United States Department of Agriculture

Cooperative State, Research, Education and Extension Service

CSREES' "Road Map" for Water Resources

Research, Education, and Extension

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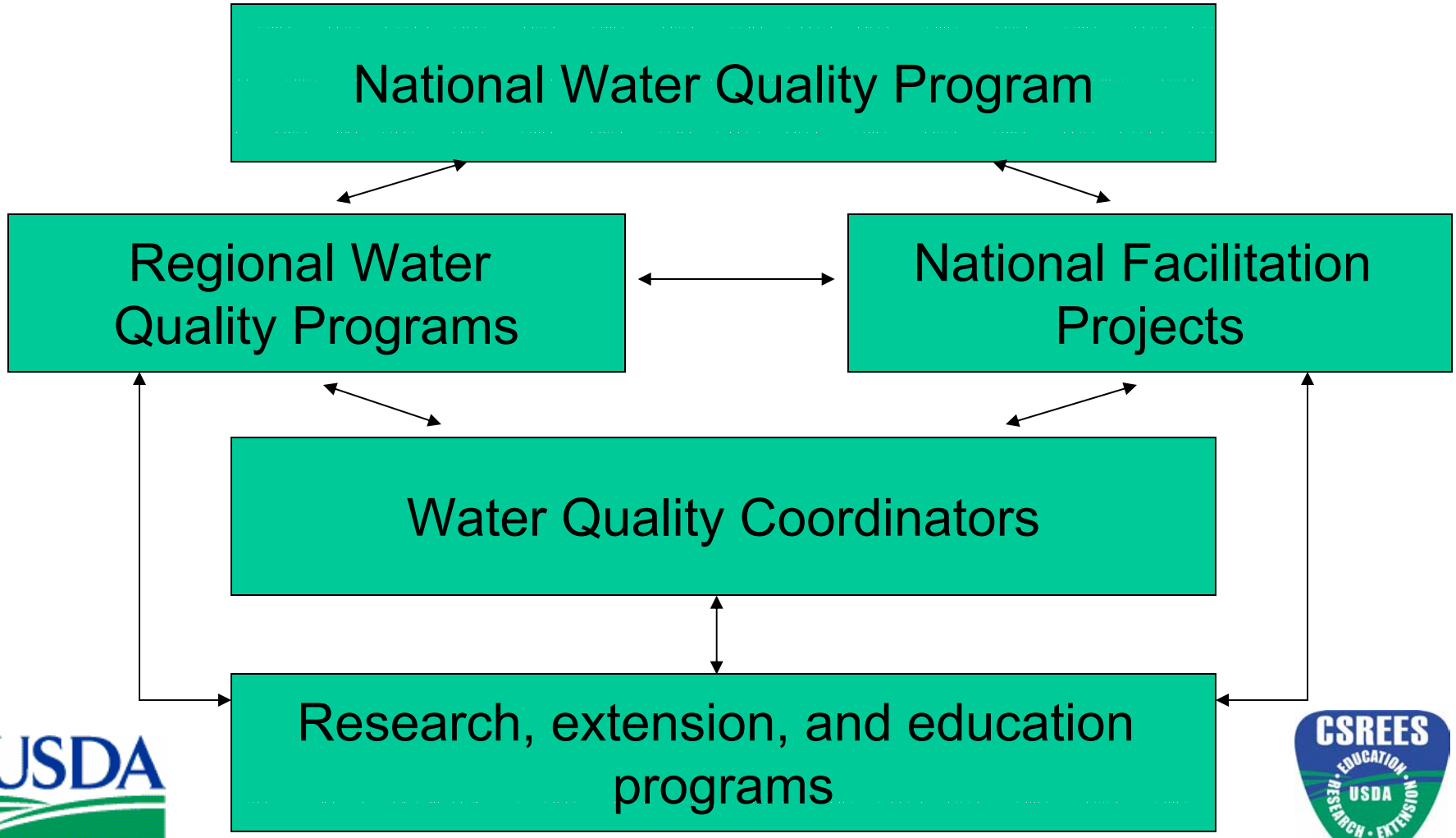
National Program Leader

Water Resources

The Integrated Water Quality Network



What is the "Road Map?"

- Vision of water resources issues
  - Water quality
  - Water quantity
  - Human dimensions
  - Technology
- Framework to help set priorities
  - Research
  - Integrated: Research, Education, Extension
- Opportunity to seek meaningful partnerships

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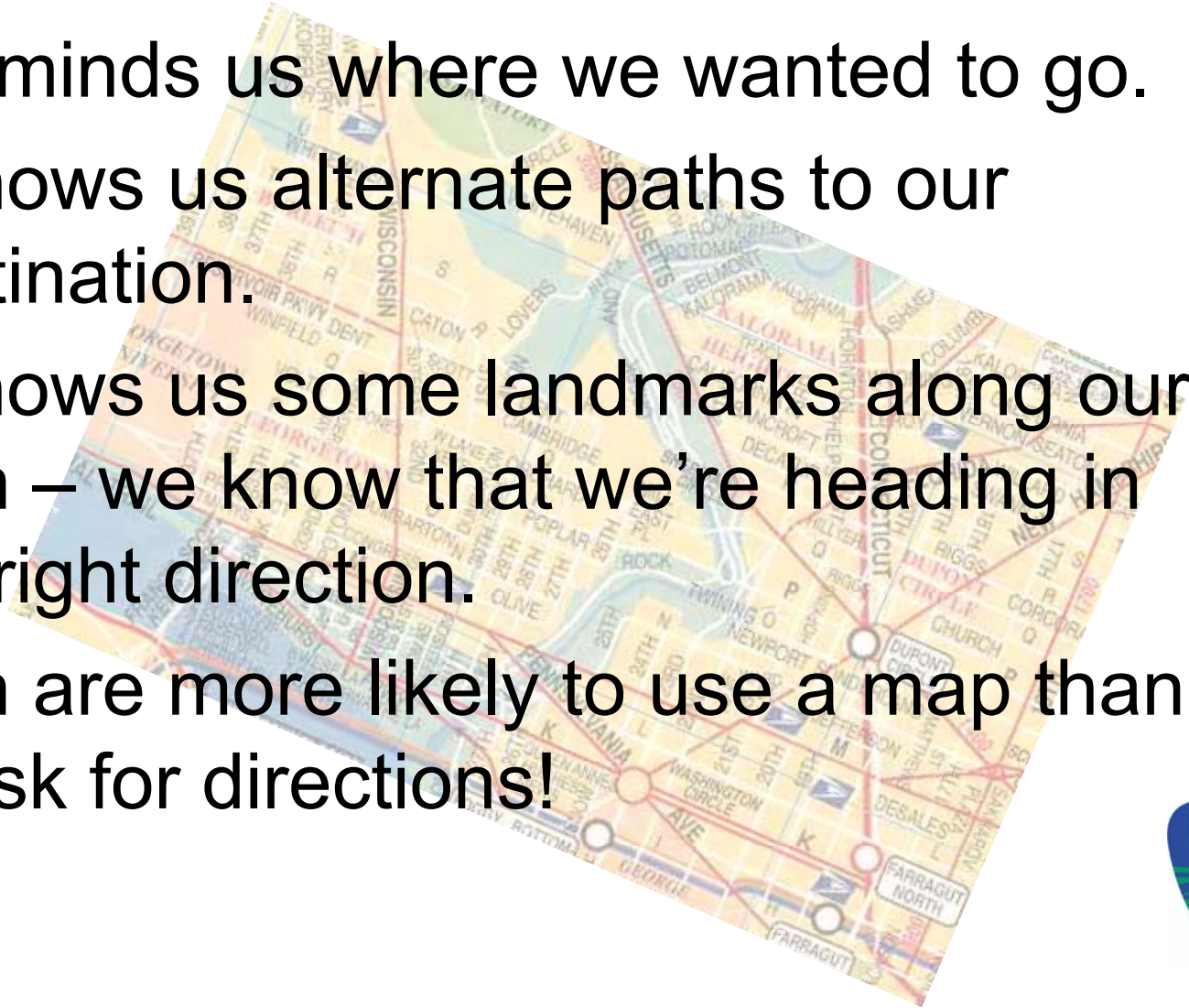
Why a Road Map?

- It reminds us where we wanted to go.
- It shows us alternate paths to our destination.
- It shows us some landmarks along our path – we know that we're heading in the right direction.
- Men are more likely to use a map than to ask for directions!



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Water Program Mission

- To create and disseminate knowledge that insures a safe and reliable source of water of the appropriate quality, to meet the needs of
  - Food and fiber production,
  - Human health, use, and economic growth, and
  - Maintenance and protection of natural environmental systems.

- CSREES' unique niche is conducting research, education, and extension programs to protect and improve water resources in agricultural, rural, and urbanizing watersheds (including forest lands, rangelands, and croplands).

Conceptual Framework

- Use the water cycle as a context for the road map
  - Focus on issues of quality and quantity throughout the water cycle
- Focus on CSREES' niche – rural, agricultural, and "urbanizing" watersheds
- Identify opportunities for research, education, and extension
- Identify new or needed technologies

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Seven Major Anthropogenic Impacts on the Water Cycle (not prioritized)

- Climate change
- Basin-scale water balance changes
- River flow regulation
- Sediment fluxes
- Chemical pollution
- Microbial pollution
- Biodiversity changes

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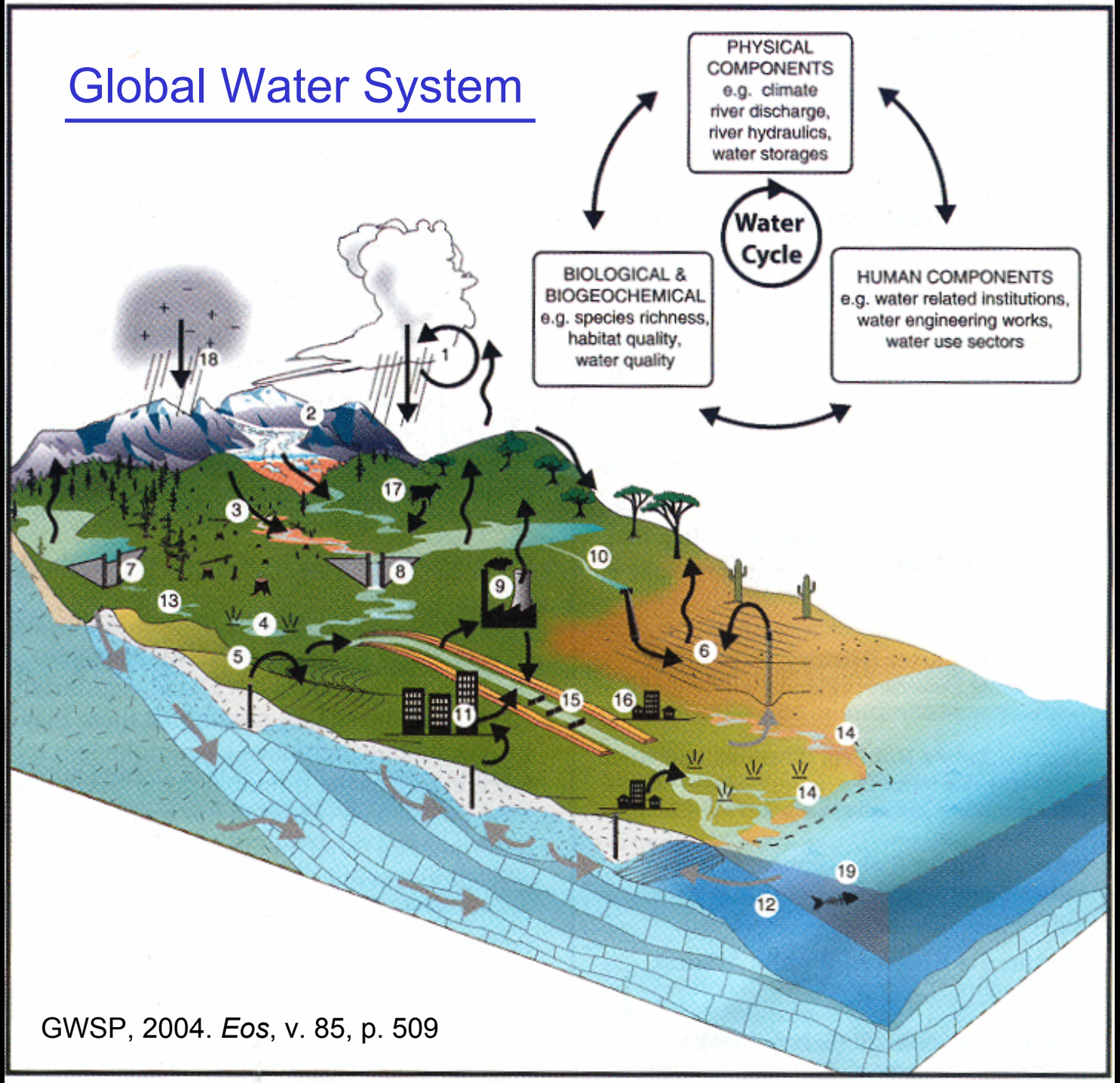
Global Water System



GWSP, 2004. *Eos*, v. 85, p. 509

Underlying Questions

- What are the human impacts (positive and negative) on agricultural and rural watersheds?
- What science, education, outreach, and technology is needed to reverse or reduce negative impacts or promote positive impacts of human activity in agricultural and rural watersheds?

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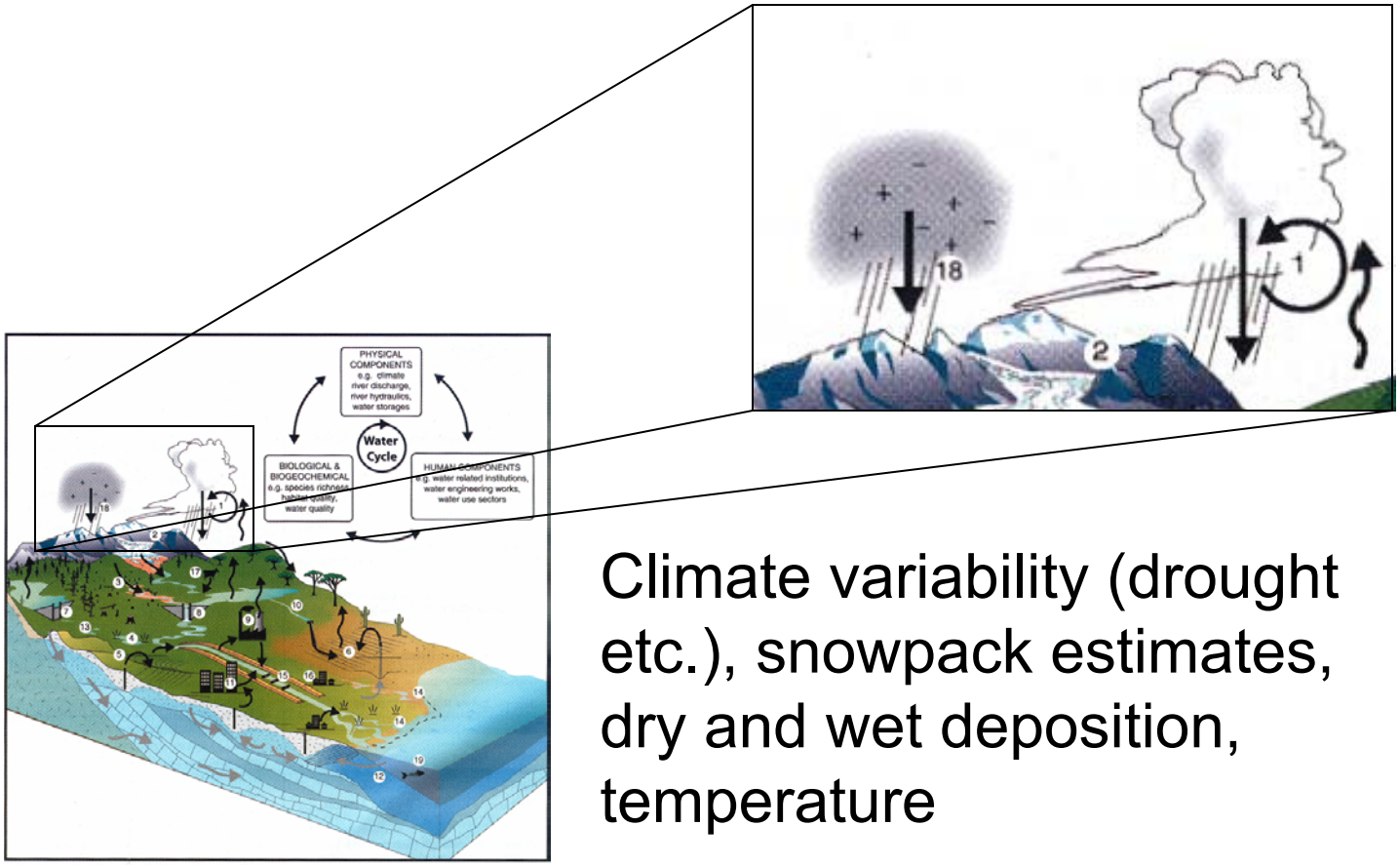
Atmospheric Inputs



Climate variability (drought etc.), snowpack estimates, dry and wet deposition, temperature

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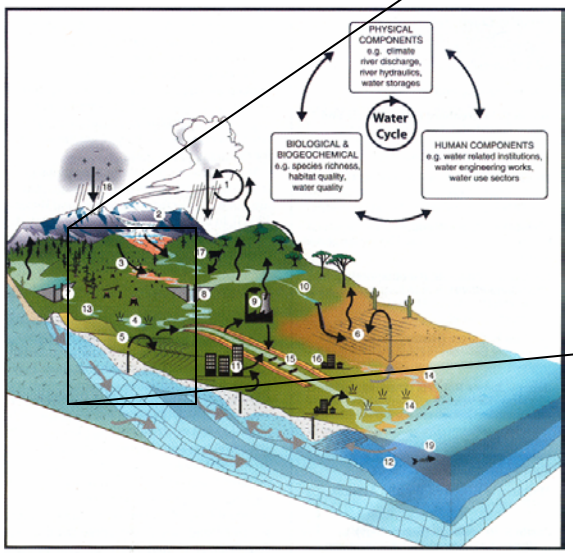
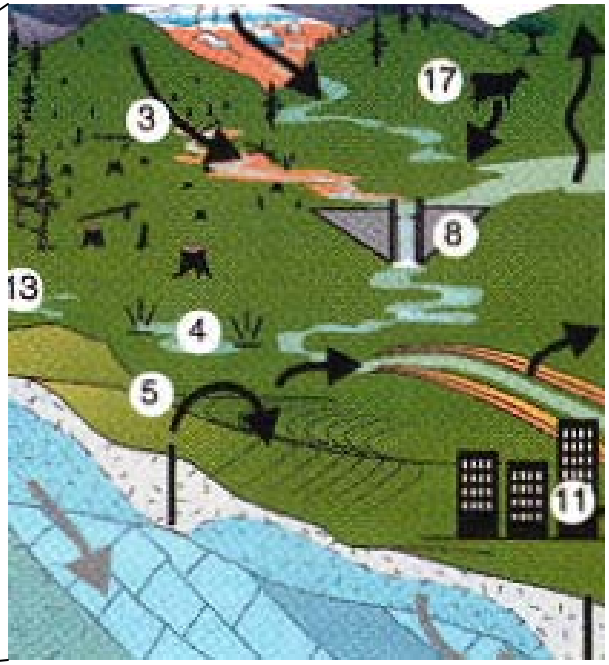
Hillslope and Runoff Processes





Infiltration, ET, hillslope erosion, sediment transport from hillslopes, contaminant transport, urbanization

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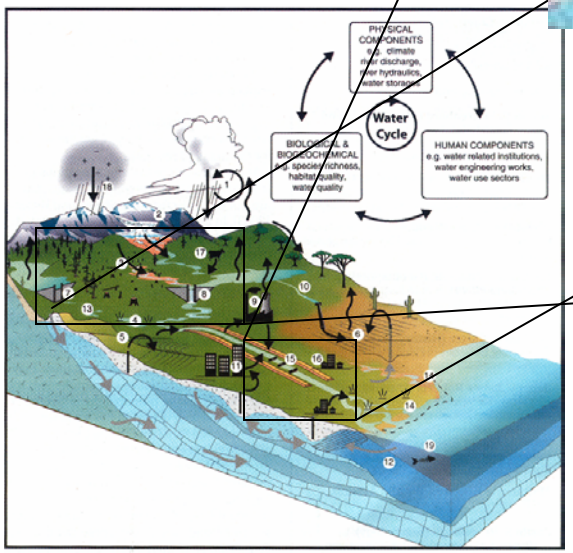
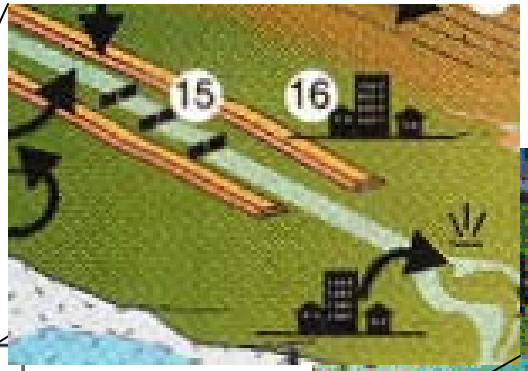
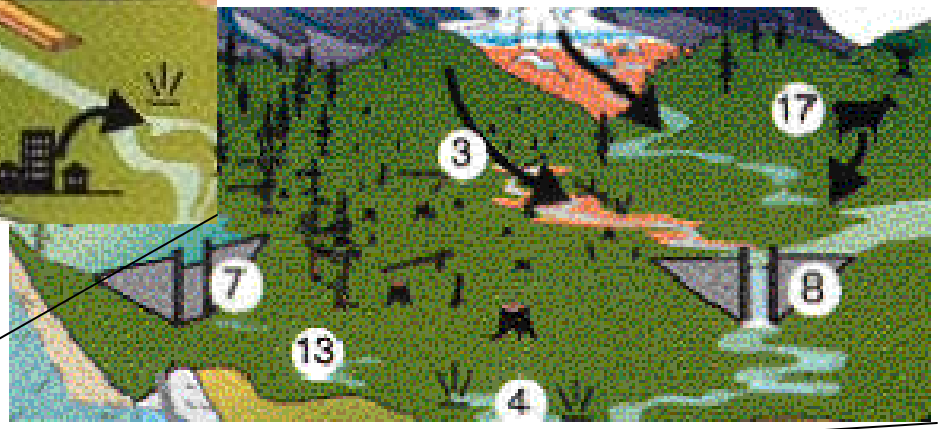
Streams, Rivers, and Lakes







Channel erosion, riparian areas, dams and reservoirs, regulated flows, impacts of agricultural contaminants on aquatic ecosystems, irrigation and drainage ditches, channelization, eutrophication

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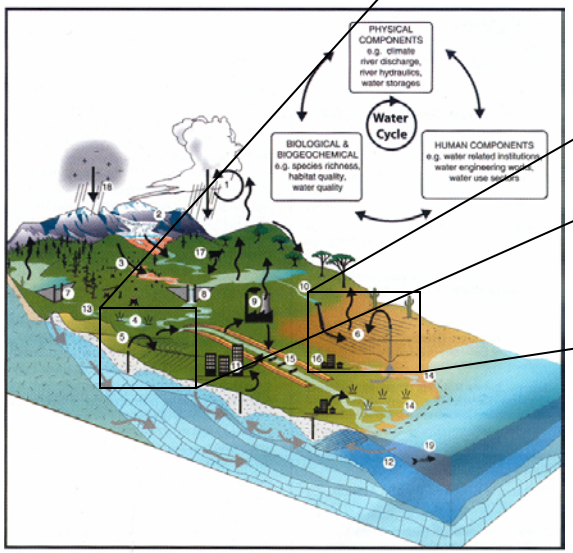
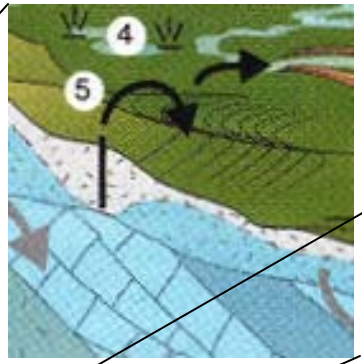
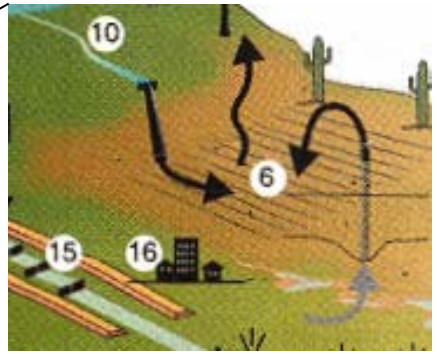
Rural and Agricultural Water Use







Arid land irrigation, humid landscape irrigation, drought and salinity tolerant plants, drinking water issues, urban and suburban landscaping

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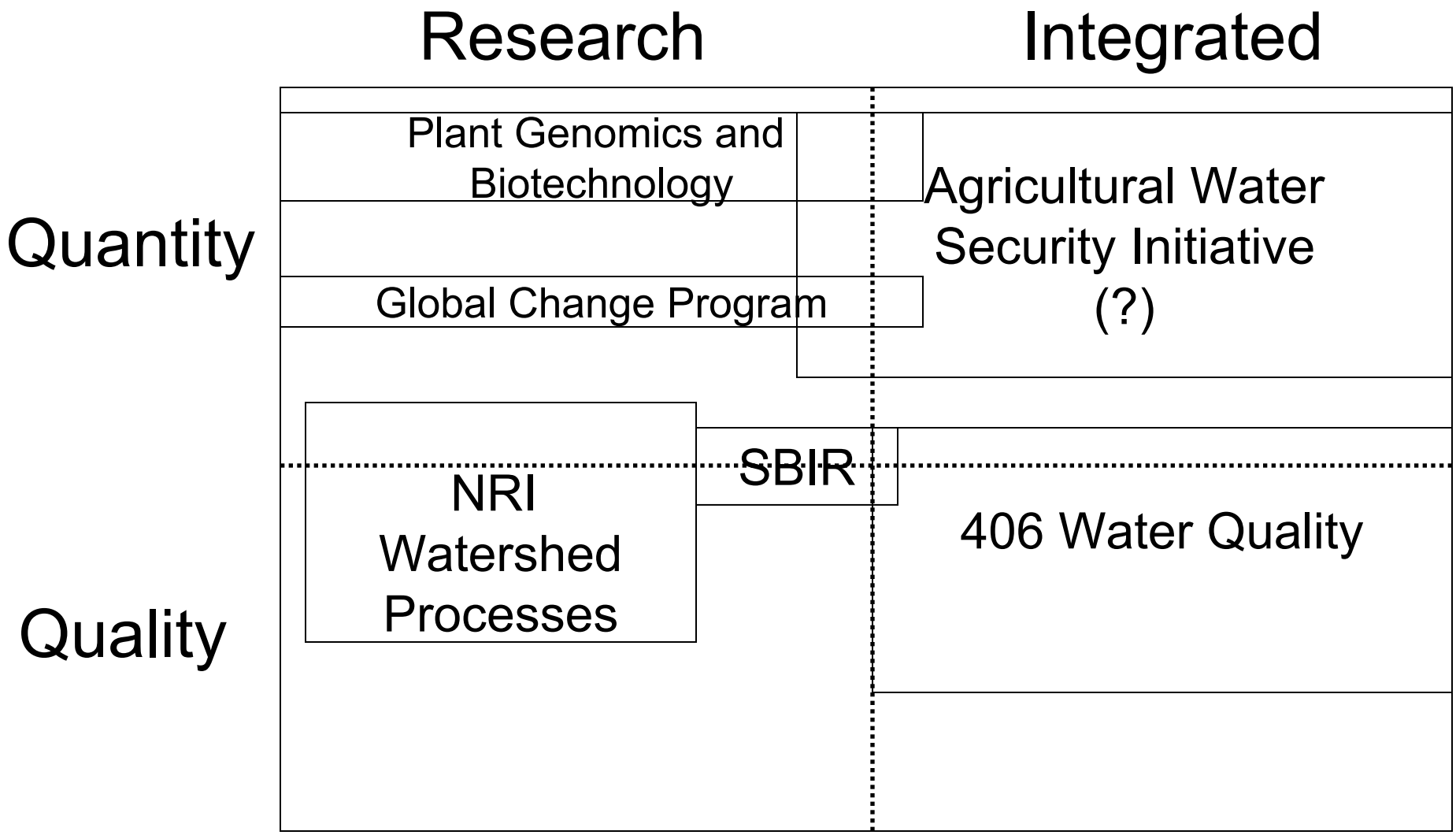
Human Behavioral Change


Research
Integrated
Quantity
Quality
Plant Genomics and Biotechnology
Agricultural Water Security Initiative (?)
Global Change Program
NRI Watershed Processes
SBIR
406 Water Quality

Examples of Quantitative Outcomes or Goals

- In 10 years, reduce agricultural water use on a per acre basis by 20%.
- In 10 years, reduce the instream nitrogen from agricultural and residential sources by 20%.
- In 10 years, address all agricultural pathogen TMDLs.

Water Quality Coordinators Discussion

- What key issues need to be identified?
  - Quantity
  - Quality
  - Human Dimensions
  - Technology

Water Quality

- Fate and transport of nutrients, pesticides, pathogens and pharmaceuticals
- TMDLs and action thresholds
- Barriers and incentives for adopting and maintaining BMPs (e.g. economic impacts)
- Documentation of and linkage between impacts of landscape activities, receiving water quality and aquatic ecosystems
- Salt tolerant plant species (related to water use/onsite wastewater treatment for remediation)
- Arsenic and drinking water
- Measurement and scaling

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Water Quantity

Policy Makers:

- Water supply forecasting
- Ecological models (predicting impacts and identifying thresholds)
- Economic models
  - Economics of water uses and related policy
  - Valuation of ecological services provided by ecosystems

Users:

- Water reuse technology
- “Smart” irrigation systems (sensors and probes)
- Storm water systems

Decision Support Systems:

•Interaction of policy, economics, water use technology and ecological impacts

Human Dimensions

TOPICAL ISSUES:

- Identifying human motivations for desired behavior change (e.g. economic impacts, social influence, policy interventions, environmental science)
- Research most appropriate communication/education methods for specific target audiences
- Identifying innovative, effective communication methods (e.g. marketing) that encourage personal responsibility and behavior change through the delivery of science-based information

PROGRAMMATIC CHALLENGES:

- *Exploring partnerships with other academic departments and related behavior change agents (e.g. dept. of public health) and commercial marketers*
- *Encourage multidisciplinary collaborations*
- *Build capacity for human dimensions*

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Technology

- Web-based learning and webcasting
  - Interactive/on-demand
- Improve science to support non-point source modeling
- Application of precision agriculture (software tools, sensing technology) on small farms
- Improve monitoring and forecasting capabilities
- Crop biotechnology for water use efficiency

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Next Steps

- Continue to distill this information and narrow the list
- Develop and describe quantitative, measurable outcomes for water resource issues
- Continue the dialogue – you need to provide input

Comments to: water@csrees.usda.gov