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# Tested by Fire – How two recent Wildfires affected Accelerator Operations at LANL

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**WAO 2012**

# Los Alamos National Laboratory Accelerator Facilities

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- **Los Alamos National Laboratory (LANL) is located in Northern New Mexico, at the foot of the Jemez Mountains.**
- **Two major accelerator facilities at LANL:**
  - Dual Axis Radiographic Hydrodynamic Test Facility (DARHT)
  - Los Alamos Neutron Science Center (LANSCE)



Operated by Los Alamos National Security, LLC for the U.S. Department of Energy's NNSA

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# The Dual Axis Radiographic Hydrodynamic Test Facility

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- Two linear induction accelerators at a right angle to each other.
- Electrons impinge in metal target, producing x-ray pulses.
- Multi-view radiographic images of dynamic processes.
- “How DARHT works” video on YouTube:

**<http://www.youtube.com/user/LosAlamosNationalLab>**



CIC-9-RN99-156-049



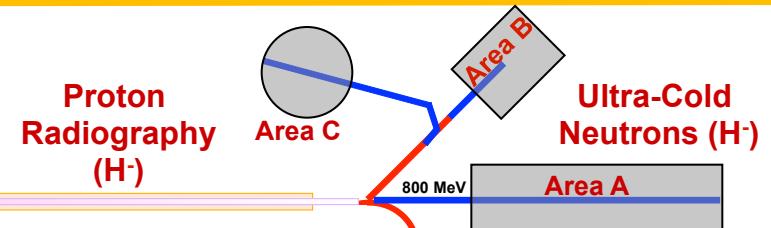
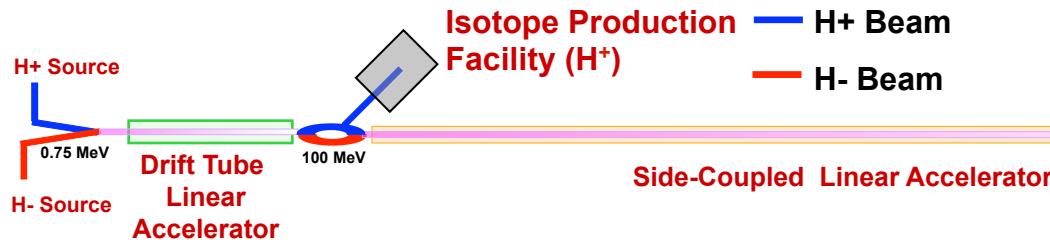
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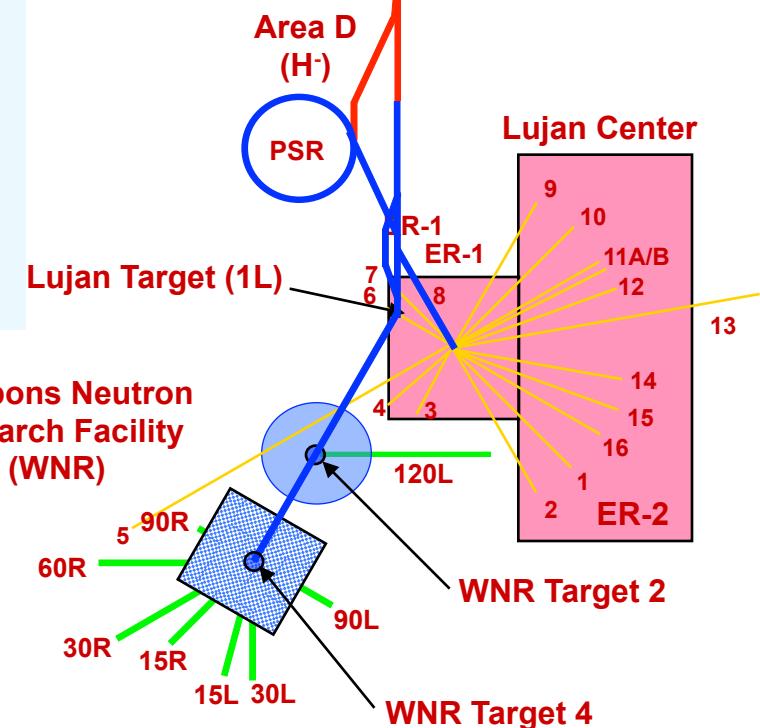


# The Los Alamos Neutron Science Center



Simultaneously delivers H<sup>+</sup> and H<sup>-</sup> beams to:

- Isotope Production
- Proton Radiography
- Neutron Production Targets, covering wide range of Neutron Energies.





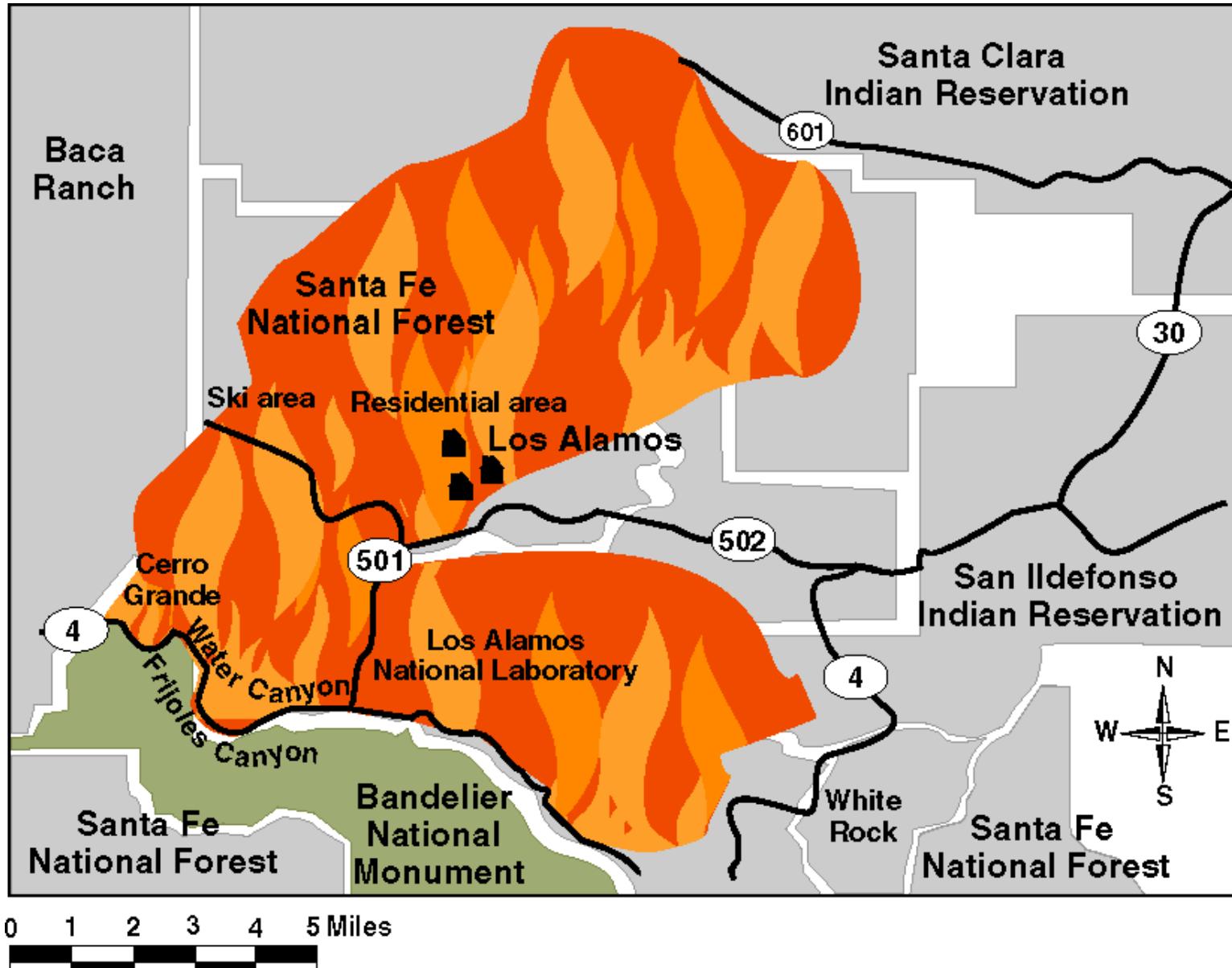
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# Los Alamos National Lab – Tested by Fire, Part I

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## ■ Cerro Grande Fire: May 2000

- Started as a controlled burn; got out of hand due to high winds and drought conditions.
- Los Alamos and White Rock (~ 18,000 residents) were evacuated.
- 47,000 acres in Los Alamos, LANL and surroundings burned.
- 280 homes destroyed.
- 40 LANL structures destroyed.
- Estimated fire damage ~ \$ 1 billion.
- Over 1000 firefighters and equipment involved.
- LANL shut down for two weeks.
  - LANSCE not directly affected, but long shutdown made recovery difficult.
  - DARHT incurred huge loss of equipment and structures.



# Impact on Accelerator Operations – DARHT



Transportainers  
NOT fireproof!

(Looking out my office  
window, what do I see?)

## Impact on Accelerator Operations – DARHT

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- DARHT workers had to wait for another week before being allowed back on site.
- DARHT accelerators were shutdown and was unable to be restarted.
- High Explosives were destroyed.



# Los Alamos National Lab – Tested by Fire, Part II

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## ■ Las Conchas Fire: June 2011

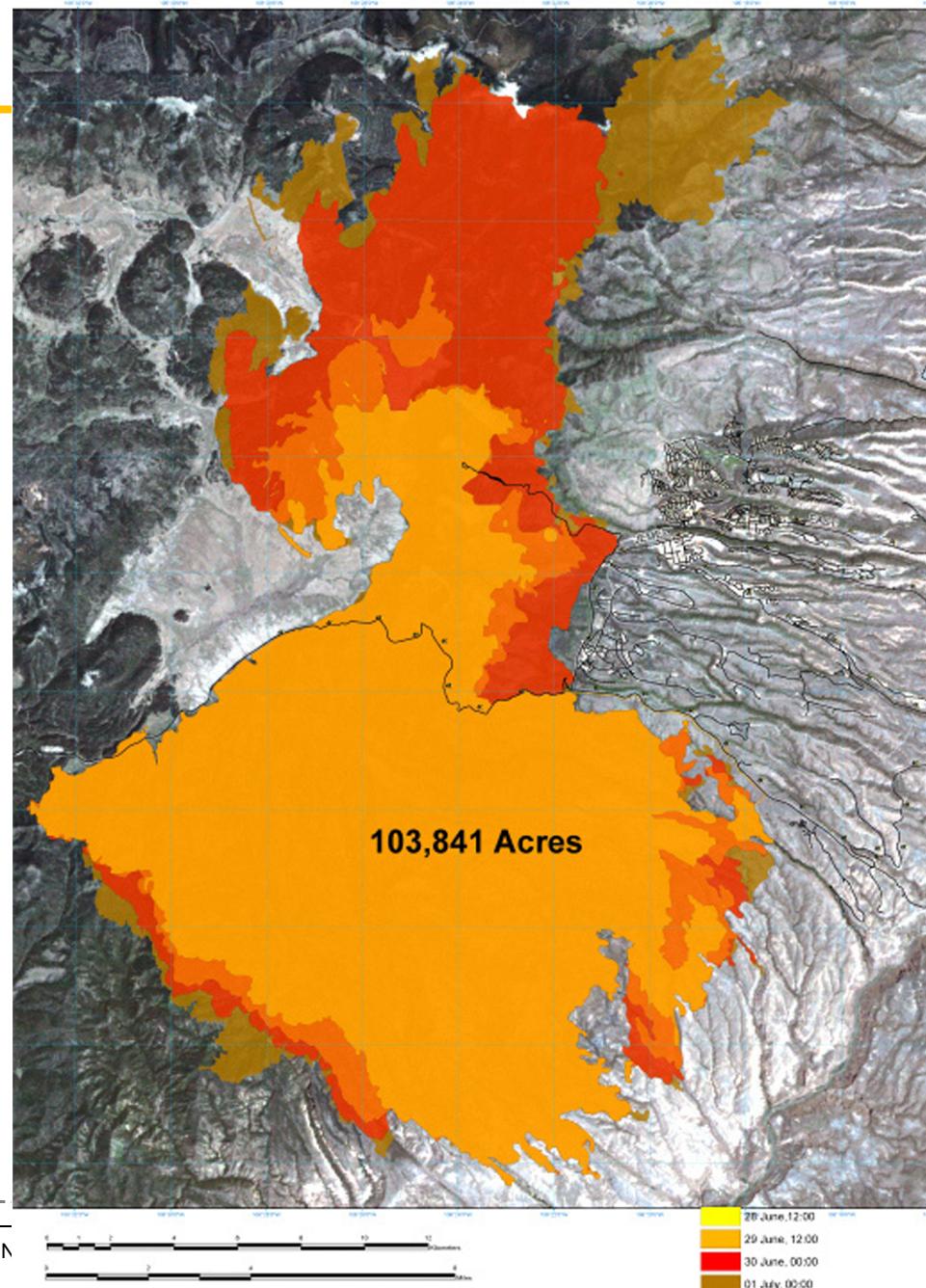
- Started June 26 when a tree fell on a power line.
- Over 150,000 acres burned (630 square kilometers).
- Mandatory evacuation of Los Alamos June 27.
  - No mandatory evacuation of White Rock, but poor conditions caused many residents to evacuate anyway.
- Over 60 residences destroyed outside of Los Alamos.
- LANL also closed for all non-essential personnel (including myself) on June 27.
- No LANL structures destroyed. Only one spot fire on LANL property (more on that in a moment).
- Largest wild fire in New Mexico state history! ...until 2012...

View from Los Alamos High School on the evening of June 26:



- **Extent of the fire as of July 1<sup>st</sup>.**
  - Burnt area is much larger than Cerro Grande, but Los Alamos and LANL spared, due to fire changing direction.

FIRE PROGRESSION: LAS CONCHAS  
LOS ALAMOS NATIONAL LABORATORY



## Impact on Accelerator Operations – LANSCE

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- **Sunday, June 26, 5:30 pm (around shift turnover):**
  - Associate Director for Experimental Sciences (ADEPS) calls Central Control Room (CCR), instructing crew to place accelerator in a safe mode for possible evacuation.
    - ADEPS “owns” LANSCE User Facility (LUF Director is also Deputy ADEPS).
    - Accelerator Operations and Technology (AOT) division (including Operations group) is part of a different directorate.
    - Facility management is part of yet another directorate.
  - Day crew confirms shutdown instructions with AOT and Facilities division leaders.
  - Crews also consult with system owners, who are off-site for the weekend.

# Impact on Accelerator Operations – LANSCE

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- **Night crew continues shutdown of accelerator.**
  - Water and vacuum systems are kept on, in the hope to facilitate recovery.
- **After 19:00:**
  - Non-essential personnel ordered off-site.
  - Personnel attempting to come on site are turned around.
  - CCR crew and Radiation Protection personnel remain on site. Ensure evacuation of others and secure radioactive sources and materials.
  - CCR secures equipment as per phone instructions from system owners.
- **After 20:00:**
  - Operators can see flames in the Jemez mountains.

# Impact on Accelerator Operations – LANSCE

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- **Monday, Day shift:**
  - Two of four day shift operators have heard about LANL closure, started to evacuate, and are not coming in. One operator comes in late.
  - For some hours in the morning only crew chief and Operations group leader are staffing CCR.
- **~ 15:00: All remaining personnel except Emergency Response are ordered to evacuate LANL. Los Alamos under mandatory evacuation.**

## Impact on Accelerator Operations – LANSCE

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- **On Thursday, June 30 two operators take part in a walk down of the LANSCE facility.**
  - One operator brings the control system back online, so that he can more easily check site-wide equipment statuses.
  - A squirrel had a fatal encounter with the facility substation, causing the only fire on LANL property. The fire is spotted by a facility worker who takes part in the walk down, and put out by LAFD, having burned 1 acre. Power is diverted to LANSCE from other sources to keep vacuum in the machine. Operators start from scratch in their recovery efforts.
- **On Tuesday, July 5, one day before LANL officially reopens, crews return to staff CCR.**
  - The plan to recover equipment in a timely fashion is hampered by the absence of system owners for another day.

## Summary

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- In a little more than a decade two large wild fires threatened Los Alamos and impacted accelerator operations at LANL.
- In 2000 the Cerro Grande Fire destroyed hundreds of homes, as well as structures and equipment at the DARHT facility. The DARHT accelerators were safe in a fire-proof building.
- In 2011 the Las Conchas Fire burned about 630 square kilometers (250 square miles) and came dangerously close to Los Alamos/LANL.
- **LANSCE accelerator operations Lessons Learned during Las Conchas fire:**
  - Develop a plan to efficiently shut down the accelerator on short notice.
  - Establish clear lines of communication in emergency situations.
  - Plan recovery and keep squirrels out!