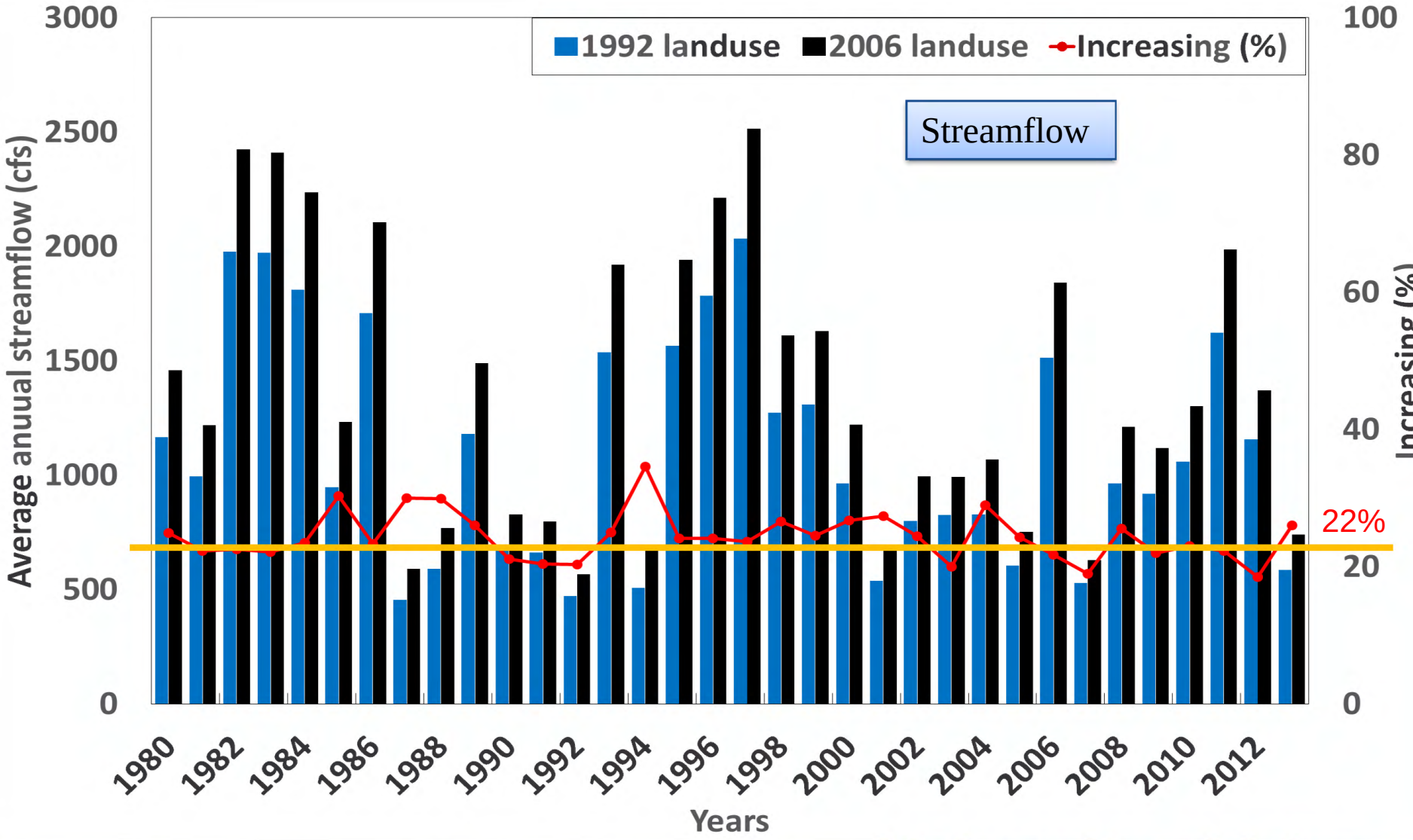
Hydrological Simulations (Below Reservoir)

- Station 6: Boise River near Nampa, Mouth of Watershed, USGS#: 13212955



Water Quantity and Quality (WQQ) Assessment Induced by Urbanization

Hydrological Responses to Land Use Change



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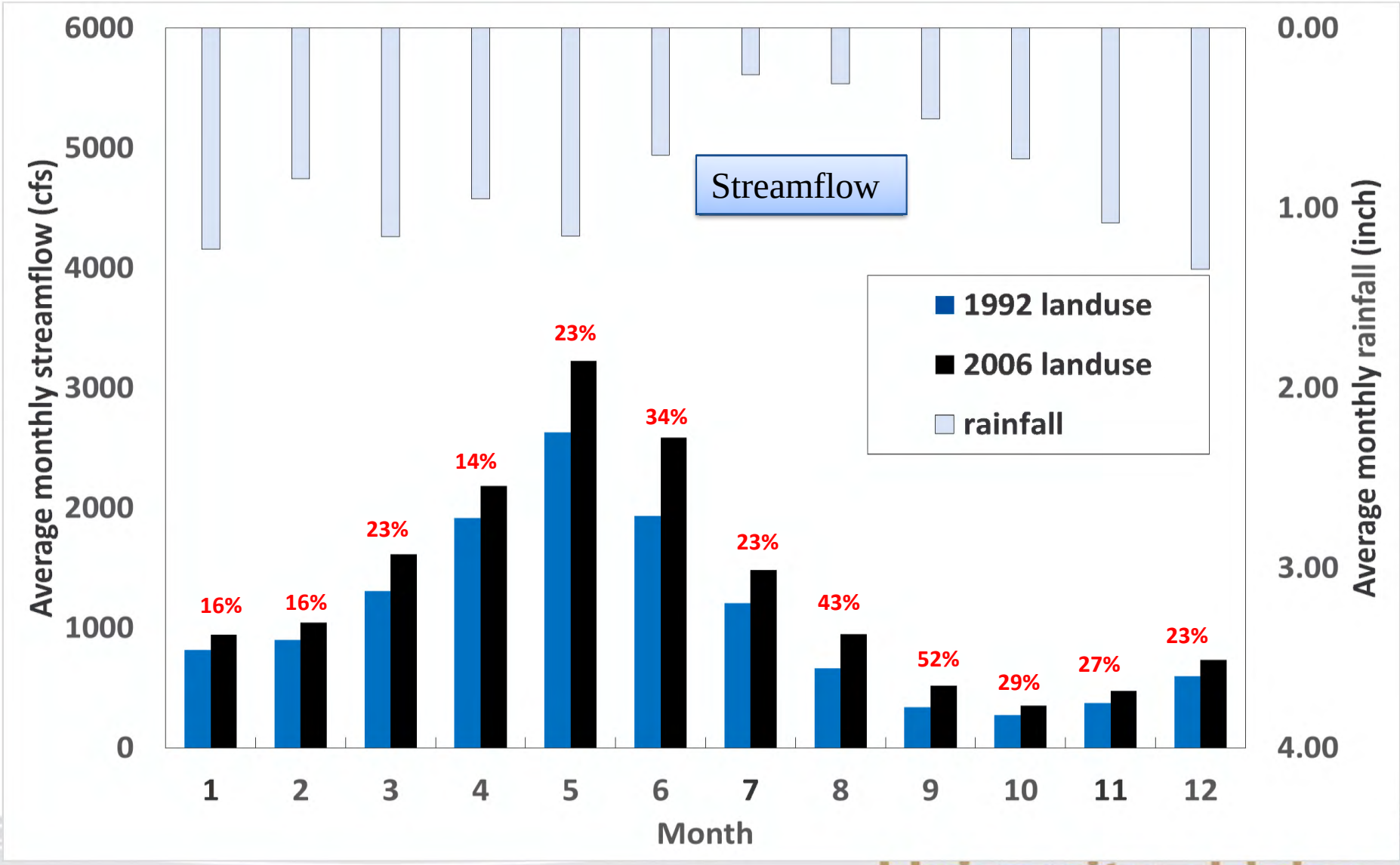
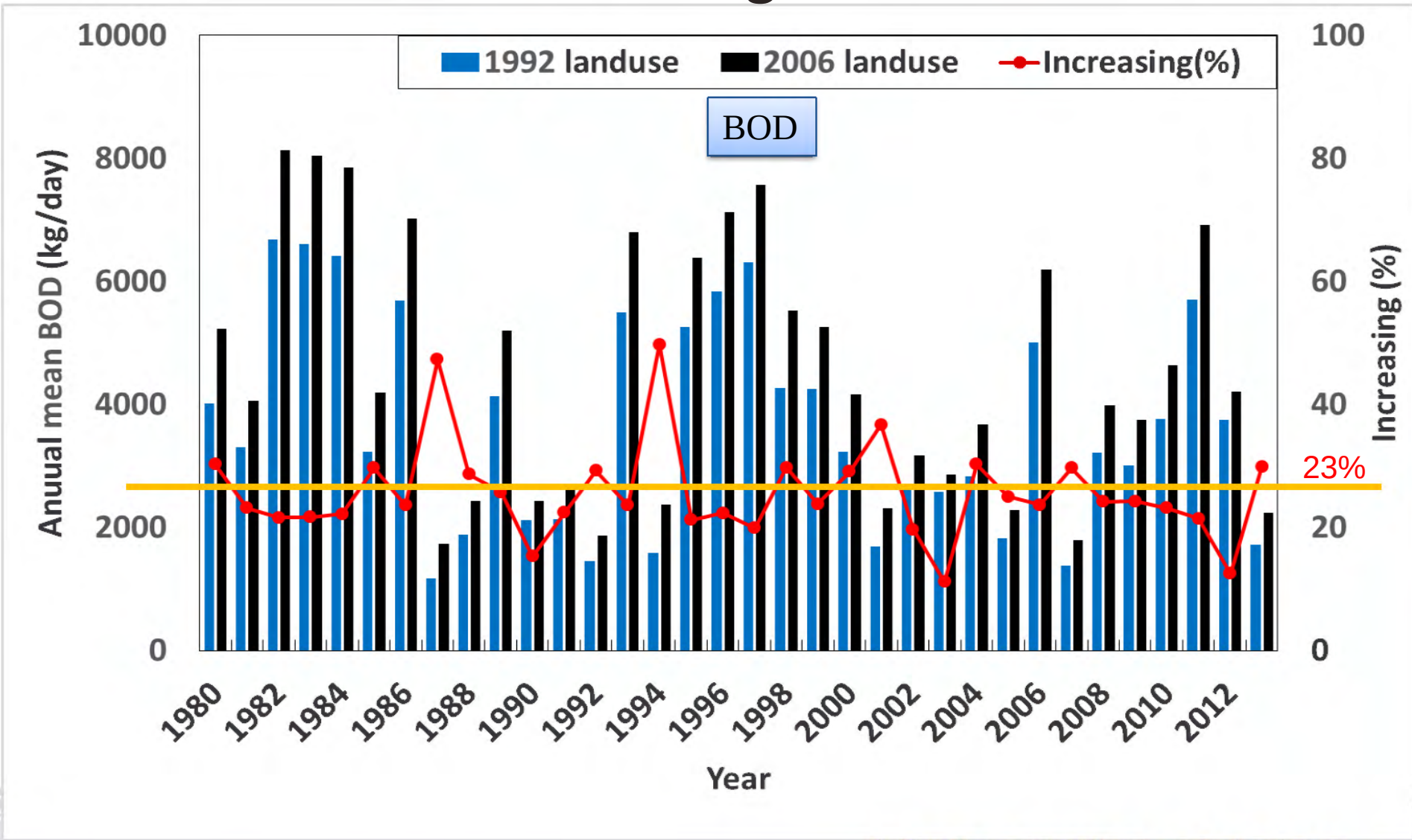


Environmental Responses to Land Use Change



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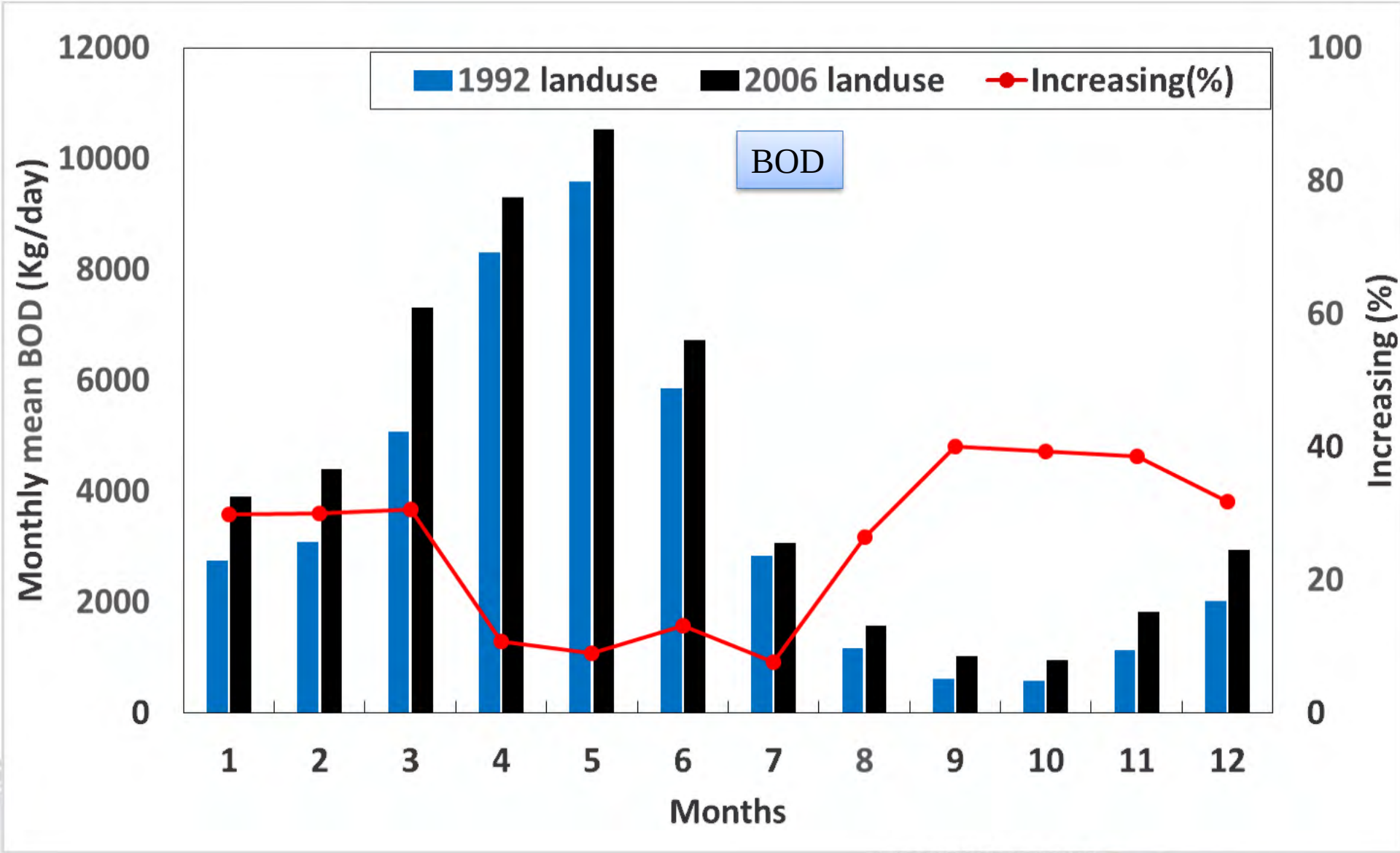
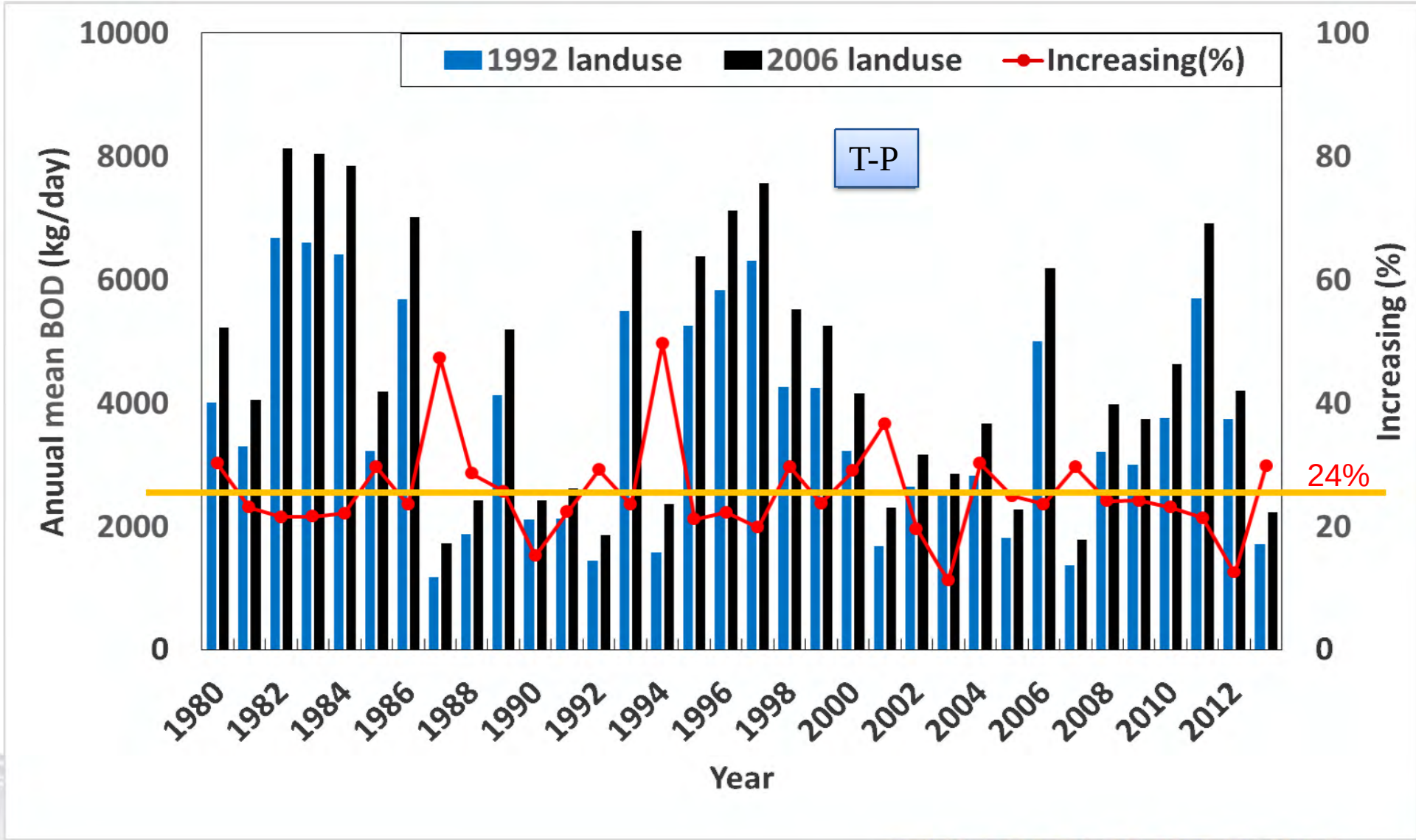


Hydrological and Environmental Responses to Land Use Change



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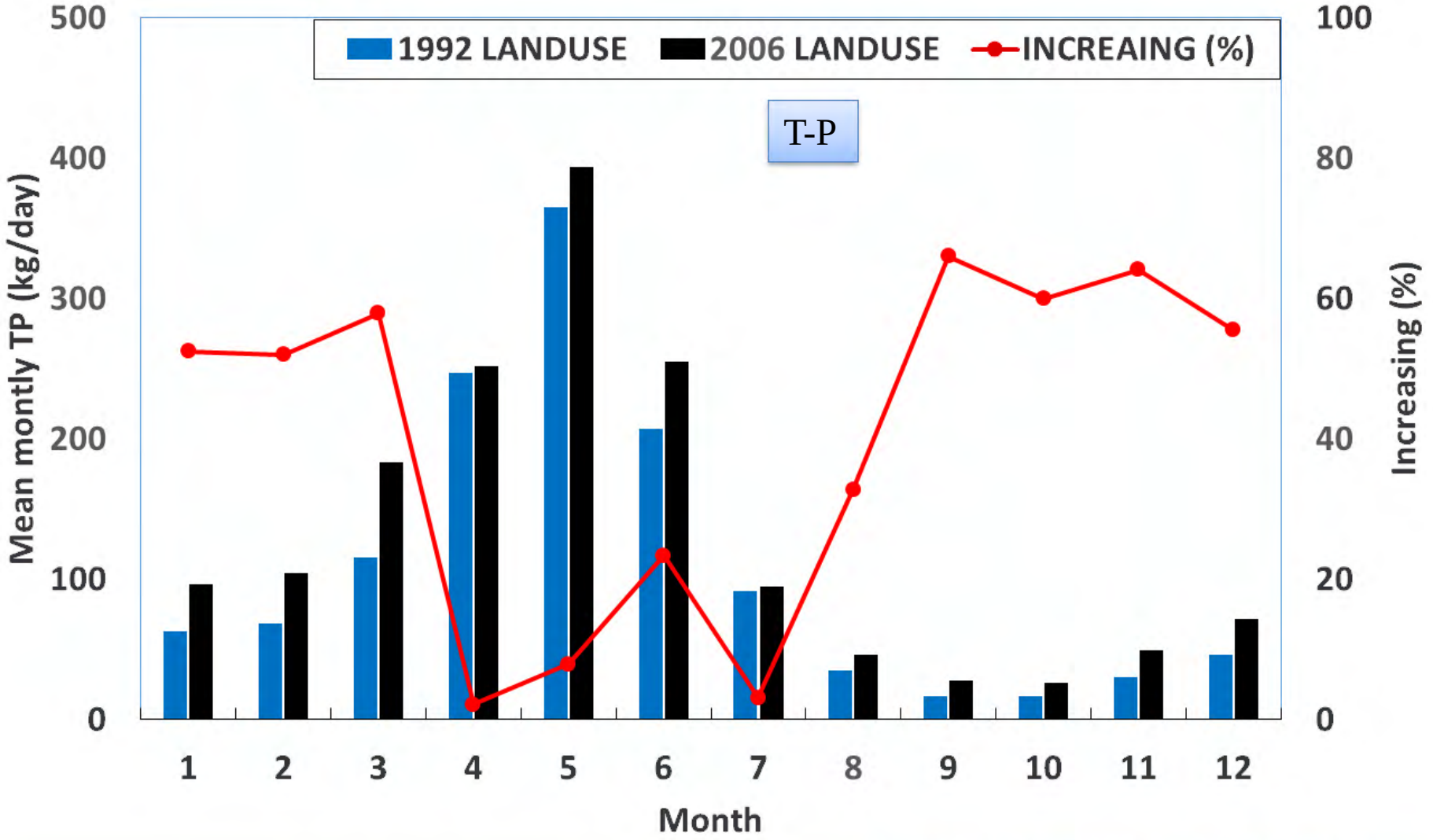

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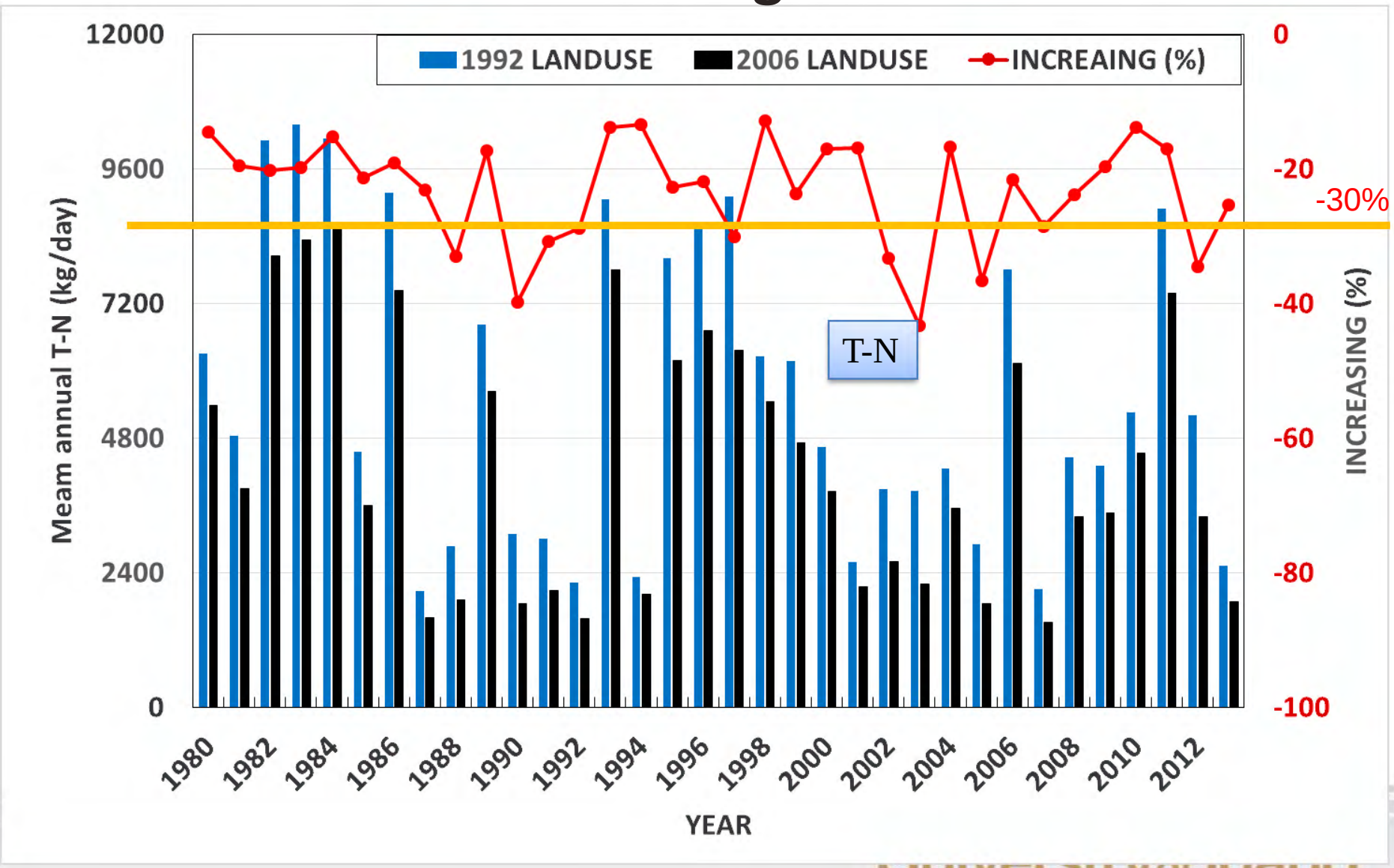

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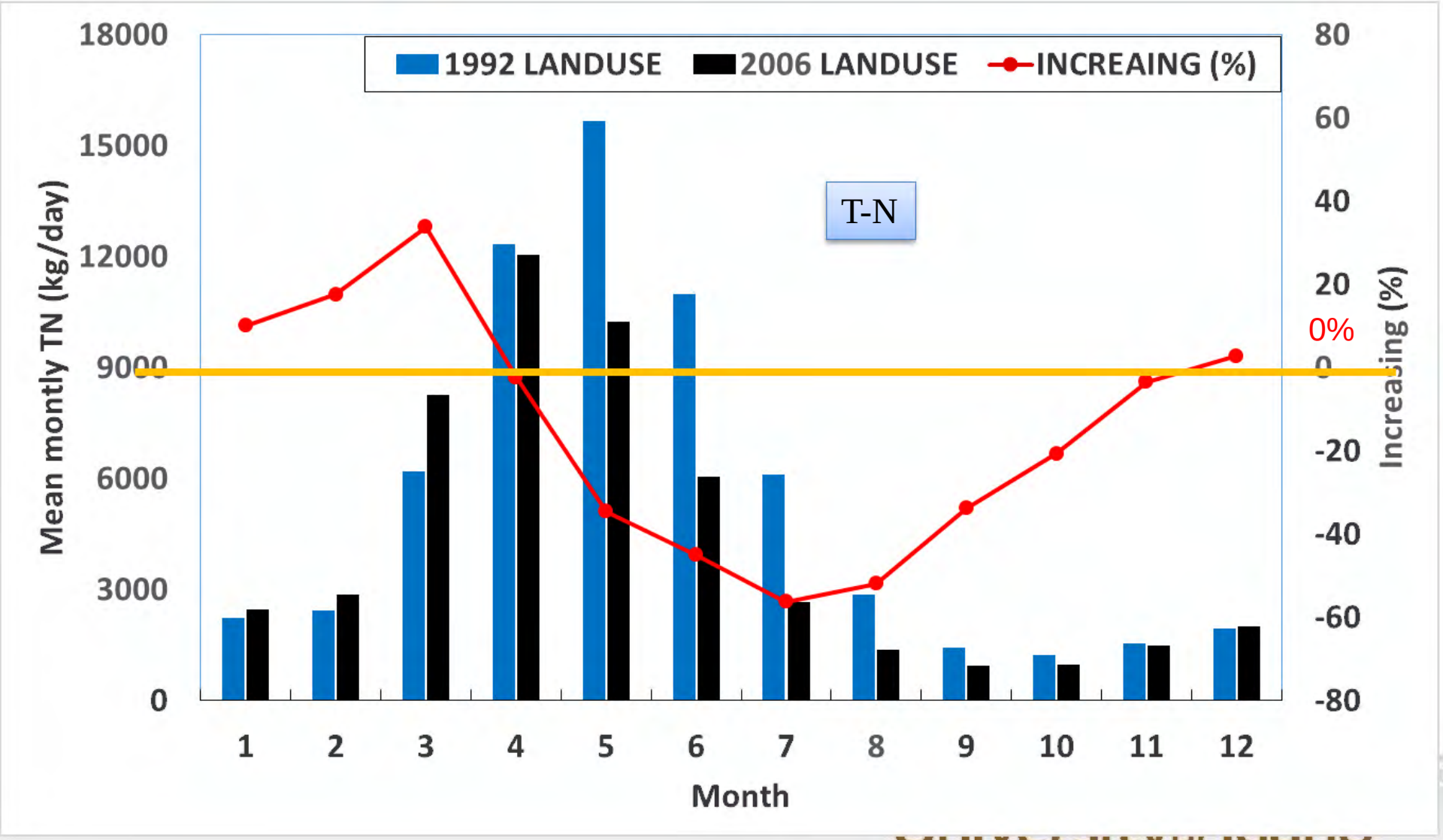

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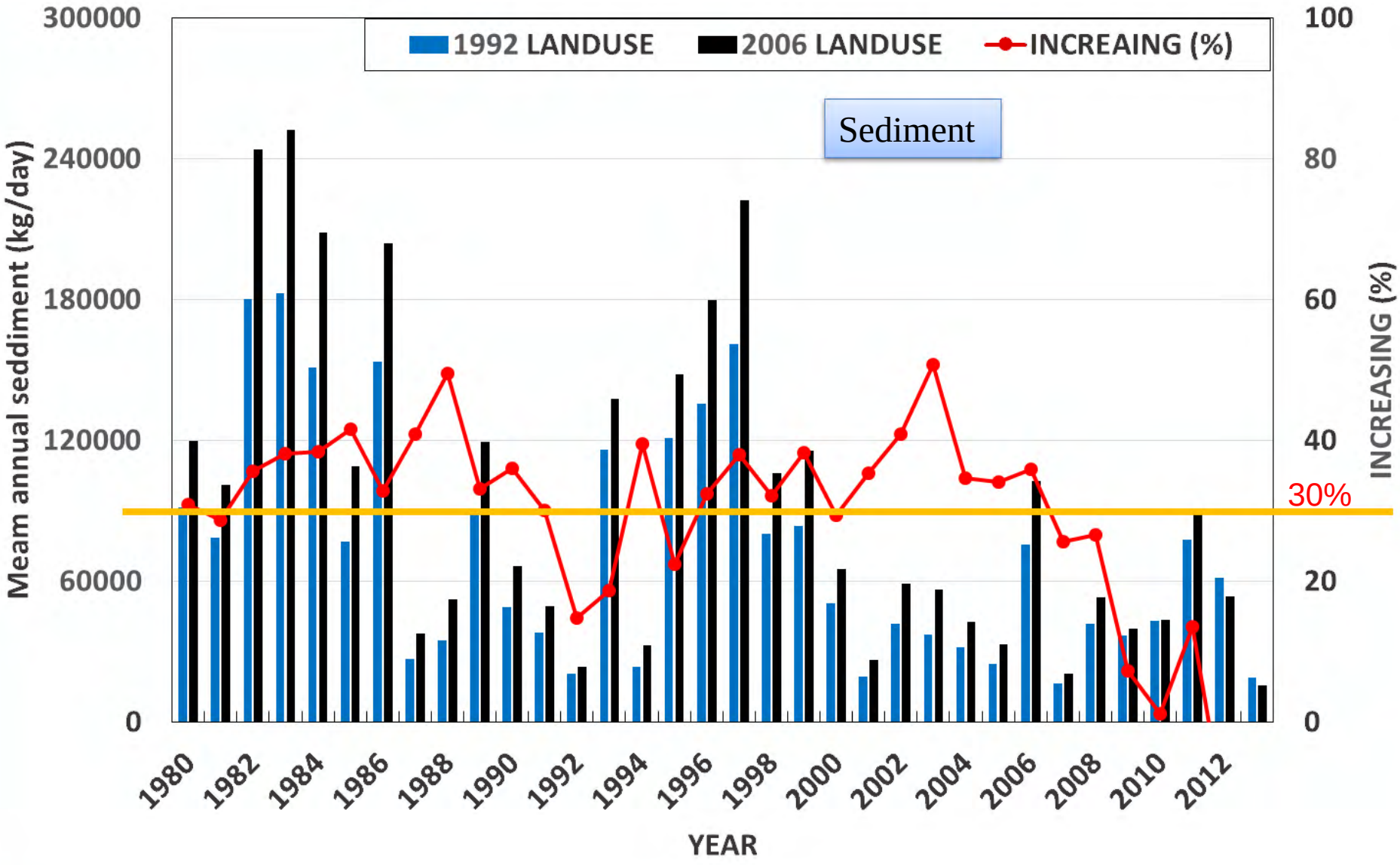
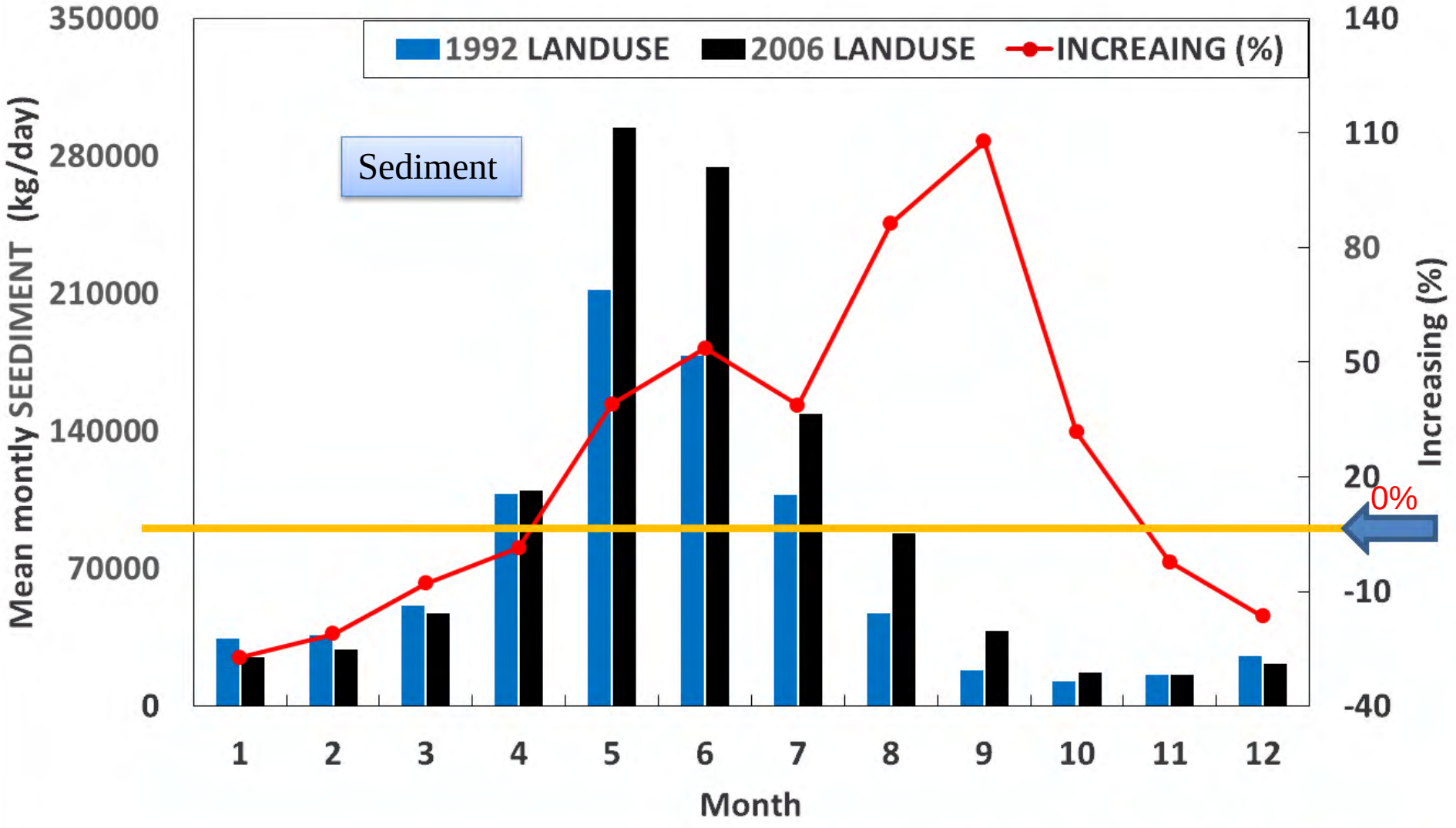
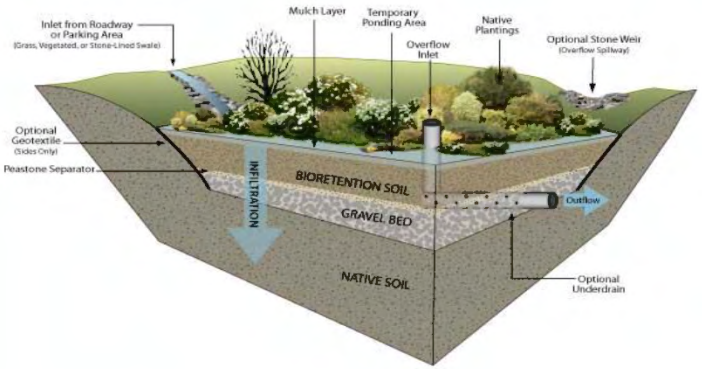


Hydrological and Environmental Responses to Land Use Change

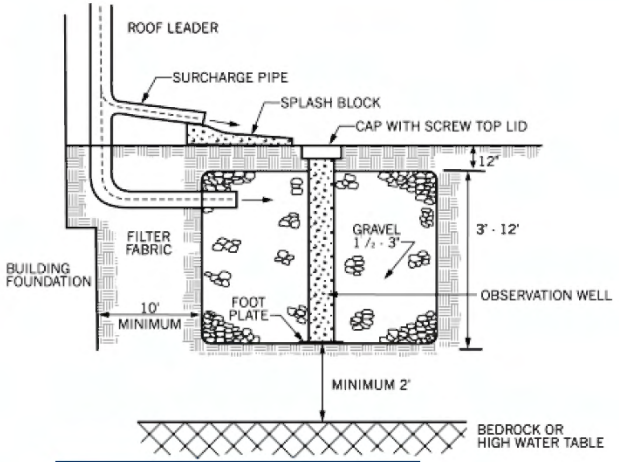


Low Impact Development (LID)Techniques in Boise

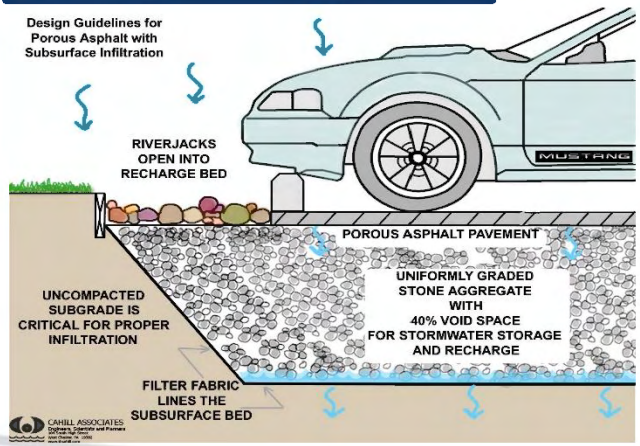
Bioretention



Drywell



Permeable pavement



Buffer strip

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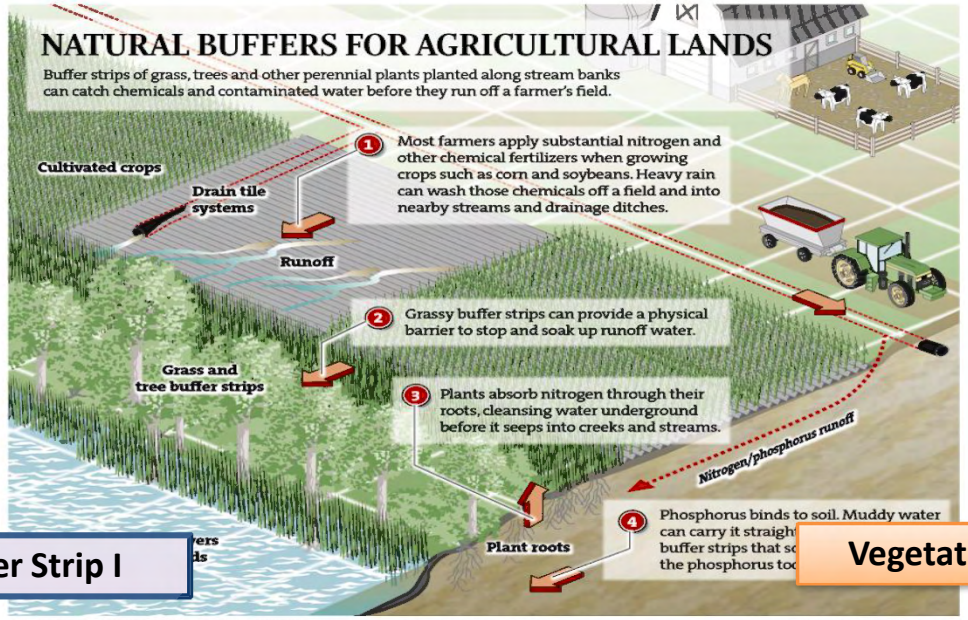
Best Management Practice (BMP) in Agriculture



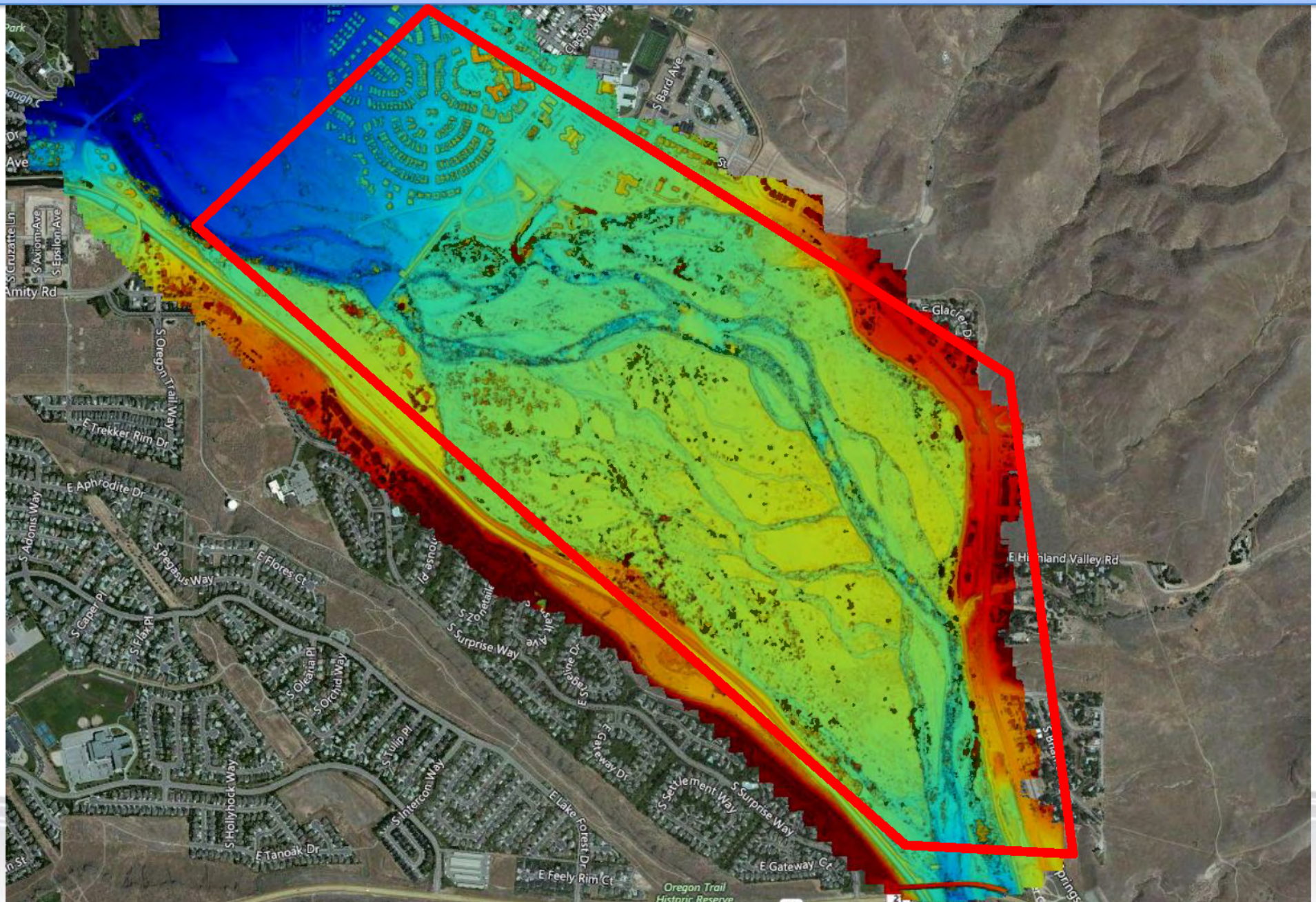
Vegetative Filter Strip I

Vegetative Filter Strip II

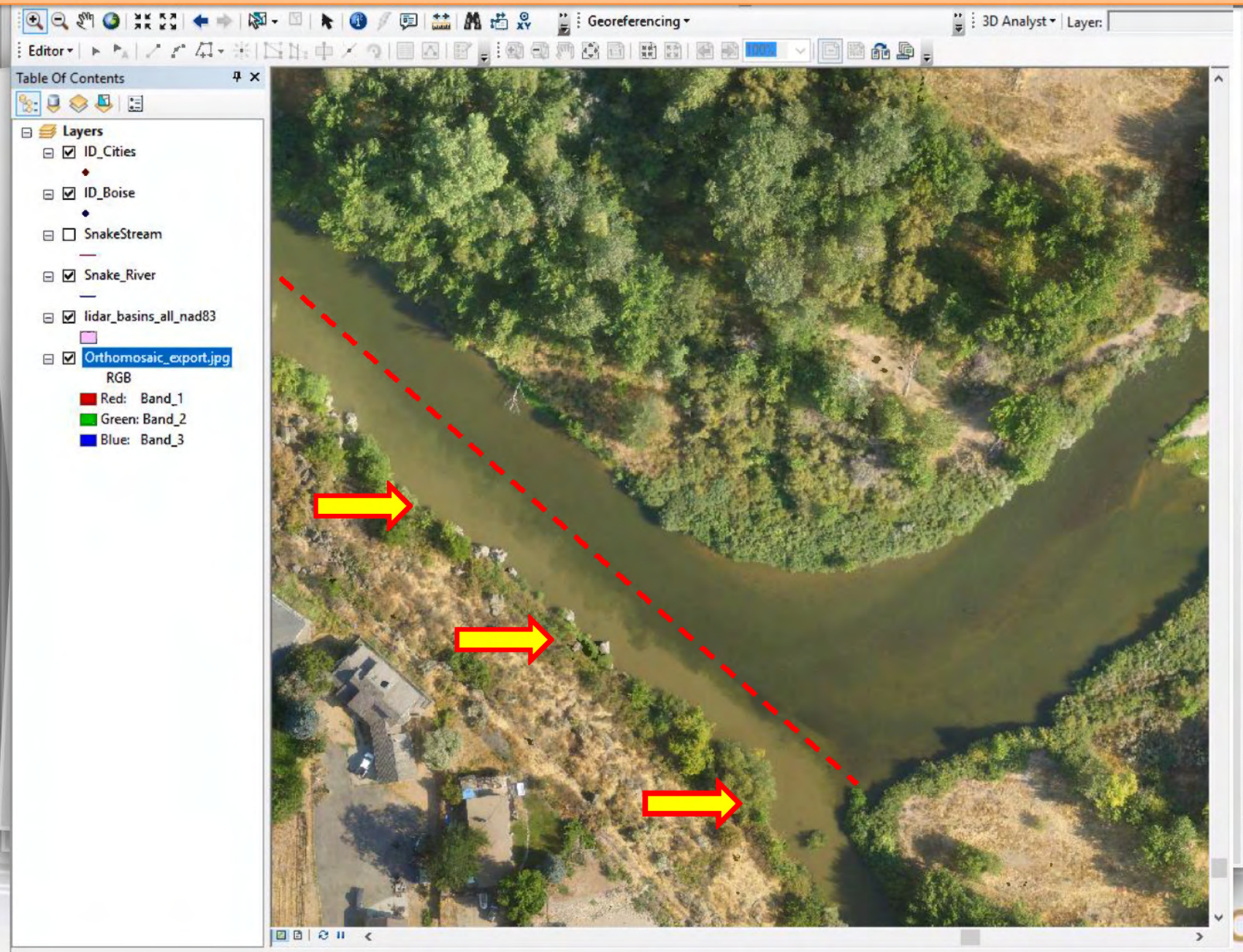
WQ Monitoring and Data Collection

1. Water quality monitoring before and after implementation of ag (or other) BMPs
: Methodology Real-time ground sensing/Remote sensing using Unmanned Aerial System (UAS, a.k.a. drone)

UAS Applications for Water Resources



Water Quality Monitoring, Caldwell (Summer, 2016)



Sampling Activities

https://www.youtube.com/watch?v=DRjiYuQSulU

SPRING 2018
iDRONE

Moscow, Boise, Pocatello

3 days each of flying drones, understanding regulations, and exploring our surrounding through the eyes of drones

for middle and high school students who want to see what drones can do for fun and for research

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3 DAYS OF FLYING DRONES

UNDERSTANDING REGULATIONS

EXPLORING OUR SURROUNDING THROUGH THE EYES OF DRONES

FLYING WITH SENSORS

FIND SOLUTIONS TO PROBLEMS

FREE

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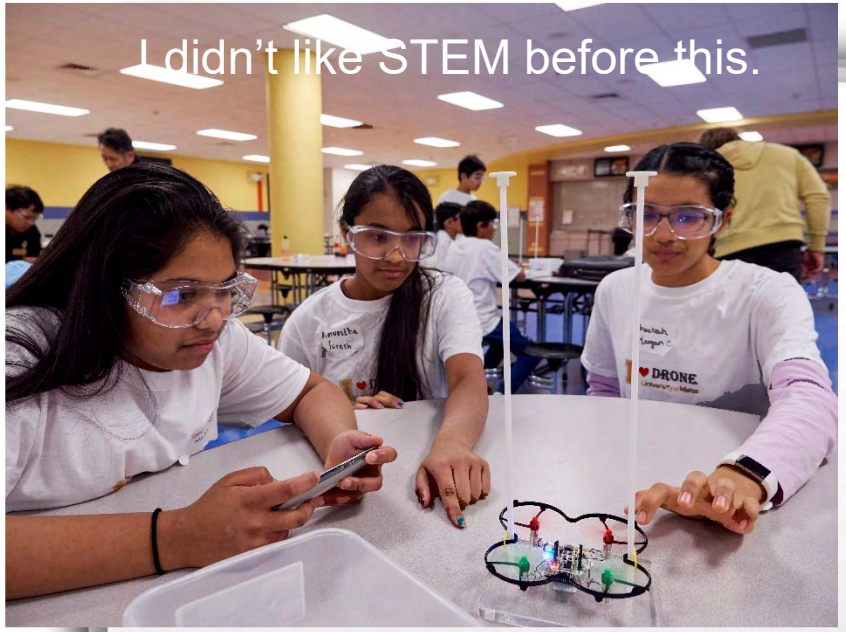
I didn’t like STEM before this.


iDrone LED Indicators
University of Idaho


iDrone STEM is awesome!

It was very hands on and taught me about how to fly drones safely.

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Messages

1. WQQ Modeling associated with urbanization
2. Real-time WQQ monitoring and data collection using ground and remote-sensing (e.g., UAS) before and after BMP installation
3. Data clearing house (water data, GIS, and other data portal)


Questions?
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