

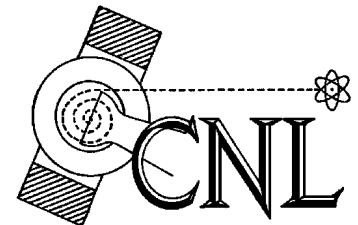
IMPROVE

Particle Monitoring Network:

Status Report to

IMPROVE Steering Committee

Chuck McDade
Crocker Nuclear Laboratory
University of California, Davis
Wind Cave, South Dakota
September 2009

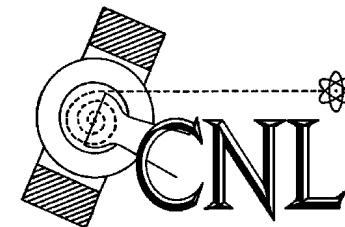


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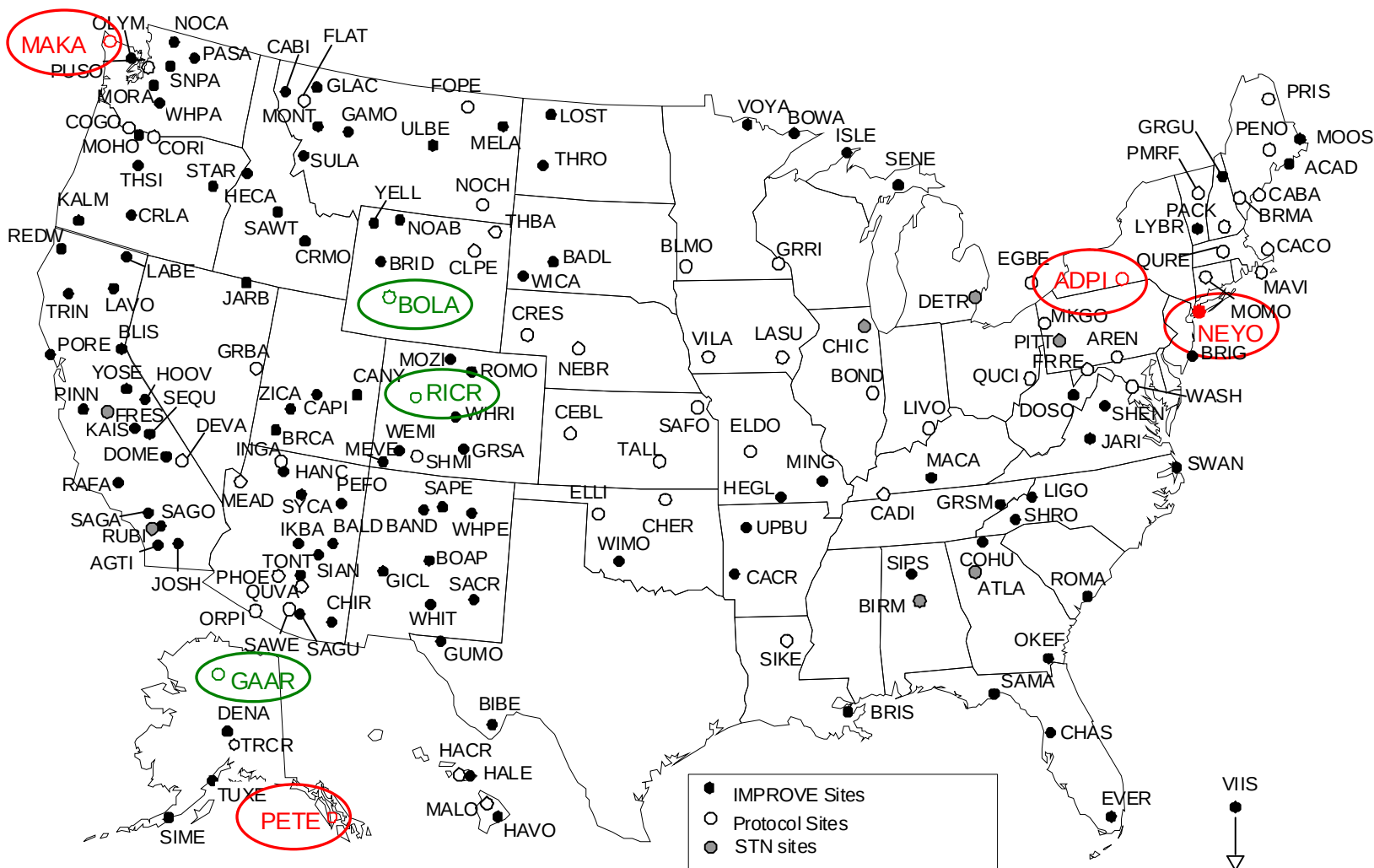


IMPROVE Network

Fall 2009

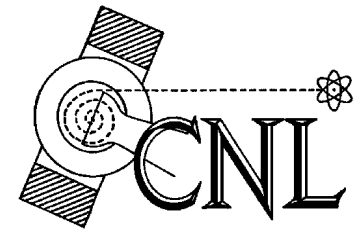


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Gates of the Arctic, Alaska



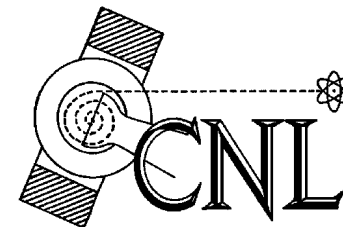
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Gates of the Arctic, Alaska

First Sample November 2008

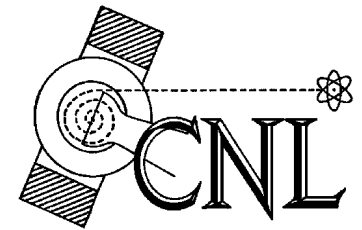


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Ripple Creek Pass, Colorado



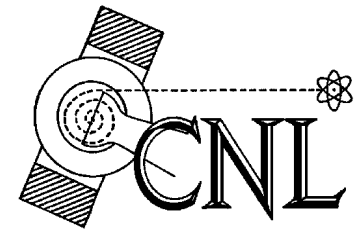
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Ripple Creek Pass, Colorado

First Sample March 2009



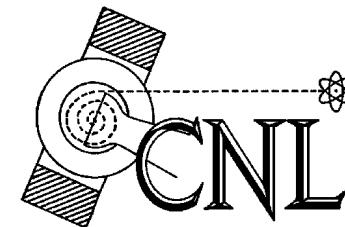
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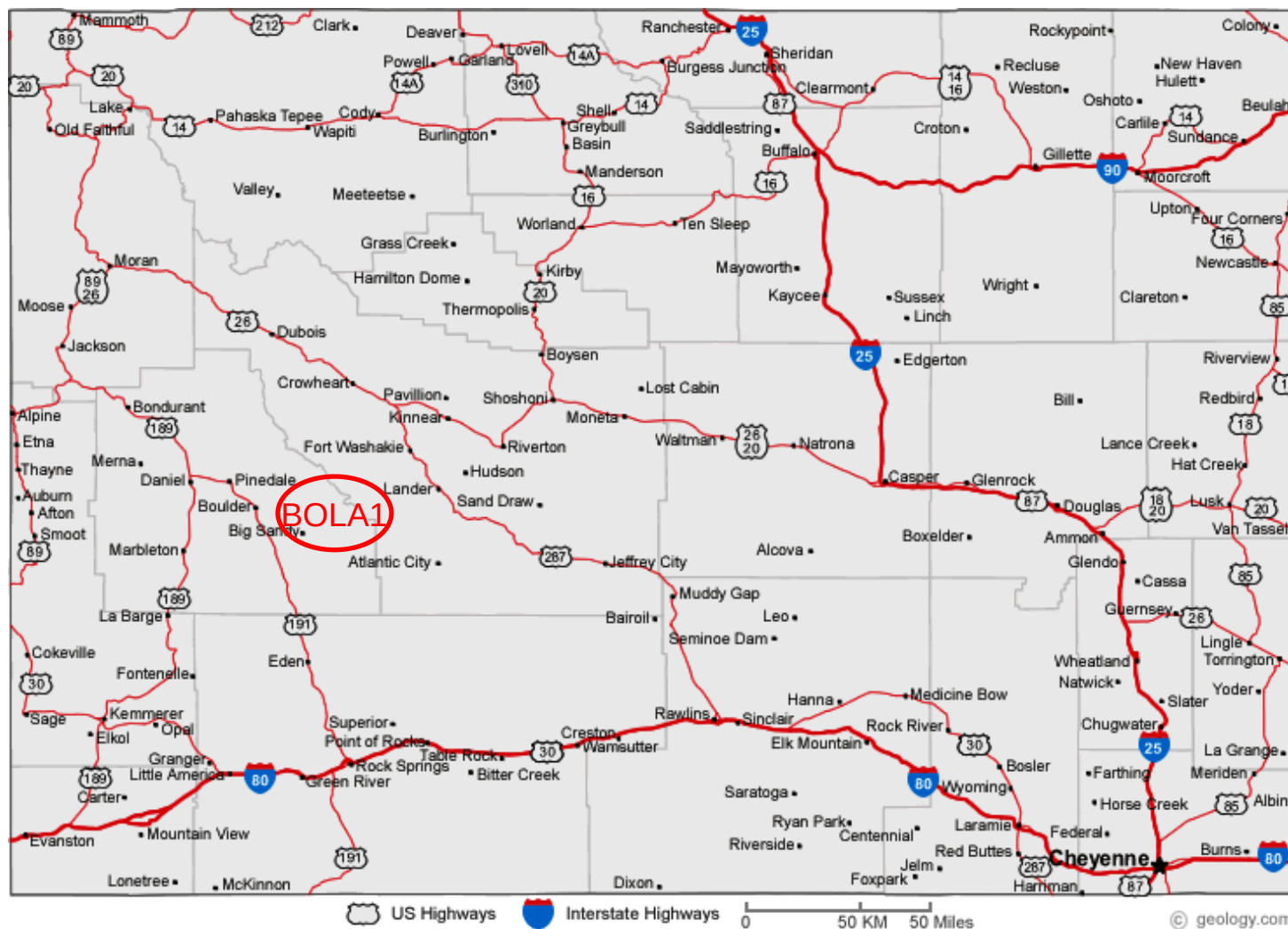


Boulder Lake, Wyoming

First Sample August 2009

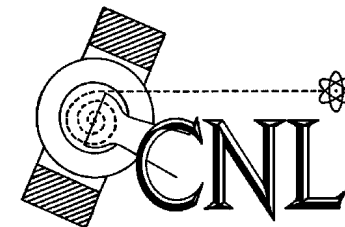


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New Batteries at Tuxedni, Alaska

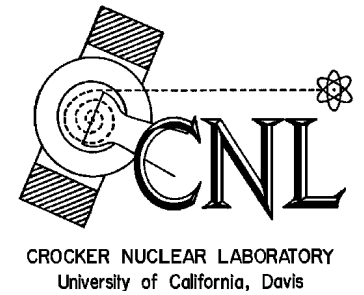


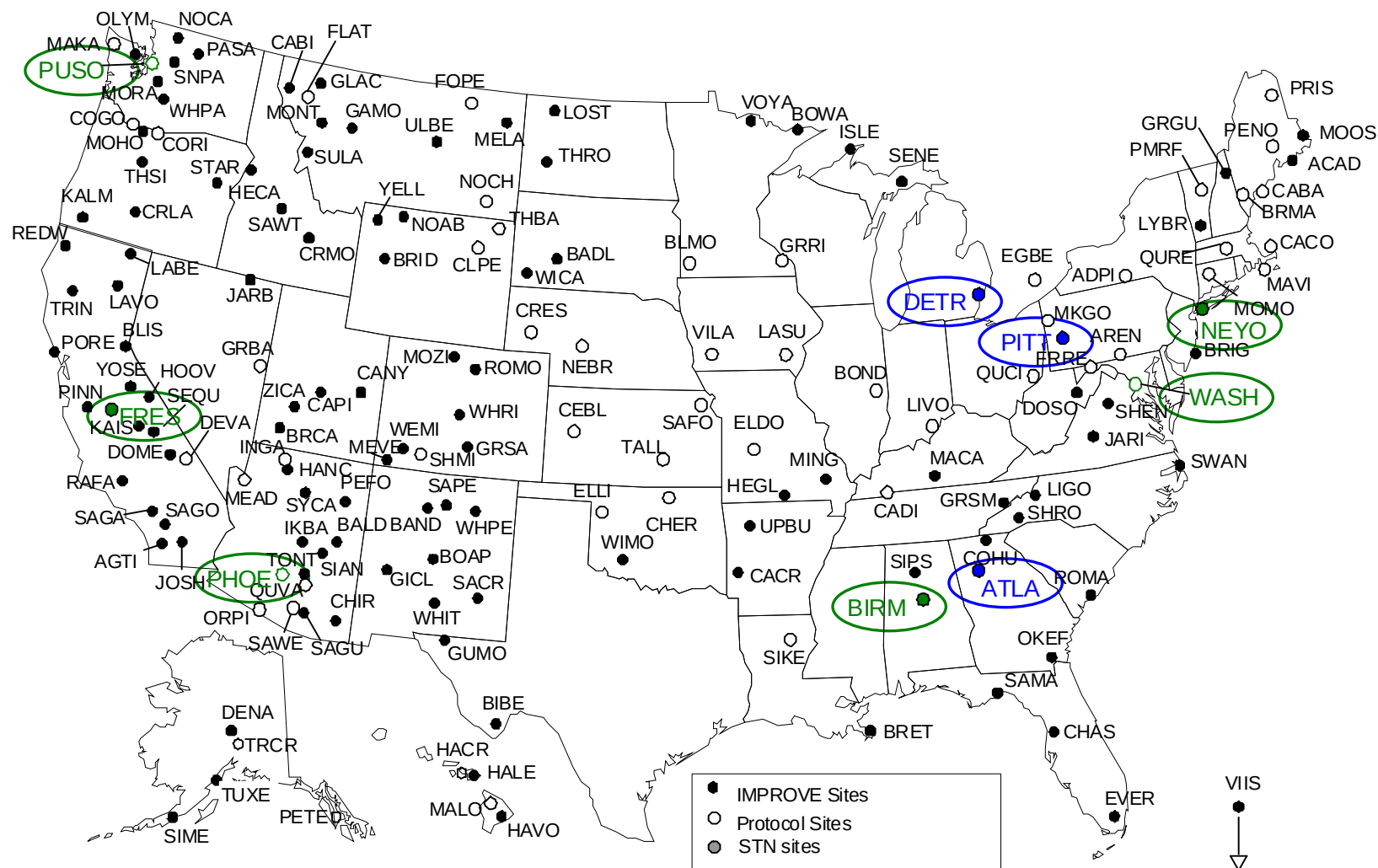
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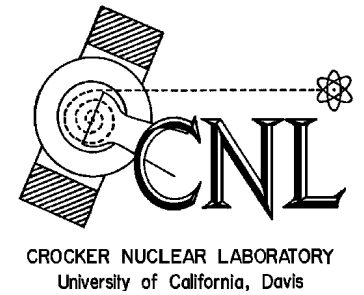




Storing solar and wind power avoids generator usage



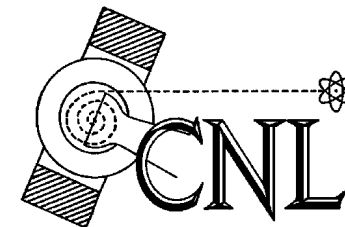




NETWORK PERFORMANCE: CALENDAR YEAR 2008



2008 Sample Recovery (A Channel, PM_{2.5} Teflon)

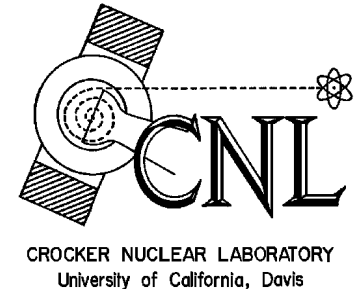


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- 93% Q1
- 93% Q2
- 93% Q3
- 94% Q4
- 93% Annual A Channel
2007 was 94%



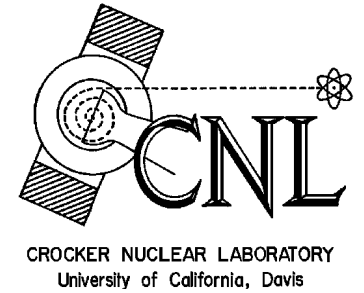
2008 Sample Recovery (All channels, ABCD)



- 89% Q1
 - 91% Q2
 - 89% Q3
 - 91% Q4
 - 90% Annual ABCD
- 2007 was 92%



Reasons for Sample Losses

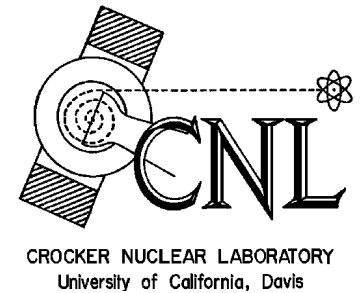


Of the 10% of lost samples (ABCD):

- 45% Equipment problems
- 21% Operator no-show
- 15% Power outages
- 13% Incorrect filter cassette installation
- 6% Torn or damaged filter



Regional Haze Rule Requirements



A “complete” site has, for ABCD:

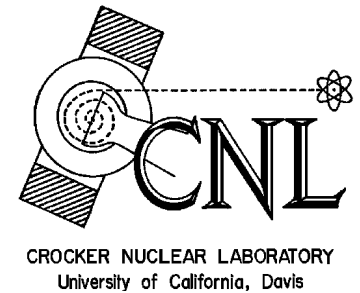
- >75% annual recovery
- >50% recovery in each quarter
- <11 consecutive missed samples

13 sites failed in 2008

(8 in '03, 5 in '04, 6 in '05, 4 in '06, 7 in '07)



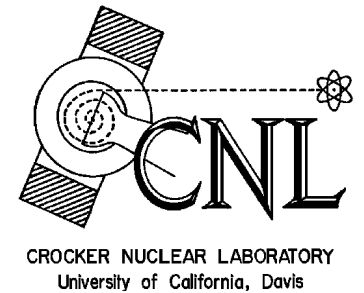
Sites Failing RHR Requirements: Weather



- Breton, LA (IMPROVE)
 - Failed annual & 3rd quarter criteria
 - Lost first 10 samples of 2008 while finalizing land use arrangements
 - Sampler was removed in August/September to protect it from Hurricanes Gustav and Ike
- Cohutta, GA (IMPROVE)
 - Failed annual, quarter, & consecutive criteria
 - D-module pump failure, followed by lightning strike & damaged controller



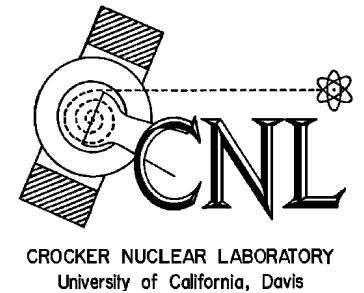
Sites Failing RHR Requirements: Weather



- Wheeler Peak, NM (IMPROVE)
 - Failed 50% 3rd quarter criterion
 - Variety of short-term equipment problems compounded by lightning strikes
- Remedy for lightning strikes
 - Store a spare controller at sites prone to summer lightning



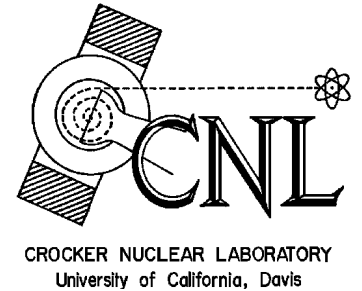
Sites Failing RHR Requirements: Winter Weather



- Lye Brook, VT (IMPROVE)
 - Failed 1st quarter & consecutive criteria
 - Shelter door frozen shut by ice
 - Door reconstructed in summer 2008; no further losses
- Thunder Basin, WY (Protocol)
 - Failed annual criterion
 - Access road closed due to snow during especially harsh winter



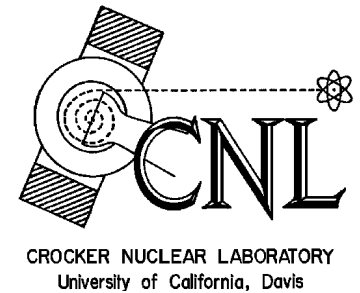
Sites Failing RHR Requirements: Operator Unavailability



- Sierra Ancha, AZ (IMPROVE)
 - Failed annual, quarter, & consecutive criteria
 - Operator, a firefighter, was sent away to fight last summer's severe fires
 - Backup did not change samples as instructed
- Remedy for operator unavailability
 - Call backup operators when we know they will be required to change samples



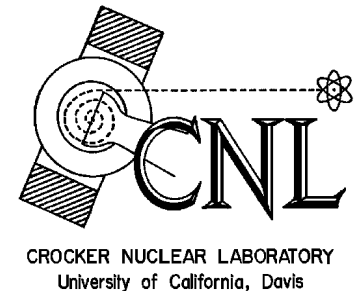
Sites Failing RHR Requirements: Water in Sampler



- Quabbin Reservoir, MA (Protocol)
 - Failed quarter and consecutive criteria
 - Ice in sample lines, followed by water when melted
 - Apparently due to ice accumulation on insect screen
- Remedy for water in sampler
 - Short-term: Remove insect screens at sites prone to water
 - Long-term (this fall): Retrofitting inlets to protect from ice and water accumulation



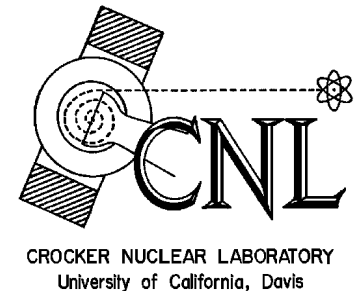
Sites Failing RHR Requirements: Maintenance Error



- Mohawk Mountain, CT (Protocol)
 - Failed annual, quarter, & consecutive criteria
 - PM-10 stack not properly replaced at 2008 maintenance
 - Discovered in data review by MF>MT
- Remedy for maintenance error
 - Checklist before leaving site
 - Electrical tape to secure stack after maintenance
 - Photos of each module



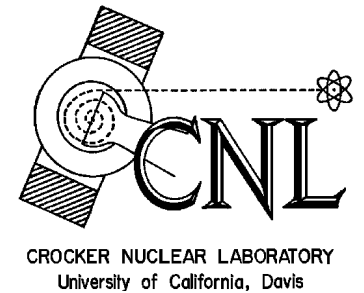
Sites Failing RHR Requirements: Dislodged Cyclone Throat



- Brigantine, NJ (IMPROVE)
 - Failed annual, quarter, & consecutive criteria
 - C module replaced in January
 - Dislodged throat discovered at June maintenance
- Sula, MT (IMPROVE)
 - Failed annual, quarter, & consecutive criteria
 - Low & erratic flowrates prompted cyclone check



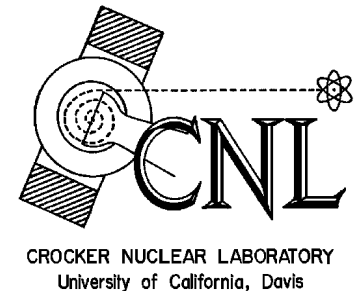
Sites Failing RHR Requirements: Dislodged Cyclone Throat



- Remedy for dislodged cyclone throat
 - If a cyclone throat is suspect, we are now asking the operator to open the cyclone and check it. Have done this twice, both negative.
 - Flowrate changes are subtle, difficult to detect. Easy to mistake for a controller malfunction or a slight flow drop.
 - New database tools will be designed to identify subtle flowrate changes.



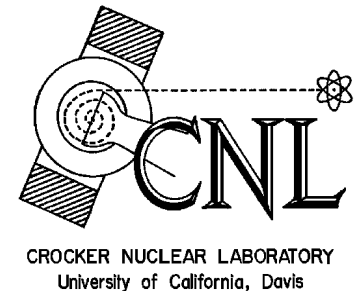
Sites Failing RHR Requirements: Persistent Problems



- Nebraska National Forest, NE (Protocol)
 - Failed annual, quarter, & consecutive criteria
 - Misdiagnosed as an electrical problem
 - Ultimately required replacing module & controller
- Sawtooth, ID (IMPROVE)
 - Failed consecutive sample criterion
 - Pump was operating intermittently due to a loose electrical plug
 - Because the pump operated occasionally, the operator did not notify UC Davis of the problem immediately



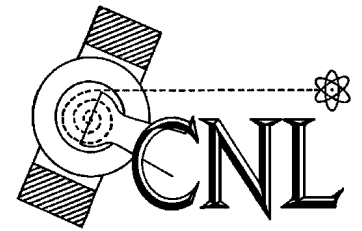
Sites Failing RHR Requirements: Persistent Problems



- Swanquarter, NC (IMPROVE)
 - Failed annual, quarter, & consecutive criteria
 - Long string of controller malfunctions
 - Problems exacerbated by slow response from local operator
- Remedy for persistent problems
 - Send UCD technician to site promptly when initial repair attempts fail
 - Thus far in 2009 we have saved Northern Cheyenne, MT, Crater Lake, OR, and San Gabriel, CA, from RHR failure by dispatching a technician



Crater Lake, OR: Pumps Replaced & Enclosure Modified

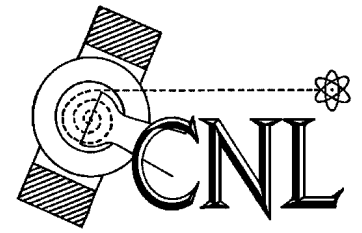


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San Gabriel, CA: Replaced Quickly After SoCal Fires

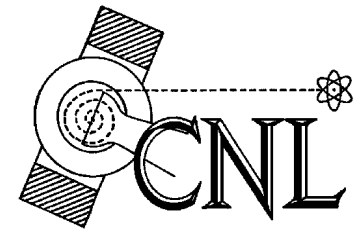


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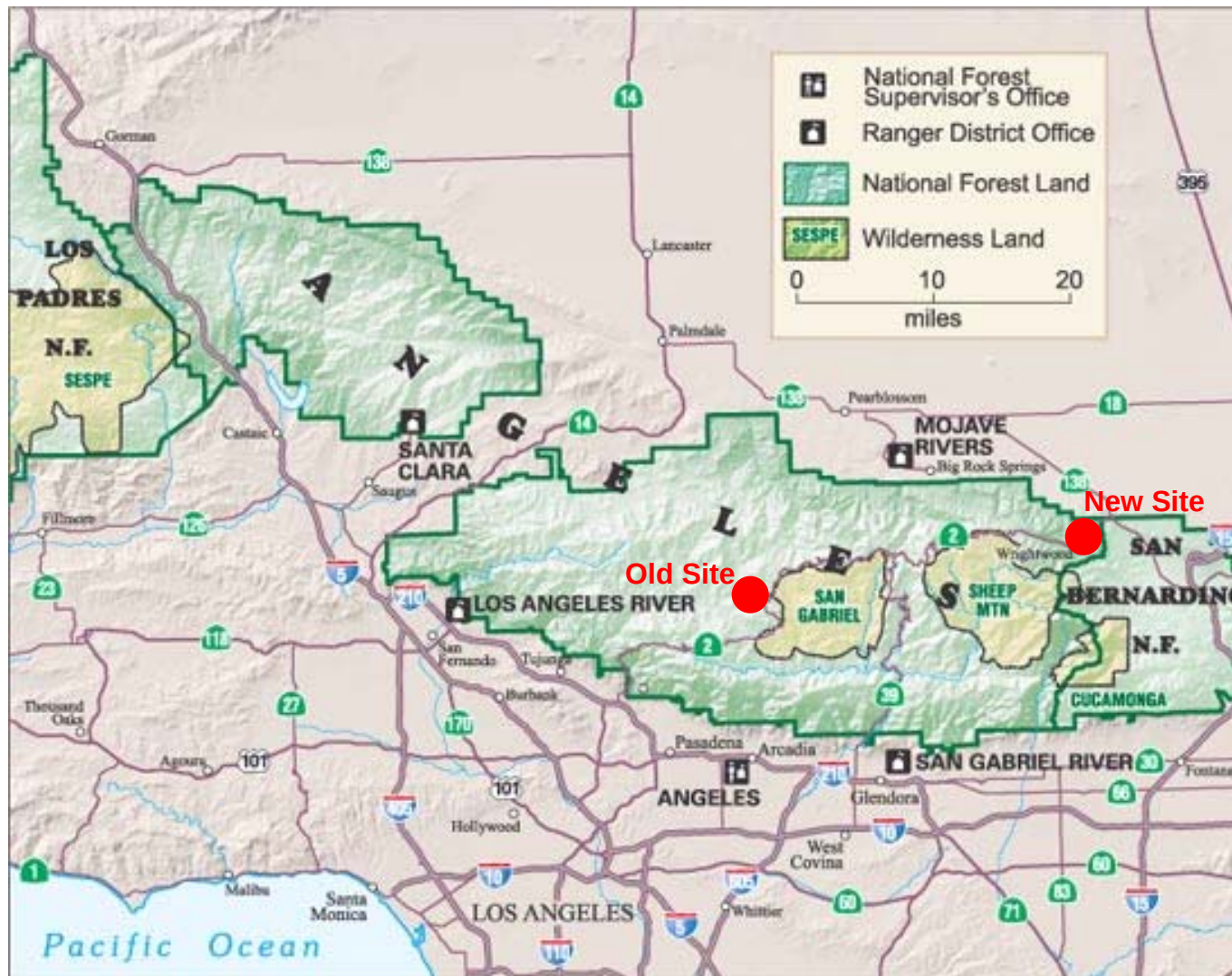




Nearest Power was at Wrightwood (35 km)

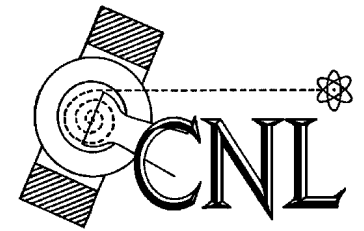


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The New Sampler at Wrightwood

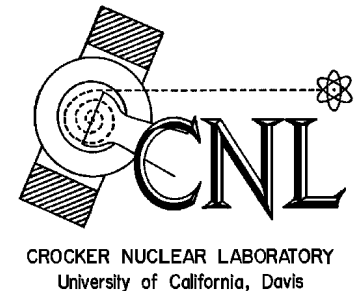


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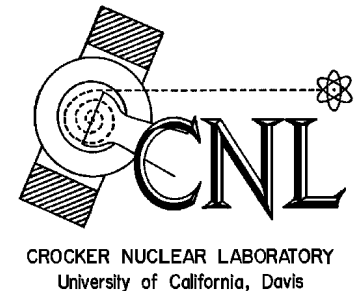




Good RHR Start for 2009: 3 lost sites through July



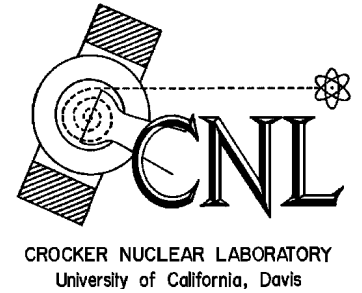
- Mohawk Mountain, CT (Protocol)
 - Continuation of displaced inlet; fixed now
- Indian Gardens, AZ (Protocol)
 - Power outage; NPS electrician has since repaired
 - Challenging remote site
- North Absaroka, WY, (IMPROVE)
 - Multiple lightning strikes
 - Visited site for repairs, more lightning the next day



DATA MANAGEMENT AND DELIVERY



Data Status and Schedule



- Data soon to be delivered for January through March 2009
- We have approached our desired 6 month lag in delivery