NEID: Prepping for and Recovering from the 2022 Contreras Fire

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Contreras Wildfire Threatens Kitt Peak

In June 2023, the 30,000 acre Contreras Fire significantly impacted Kitt Peak National Observatory. During the threat, coordination between observatory leadership and the Eastern Area Type 2 and Southeast Zone Type 3 Incident Management Teams proved critical to the staff's safety and the observatory's survival. Up-to-the-minute reports, especially during the critical days of June 14-15, when the fire rapidly moved across the valley and onto the slopes and summit of Kitt Peak, allowed staff to gracefully shut down instruments and computers, cover major optics, map locations of flammables and caustics, aid fire staff, and evacuate transportable capital assets. In particular, communication between Kitt Peak management, WIYN staff on-site, and members of the instrument team off-site was critical to optimally safing NEID.

Left: An aerial image showing the approximate location of where the fire started (red circle) and direction of growth (red arrow) on June 11, 2022. Right: An image of the Kitt Peak summit shortly before power was shut off by the firefighters on June 17, 2022. The WIYN telescope dome (home of NEID) is indicated with an orange arrow.

NEID Initial Safing Decisions/Actions:

Key Considerations Influencing Warm-Up Discussions:

- Safety of WIYN/Kitt Peak personnel on the mountain
- Safety of the instrument
  - -- Access to reliable infrastructure, predominantly power and internet
  - -- Physical access to the instrument by knowledgeable personnel
- Potential loss of science

Decision Points and Actions:

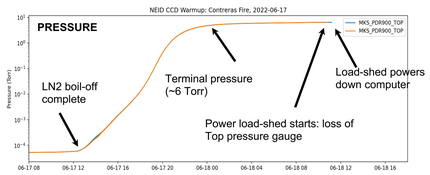
- **June 14:** Halted automated LN2 fills and began preparing to warm NEID, if needed; fire still expected to be several days away
- **June 15**: Fire had advanced more than expected
  - *Morning* – Began actively heating internal LN2 tank to accelerate warmup timeline (~4 day passive hold time)
  - *Early Afternoon* – Powered down Laser Frequency Comb – this action both enabled a safe and controlled Comb shutdown and reserved UPS battery power for detector heating and telemetry monitoring
  - *Late Afternoon* – Transitioned to Type 2 fire team, evacuation order, staff engaged emergency detector heater and evacuated WIYN

Land Acknowledgment:
Kitt Peak National Observatory sits atop I'oligam Du'ag. Astronomers are honored to be permitted to conduct scientific research on I'oligam Du'ag (Manzanita Bush Mountain), in the homeland of the Tohono O'odham Nation. We honor their past, present, and future generations, who have lived here for time immemorial and will forever call this place home.

NEID's Automated Warm-Up:

NEID is extremely sensitive to loss of power. Thus, the spectrograph and calibration systems sit behind a ~24 hr (with LFC powered-off) lithium-ion battery powered UPS. Moreover, the Instrument Control Software has an automated emergency load-shed/safing procedure that is designed to trigger with smaller ~1 hr UPS units beyond 24 hrs. This automated safing system was put to the ultimate test.

- **June 17:** LN2 boil-off complete, getters begin to outgas; Power cut to mountain at 4:39 AM MST – network access lost ~25 min later; NEID systems remain online, powered by internal WIYN UPS
- **June 18:** Vacuum chamber reached terminal pressure (~6 Torr) and CCD temp crossed 0 C (safety point); WIYN UPS power exhausted at ~4AM MST; NEID automated load-shed sequence activated



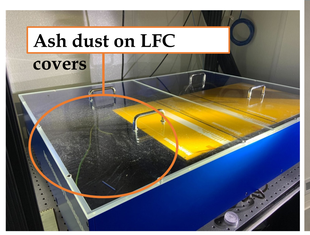
Above: Pressure plot showing the NEID warm-up until the NEID computer was automatically load shed. Right: We are still here! WIYN peeking out of the smoke at the end of a harrowing day on June 17 (photo credit: Fred Wortman/NOIRLab).

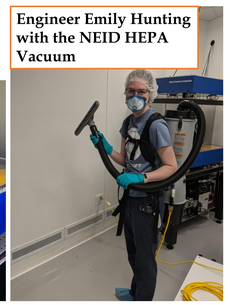
Early Checkouts and Recovery:

- **Late-June:** Preliminary inspections of summit buildings and electrical conduits; generators energized
- **June 28:** Emergency access to WIYN granted to retrieve NEID telemetry; Cleanroom discovered to be contaminated with ash and very hot (30C+) due to re-energizing of some components when generator power restored. Trip cut short due to Monsoon rains
- **July 13:** Second emergency access visit to test CCD aliveness
- **August:** After careful, independent assessments of summit safety, staff permitted to return to the mountain en masse to begin clean up

Key NEID Early-Recovery Actions:

- Spectrograph pumped to 7x10-2 Torr and backfilled with GN2 to 200 Torr for stow (see "Considerations for Return to Science")
- HVAC inspection and test run
- Ash infiltration locations identified in air plenums and sealed
- Cleanroom/equipment hand-cleaned (DI water + IPA solution) and HEPA vac'd to remove bulk of ash
- LFC optical boxes carefully inspected and cleaned





Infrastructure Needs for NEID Restart:

	Status After Fire	Impact on NEID	Response
Road Access	**Severely limited:** Monsoons washed out rocks and loose soil; Road surfaces/culverts damaged; guard rails burned	Limited road access and monsoon-driven evacuations lengthen response times to NEID emergencies	Limit restart activities to short/daytime tasks until staff permitted to overnight on the mountain
Potable Water/Food	**Interrupted:** water restored quickly; Food limited to week-day lunches and pre-order meals until Feb 2023	Minimal to instrument; Staff negatively impacted	Staff packed food or ordered ahead of time
Line Power	**None:** severe damage to line power with many utility poles burnt down; Summit generators initially off – quickly brought on-line	Significant risk of warm-up without stable power	**Instrument not restarted until line power restored**
Internet	**None:** Fiber destroyed by fire	Internet required for remote monitoring of instrument health	On-site staff + interim internet solution for limited remote monitoring until fiber internet restored

Far Left: Monsoons brought rock and mud slides; Left: Many power poles were burnt and needed replacement

Returning to Science:

- **October 17:** Line power restored to the summit
- **October 18 – 25:** Calibration systems energized, Spectrograph pumped and cooled, solar feed inspected and energized
- **Nov 11:** On-sky checkout
- **Nov 12**: Start of Shared Risk Science – low precision only
- **Nov 23:** Resumed high precision science
- **Jan 31, 2023:** Updated pipeline delivered & Shared Risk status lifted for 2023B Semester

Lessons Learned:

Observatory-wide Management Style:

- Active communication from the director's office so that teams can trigger decision points and actions based on latest fire activity
- Rely on in-dome expertise to make real-time decisions
- Expect rapid evolution of plans and timescales; keep approach agile.

NEID:

- Active communication between knowledgeable observatory staff and key members of the NEID instrument team was critical for defining decision points and acting on them safely
- Investment in back-up power and automatic load-shed scripting is essential; Post fire, a Heising-Simons grant enabled the purchase of a WIYN generator as additional power reserve
- Adequate time and resources must be allocated for updating instrument- profile dependent pipeline files

We thank the firefighters of the Eastern Area Type 2 and Southeast Zone Type 3 Incident Management Teams for their heroic efforts in saving Kitt Peak National Observatory.