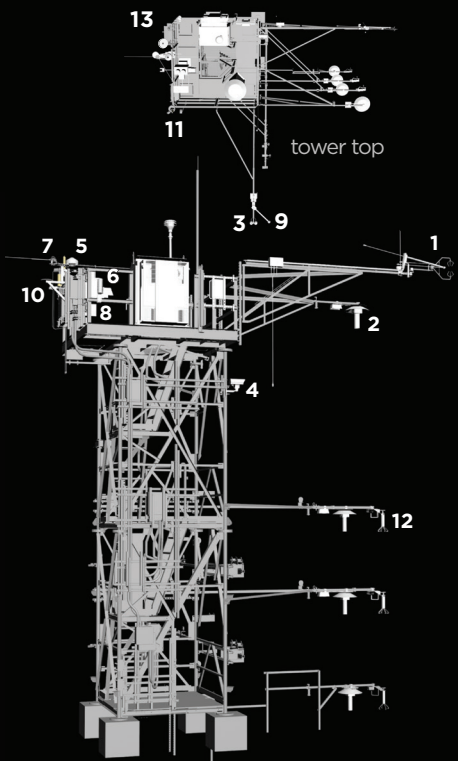


# Soil, Meteorological, and Flux Measurements at NEON sites

NEON has 47 terrestrial sites and 34 aquatic sites. Sites are strategically located in varying ecosystems and habitats across the United States including Alaska, Hawaii, and Puerto Rico. Field sampling, airborne remote sensing surveys, and automated instruments are used to collect data at every field site. All data are open access.

## Automated instruments at terrestrial field sites:

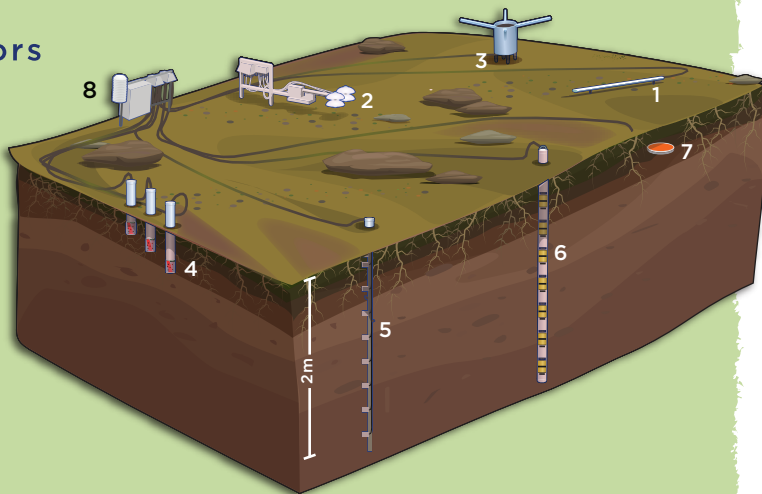


### How Atmospheric Data are Collected with NEON's Flux Towers

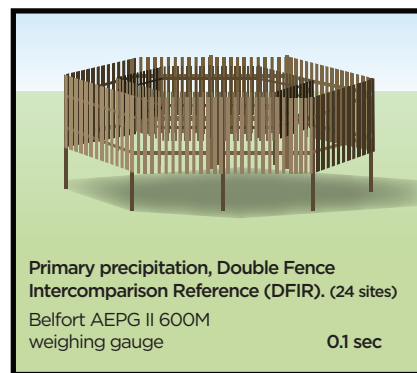
- 1. Eddy Covariance Turbulent Exchange**  
Uses a 3D sonic anemometer paired with an infrared gas analyzer to measure surface-atmosphere exchange of heat, water, and carbon dioxide.
- 2. Aspirated Air Temperature (ATS)**  
Uses one to three Platinum Resistance Thermometers to measure ambient air temperature.
- 3. Net Radiometer**  
Uses a pyranometer to measure shortwave radiation and a pyrgeometer to measure longwave radiation.
- 4. Phenocam**  
Collects timelapse imagery of canopy and understory throughout the year.
- 5. Atmospheric Deposition**  
Collects precipitation for external lab analysis of major ion concentrations.
- 6. Humidity and Temperature**  
Sensors inside a ventilated radiation and precipitation shield measure relative humidity, air temperature, and dew point/frost point temperatures.
- 7. Sunshine Pyranometer (SPN1)**  
Measures light in the spectral range of 300 - 3000 nanometers.
- 8. Pyranometer (CMP22)**  
Measures shortwave radiation between 200 - 3600 nanometers.
- 9. Photosynthetic Active Radiation (PAR)**  
Measures radiation in the visible light spectrum of 400 - 700 nanometers.
- 10. Biological Temperature**  
An infrared radiometer measures the surface temperature without physical contact.
- 11. Sun Photometer**  
Calculates the concentration of aerosols in the atmosphere by analyzing the type and quantity of light that passes through the lenses and into the internal analyzers.
- 12. Sonic Anemometer**  
Measures horizontal and vertical wind speed and direction.
- 13. Secondary Precipitation**  
Measures precipitation at the tower top using a tipping bucket at some sites.

## Soil Plot Sensors

NEON installs an array of five soil plots within or near the flux tower's footprint and in the locally dominant (1 km<sup>2</sup> scale) soil type of each terrestrial field site. Soil plots are typically spaced up to 40 m apart.



<b>1</b> Photosynthetically Active Radiation (PAR) LI-COR LI-191-01 Quantum Line Sensor	<b>1 sec</b>	<b>5</b> Soil temperature Thermometrics - Climate RTD 100-ohm Probe	<b>0.1 sec</b>
<b>2</b> Net-shortwave & net-longwave radiation, & biological temperature Hukseflux NR01 Net Radiometer	<b>1 sec</b>	<b>6</b> Soil moisture and salinity Sentek - EnviroSCAN TriSCANe	<b>0.1 sec</b>
<b>3</b> Precipitation/Throughfall * Met One 372 tipping bucket (non-heated) (excludes short-stature sites)	<b>0.5 sec</b>	<b>7</b> Soil heat flux Hukseflux - HFPO1SC	<b>0.1 sec</b>
<b>4</b> CO <sub>2</sub> concentrations Vaisala - GMP343 diffusion model	<b>0.1 sec</b>	<b>8</b> Relative humidity Vaisala HUMICAP humidity & temperature probe - HMP 155	<b>1 sec</b>



Learn more and explore the data

[NEONscience.org](https://neonscience.org)



# Meteorological Measurements at Terrestrial and Aquatic NEON Sites



Data collection frequency and location

Measurement & Data Product	Sensor	TERRESTRIAL SITES			AQUATIC SITES	
		Tower Top	Lower Levels	Soil Array	On Bank Met Station	Above Water Met Station
Shortwave radiation (primary pyranometer)	Kipp and Zonen CMP22 Pyranometer	1 sec (core sites)	⊘	⊘	⊘	⊘
Shortwave radiation (direct and diffuse pyranometer)	Delta-T Devices SPN1 Sunshine Pyranometer	1 sec	⊘	⊘	⊘	⊘
Shortwave and longwave radiation (net radiometer)	Hukseflux NR01 Net Radiometer	1 sec	⊘	1 sec (only longwave)	1 sec	30 sec
Photosynthetically Active Radiation (PAR)	Kipp & Zonen PQS 1 PAR Quantum Sensor (additional downward-facing)	1 sec	1 sec	⊘	1 sec	30 sec
Photosynthetically Active Radiation (PAR) - quantum line	Licor LI-191-01 Quantum Line Sensor	⊘	⊘	1 sec	⊘	⊘
Spectral sun photometer - calibrated sky radiances	CIMEL Electronique - CE318N-EBS9	15 min	⊘	⊘	⊘	⊘
Air temperature	Thermometrics Climate RTD 100 Ω Probe, housed within a Met One 076B fan aspirated radiation shield (triplet probes in tower top shield)	1 sec	1 sec	⊘	1 sec	1 min
IR biological temperature	Apogee SI-111 infrared (IR) temperature sensor	⊘	1 sec	1 sec	⊘	⊘
Relative humidity	Vaisala HUMICAP Humidity and Temperature Probe - HMP 155	1 sec	⊘	1 sec	1 sec	1 min
Barometric pressure	Vaisala - BAROCAP Digital Barometer PTB330	⊘	1 sec	⊘	1 sec	1 min
Primary precipitation Double Fence Intercomparison Reference (DFIR)	Belfort AEPG II 600M weighing gauge	0.1 sec (20 sites)			0.1 sec (4 sites)	
Secondary precipitation	Met One 372 tipping bucket (non-heated) and 379 tipping bucket (heated)	On event (37 sites)	⊘	⊘	On event (6 sites)	⊘
Throughfall precipitation	Met One 372 tipping bucket (non-heated)	⊘	⊘	On event	⊘	⊘
2D wind speed and direction	Gill - Wind Observer II; Extreme Weather Wind Observer; RM Young 05108-45 Wind Monitor-HD Alpine (buoy); Honeywell HMR 3330 (buoy)	⊘	1 sec	⊘	1 sec	~4 sec
3D wind speed, direction and sonic temperature	Campbell Scientific. CSAT-3 3-D Sonic Anemometer	20 sec	⊘	⊘	⊘	⊘
3D wind attitude and motion reference	Xsens North America Inc. MTI-300-2A5G4 Attitude Heading Reference System	40 sec	⊘	⊘	⊘	⊘
CO <sub>2</sub> and H <sub>2</sub> O concentration & flux	LI-COR LI7200 or LI7200RS	20 sec	⊘	⊘	⊘	⊘
CO <sub>2</sub> and H <sub>2</sub> O concentration & flux (storage/profile)	LI-COR LI840A or LI 850	1 sec	1 sec	⊘	⊘	⊘
CO <sub>2</sub> atmospheric isotopes (storage/profile)	PICARRO - G2131-i isotopic CO <sub>2</sub> analyzer	1 sec	1 sec	⊘	⊘	⊘
H <sub>2</sub> O atmospheric isotopes (storage/profile)	PICARRO - I2130-i isotopic H <sub>2</sub> O analyzer	1 sec (21 sites)	1 sec (21 sites)	⊘	⊘	⊘
Wet deposition chemistry and precipitation isotopes	N- Con Systems Company Wet Deposition Collector, Manufacture Model No: NEON 00-127-7	2 wks (37 sites)	⊘	⊘	2 wks (6 sites)	⊘
Phenology images	Stardot NetCam SC CAM-SEC5IR-B	15 min	15 min	⊘	15 min	

Additional measurements only at D10 & D13 terrestrial sites (MOAB, ONAQ, NIWO, RMNP, STER, CPER):  
Dust and particulate size distribution (TSI DustTrak model: 8533EP): 1 sec