RESEARCH PROGRAM ON Water, Land and Ecosystems

CGIAR

Incorporating gendered landscapes into physically-based models via Participatory 3-D Mapping

Dr. Tracy Baker - Researcher, Hydrology & Hydrologic Modeling
Dr. Liza Debevec - Social Scientist Ms. Yenenesh Abebe - GIS and Database Management
International Water Management Institute - East Africa & Nile Basin

Dr. Beth Cullen - Social Scientist
International Livestock Research Institute - Ethiopia

Uniting agriculture and nature for poverty reduction

IWMI International Water Management Institute · CGIAR Challenge Program on WATER & FOOD (Andes • Ganges • Limpopo • Mekong • Nile • Volta) · CIAT · ICARDA Science for Better Livelihoods in Dry Areas · ICRISAT Science with a human face · World Agroforestry Centre · Bioversity International · Centro Internacional de la Papa CIP · IFPRI International Food Policy Research Institute A member of the CGIAR Consortium · ILRI International Livestock Research Institute · IITA Research to Nourish Africa · WorldFish · FAO Fiat Panis

Four Categories of Ecosystem Services

Provisioning Services

Products obtained directly from ecosystems

- Food
- Fresh water
- Fuel
- Wood, Fiber, Medicine

Photo: Tracy Baker, IWMI

Regulating Services

Benefits obtained by regulating ecosystem processes

- Climate regulation
- Flood regulation
- Disease regulation
- Water purification

Photo: Matthew McCartney, IWMI

Cultural Services

Material and non-material ecosystems benefits

- Aesthetic
- Spiritual
- Educational
- Recreational

Photo: Joseph King, TAMUS

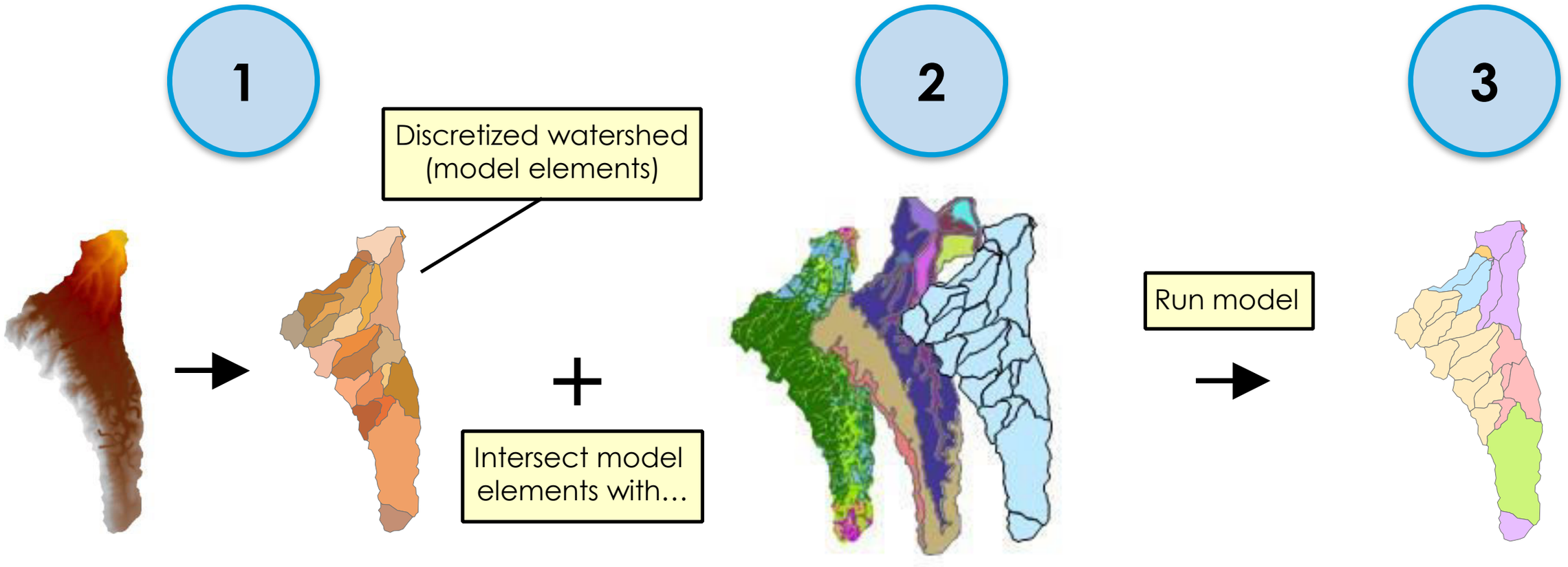
Supporting Services

Services necessary for the production of all other ecosystem services:

Soil Formation Nutrient Cycling Primary production

MEA 2006

Hydrologic model



How to reconcile the biophysical with the social?

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Traditional

- Paper Surveys
- Participatory Rural Appraisal
- Focus Groups
- Working with community leaders one-on-one
- Policy-driven approach
- Science-driven

Spatial

- Location
- Size
- Direction
- Inter-object relationships
- Reveals things we don't or can't say
- Non-literate
- Ecosystem dynamics

Challenge

We need to incorporate human perception and value systems

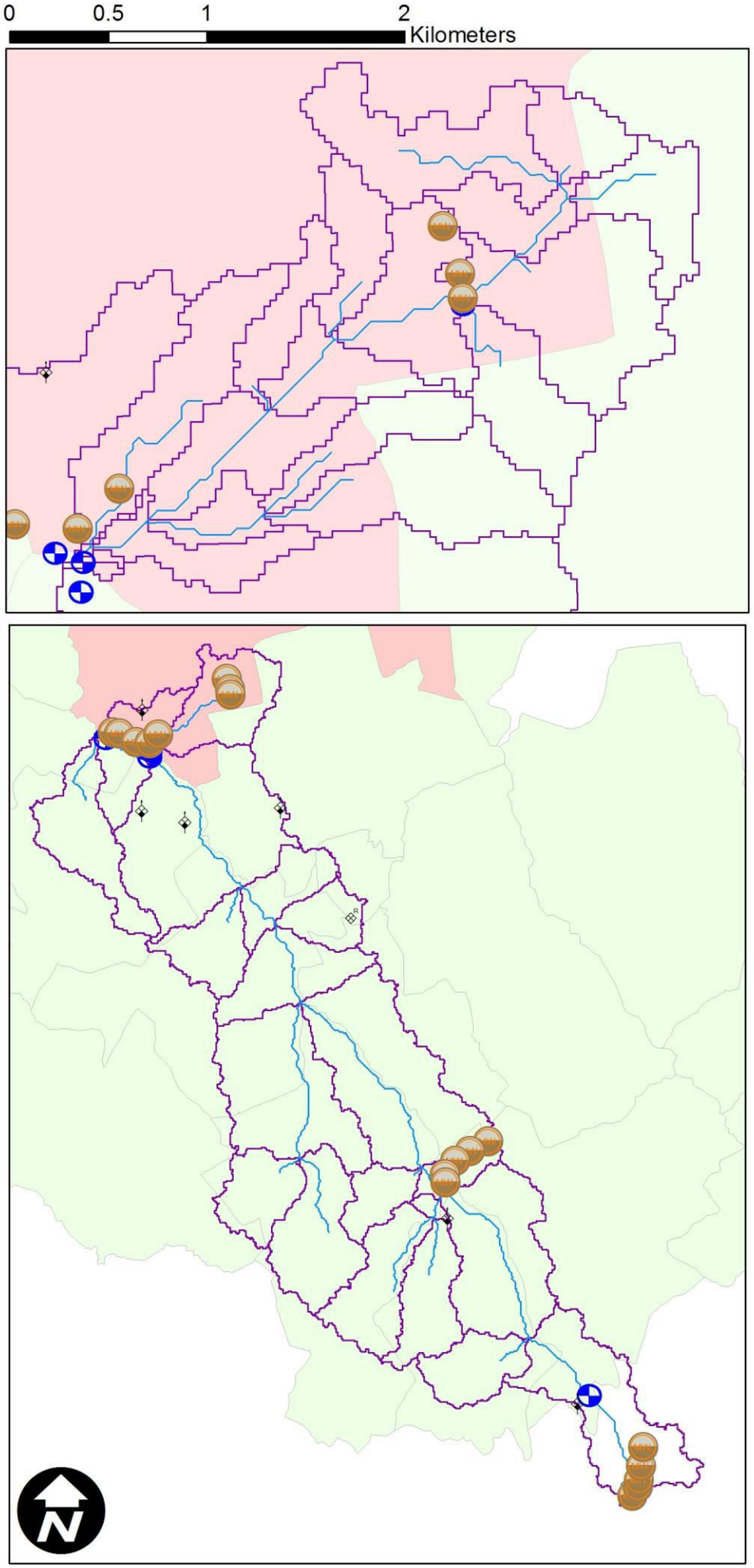
- Local knowledge identifies **most important** resources
  - Necessarily points out ESs
  - Connected to livelihoods
- Takes many forms (2D, 3D, drawing, community measuring, GPS)


Photo: Scott Miller, UWYO


Photo: Liza Debevec, IWMI

Caution

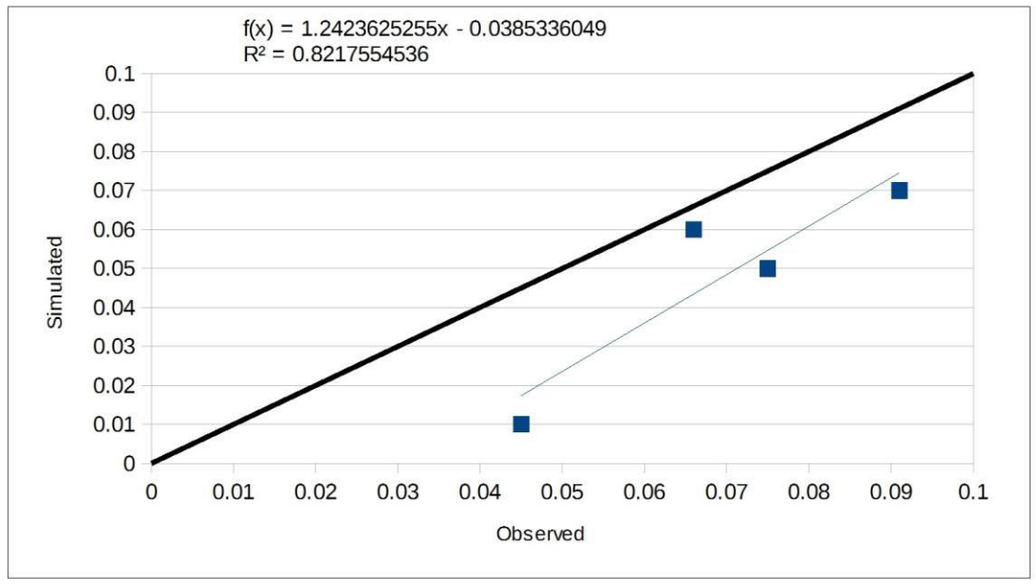
- Who participates and why?
- Maps contain private information
- Have potential to **empower** or **marginalize**



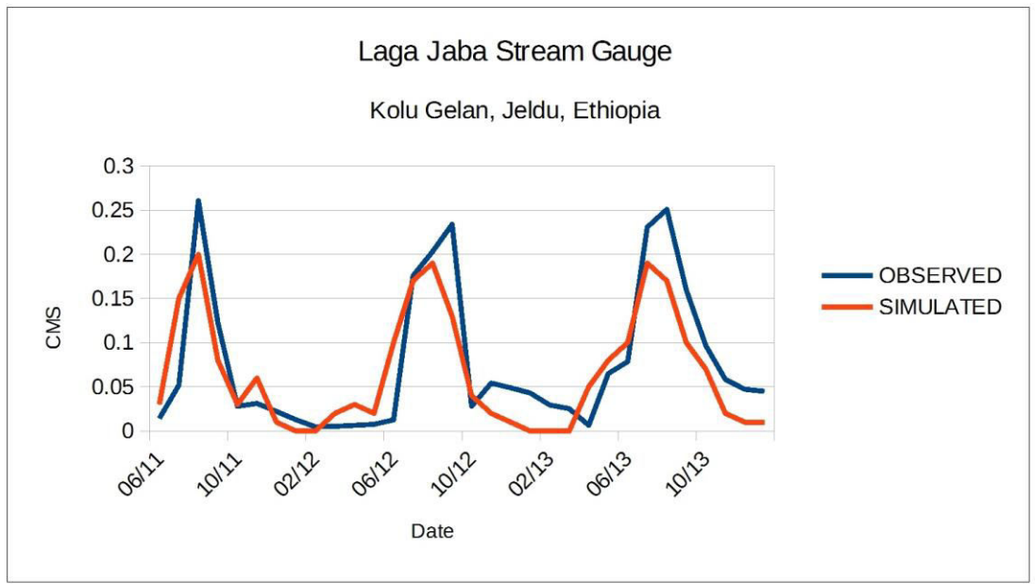
Laga Jaba Watershed
Kolu Gelan, Jeldu, Ethiopia

Legend

- Ground Water level
- Water level
- Reach
- Precipitation
- Weather
- Subbasin
- Soil moisture



N-S R^2 = 0.84 PBIAS = 15% ET = 434mm



SWAT Inputs

- FAO Soils
- ASTER 30m GDEM v.2
- Digitized land use from GoogleEarth
- CFSR Weather & Daily collected

Manual calibration

Annual Water Balance

Monthly Flow Calibration

SWAT Landuse

- Rangelands
- Bush
- Forest*
- Pasture
- Barley-Teff-Potato
- Eucalyptus
- Barren*
- Low density residential

** Not in analyst land use map*

Female LU

N-S R^2 = 0.74

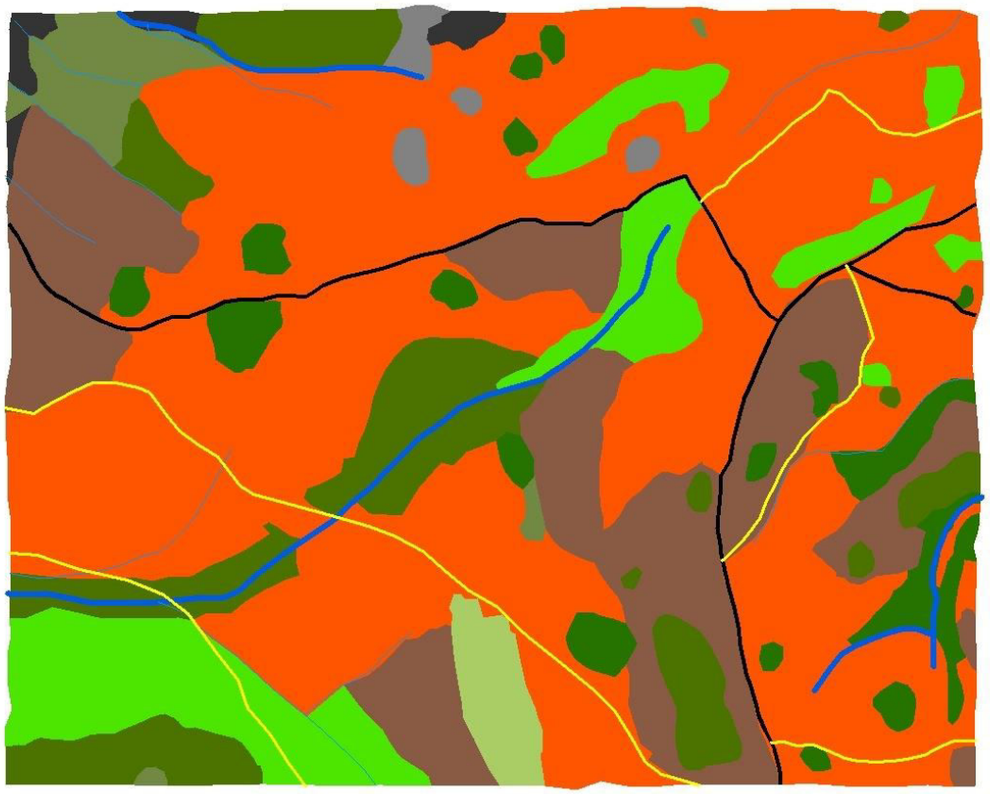
PBIAS = 19%

Male LU

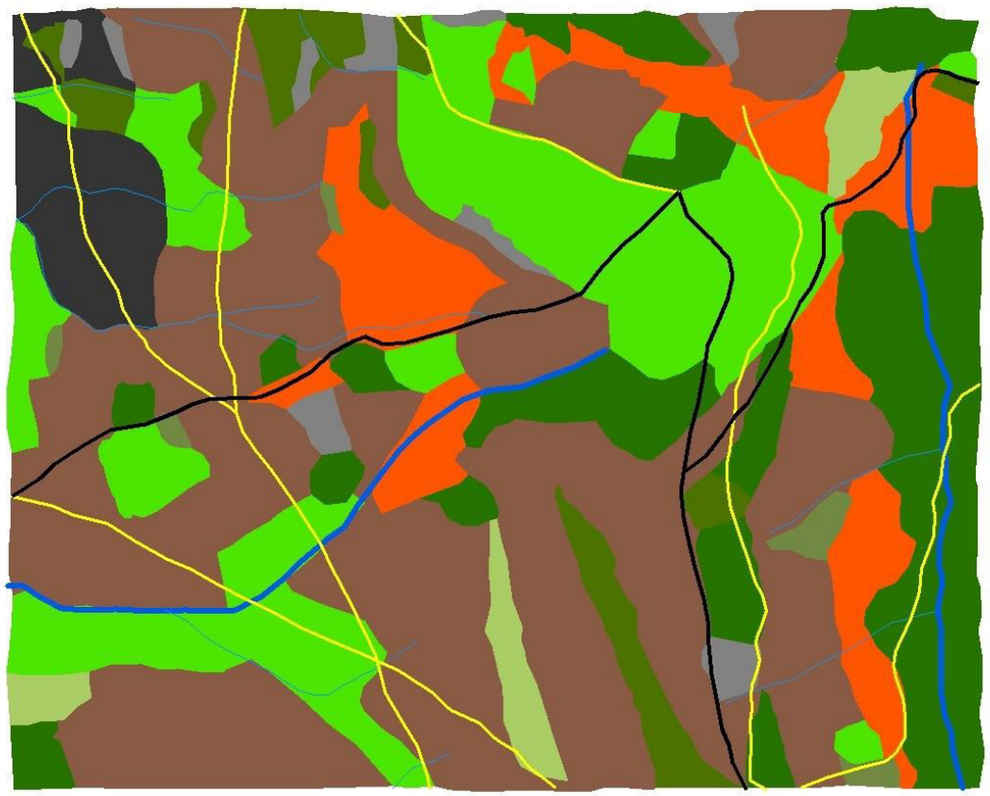
N-S R^2 = 0.87

PBIAS = 24%

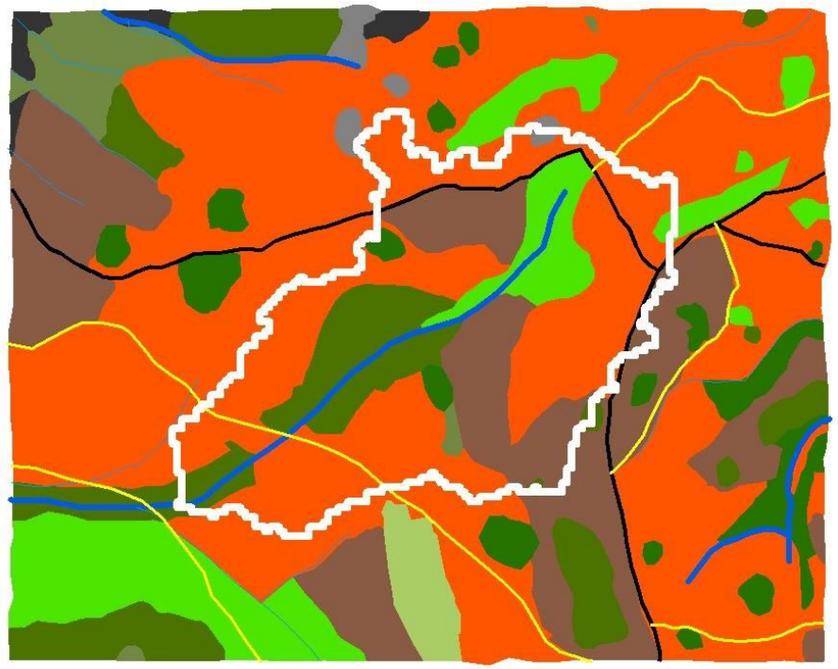
Female



Male



Kolu Gelan Gendered P3D Mapping



Legend

- Black Soil
- Brown Soil
- Bush
- Eucalyptus
- Grazing Land
- Market
- Natural Forest
- Re-aforested Land
- Red Soil
- Stony Land
- Big River
- Tributary
- Asphalt
- Feeder

0 0.75 1.5 3 Kilometers

Important Differences

	Female	*Male*
Surface Q (mm)	*622*	*584*
Shallow GW (mm)	*389*	*353*
ET (mm)	*627*	*703*
Sediment (T/ha)	*10.3*	*8.5*

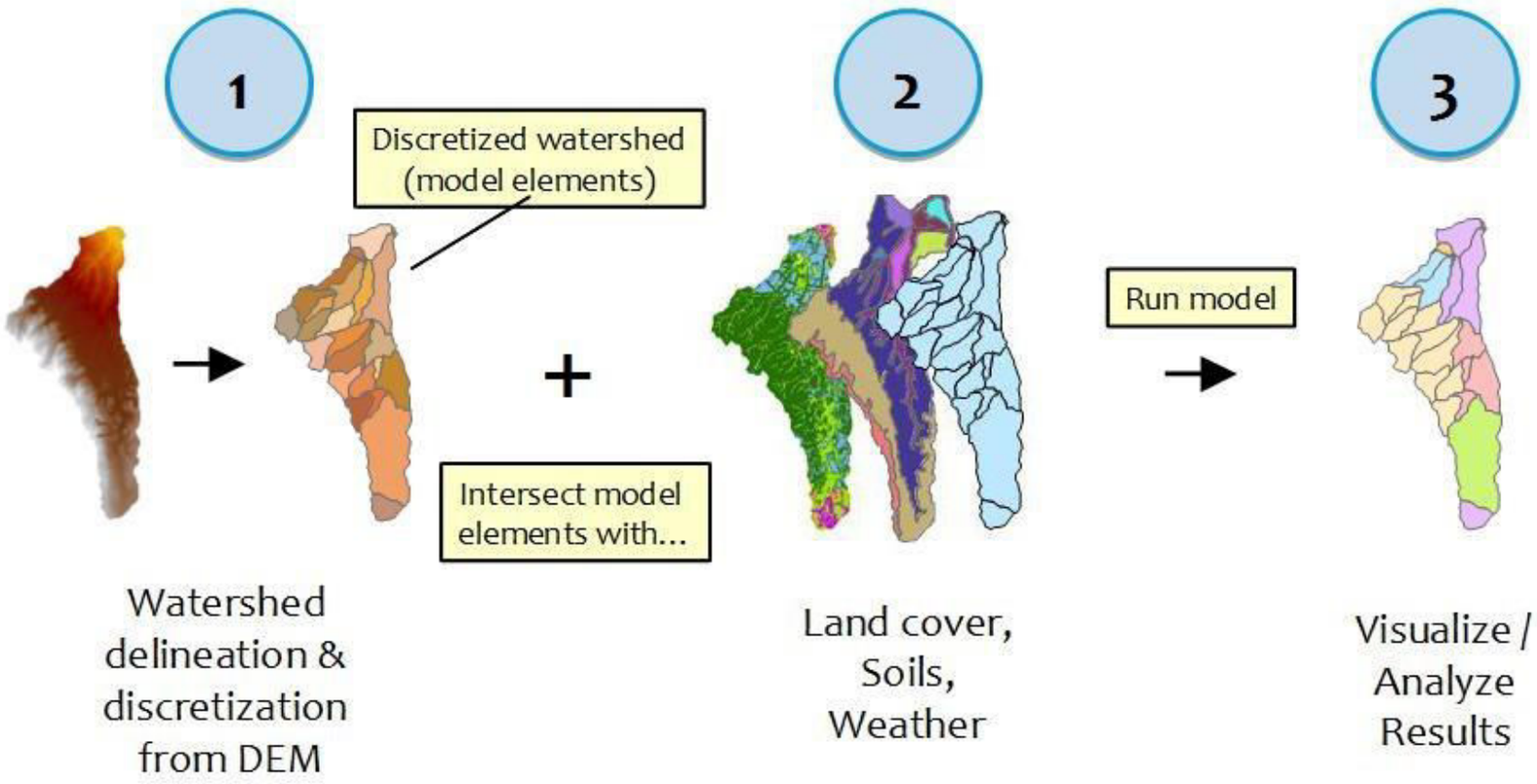
- Males identified
  - 11 Springs
  - 6 Sacred Trees
  - 3 Sacred Sites
  - More grazing land
  - More fertile soils
- Females identified
  - 15 Springs
  - 3 Sacred Trees
  - 4 Sacred Sites
  - 2 Holy Water Sites
  - 4 Quarries
  - More degraded & less fertile soils

Use models to …

- Evaluate multiple perceptions of landscapes and quantify impact on ecosystem services
- Assess how alternate future climates, land use, and attendant hydrologic response will impact ecosystem services as ***valued by communities***

Explore:

- Focused Site(s) for evaluating models
- Identification of ESs at multiple scales
- Alternative climate and land use scenarios



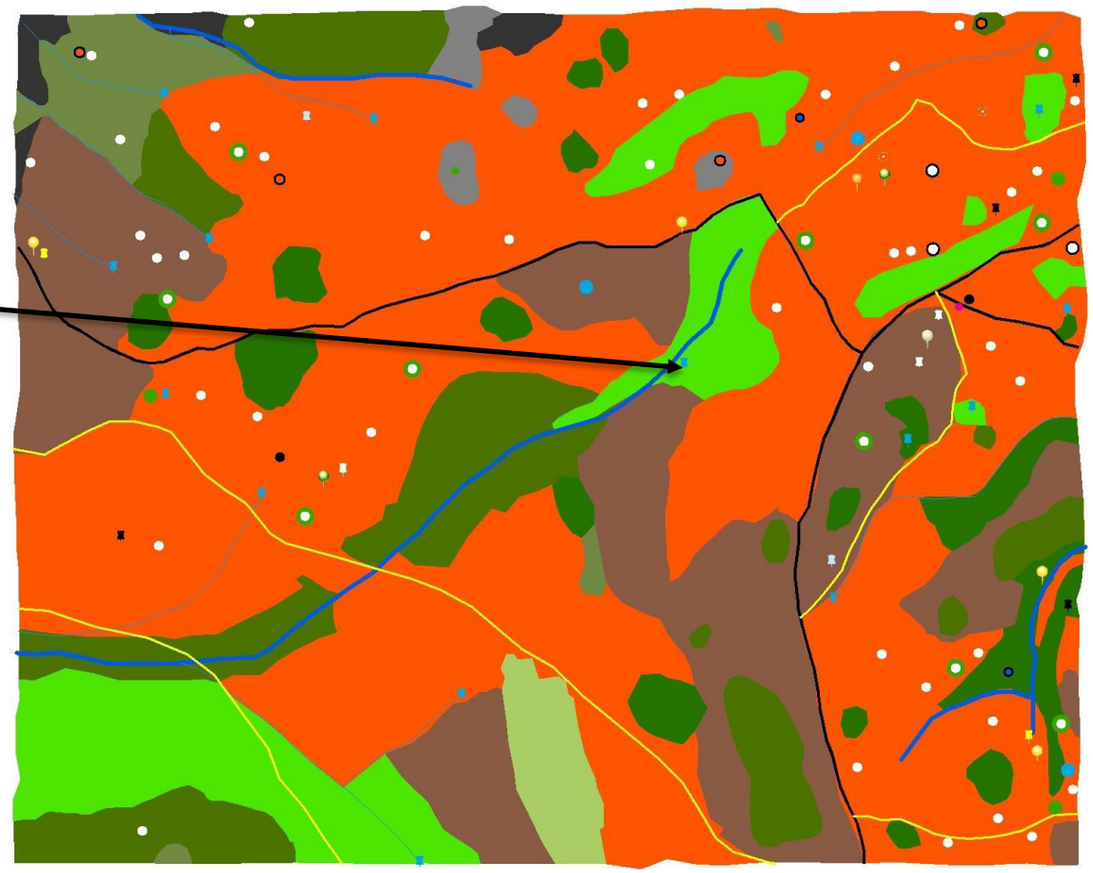
Run many scenarios

10 - 20 yr Management

Opportunities & Limitations

Examples driven by point location and watershed configuration options

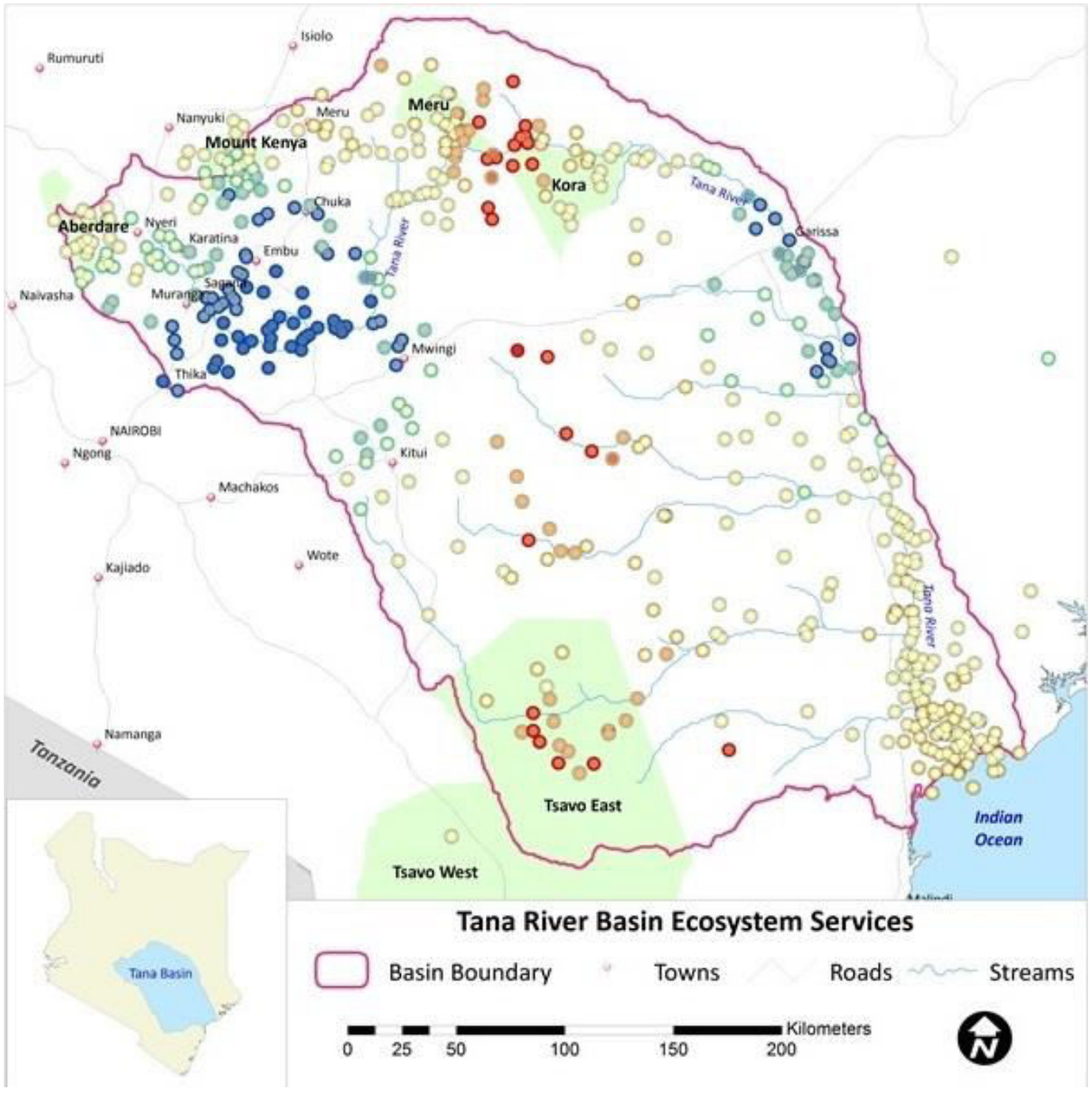
- Flow at a spring or important water point (.rch)
- Impact of irrigation - Consumptive water use (.wus)
  - Water distribution at key grazing areas
- Plant water stress in a given hru
- Changes in water sourcing (groundwater vs surface water)



Issue: How practical for land use planning and management?

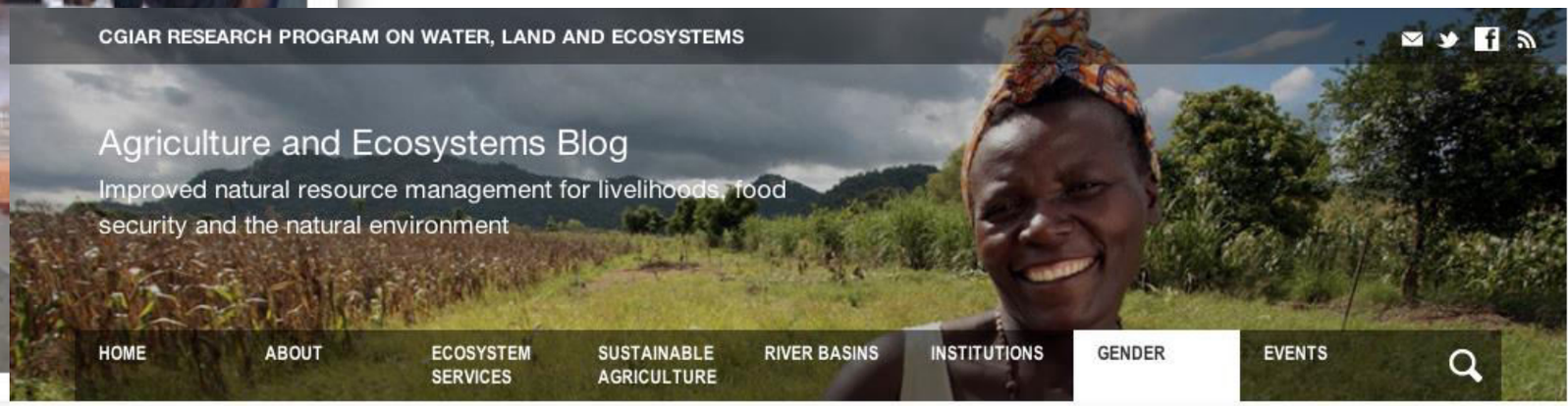
What's Next?

- Continued support of 3D and 2D mapping at multiple scales in Ethiopia and Kenya
  - *WLE, Rainfed, Humidtropics, WISE-UP*
  - *Multiple scale assessments*
- CG-SWAT Community of Practice
  - October 2014
  - 15 SWAT experts from CG w/ Dr. Srinivasan (TAMUS)
  - Ecosystem Services Protocols



Thank You!

If you're not on the map …
… then, *you don't exist*!



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Hydrologist reality check: impact rests on social inclusion

NOVEMBER 25, 2013 BY *TRACY BAKER* *Featured, Gender, IWMI*

I am a hydrologist. And I'm intrigued by the opportunities I see to incorporate gender into biophysical models.

To many of my hydrology colleagues it may sound like I should be standing up at a self-help meeting if I am going to make such proclamations. After all, we're concerned with the physical and quantifiable world. A world governed by physics, a world where variability and uncertainty are still somewhat quantifiable and predictable. Precipitation, streamflow, runoff, evapotranspiration, and groundwater. These are all measurable, and predictable, inputs and outputs of a system we call the water cycle. When we are asked about how we understand this system, it is quite simple: physics.

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