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## Design and Status of the Elevationl Transect and Monitoring Systems for Nevada's NSF EPSCoR Climate Change Research Program

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# Design and status of the elevation transect and monitoring systems for Nevada's NSF EPSCoR climate change research program

Brian Bird, Scotty Stracham, Dave Simeral, and Richard Jasoni



# NEVADA

Reno

Snake Range

Sheep Range

Las Vegas





# Sheep Range Transect



**Site 1**  
**Creosotebush (900m)**

**Site 2**  
**Blackbrush (1,670m)**

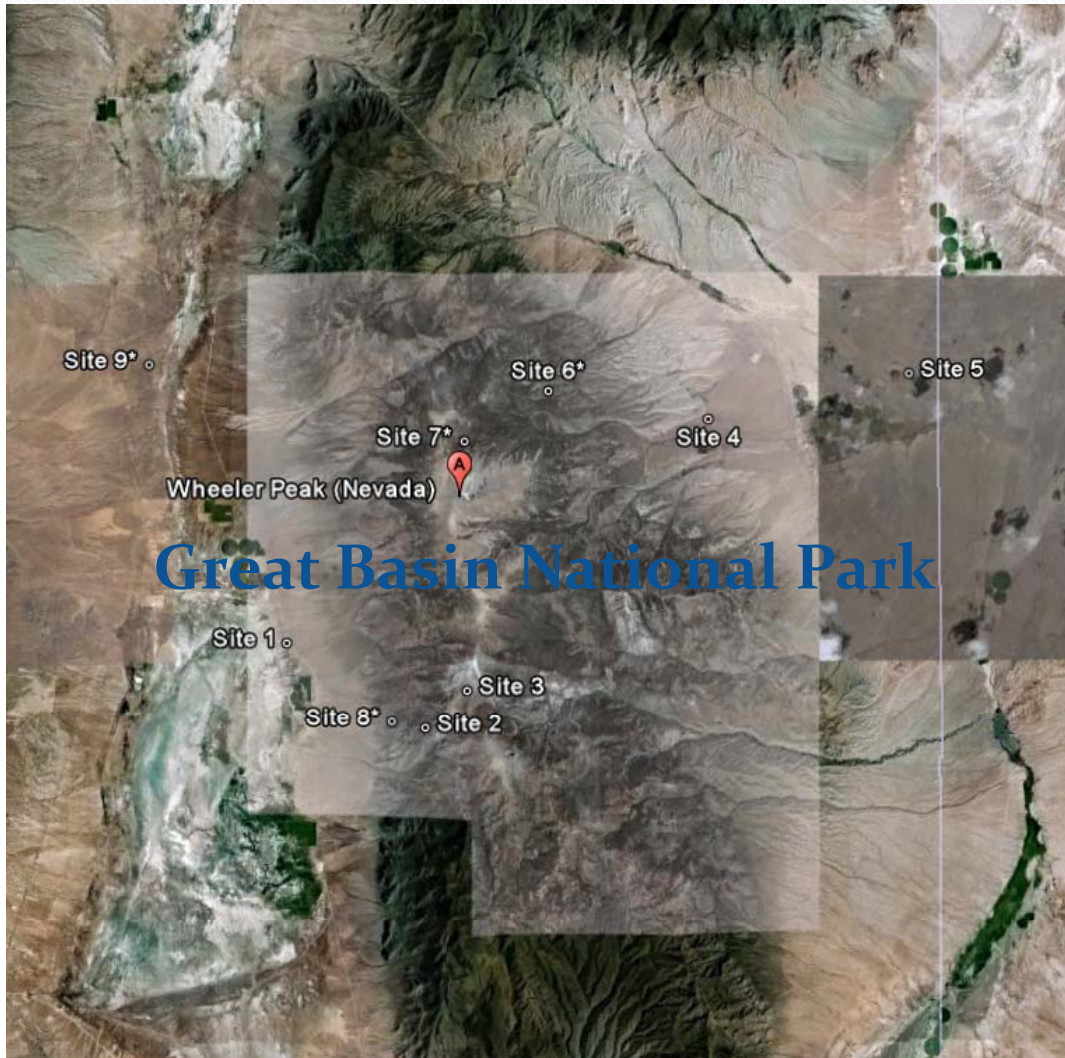
**Site 3**  
**Pinyon-Juniper (2,065m)**

**Site 4**  
**Ponderosa Pine (2,320m)**

**Site 5**  
**Hayford Peak Subalpine  
(3,015m)**

**\*Fish and Wildlife Permits**

# Snake Range Transect



## Site 1

Long Now Sagebrush (1,790m)

## Site 2

Long Now Montane (2,810m)

## Site 3

Long Now Subalpine (3,355m)

## Site 4

NV Land Conservancy Sagebrush (1,835m)

## Site 5

Snake Valley Phreatophytic (1,560m)

## Site 6\*

GBNP Pinyon-Mahogany (2,590m)

## Site 7\*

GBNP Subalpine (3,070m)

## Site 8\*

BLM Pinyon-Juniper (2,200m)

## Site 9\*

BLM SV6 Phreatophytic (3,070m)





# Current status of Transects

- Sheep Range Transect (5 sites) fully permitted through Fish and Wildlife Service.
- Site access agreement acquired from the Long Now Foundation for Snake Range (sites 1, 2 and 3).
- Snake Range site 4 access granted through the Nevada Land Conservatory.
- Waiting for site permit approval on sites 8,9 and 6,7 from BLM and GBNP respectively.
- Tower installed at North Las Vegas UWCC for testing of sensors and communications.
- Installation of towers will begin winter 2010 at lower elevational sites within the Sheep Range.
- Site Network communications testing will begin March-April

# Core Site Instrumentation

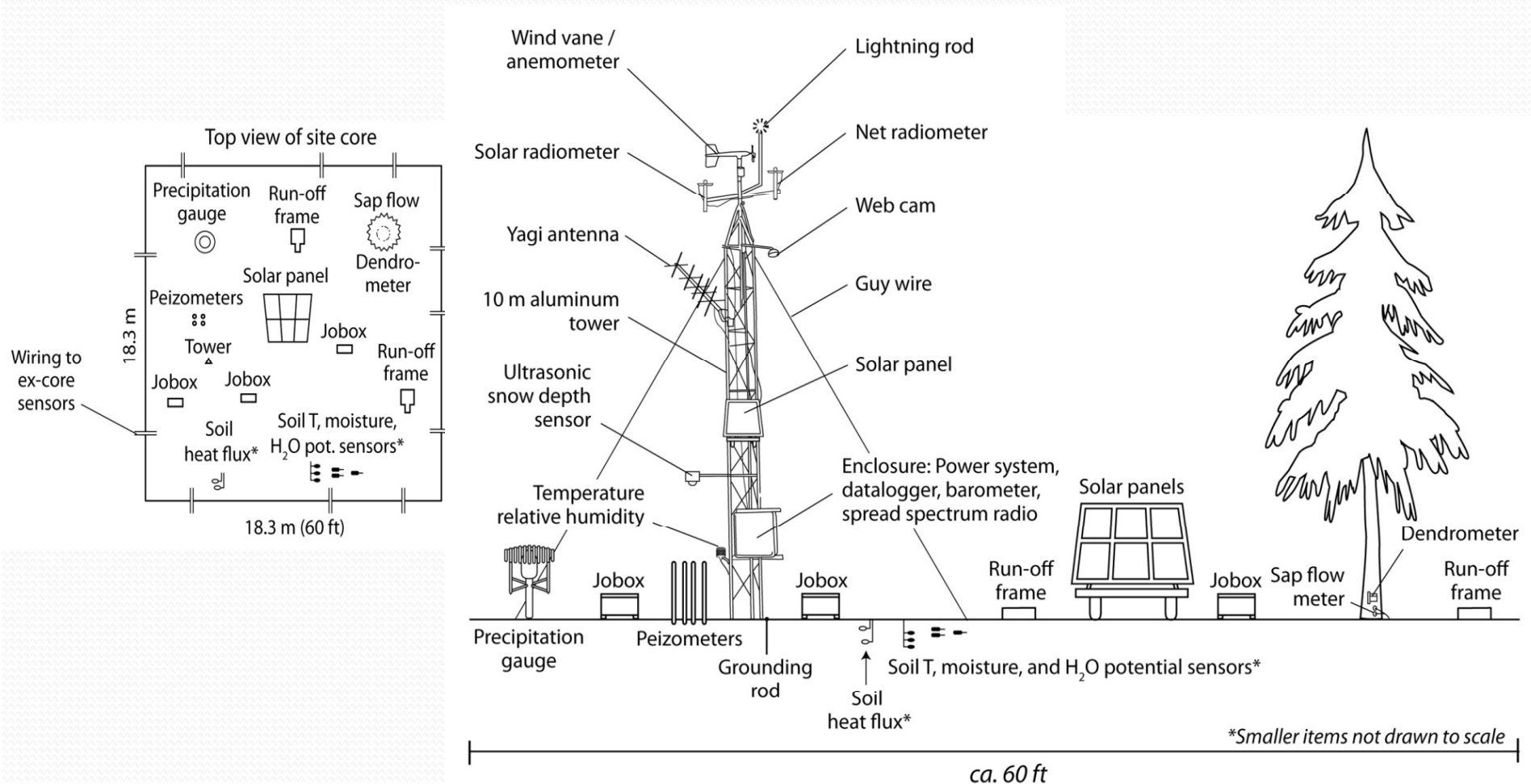


Image courtesy of: J. Arnone, D. Simeral and L. Wable



# Meteorological Instrumentation

- Wind speed/direction (Met one anemometer)
- Air temperature/Relative humidity (Vaisala chip)
- Precipitation
  - GEONOR (High elevation)
  - Hydrologic Services (Low elevation)
- Net Radiation (CNR<sub>1</sub>, Kipp and Zonen)
- Solar Radiation (Apogee PYR)
- Snow Depth (Ultra-sonic depth)



# Vadose Zone Sensors



**Dual probe heat pulse (DPHP) sensor**  
(soil thermal conductivity, diffusivity  
and specific heat)



**Soil water matric potential  $\Psi$**   
(-10 to 2500 kPa)



**Soil heat flux (G) plate**  
(self-calibrating “Van den Bos-  
Hoeksma” method, -30° to 70° C)

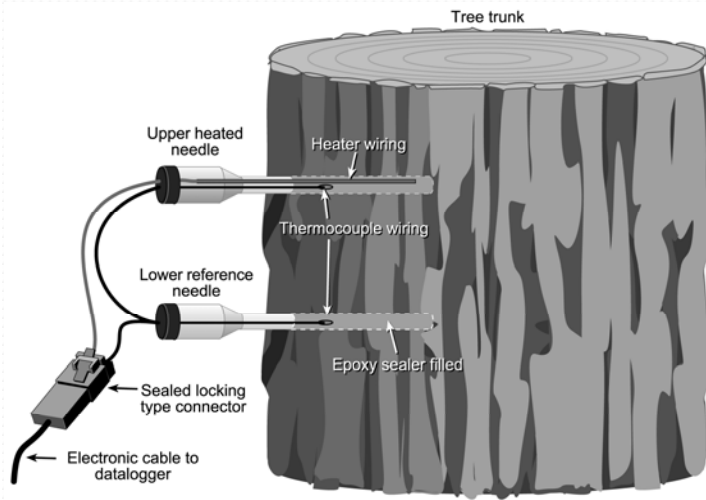


**Time domain reflectometry (TDR)**  
volumetric water content, soil water storage, water infiltration rates, depth of wetting front and infer ground water recharge. (installed at 3 depths)

**Soil temperature**

**Copper constant thermocouple (installed at 3 depths)**

# Vegetation Zone Sensors



## **TDP Sap Flow Sensors, Dynamax Inc., Houston TX.**

**(sensors installed at all dominant shrub and/or tree species)**



## **Point Dendrometers**

**(sensors installed at all dominant tree species)**

TDP Image from Kansas State Univ. [www.ksre.ksu.edu/pr\\_irrigate/Photos/Probe.jpg](http://www.ksre.ksu.edu/pr_irrigate/Photos/Probe.jpg)





**100 Tree Tower Testing Facility**

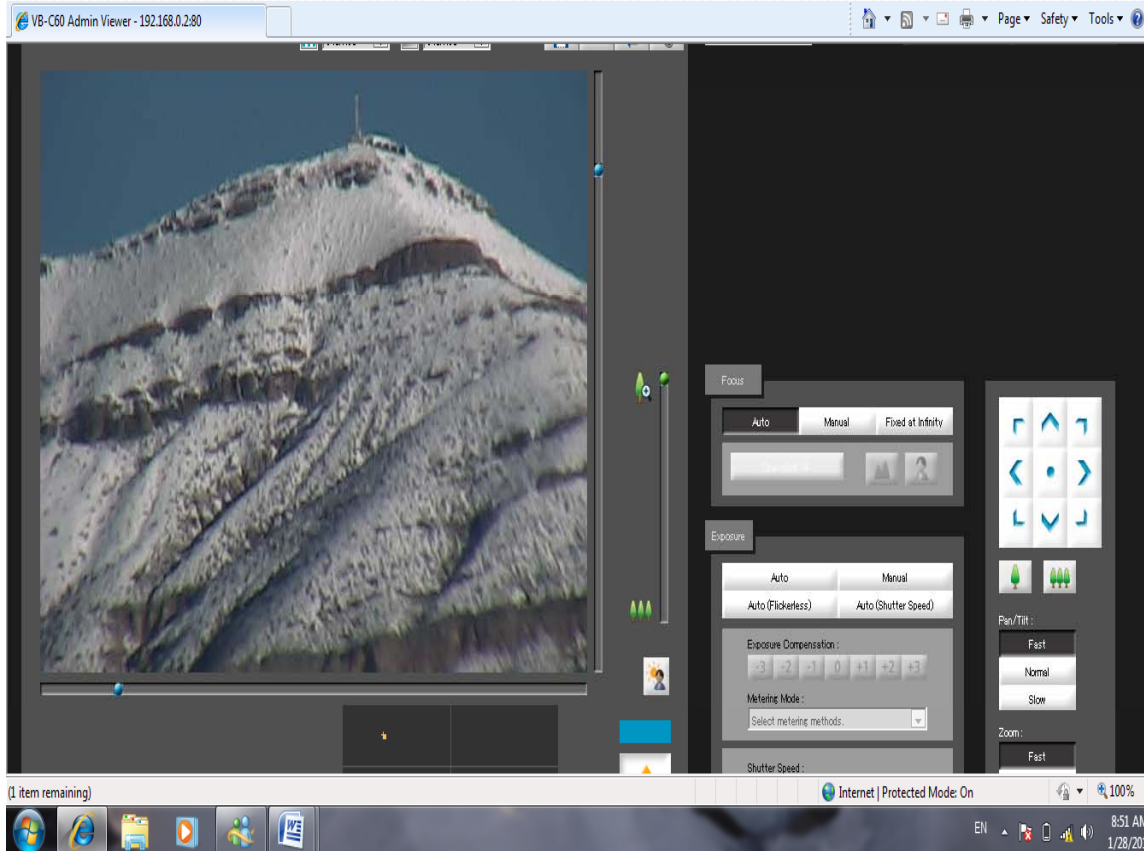


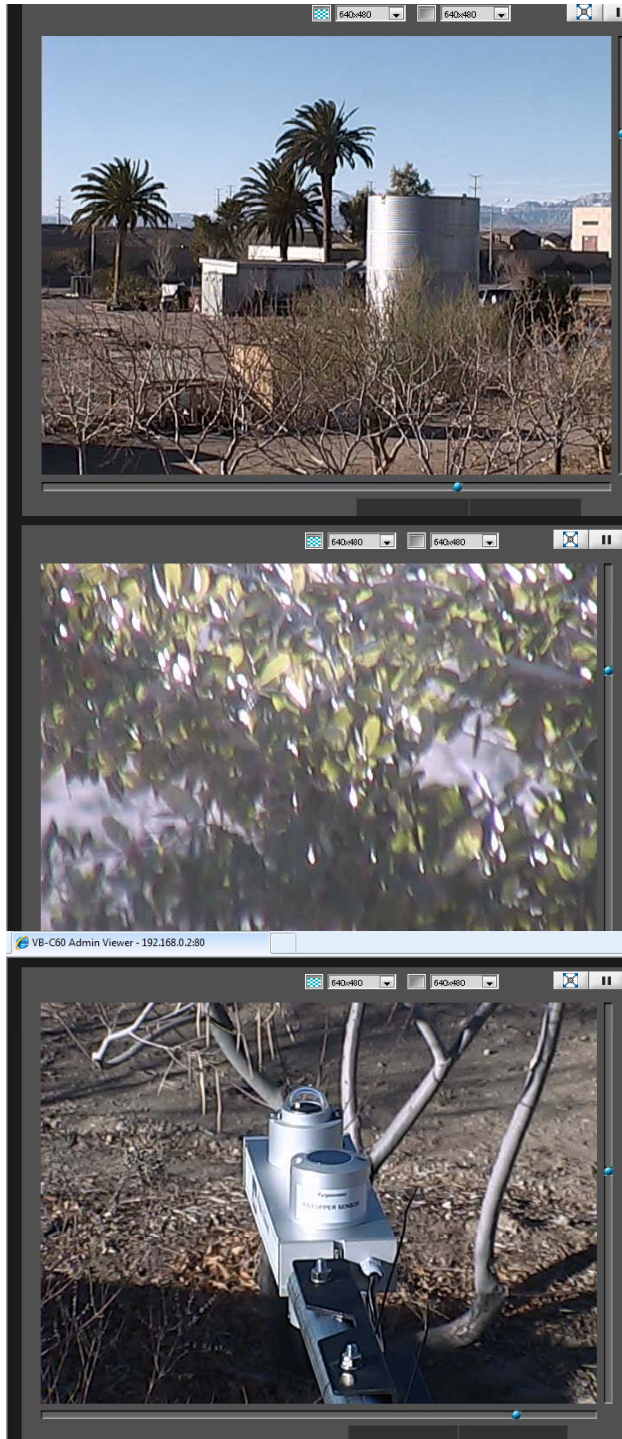


# VB-C60 PTZ Internet Camera

## Features:

- ✓ Remotely controlled
- ✓ Motion detection
- ✓ Auto Day/Night
- ✓ Programmable fixed location recording
- ✓ 40X Optical Zoom
- ✓ Image Stabilizer
- ✓ 360 Degree view





## VB-C60 PTZ Internet Camera

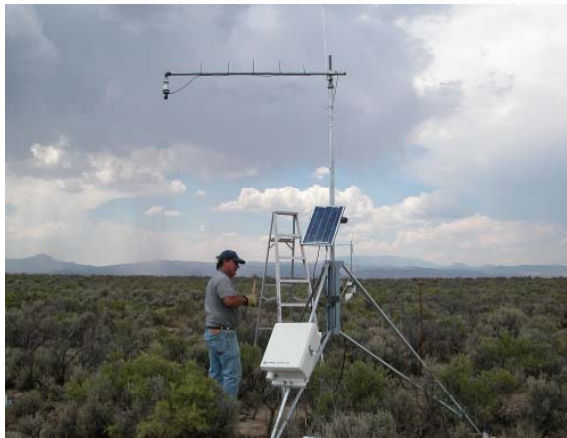
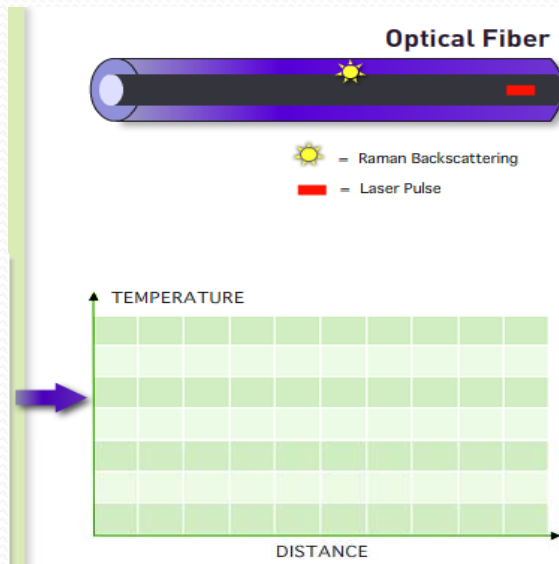


### Potential Measurements/Uses:

- ✓ LAI/Canopy greenness
- ✓ Canopy phenology (timing of start, peak, senescence of plant growth)
- ✓ Aboveground plant productivity (pics calibrated with harvests)
- ✓ Quick visual indicator of snow cover and depth (with depth stakes)
- ✓ Atmospheric cloudiness (spatial & temporal dist.)
- ✓ Herbivory of marked plants
- ✓ Surface soil erosion
- ✓ Remotely troubleshoot plausibility of sensor measurements, e.g. sensor obstruction, rain/snow day, cable herbivory, etc.

# Addition to Core Site Sensors

- Fiber optic Distributed Temperature (DTS) System
- NDVI, WBI Ground Based Sensors (Skye, PP-Systems)
- Acclima TDT Soil Moisture, Salinity & Temperature Monitoring System





Questions?

