



The National Forest Genetics Laboratory

Session V: Current State of Technologies: Genetics

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U.S. FOREST SERVICE

Caring for the land and serving people

Outline

Overview of our wood ID work

- Prior and current relevant projects:
 - Project year/duration
 - Funding source(s)
 - Project partners and roles
 - Taxa under scrutiny
 - Are your methods and data open-access and publically available for use?
- Meta-analysis of projects:
 - challenges/successes observed between projects?
 - biggest hurdles?

Detailed overview of one specific project

- How you acquired your reference material
- Methods you used to generate your reference data
- Your specific analysis methods
- Your results

The National Forest Genetics Lab (NFGEL)

OVERARCHING CONTEXT TO ALL OUR PROJECT

DNA ISOLATION

MARKERS (existence and appropriateness)

REFERENCE MATERIAL (databases; maps)

TIME (inquiry to answer)

COST

FACILITY/EXPERTISE

Requests

Individualization

- **Individual tree theft (cedars, pines, Douglas-fir)**
- **Reconstructing the scene of wildland fires (eucalyptus, pines)**

Species Identification

- **Black Walnut species ID of furniture from Getty Museum**
- **Whitebark pine vs Western White pine (ski resort expansion)**
- **Virginia pine vs Shortleaf pine (FS sold seedlings of wrong species)**

Geographic Provenance (source)

- **Mulanje Cedar (*Widdringtonia whytei*) (identifying origin of seed plantations; matching seed to origin)**
- **Eastern white pine (selection and planting of specific sources)**
- **Ponderosa pine (identifying seed source of unknown plantations)**



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DNA ISOLATION

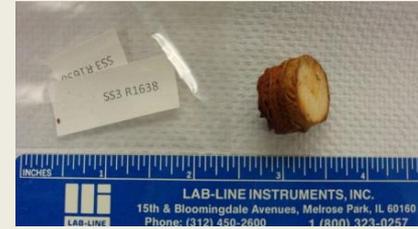
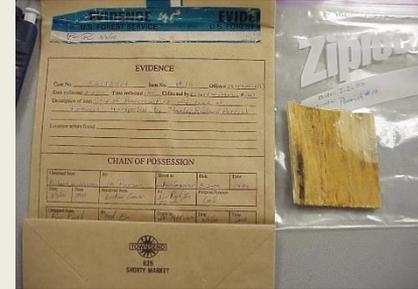
MARKERS (existence and appropriateness)

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COST

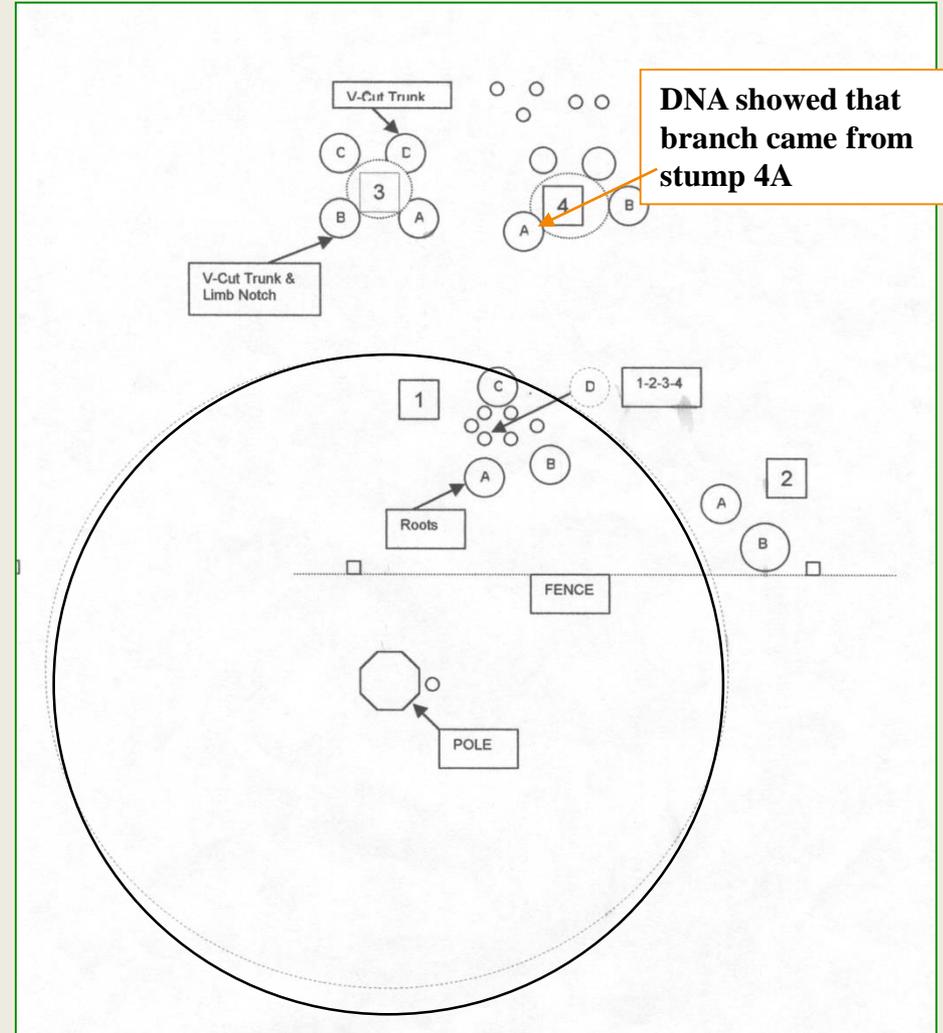
FACILITY/EXPERTISE



Reconstructing the Scene of a Fire

Detailed overview of one specific project

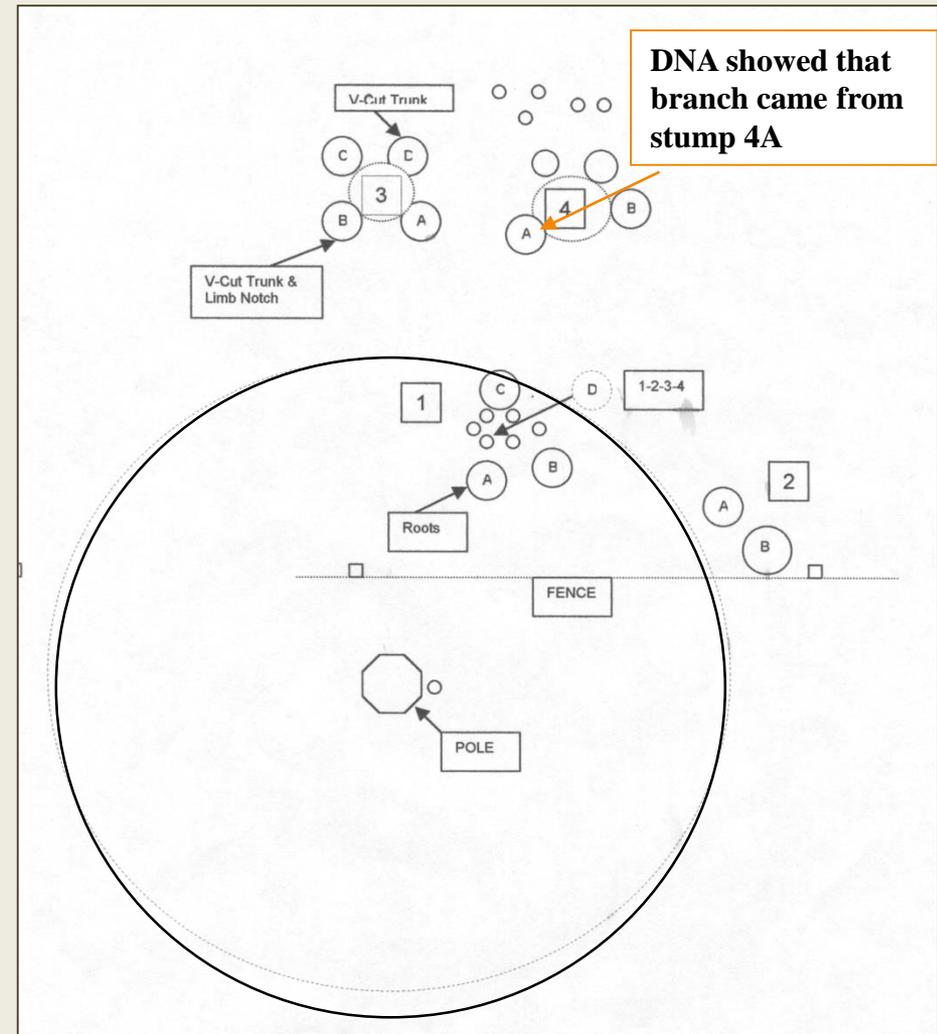
- How you acquired your reference material
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- Your specific analysis methods
- Your results



Reconstructing the Scene of a Fire

Detailed overview of one specific project

- How you acquired your reference material
 - Eucalyptus calabasas; California Department of Forestry and Fire Protection*
- Methods you used to generate your reference data
 - only small database needed (<50 trees); mix of wood and leaves*
- Your specific analysis methods
 - 1999*
 - RAPDs; microsatellites (12)*
- Your results
 - 4 months to perform work*
 - 2 months to transfer*
 - 2 months to repeat (Dario Grattapaglia (EMBRAPA))*
 - Final rpt in 8 months from inquiry*
 - \$15K to NFGEL*
 - Recovered ~\$7million USD from power company in damages*



Identifying Original Seed Source of Plantations

Detailed overview of specific project

- How you acquired your reference material
 - Pinus ponderosa*; 114 stands over 3,000 trees;
needle collections; USFS, BLM, NPS, State
agencies, universities, NGOs
 - Methods you used to generate your
reference data
 - rangewide database needed*
samples received from May 2001 – Aug 2012
 - Your specific analysis methods
 - 2000*
allozymes; microsatellites (nuclear and cp);
mtDNA
 - Your results
 - over 10-yrs of lab work*
\$550,342 (BLM and USFS)
4 peer-reviewed publications
source ID of known stands
- *** *portable “DNA-barcoders” for use in building
reference databases*



Matching Seed to Origin

Detailed overview of specific project

- How you acquired your reference material

Mulanje Cedar (Widdringtonia whytei)

BGCI (Botanic Gardens Conservation

International); Forestry Research Institute of

Malawi; Mulanje Mountain Conservation Trust;

USFS

700 wood samples; 150 foliage samples

- Methods you used to generate your reference data

single native stand; plantations

- Your specific analysis methods

?

- Your results

inquiry (identifying origin of seed orchards;

matching seed to origin): February 2017

700 wood samples, 150 des. tissue samples

No markers

Final data requested by December 2017 (10 months)

\$7,000



Individualization (tree theft)

Detailed overview of specific project

- How you acquired your reference material
 - Bigleaf maple (Acer macrophyllum)*
 - WRI; Double Helix; Andrew Lowe (U Adelaide); USFS – IP, LI&E, NFGEL; USFSW*
 - DNA extractions from stump and local stand*
- Methods you used to generate your reference data
 - rangewide (sampled by A Lowe et al)*
- Your specific analysis methods
 - SNPs and INDELS*
- Your results
 - inquiry: September 2012*
 - request for results (plank to stump match) within 6-months*
 - 1st publication describing markers in August 2015.*



Future Efforts.....

DNA ISOLATION

MARKERS (existence and appropriateness)

REFERENCE MATERIAL (databases; maps)

TIME (inquiry to answer)

COST

FACILITY/EXPERTISE

FOCUS (species, scope, application)

REFERENCE DATABASES (new technologies)

COOPERATION