This presentation premiered at WaterSmart Innovations

watersmartinnovations.com

HydroPoint Data Systems

National Evapotranspiration Data
For Water Agencies

WeatherTRAK®
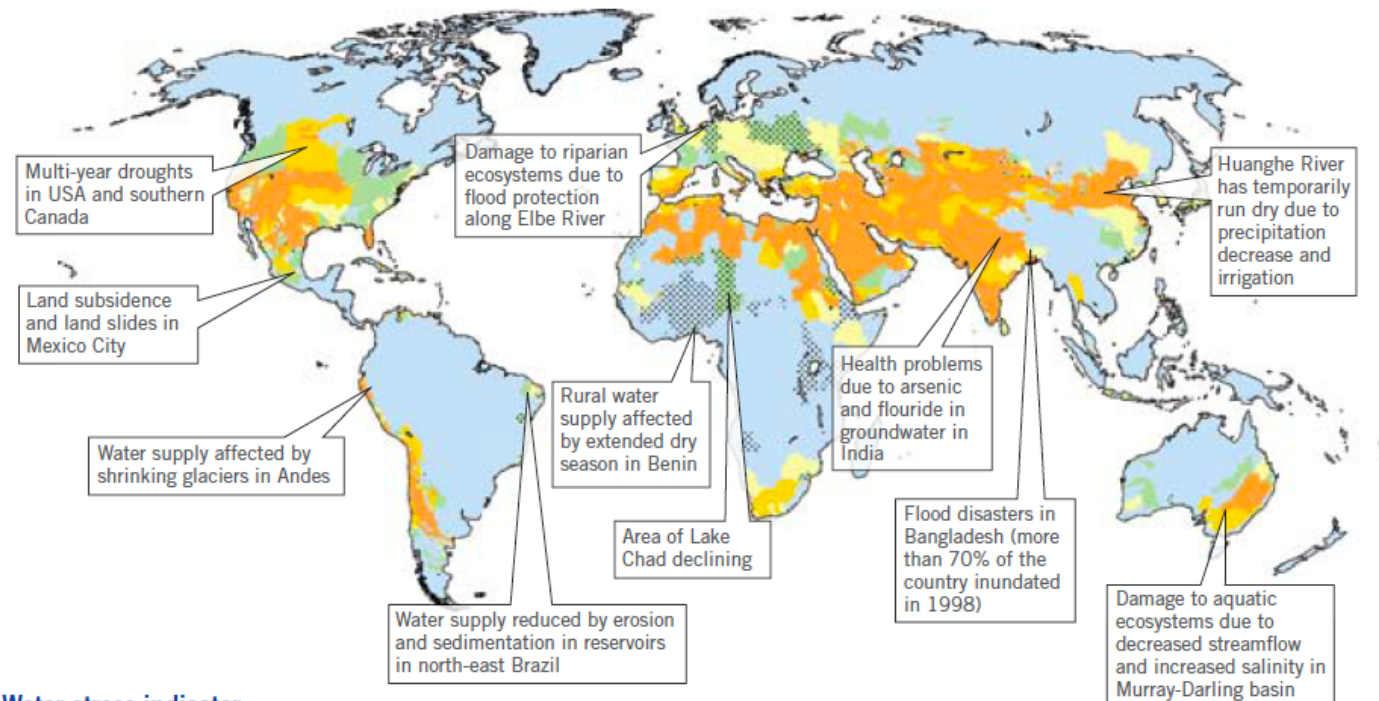
The proven leader in smart water management.

The era of abundant water supplies is over

As Scarcity Increases
Intelligent Resource Analysis Is Critical

Figure 1. Examples of Global Freshwater Resource Risks

Multi-year droughts in USA and southern Canada

Damage to riparian ecosystems due to flood protection along Elbe River

Huanghe River has temporarily run dry due to precipitation decrease and irrigation

Land subsidence and land slides in Mexico City

Water supply affected by shrinking glaciers in Andes

Rural water supply affected by extended dry season in Benin

Health problems due to arsenic and flouride in groundwater in India

Area of Lake Chad declining

Flood disasters in Bangladesh (more than 70% of the country inundated in 1998)

Damage to aquatic ecosystems due to decreased streamflow and increased salinity in Murray-Darling basin

Water supply reduced by erosion and sedimentation in reservoirs in north-east Brazil

Water stress indicator:
withdrawal to availability ratio

no stress   mid stress   very high stress

0   0.1   0.2   0.4   0.8

No/low stress and per capita water availability <1,700m³/yr

Water withdrawal: water used for irrigation, livestock, domestic and industrial purposes (2000)

Water availability: average annual water availability based on the 30-year period 1961–90

Source: B.C. Bates et al. "Climate Change and Water IPCC," Technical Paper VI of the Intergovernmental Panel on Climate Change.

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Evapotranspiration Data: ET Powerful Tool For Water Planning

- **What is ET**
  - Evapotranspiration
    - Originally developed to determine agricultural water demand
- **Why Use ET?**
  - Primary driver for water need
  - Allows for depletion irrigation which conserves water while improving plant health

evapotranspiration = transpiration + evaporation

transpiration

trees   grass

evaporation

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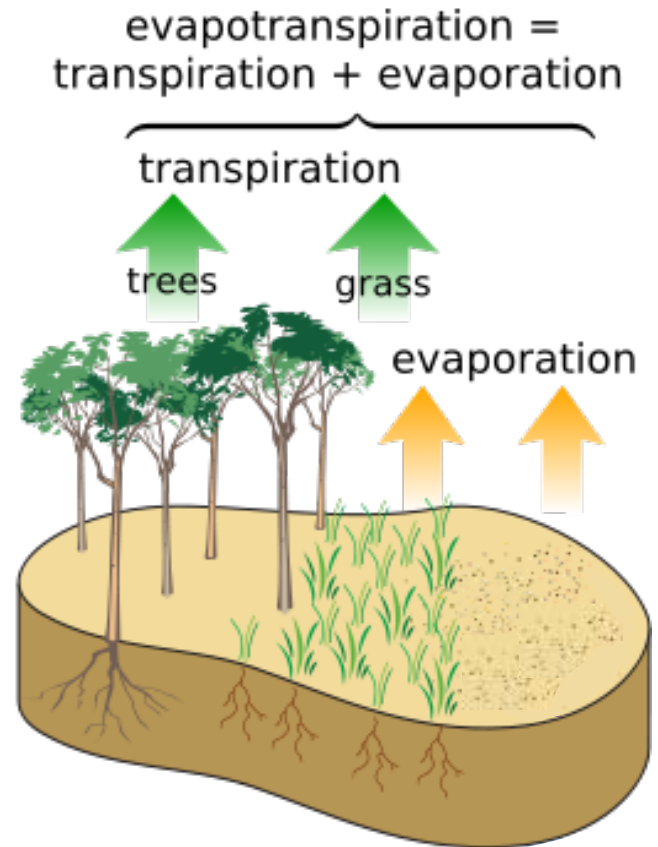
How Agencies & Corporations Use ET Data

- **Short and long-term strategic and system planning**
- **Water demand calculations for developers / builders**
- **Agricultural crop and landscape water demand calculations**
- **Weather based irrigation controllers daily irrigation**
- **Water budget billing systems calculations**
  - (# of residents) (gpcd) + (ET) (Landscape factor) (Daily ET) = Water Budget

Determining ET
Not All ET's Are Created Equal

- **Determining ET – Main approaches**
  - **Lysimeter**
    - Most accurate measuring device
    - Expensive and problematic outside of a laboratory
  - **ASCE Penman-Monteith** (4 parameters)
    - Accepted as international standard
    - Calculation using at least 4 weather parameters
      - Temperature, Solar Radiation, Wind, Humidity
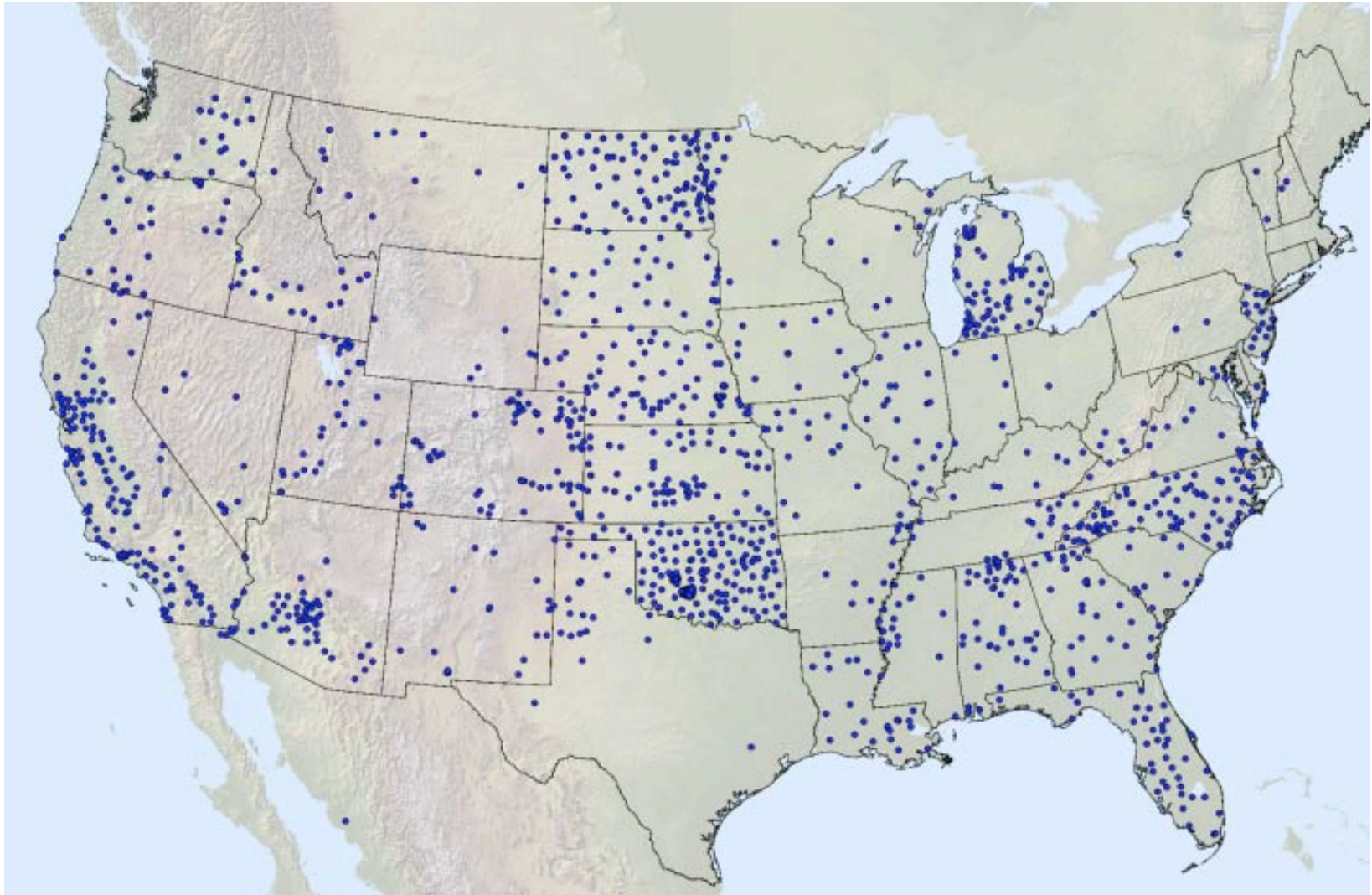   - Highest quality calculated ET
      - within 1% of Lysimeter
  - **Hargreaves** (1 parameter)
    - Temperature only
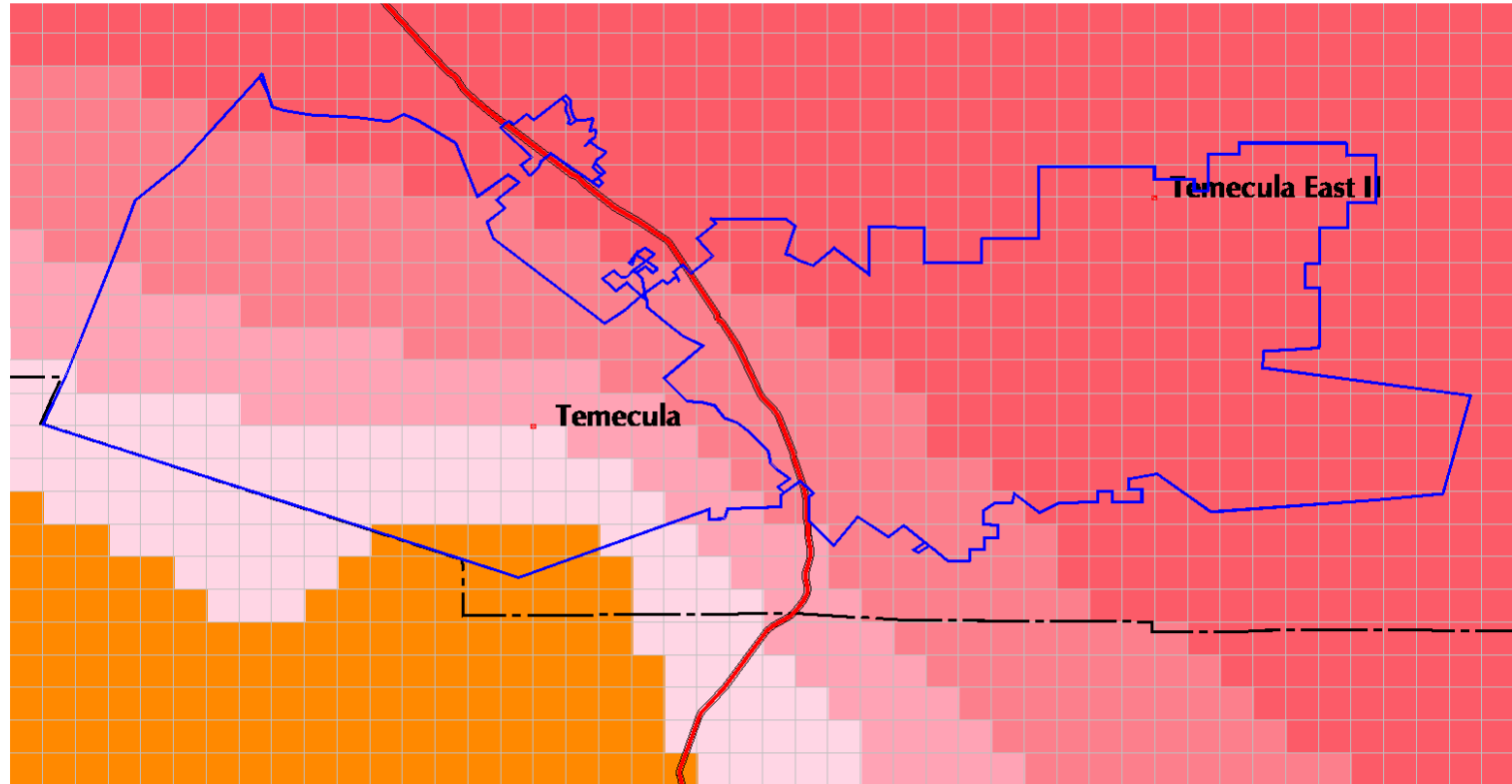   - Inaccurate as much as 300% due to lack of key ET weather drivers
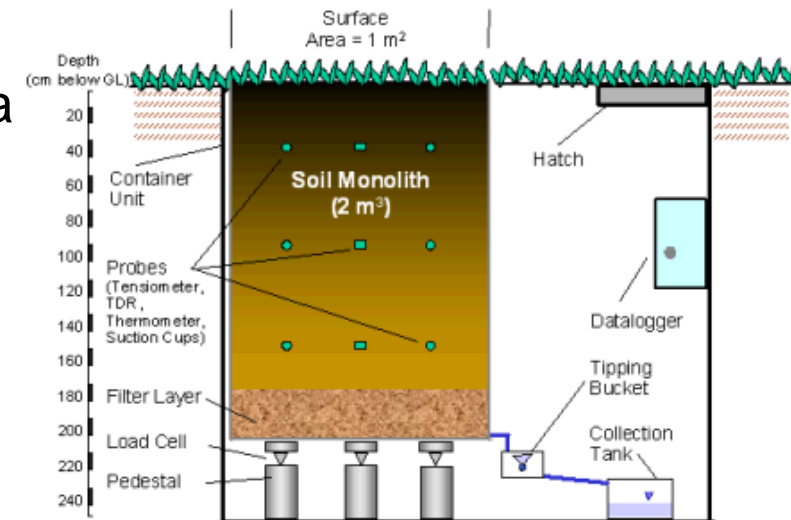
Lysimeter

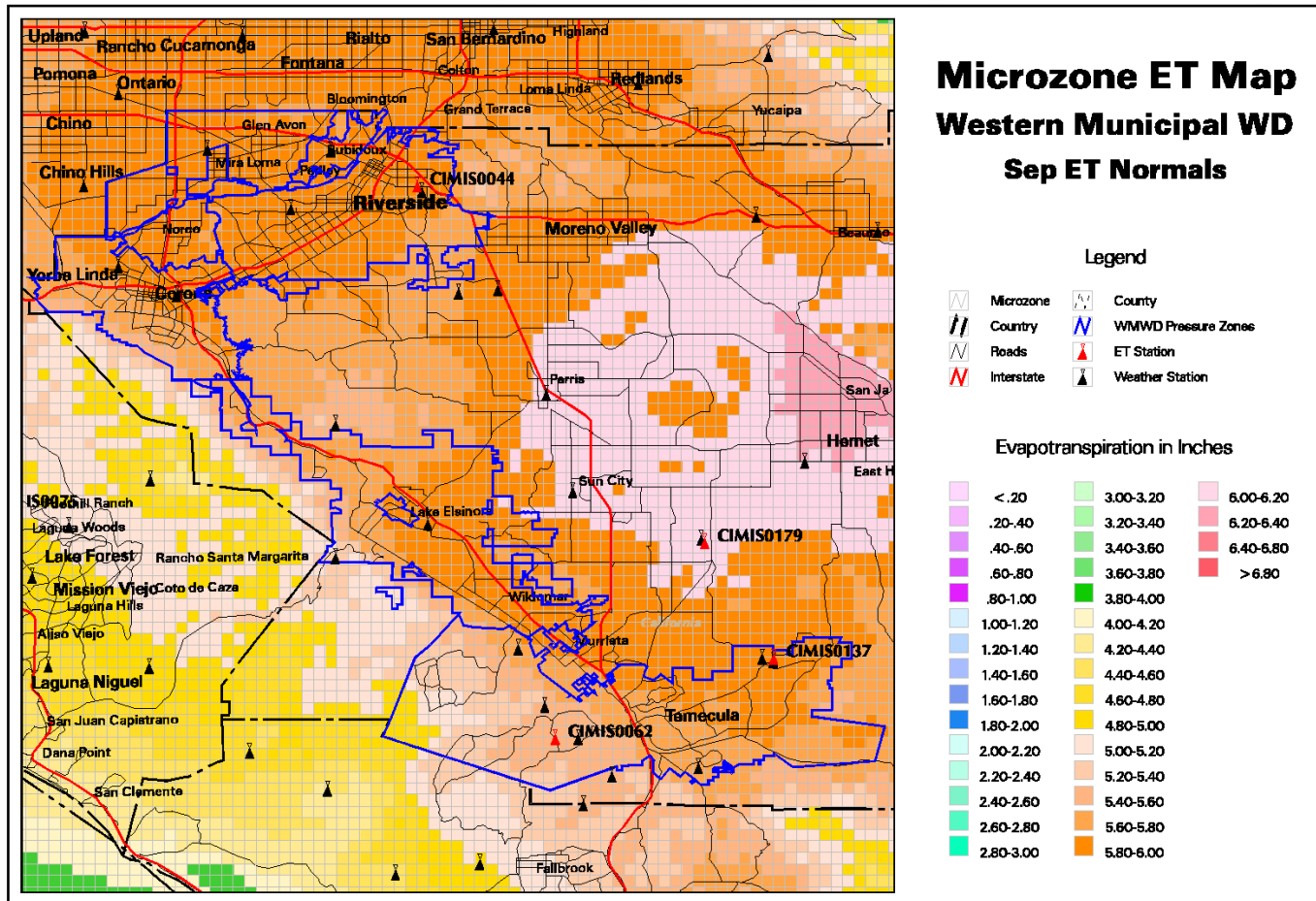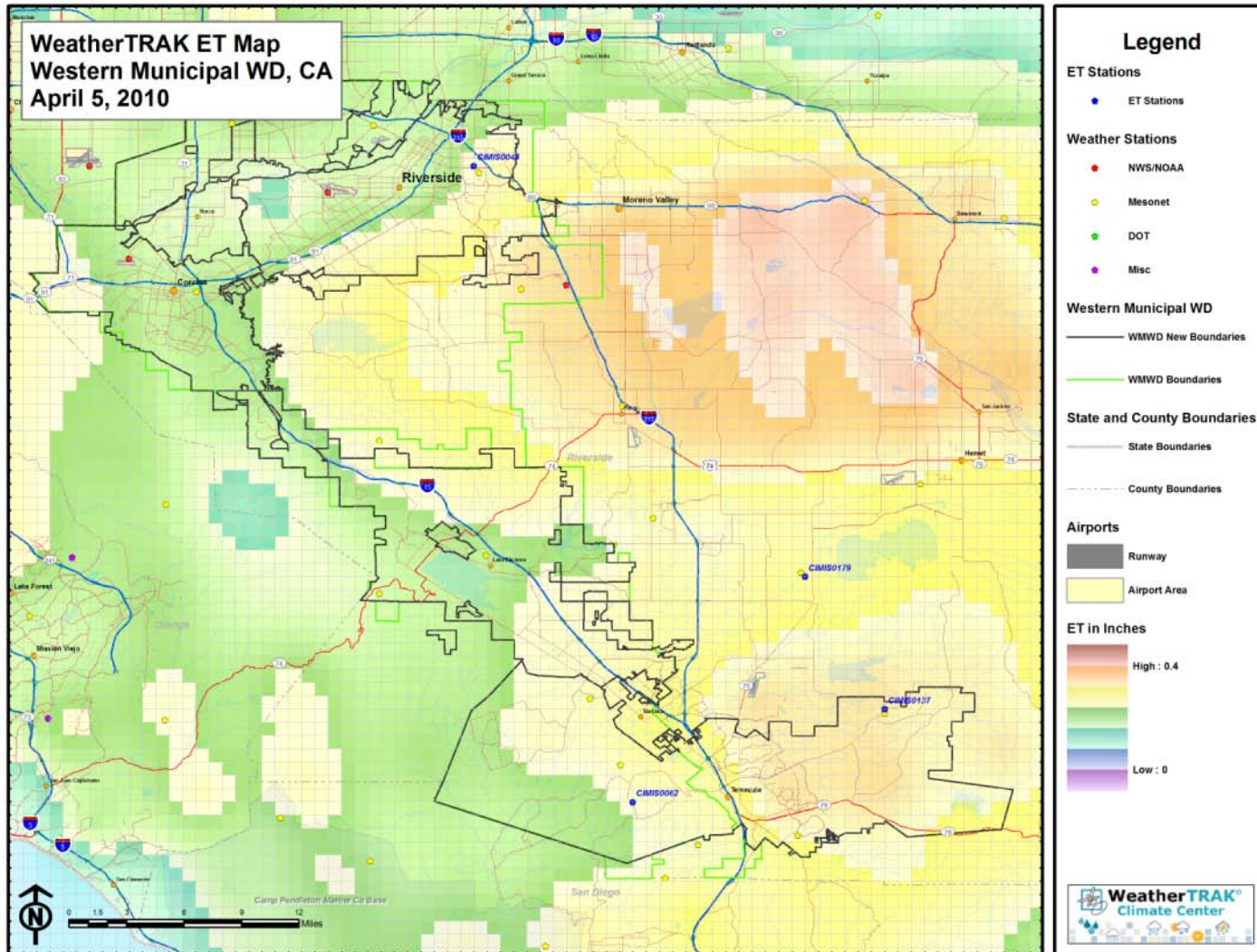# ET Weather Stations in US

Key Issues with ET Measurement:
Weather Variation Even Across Short Distances

Temecula East II

Temecula

Evapotranspiration in Inches

< .20	1.00-1.20	2.00-2.20	3.00-3.20	4.00-4.20	5.00-5.20	6.00-6.20
.20-.40	1.20-1.40	2.20-2.40	3.20-3.40	4.20-4.40	5.20-5.40	6.20-6.40
.40-.60	1.40-1.60	2.40-2.60	3.40-3.60	4.40-4.60	5.40-5.60	6.40-6.80
.60-.80	1.60-1.80	2.60-2.80	3.60-3.80	4.60-4.80	5.60-5.80	> 6.80
.80-1.00	1.80-2.00	2.80-3.00	3.80-4.00	4.80-5.00	5.80-6.00	

Legend

Microzone		Roads		County	
Rancho WD		Interstate		CIMIS Station	

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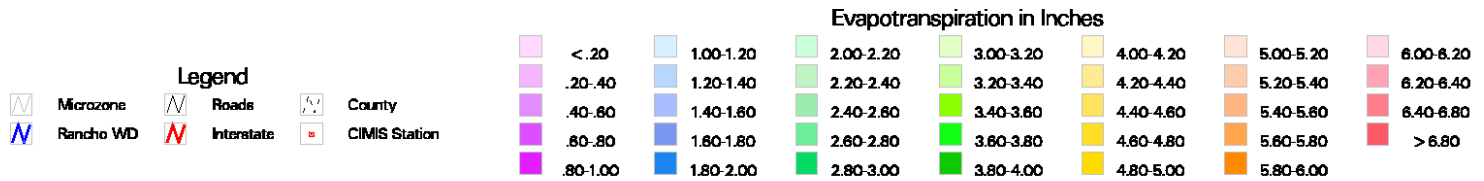
Key Issues with ET Measurement:
Weather Variation Even Across Short Distances

Key Issues with ET Measurement:
Weather Variation Even Across Short Distances

Need validation even with a Weather Station: Weather Station Data Can Be Incorrect

Even best of breed sources have issues relying on sensors alone.

Example: Solar radiation sensor reported 0 solar radiation mid-day, which is impossible.

Misrepresenting ET for locations as much as 50% too low.

ISSUE: Dependent on single source

Key Requirement
- Independent validation

Pomona - Los Angeles Basin - Station 78

| Date	Hour	Sol Rad (Ly/day)	Net Rad (Ly/day)	Air Temp (°F)	Wind Speed (MPH)	ETo (in)	Rel Hum (%)	Dew Point (°F)	PM ETo (in)
09/20/2009	0100	2	-130	65.2	2.4	0.00	89	61.8	0.00
	0200	5	-130	64.1	2.7	0.00	91	61.3	0.00
	0300	6	-131	62.8	1.6	0.00	92	60.3	0.00
	0400	5	-131	62.2	2.4	0.00	92	60.0	0.00
	0500	5	-131	62.0	2.2	0.00	93	60.0	0.00
	0600	12	-121	63.2	2.0	0.00	94	61.3	0.00
	0700	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	0800	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	0900	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	1000	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	1100	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	1200	-- M	-- M	-- M	-- M	-- M	-- M	-- M	-- M
	1300	1534	921	86.0	6.5	0.02	41	59.2	0.02
	1400	1385	814	87.3	7.1	0.02	38	58.9	0.02
	1500	1130	637	86.8	7.4	0.02	40	59.7	0.02

'Onsite' Weather Stations Issues

- **Quality**
  - Quality can be comprised due to improper maintenance, sensor failure
    - HydroPoint independently verifies all data by multiple methods, from all agencies/sources thus insuring that the best available data is used.
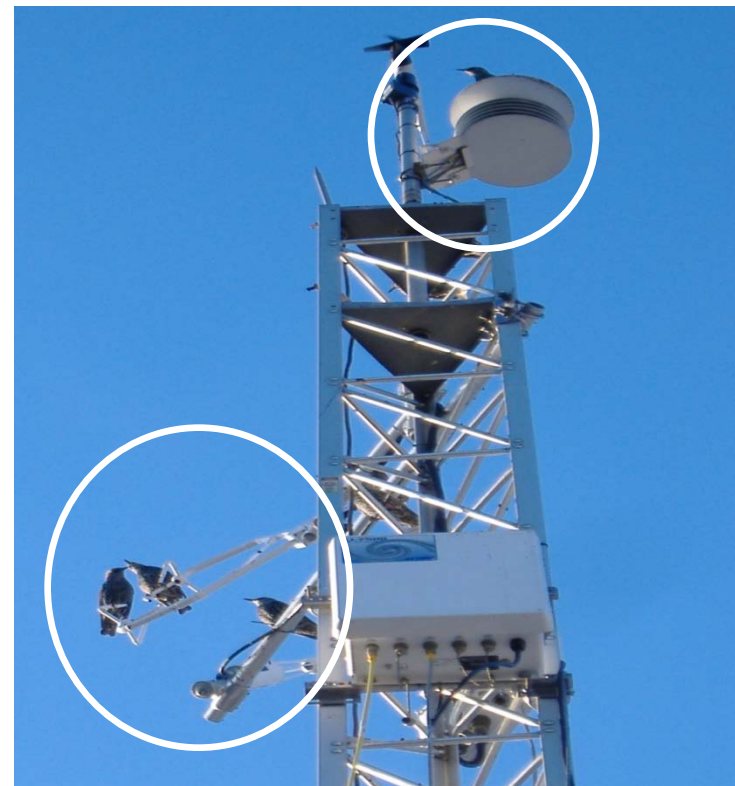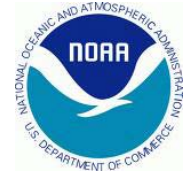
HydroPoint's: WeatherTRAK Climate Center ET Everywhere

- **ET Everywhere uses proven energy based modeling techniques, to calculate weather parameters for entire US and southern Canada**

- **ET Everywhere uses Weather Research Forecast (WRF) as basis for modeling calculations**
  - HydroPoint has made proprietary modifications to optimize WRF model for precision hourly ET calculations

- **Patented and proven accurate to 2% over a 1 year period**

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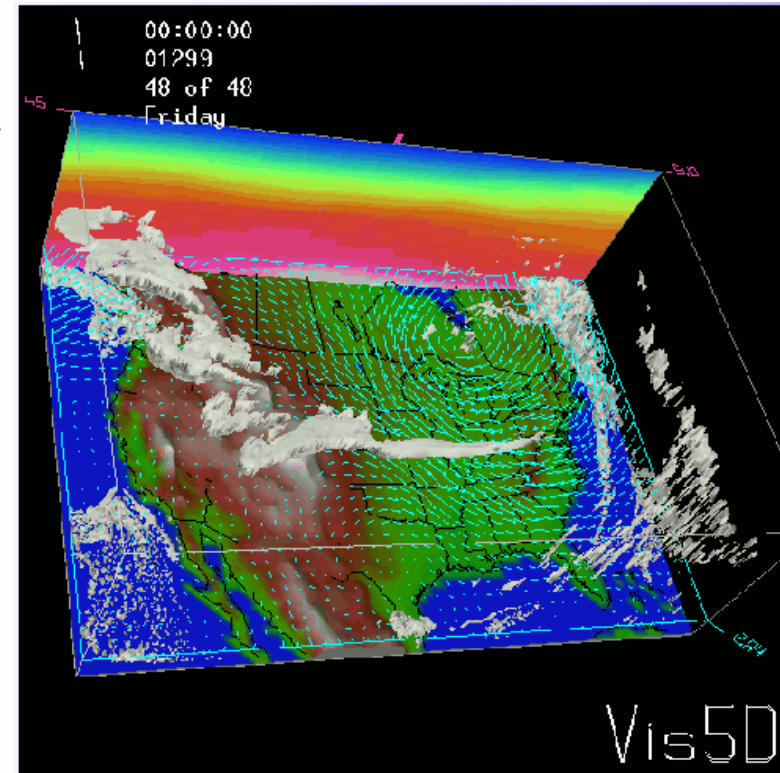
HydroPoint WeatherTRAK Climate Center
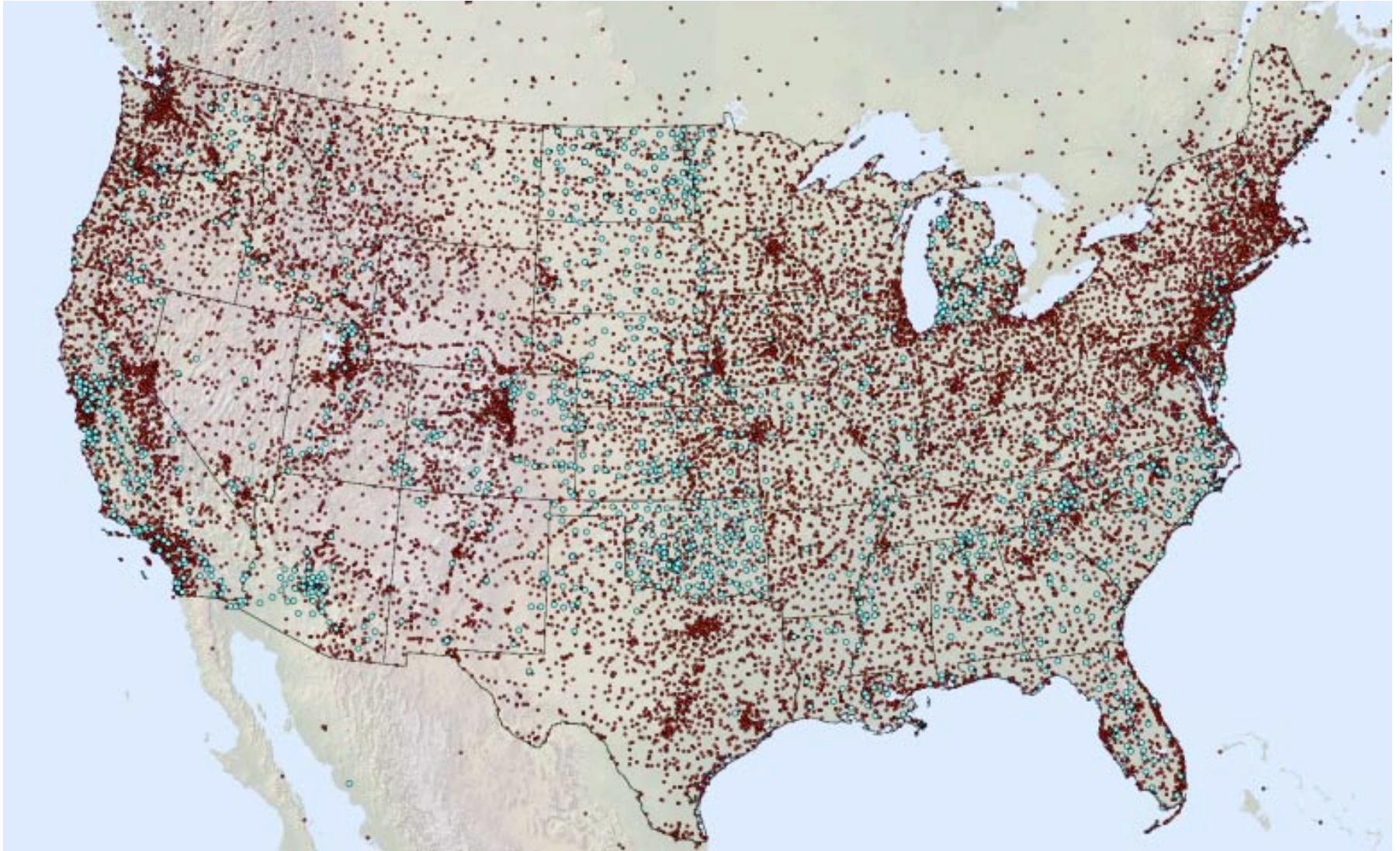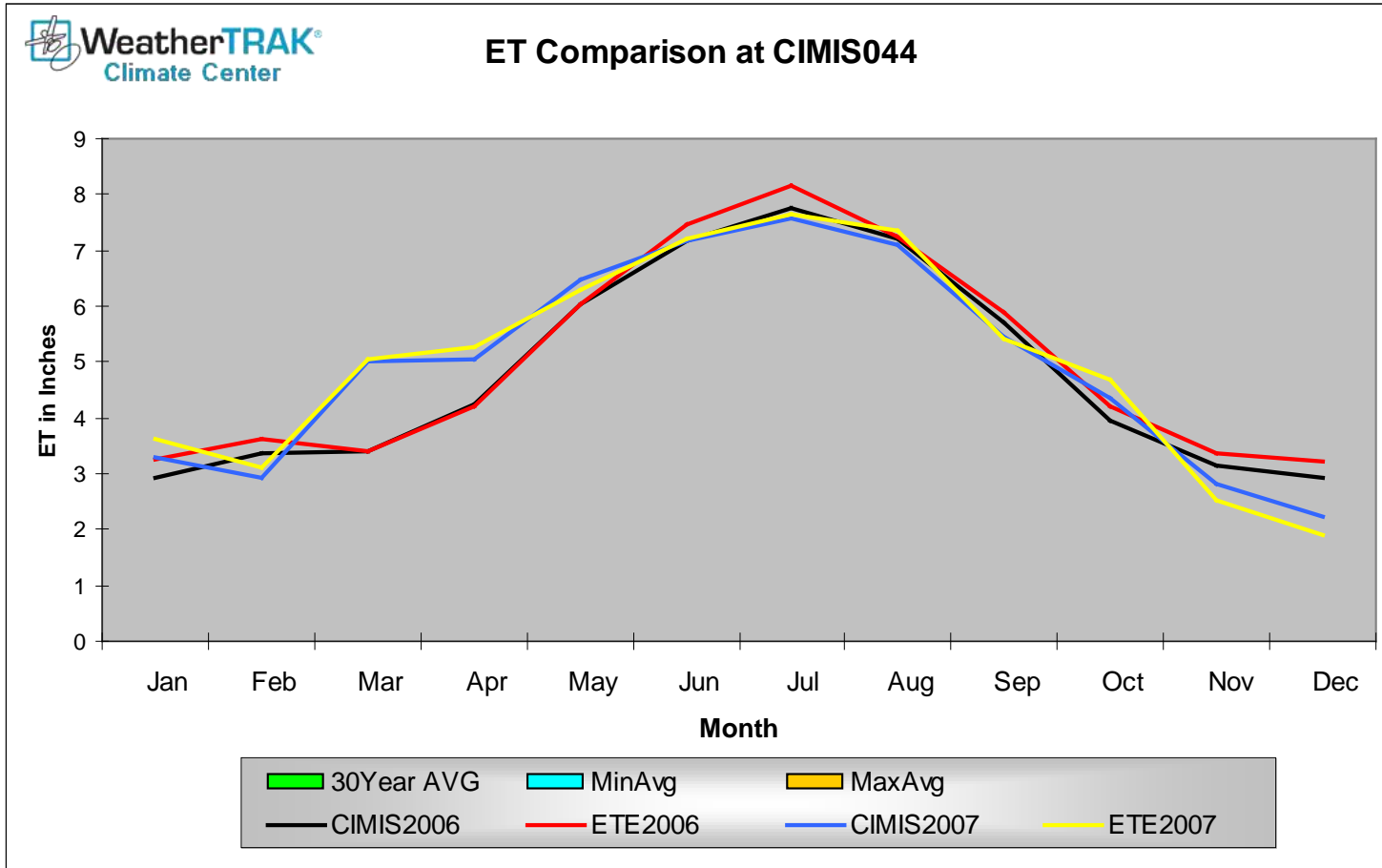# What We Do

- **What we do**
  - Providing hourly Penman-Monteith ET values for North America & Hawaii
    - Calculated over 60 billion ET values
    - 16 Million ET values calculated daily

- **How we do it**
  - Data Gathering
    - Over 8 million data points daily from over 40,000 weather data sources
      - Weather Stations, Radar Stations, Radiosonde, Vertical Atmosphere Profilers, River Gauges, Ocean Buoy Stations, Aircraft Data, Satellites
  - Data Verification
    - Quality filtering and climatologist validation
  - Data Modeling
    - Physics based balanced weather calculation
    - Incorporates over 256 localization categories, topography, surface information
  - Modeled Data Validation & correction
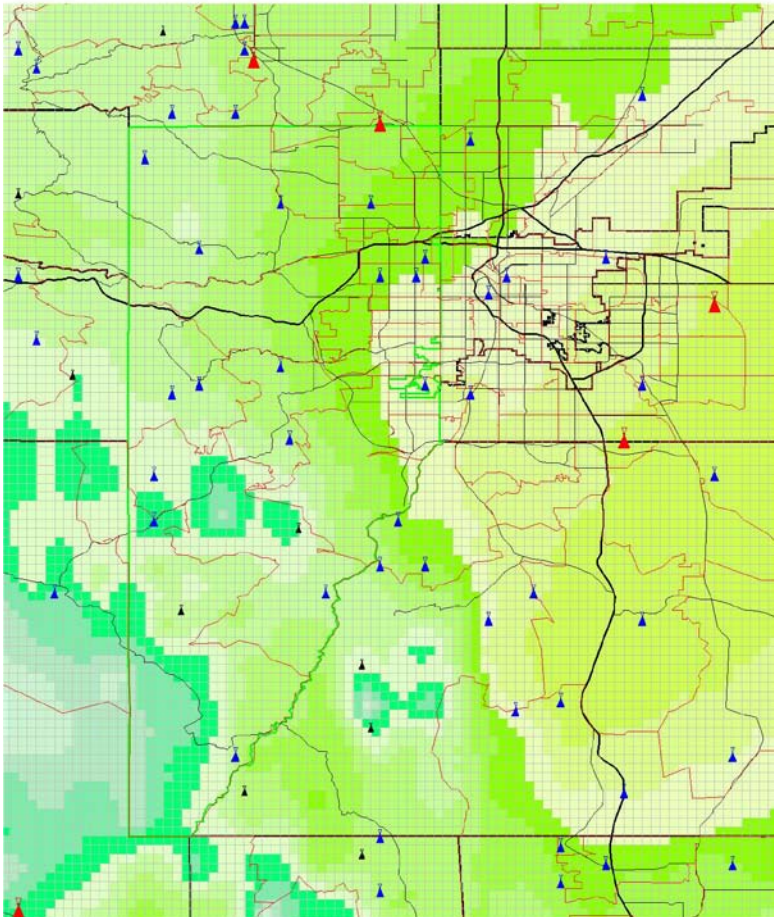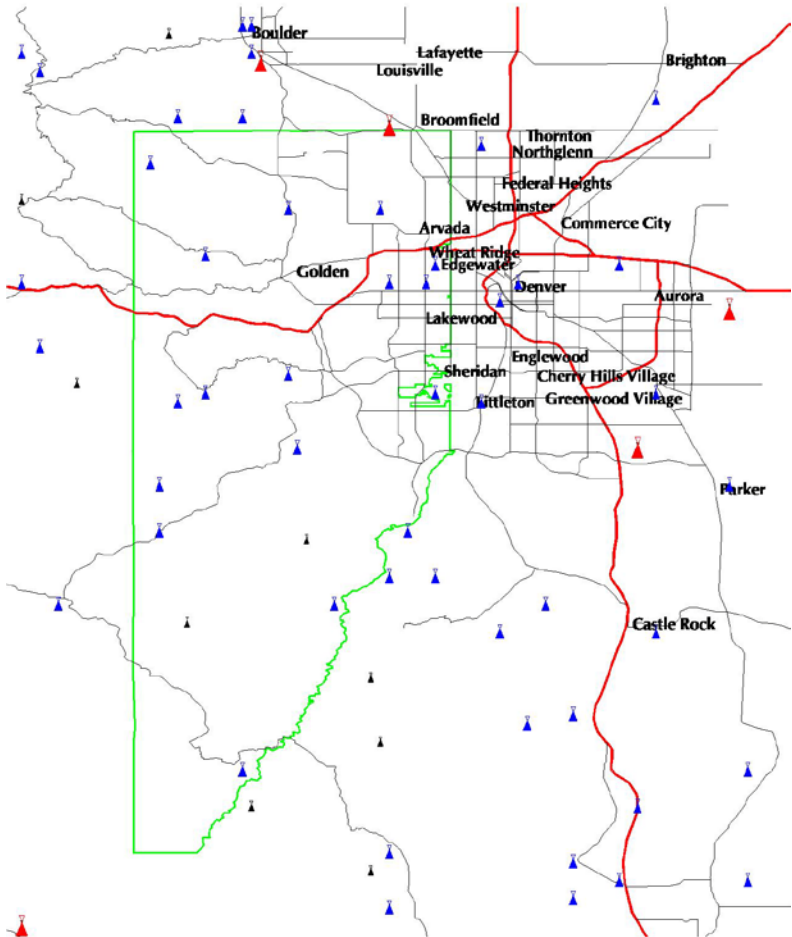   - Post calculation verification and correction

Collects data from over 40,000 stations

Weather Stations

Climate Center

Weather Stations Used by WeatherTRAK

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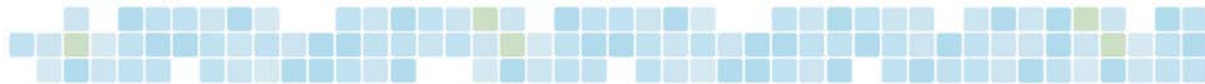
1 Year Comparison:
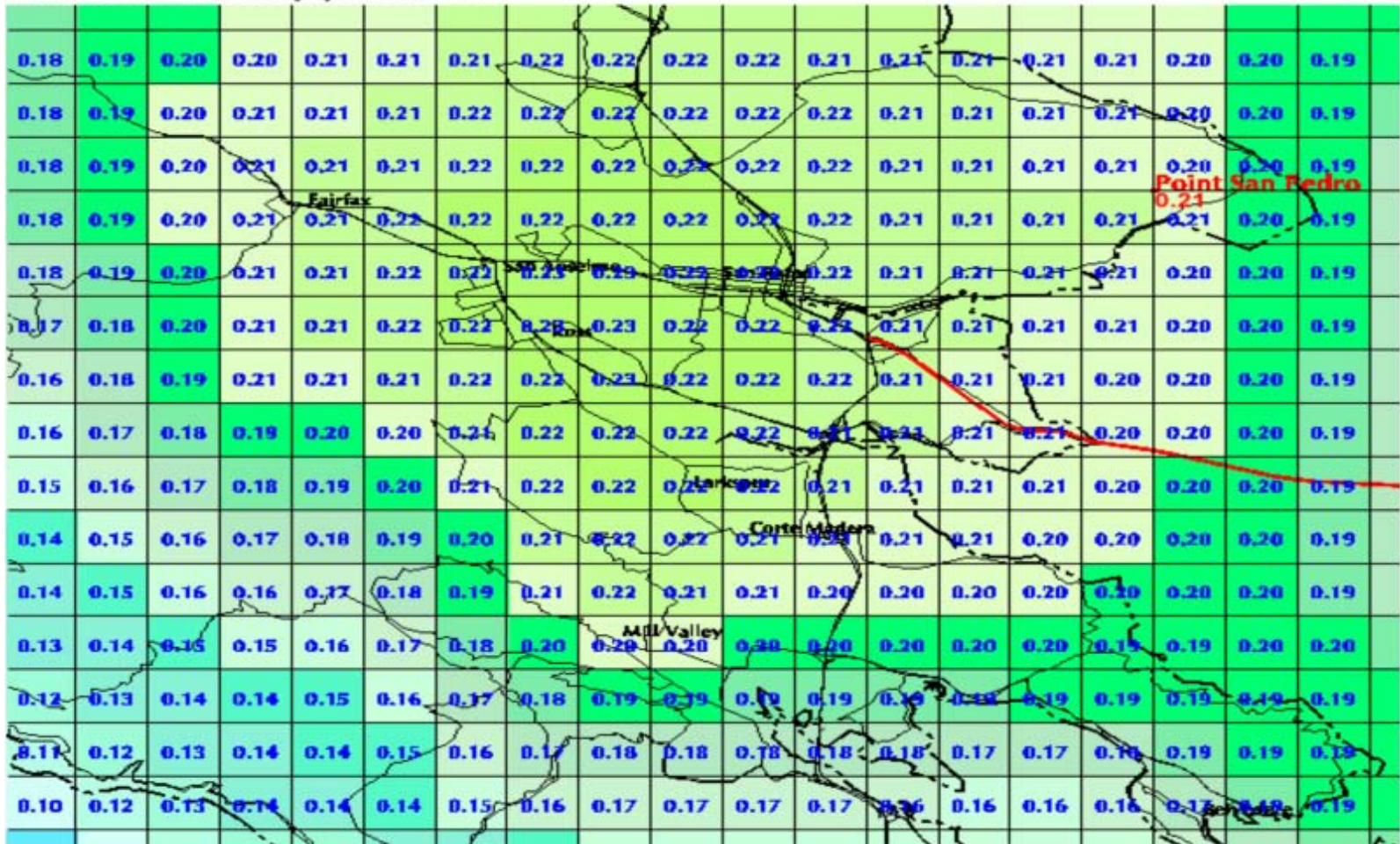# ET Everywhere vs. CIMIS Station

ET Comparison at CIMIS044

Colorado Weather Station versus ETE comparison

WeatherTRAK ETE
Each Square is 1 microzone - ET Values in blue
Cimis Station(s) in RED

HydroPoint Precision Weather Intelligence Applications Summary

- **Agency based billing**
  - Provide agencies with daily ET data used to determine customer water allocation for tiered rate structure

- **Short and Long Term Strategic Water Demand and Use Planning**
  - Report providing weather variation for a given region (such as a water agency)

- **Site Specific Measurement & Verification**
  - Weather normalized site specific comparison data for measurement and verification

- **Rain Water Harvesting Analysis**
  - Report providing historical water demand and supply utilized to determine Rain Water Harvesting tank sizing and RHW ROI

- **Water Demand and Weather Data for Environmental Impact Report (EIR)**
  - Report providing water requirements for specific region

- **Weather Event Reporting Services**
  - Snow Service
  - Historical Seasonal Trend

HydroPoint's WeatherTRAK ET Everywhere
High Resolution Site Specific Weather Intelligence

- **National coverage, every hour, every day**
- **Constant validation**
- **Fraction of the cost of setting up and maintaining your own mesonet**
- **Patented, proven, most accurate weather intelligence available**
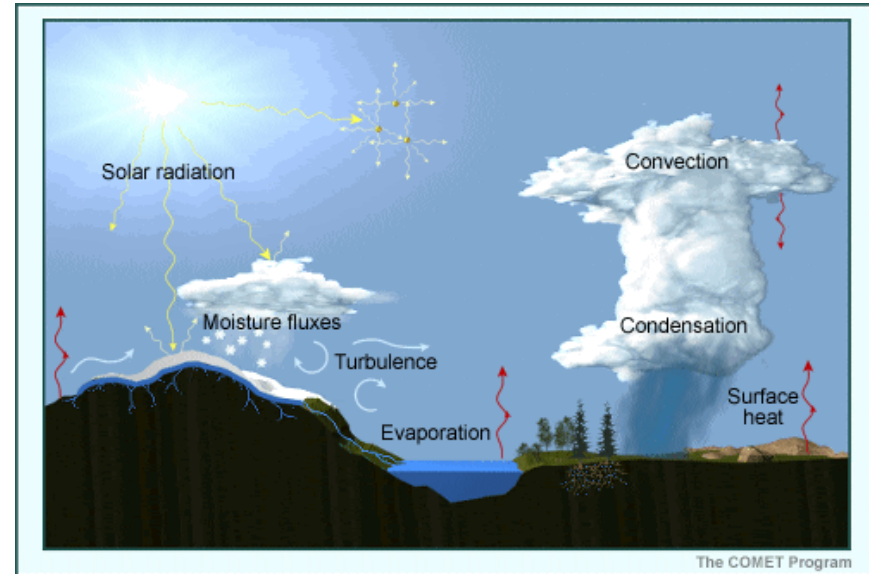
Thank you for your time!

Christopher Spain

Chief Strategy Officer, Chairman

HydroPoint Data Systems, Inc

cspain@hydropoint.com

(707) 285 3260

www.hydropoint.com