

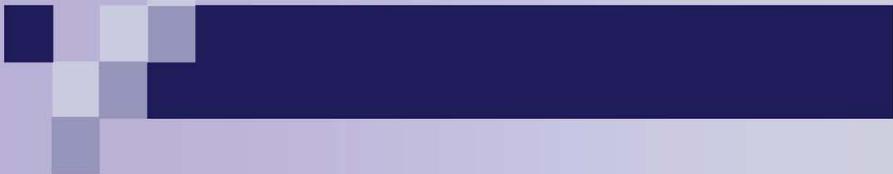
The West's Water Information Needs and Strategies

Fort Collins, Colorado

January 7, 2009



Tony Willardson, Deputy Director
Western States Water Council



Water Needs and Strategies for a Sustainable Future



Western Governors' Association ♦ June 2006

1. Growth and Water Policy
2. Meeting Future Water Demands
3. Water Infrastructure Needs and Strategies
4. Resolution of Indian Water Rights Claims
5. Climate Change Impacts
6. ESA & Protecting Aquatic Species

Water Needs and Strategies for a Sustainable Future



Western Governors' Association ♦ June 2006

Water Needs and Strategies for a Sustainable Future: *Next Steps*



Western Governors' Association ♦ June 2008

The Congress

4. Congress should immediately provide funding sufficient to include the emissive thermal infrared (TIR) instrument on Landsat 8 as part of the Landsat Data Continuity Mission (LDCM) as a unique and cost-effective means to measure agricultural and other consumptive water uses.

NASA

5. NASA should immediately begin preparing a request for proposals (RFP) and take other steps needed to ensure TIR is included on Landsat 8, and request supplemental and future funding sufficient to minimize any necessary delay in the scheduled launch.

United States Senate

WASHINGTON, DC 20510

May 5, 2008

Senator Robert C. Byrd
Chairman
Committee on Appropriations
Washington, D.C. 20510

Senator Thad Cochran
Ranking Member
Committee on Appropriations
Washington, D.C. 20510

Senator Barbara Mikulski
Chairwoman
Subcommittee on Commerce,
Justice, Science & Related Agencies

Senator Richard Shelby
Ranking Member
Subcommittee on Commerce,
Justice, Science & Related Agencies

Dear Chairman Byrd, Chairwoman Mikulski, Ranking Member Cochran, and Ranking Member Shelby:

We are writing to request inclusion of \$35 million in NASA's budget for FY 2009, to design, construct and deploy a thermal infrared (TIR) instrument on Landsat 8 that will provide data continuity consistent with that now available from Landsat 5 and Landsat 7. The total funding commitment required for a TIR instrument on Landsat 8 should be between \$90 and \$100 million over three years.

The future of our Nation's water resources is increasingly unclear. Conflicts over water use are growing, and the serious situation in the Southeast demonstrates that scarcity isn't just a problem in the West, where water has always been a scarce resource and roughly 80% of all consumptive water use is for irrigation. Across the U.S. water demands for agriculture, energy production, and municipal and industrial uses are rising, while reservoir and ground water levels are falling. It is clear that more data on water supplies and water uses will be needed to address present and future water problems.

Today, TIR data is essential for measuring and monitoring evapotranspiration and calculating consumptive water usage, particularly for agriculture. This data stream has been the gold standard for administration of water transfer agreements as it provides a cost effective means of determining not only present, but past consumptive use, given the U.S. Geological Survey's (USGS) archive of TIR data collected since 1982.

We are grateful that the Appropriations Committee is committed to ensuring the continuity of these unique and fundamentally valuable data streams. In particular, the FY 2008 Consolidated Appropriations Act included the following language: "NASA is directed to provide a plan on all continuity of data for the Landsat Data Continuity Mission (LDCM) to the Appropriations committees no later than 120 days after enactment of this Act. The amended bill provides \$1 million above the budget request for this mission to ensure data continuity."

Unfortunately there is evidence that NASA does not share the Committee's priorities. Although NASA plans to present its report to the committees later this month, in a December 19, 2007 letter, Administrator Michael Griffin stated, "While thermal data is scientifically relevant, analysis of the mission development cost and schedule indicates that LDCM cannot be implemented with the thermal capability within the present budget constraints. Additionally, if the thermal infrared sensor were added, it is likely that NASA would be unable to maintain the current launch readiness date and, consequently, the undesirable gap in data continuity between existing Landsat capability on-orbit and the launch of LDCM would be increased."

Administrator Griffin omits the fact that a thermal infrared (TIR) instrument was included on Landsat 4 in 1982, Landsat 5 in 1984, Landsat 6 in 1993 and Landsat 7 in 1999. Without TIR on the next spacecraft, the Landsat Data Continuity Mission will not be complete, and we fear none of the TIR alternatives under NASA review will prove acceptable. A delay in the launch of Landsat 8 merits serious NASA consideration, rather than prematurely eliminating what has become an invaluable practical application of our nation's investment in NASA-pioneered research and development.

Landsat 5 and 7 TIR data has become an irreplaceable resource for a variety of applications that are increasingly important, but hampered by the uncertainty surrounding its future availability. There is no other comparable federal source of this data, a past privatization attempt proved "troublesome" in NASA's own words, and relying on limited foreign data sources would prove costly and difficult.

However, unless NASA is directed to include TIR on Landsat 8 and sufficient funds are appropriated, we will be without perhaps the single most important instrument capable of measuring by far the largest use of water in the West. While we recognize the present budget constraints, we urge you to fund a TIR instrument in NASA's LDCM budget for Landsat 8.

Sincerely,

Ken Salazar
Mike Crapo
John Barrasso
Mike Enzi
John Tester
John Chafee
Ron Wyden
Max Baucus
Mark Warner

Future Actions

- Educate policymakers/legislators about importance of TIR to water management
- Continue efforts to secure FY2009/FY2010 funding for Landsat TIR in House/Senate
- Consider use of Stimulus Spending to fund information system infrastructure/TIR
- Work with new Administration on TIR request/NLIP w/TIR component

Water Policy and Growth

Population growth is continuing at an unprecedented rate in the West with ramifications not only for cities but rural communities and agricultural areas.

In the future, we may not be able to sustain unlimited growth and still maintain our current quality of life. Difficult political choices will be necessary....

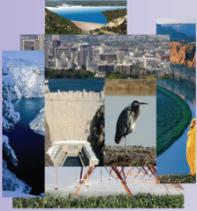
Decisions about where and how to grow are rarely influenced by water policy or by the availability of water



It is obvious that changing demographics and values placed on various water uses is transforming the future of water management.

New uses to accommodate growth must largely rely on water obtained from changes to existing uses of surface and ground water, with limited opportunities to develop new supplies.

In many instances, this will result in the reallocation of water to "higher valued uses."



2006 WGA Water Report

- **2.A. Basic data gathering is an appropriate governmental activity.**

Federal and state agencies should increase support and funding for state and federal basic water data gathering activities that can serve as the basis for sound decision making.

Gaps in data should be identified.

To encourage sustainable growth policies and plans, states should identify the water demands and impacts associated with future growth.

Additionally, states should develop integrated growth and water resource scenarios so that the consequences of various growth scenarios can be evaluated for both the near and long term.

Water continues to move from farms to cities, with expected and sometimes unexpected results. The social, economic and environmental results are important and sometimes are not well understood.

Water transfers and declining rural economies based on irrigation, dwindling surface and ground water supplies and other water use related changes, as well as growing instream water demands for environmental and recreational uses, are all redefining our quality of life.

Water Policy and Growth

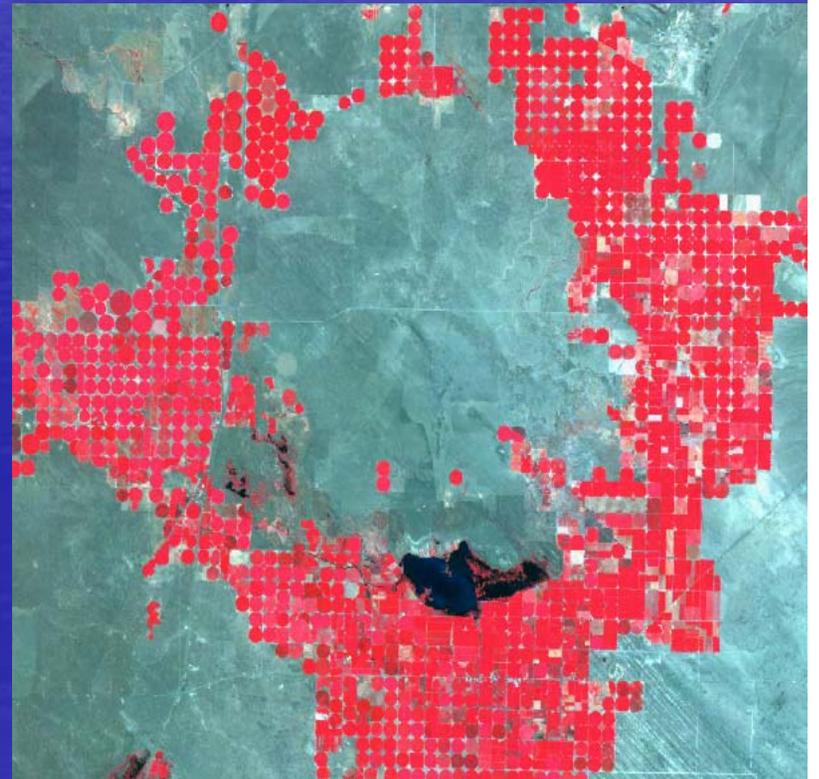
- Risk and uncertainty
- General lack of data on water needs and past, present and future uses
- Climate change and variability
- Endangered species' and other instream uses and outflows to bays and estuaries
- Increasing energy needs
- Unquantified Native American water rights

To Foster Sustainable Growth Policies

1. Identify present/future water requirements
2. Develop integrated growth impact scenarios
3. Increase available storage capacity
4. Present scenarios to local decision makers

Priority Water Information Needs

- Available Surface and Ground Water Supplies
- Present Water Uses
- Snowpack (NRCS)
- Streamflow (USGS)
- Evapotranspiration (NASA Landsat 8)
- Climate Change Impacts & Adaptation



Water Law 101

- Law of Prior Appropriation
- First in Time, First in Use
- Priority Dates and Water Duties
- No Injury
- Use it or Lose it! (Non-speculation)
- Forfeiture and Abandonment Statutes
- Water Rights Transfers
- Consumptive Water Use

Water Policy and Growth

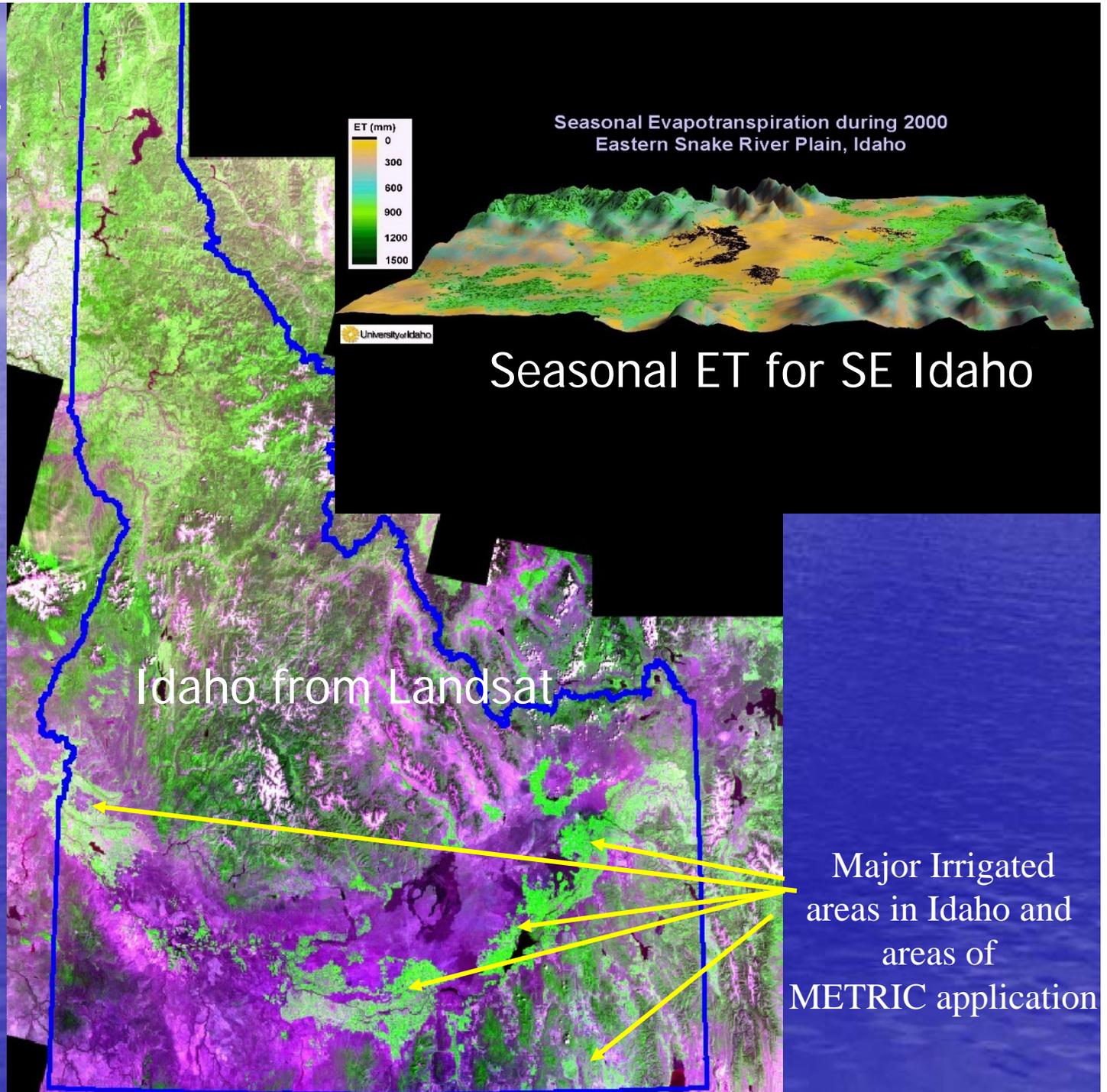
- More water is moving from agricultural to urban uses.
- Applications for new water use, water right transfers, etc. should consider local, tribal and watershed group plans.
- Third party impacts should be considered, including adverse effects on rural communities.
- Identify feasible alternatives to water transfers from agriculture to other water uses.



Other Selected Water Management Challenges

- Ground water/surface water interactions
- Interstate compacts/administration
- Water shortages and “calls” on the river
- Wetlands delineation and jurisdiction
- Coastal zone protections/restoration
- Flood control and watersheds management

Vegetation,
Water and ET
are variable
in space and
time



Make a Map of Idaho - Windows Internet Explorer

http://maps.idwr.idaho.gov/et/viewer.htm

Idaho Department of Water Resources Evapotranspiration

Layers | Legend | Metadata

- Base Map
- Evapotranspiration
 - 2003 -- P39R30
 - 2003 P39R30 6/5, 2
 - 2003 P39R30 7/7, 2
 - 2003 P39R30 8/24,
 - 2003 P39R30 6/1-9,
 - 2003 P39R30 LAND
 - 2000 -- Southern Idaho
 - 2000 Snake Plain 3/:
 - 2000 P3940 LANDS
 - 2000 -- P42R2930
 - 2000 -- P41R30
 - 2000 -- Lemhi
 - 1997 -- P42R30
 - 1985 -- P39R3031
- Background Images

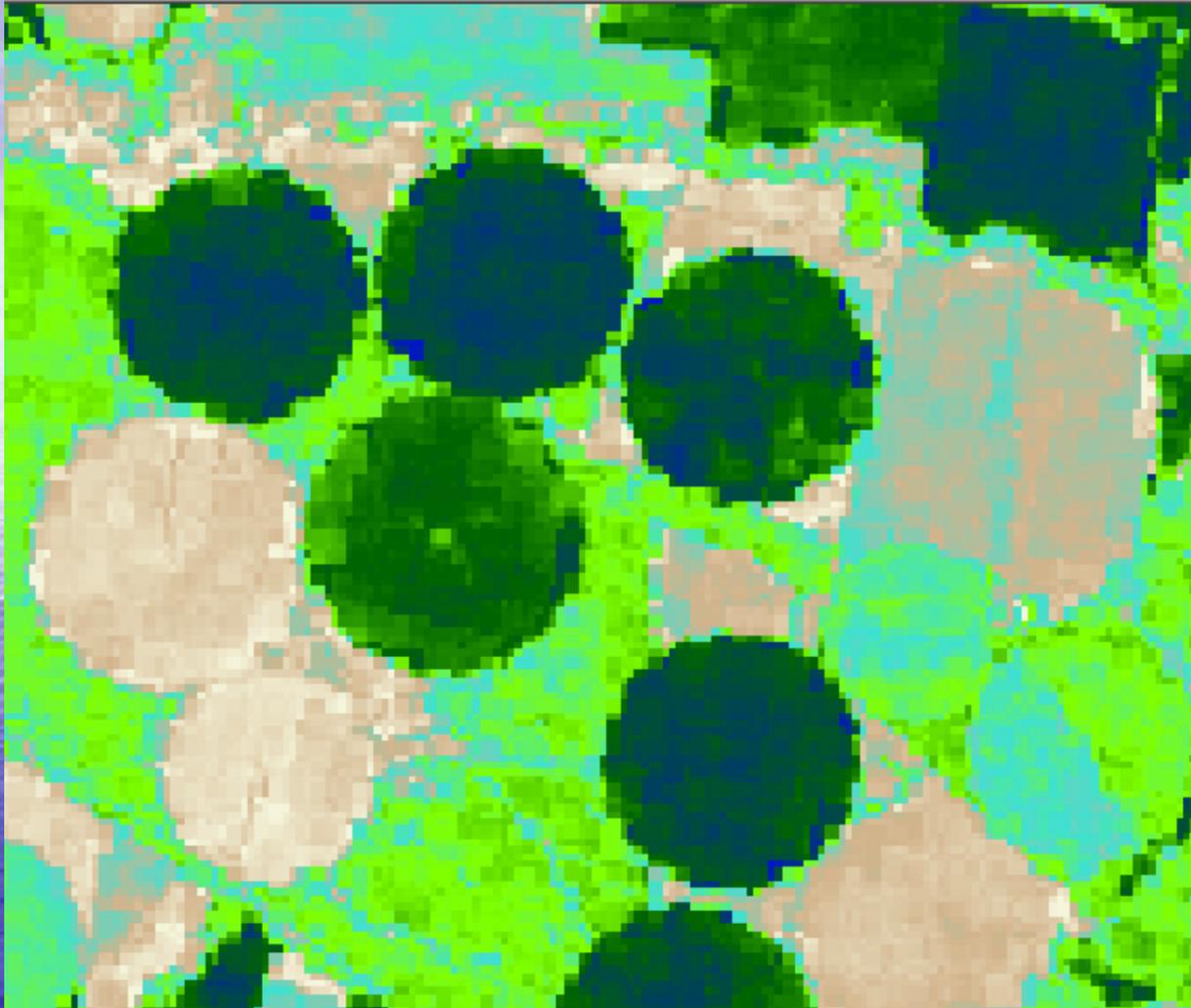
Zoom/Pan
Identify
Locate Address
Capture Screen
Print
Download
Help
Map Server Menu

Zoom In [Download GIS data from the Idaho FTP site.](#)

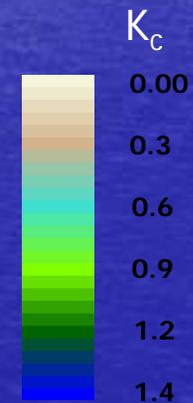
Active Layer
Counties
Refresh Map

<http://maps.idwr.idaho.gov/et/>

Why use High Resolution Imagery?



ET from
Landsat 5
with thermal
sharpened to
30 m



$$(K_c = ET_{act} / ET_{ref})$$

*ET from individual fields is essential for: Water Rights,
Water Transfers, Farm Water Management*



Arkansas River

Why use High Resolution Imagery?



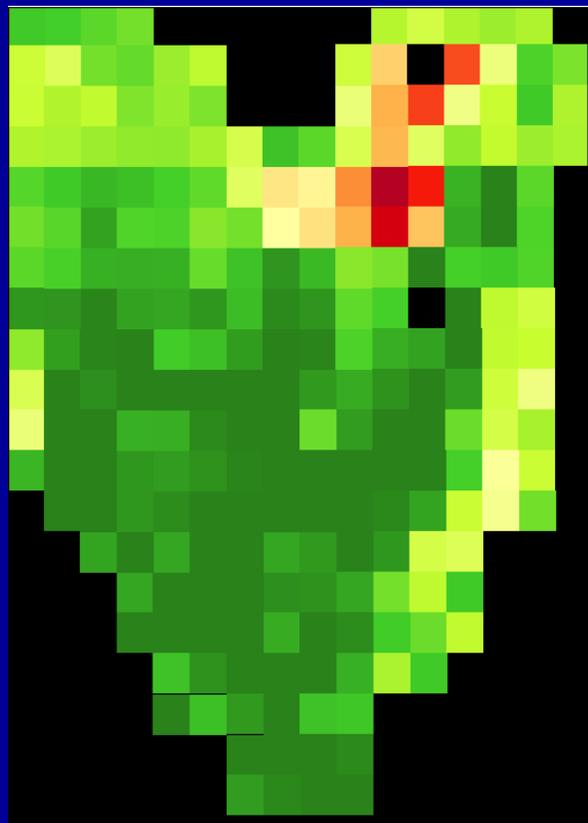
Landsat False Color
8/26/2002 10:33am

MODIS False Color
8/26/2002 11:02am

Multi-scale Ecosystem Health Monitoring

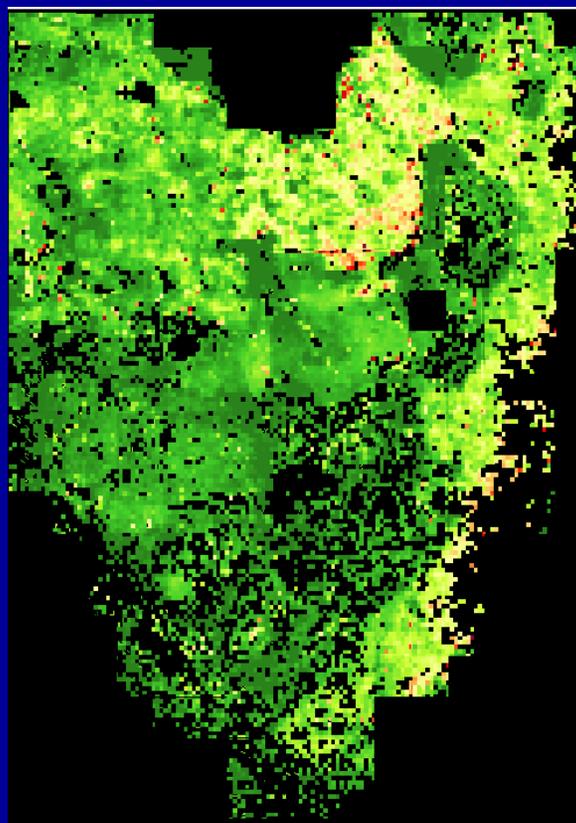
FLORIDA EVERGLADES

GOES (5km)



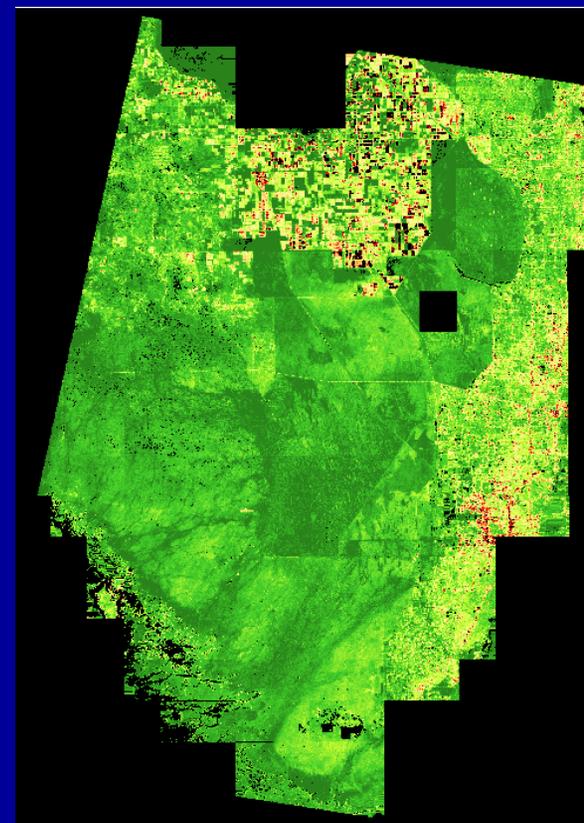
(hourly)

MODIS (1km)



(daily)

L7 (60m)



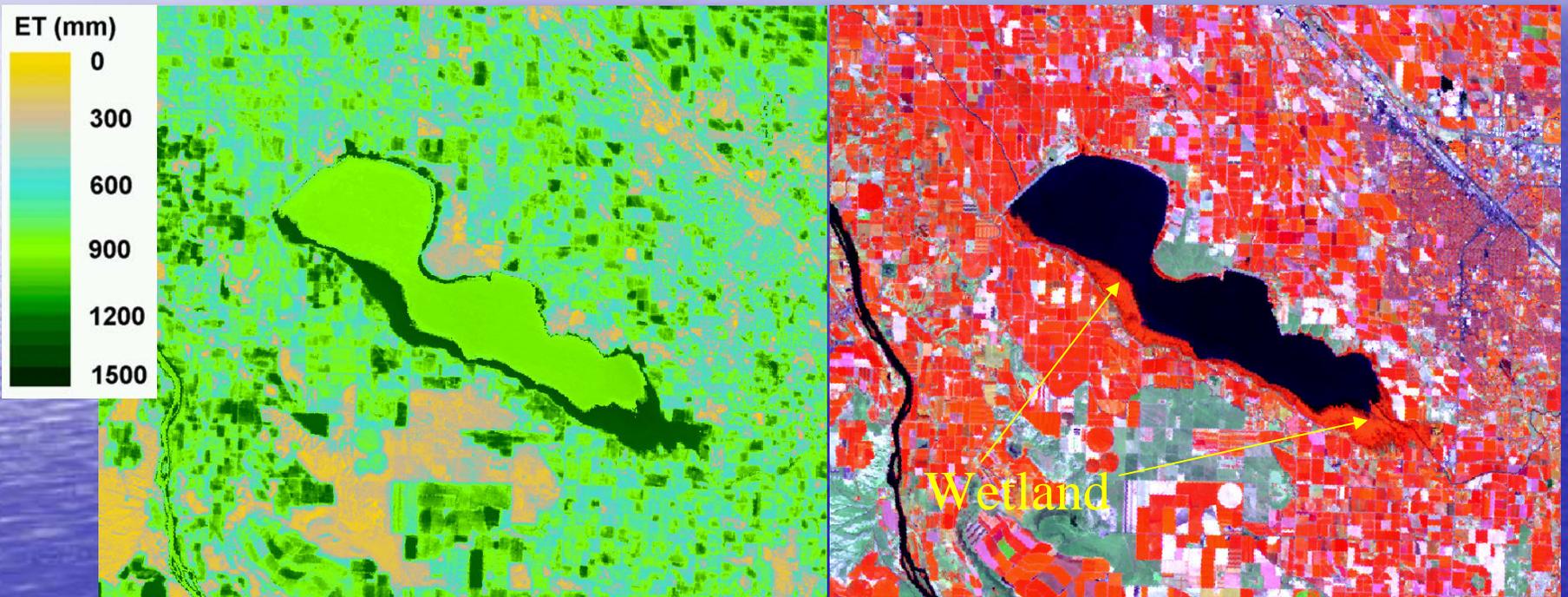
(monthly)

Evaporative stress



From M.C. Anderson, PI. Multi-scale remote assessment of land-surface hydrological response to natural and anthropogenic stressors - A case study in the Florida Everglades - proposal funded from NRA-03-OES-02 - Earth System Science Research ...

ET from wetlands and riparian systems



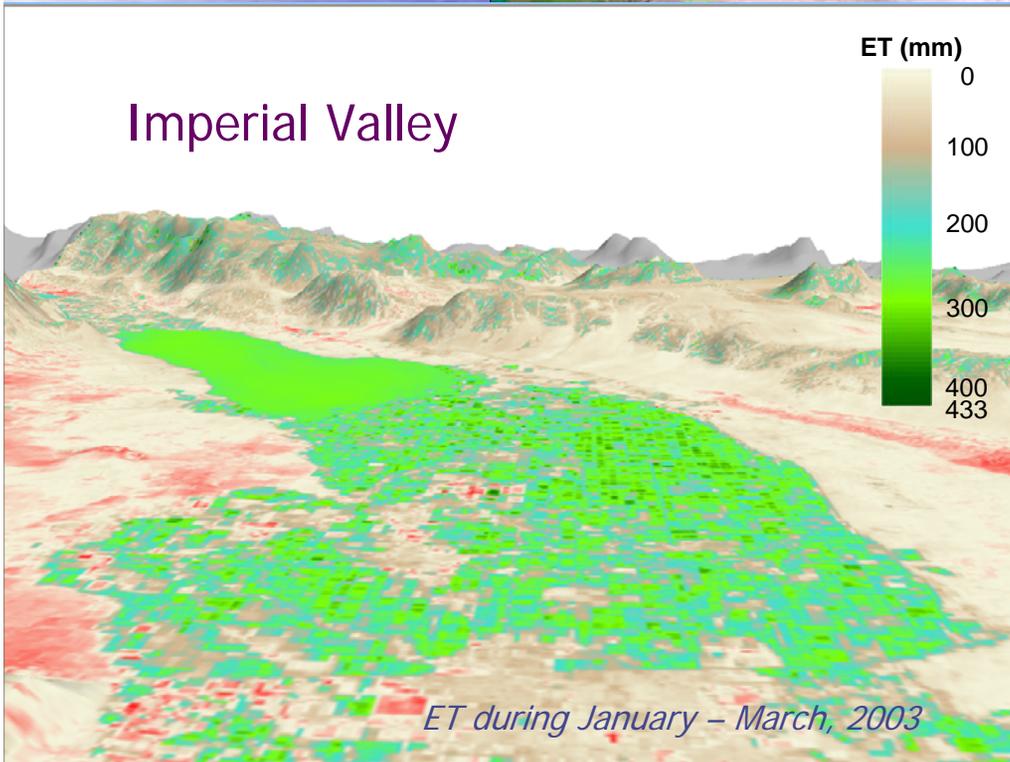
Boise Valley Seasonal ET 2000

Lake Powell and the Upper Colorado River



Shortage
Sharing and
Intentionally
Created
Surplus (ICS)
Water

Imperial Valley, CA
via Landsat 7





TODAY, SATELLITES PROVIDE A NEW GLOBAL PERSPECTIVE ON THE WATER CYCLE

The Earth Observing System -- systematic measurement of interactions among land, oceans, atmosphere, ice & life



Landsat



Aqua*

Exploratory missions to probe key Earth system processes globally for the first time



TRMM



GRACE*



Jason*



Terra



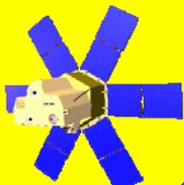
CALIPSO



Cloudsat



ICESat^



SORCE^

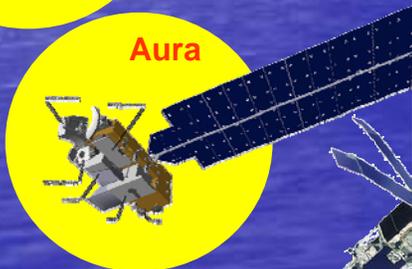


EO-3: GIFTS



EO-1: ALI & Hyperion

Aura



SeaWiFS

Operational precursor / Technology demos



NOAA/GOES

*FY02 launch (+ SAGE III)
^FY03 launch (+SeaWinds)

NOAA/POES*

Operational weather services missions for

LEADING TO THE QUESTION: WILL A NEW EPOCH OCCUR IN OUR LIFETIMES AND, IF SO, WHAT WILL BE ITS ATTRIBUTES?

IT IS OUR VIEW THAT WE ARE ON THE THRESHOLD OF A NEW EPOCH IN WATER MANAGEMENT PROVIDED WE CAN MOBILIZE OUR CAPABILITIES TO OBSERVE TOGETHER WITH OUR UNDERSTANDING AND ABILITY TO MODEL THE GLOBAL WATER CYCLE.

FACTORS THAT ARE ENCOURAGING THIS DEVELOPMENT INCLUDE:

- 1) EXPANDING CAPABILITIES TO OBSERVE HYDROMETEOROLOGICAL VARIABLES FROM SPACE.
- 2) AN EVOLVING CAPABILITY TO ASSIMILATE AND PREDICT, BASED ON IMPROVED MODELS ON AND ON BETTER DEFINITIONS OF INITIAL AND BOUNDARY CONDITIONS,
- 3) DEMANDS OF NATIONAL AND REGIONAL WATER RESOURCE COMMUNITIES WHICH ARE SEEKING TO ADDRESS THE NEEDS FOR SECURITY OF WATER SUPPLY, RELIABLE WATER QUALITY, AND RESPONSIBLE GROUND WATER USE WITHIN A FRAMEWORK OF INTEGRATED WATER RESOURCES MANAGEMENT,

Building Partnerships

- Western States Federal Agency Support Team (WestFAST)
- Western Farming/Water Organizations
- Academic Community
- Private Industry
- Environmental Community
- Native American Community

Priority Water Information Needs

- Gather and disseminate real-time data
- Increase support and funding for data
- Identify data gaps and ways to close gaps
- Foster remote sensing capabilities
- Reduce costs through technology
- Increase in-kind contributions from existing cooperators
- Find new sources of funding

Conclusion

- Good decisionmaking and risk management require sound science and adequate data.
- The states have a primary and critical role in western water management.
- Sustainable water use in the West will depend in large part on state initiative and innovation.
- The federal government is a substantial land-owner, has a significant regulatory presence, and has a critical role in water/climate research.
- Federal-State cooperation is vital, with financial and technical assistance, and collaboration with academia and other stakeholders.



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