Measurable Outcomes of a Woodstove Changeout on the Nez Perce Reservation

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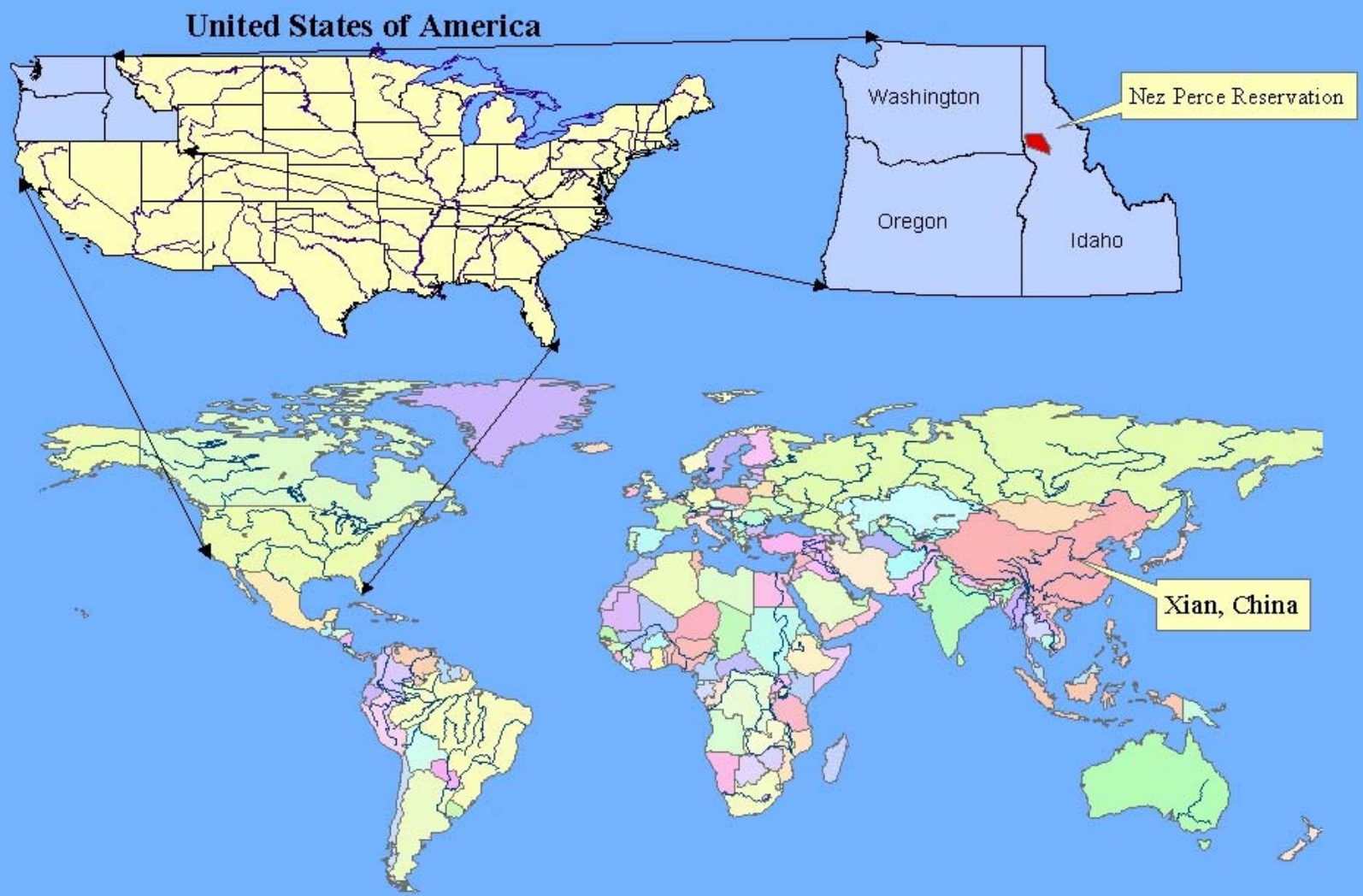
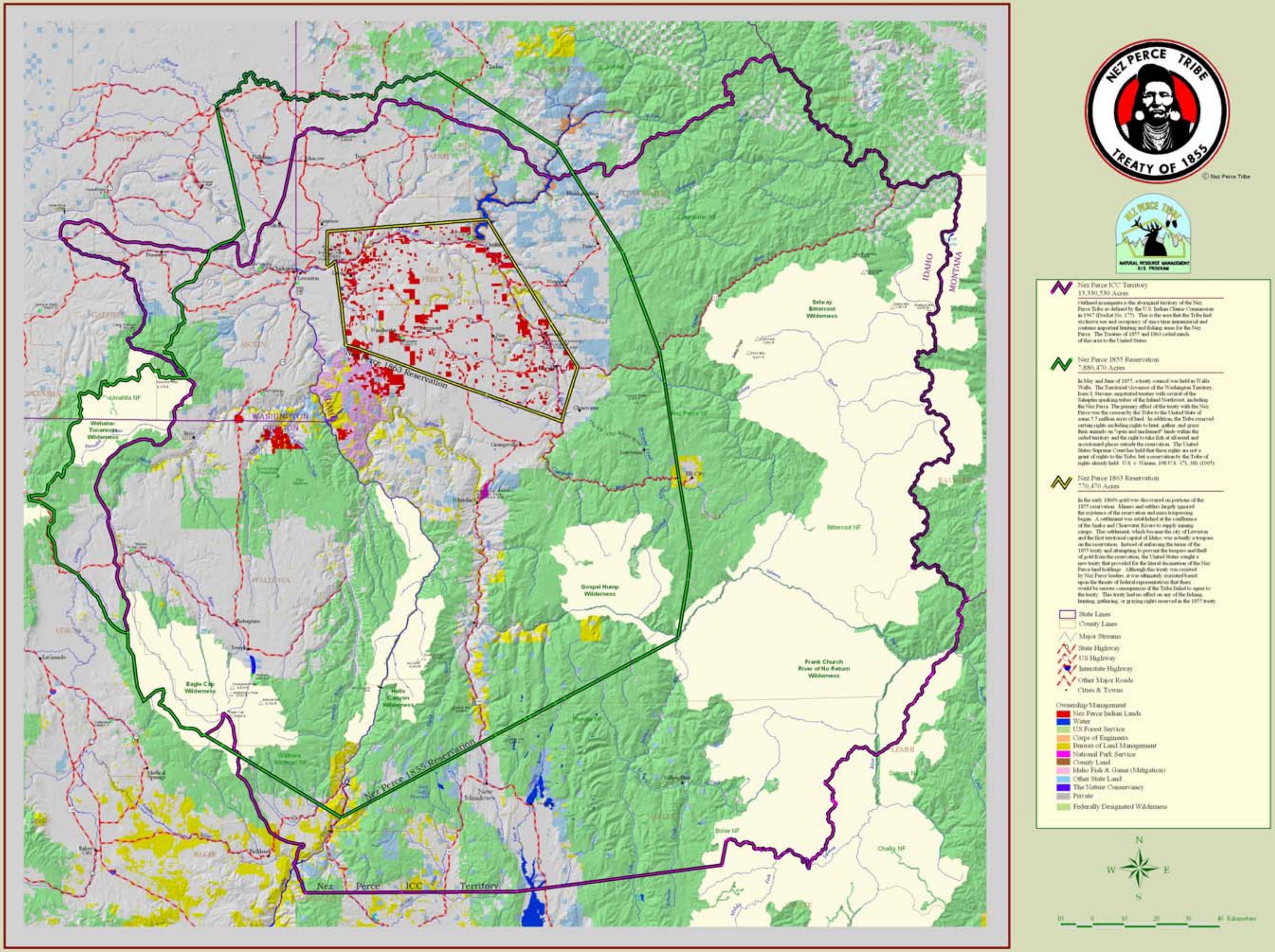
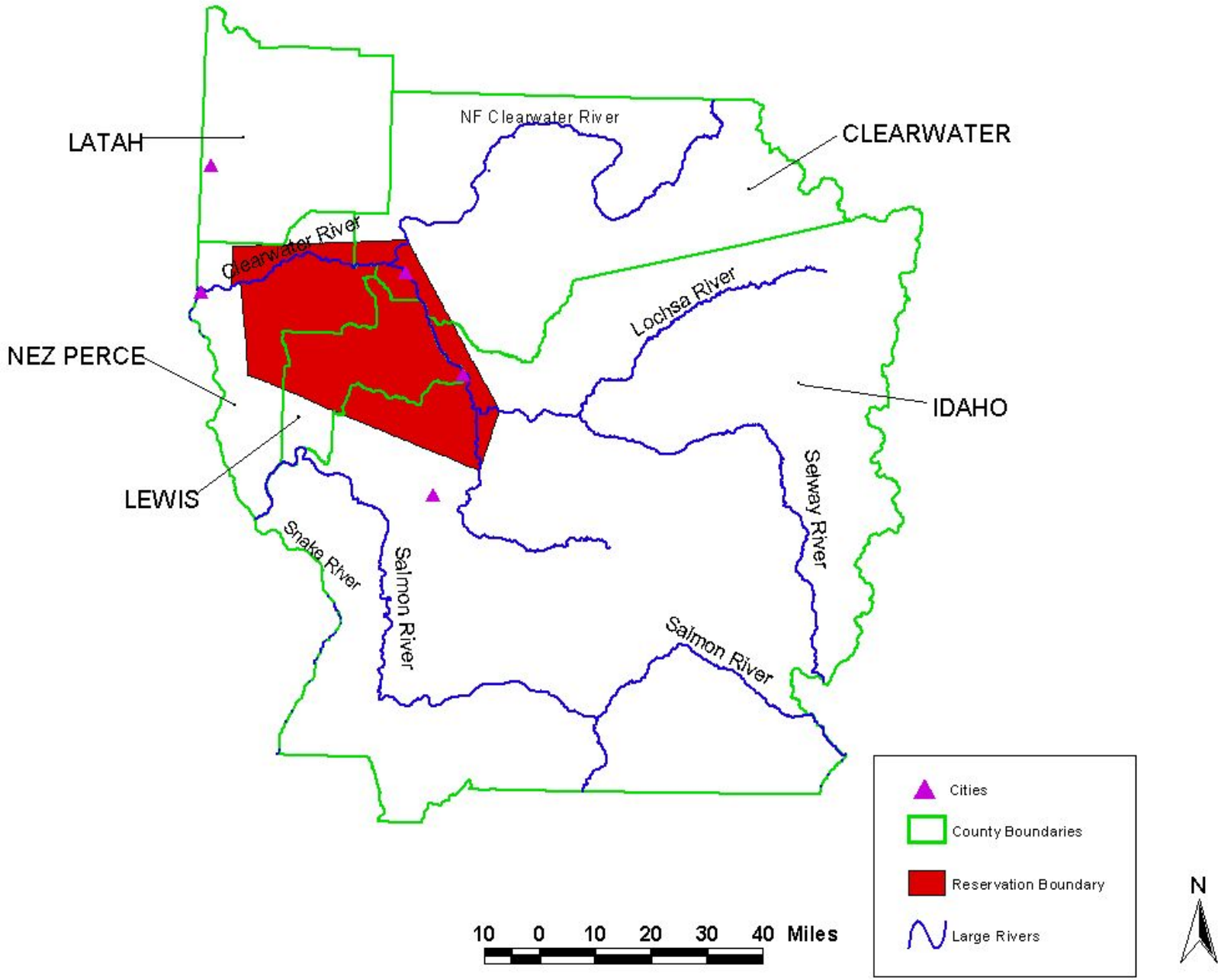
Location of the Nez Perce Reservation

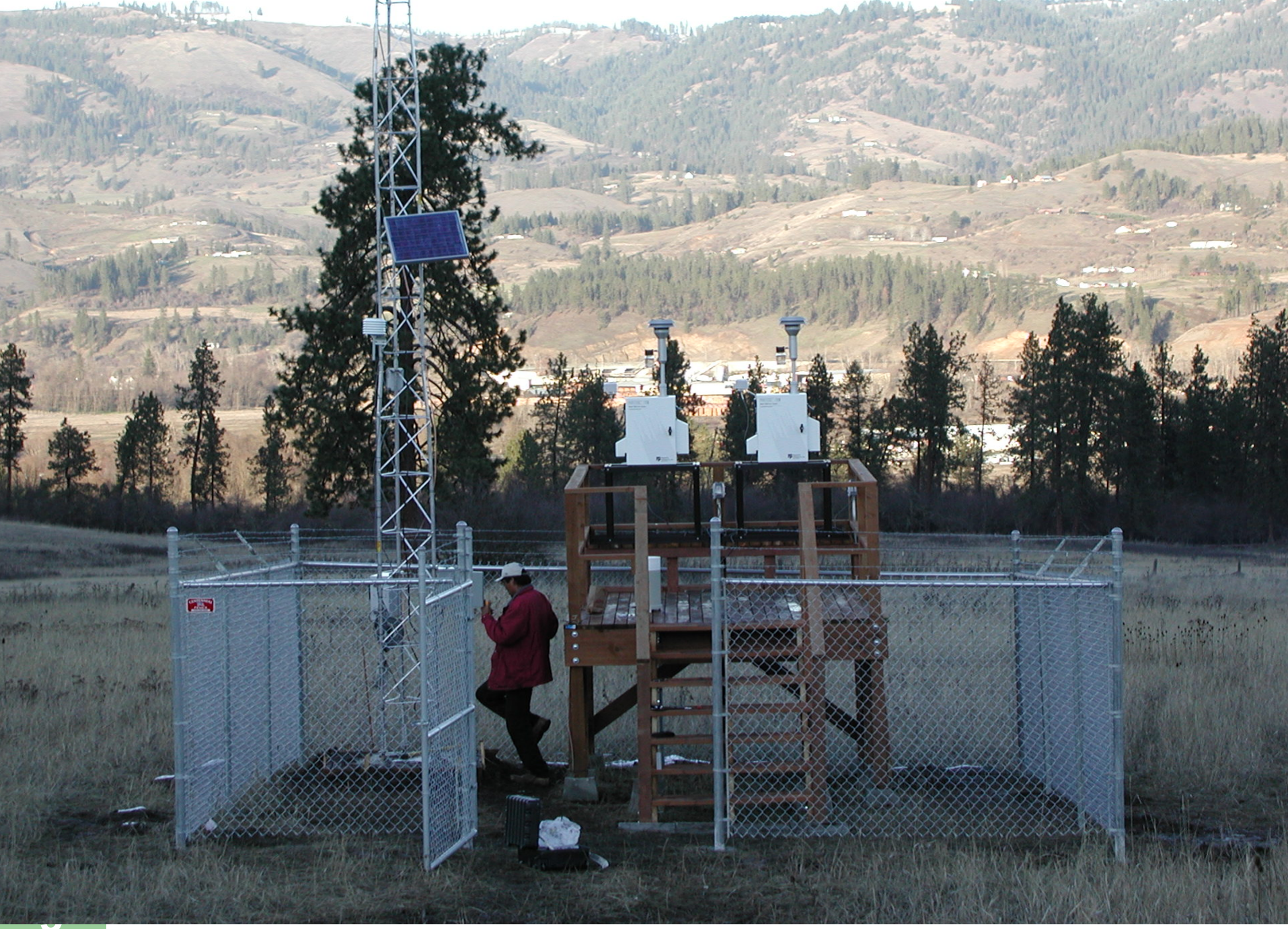


Territory of the Nez Perce Tribe




LATAH
CLEARWATER
NEZ PERCE
LEWIS
IDAHO
NF Clearwater River
Clearwater River
Lochsa River
Selway River
Snake River
Salmon River
Salmon River
Cities
County Boundaries
Reservation Boundary
Large Rivers
10 0 10 20 30 40 Miles
N

4/21/99



Hypothesis

- Woodstove replacement will reduce indoor levels of particulate matter (PM) and associated wood smoke chemical markers from domestic wood burning

Project Partners

- EPA
- Nez Perce Tribe
- University of Montana
- Northwest Indian College, Nez Perce Tribe Distance Learning Center
- Institute for Tribal Environmental Professionals (ITEP)

Study Overview

- Recruit households
- Conduct sampling during winter months 06/07 and 07/08 in 16 households in Kamiah and Lapwai
- Conduct woodstove changeouts in summer 2007 from the older non-EPA certified stove to a new EPA certified stove
- Measure ambient PM2.5 mass before and after changeout
- Measure residential indoor PM2.5 levels before and after woodstove changeout
- Education and outreach

Outreach Efforts

- Recruiting households
  - T.V. interview with KLEW News
  - News article in Lewiston Morning Tribune
  - Meeting with NiMiiPuu Health
  - Presentation for Lewis Clark Air Advisory Committee
  - Notification in Tribal employee email
  - Nez Perce Tribe Environmental Education Group
  - Nez Perce Tribe Intradepartmental Coordination

Working with Households

- "Qualifying" households
  - Tribal member home
  - Asthmatic children in household between the ages of 6-16
  - Non-smoking home
  - Use older woodstove as their main source of heating the home
  - Questionnaire
    - ~20 received
      - 6 qualifying
    - Contact with prospective participants
      - Sharing incentives
      - Challenges

Ambient Monitoring

- Utilize existing network in Kamiah and Lapwai
  - PM2.5 TEOM
  - Met Tower: temperature, humidity, precipitation, wind speed & direction
  - Record of observations and forecasts of inversion conditions (predicted elevations and when/if the inversion breaks)

EPA Standards

- 24 hour PM2.5 standard went from 65 µg/m3 to 35 µg/m3
- Annual PM2.5 standard is still 15 µg/m3

Indoor Air Sampling

- Sample for 24-hour period, 4 sample days
- Leland Sampler / Personal Environmental Monitor with a quartz filter:
  - Organic Carbon / Elemental Carbon (OC/EC)
  - Chemical markers (vanillin, acetovanillone, guaiacol, 4-ethylguaiacol, levoglucosan, abietic acid, dehydroabietic acid)
- DustTrak (continuous PM2.5 mass) set to run for 48 hours straight
- Health Effects

Health component

- As a participant in the woodstove changeout, we asked the homeowner to take part in the health component and monitor their asthmatic child's breathing using the PiKo peak flow meter
- Peak flow meter measures how much air the child can take into the lungs and breathe out

Health component cont’

Sample Days

- Interview with participant
  - Explain study
  - Equipment
  - Keeping records of daily activities
- Collecting home information
  - Age of home, square footage, number of rooms
  - Age of woodstove, wood type, cords burned per year

Indoor Sampling Equipment

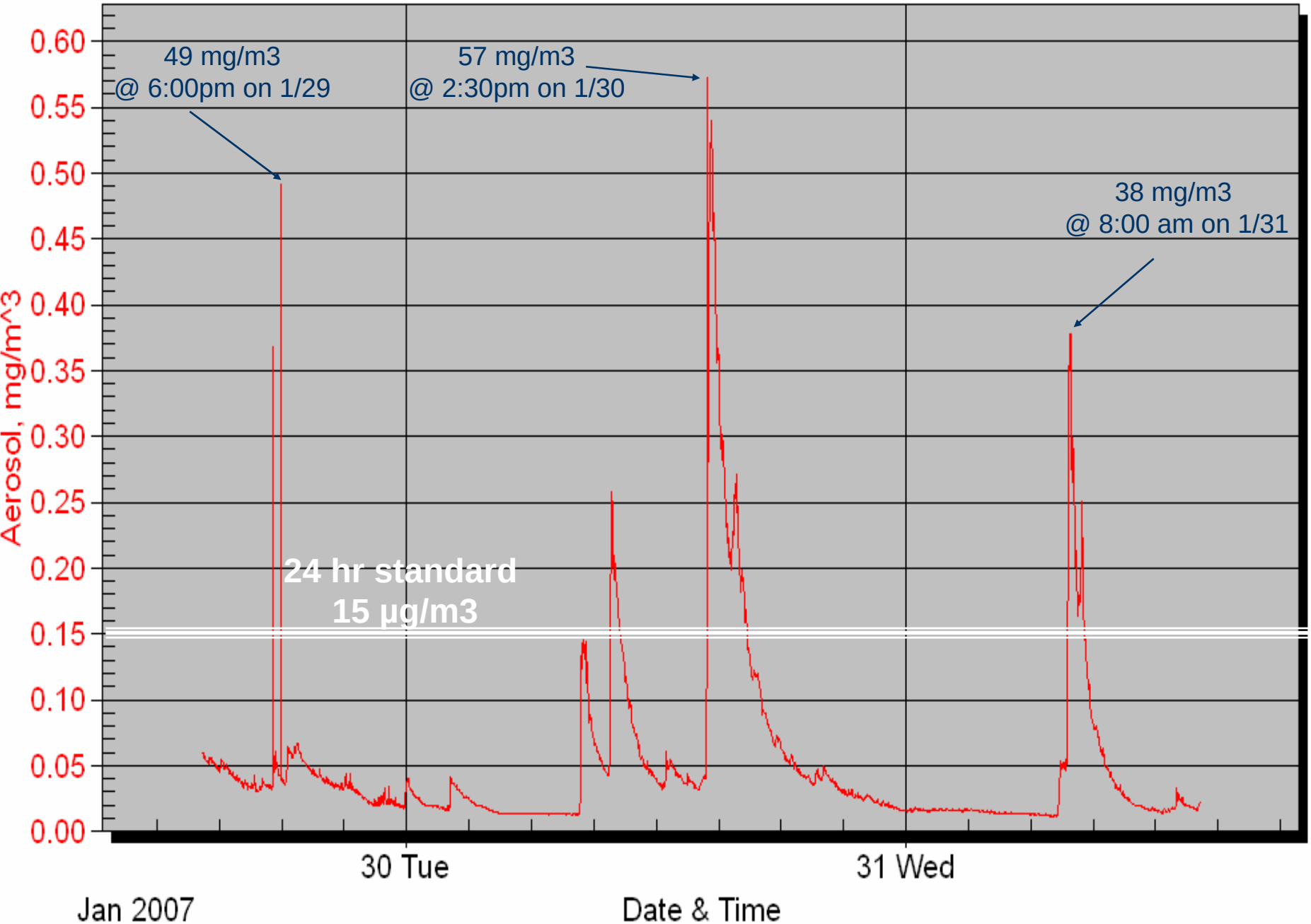
Sample Days cont’

- Equipment duties
  - Calibration and set-up
  - Cleaning
  - Uploading information to the Dust Trak to set run time and date
- Record Keeping
  - Documenting equipment readings
  - Downloading data from the Dust Trak & emailing information to Tony Ward

Calibrating the equipment

Home # 3

Test # 1


49 mg/m3
@ 6:00pm on 1/29
57 mg/m3
@ 2:30pm on 1/30
38 mg/m3
@ 8:00 am on 1/31
24 hr standard
15 µg/m3
Aerosol, mg/m^3
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
30 Tue
31 Wed
Jan 2007
Date & Time

Sample Days cont': Participant Commitment

- Record of home activities during sample day
  - 2 pages: cooking, cleaning activities, candles, etc.
  - Nez Perce traditional burning activities such as burning sweet grass, sage, or boiling kouse kouse
- Record of wood burning activities
  - Loading & stoking
  - How many pieces of wood used
- Challenges

Older woodstoves in homes sampled

Wood Stove Changeouts

- Provide & install up to 16 EPA certified stoves which are more efficient and give off less emissions
- Tribal Employee Rights Office (TERO)
  - Certifications for tribal members to become stove installers
- Work with Libby, MT changeout folks

Education and Outreach

- Health effects of wood burning stoves
- Optimal operation of wood stoves
- Asthma, smoking, & indoor air quality
- NWIC student presentations on study results
- Tribal programs
  - Wood Delivery Program
  - Housing Authority
  - Early Childhood Development Program (Headstart)
- Community events, schools

Preliminary Results from Univ. of Montana's research in Libby, Montana

- Pre-changeout average $PM_{2.5}$ concentrations within 21 homes: 53.4 $\mu g/m^3$.
- Post-changeout average $PM_{2.5}$ concentrations within 16 homes: 15.0 $\mu g/m^3$.
- Average reduction in indoor $PM_{2.5}$ as a result of woodstove changeout within 16 homes:

72%

Questions?