

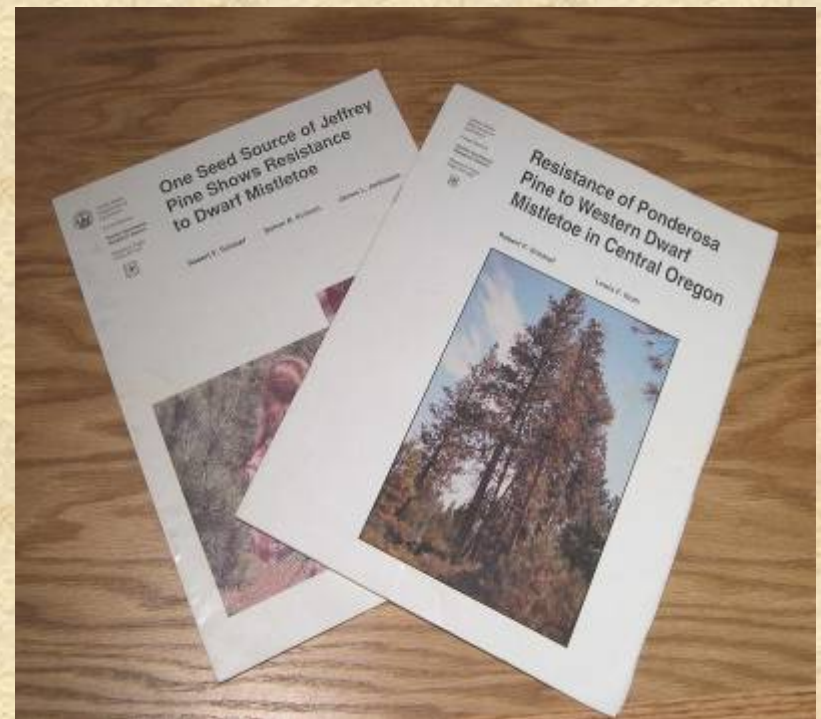
Initial Results -
Identification and Genetic
Assessment of Resistance to
Dwarf Mistletoe in Ponderosa
Pine

Paul Stover and Dennis Ringnes

Why did we do this?

Increasing Evidence of Mistletoe Resistance

- **Scharpf, R.F.; Roth, L.F. 1992.** Resistance of ponderosa pines to western dwarf mistletoe in Central Oregon. Res. Pap. PSW-RP-208. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 8p.
- **Scharpf, R.F.; Kinloch, B.B.; Jenkinson, J.J. 1992.** One seed source of Jeffrey pine seedlings shows resistance to dwarf mistletoe. Res. Pap. PSW-RP-207. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 8p.



Increasing Potential Market for Dwarf Mistletoe Resistant Planting Stock

Group Selections



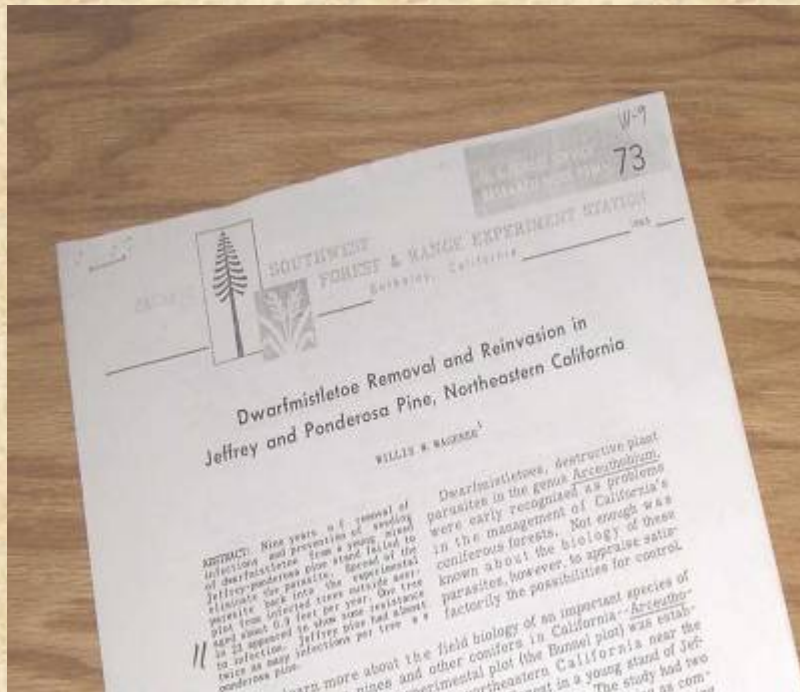
Campgrounds





Twin Falls Dwarf Mistletoe Resistance Evaluation
Ponderosa pine – 1990
USFS Region 6 - Deschutes National Forest, Oregon

Mature Resistant Candidate Material Ready for Crossing



- **Wagener, W.W. 1965** Dwarf Mistletoe removal and reinvasion in ponderosa pine and Jeffrey pine, northwestern California. Res. Note PSW-73. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; 8 p.



Carl “Snow” Fowler

Collecting Dwarf Mistletoe
Resistant Candidate Scion-wood
for Grafting in 1965



Early Resistant Candidates
Were Bred with One Another
To Produce a Potentially
Higher Level of Resistance

Breeding Design – Wagener Resistant Candidates

Tree No.	302	310	353	364	366	367
302						
310	X		X			
353	X	X				
364	X	X	X	X		
366	X	X	X	X	X	X
367	X	X	X		X	

Resistance Candidate Comparison Tree Selection

USDA FOREST SERVICE R-5 GENETIC RESOURCE PROGRAM

HISTYLETOR RESISTANCE CANDIDATE REPORT --FIELD

USE--

RECORD TYPE 1

TREE NO. PP-11-51-08	ELEVATION 56	SPECIES DNR-PP
SPECIES 122	ASPECT 2	TREE NO. PP-11-51-08
FOREST 11	SITE INDEX ---	AREA MALLARD COVE
DISTRICT 51	TREE INDEX ---	T. 24N R. 13E S. 26
COMPART. ---	BASED CODE -	CROWN CD, DR, RW, KN
LATITUDE 37°54.8'N	SEED CROP 2	R.P. PP
LONGITUDE 120°22.9'W	OWNERSHIP 01	DNR 24"
SEED CODE 223	YEAR 94	SEAR. MADE
		DIAM. 2.54

RECORD TYPE 2

DECLIN. 17.5 B

TREE	AGE	HT	DOB	DIB	HT	RATIO	WH	HW	LWH	TOT	TO SOURCE
DNR TREE	99	102	24.3	---	1.20	70	0	0	0	0	
1		70	14			50	1	2	2	5	<10 FEET
2		80	18			75	0	1	2	3	<20 FEET
3		90	18			50	0	2	2	4	<25 FEET
4		60	10			50	1	1	2	4	<5 FEET
5		110	30			65	0	2	2	4	<15 FEET

INFECTION RATIO (average Rankworth rating of comparison trees to DNR tree) 4.0 to 0

NUMBER OF LADDERS 4 ROUTINE EP

REMARKS

Core Collection	Date	Pollen Collection	Date	Scion collection	Date
229 KM/RW	9/26/94			6 TEA/DE	5/23/96
				7 HC TEA	11/2/97

RS-2400-146a
(Rev. 1/95)

TREE NO. PP-11-51-08

MOTOR LOG TO REFERENCE POINT:
FROM THE JUNCTION OF ROAD 112 AND 24NG1Y, GO EAST ON 24NG1Y FOR 0.1 MILE TO "T" INTERSECTION. GO NORTH FOR 0.1 MILE TO R.P. ON EAST SIDE OF ROAD.
R.P. IS 24" PP.

MAP TO REFERENCE POINT:

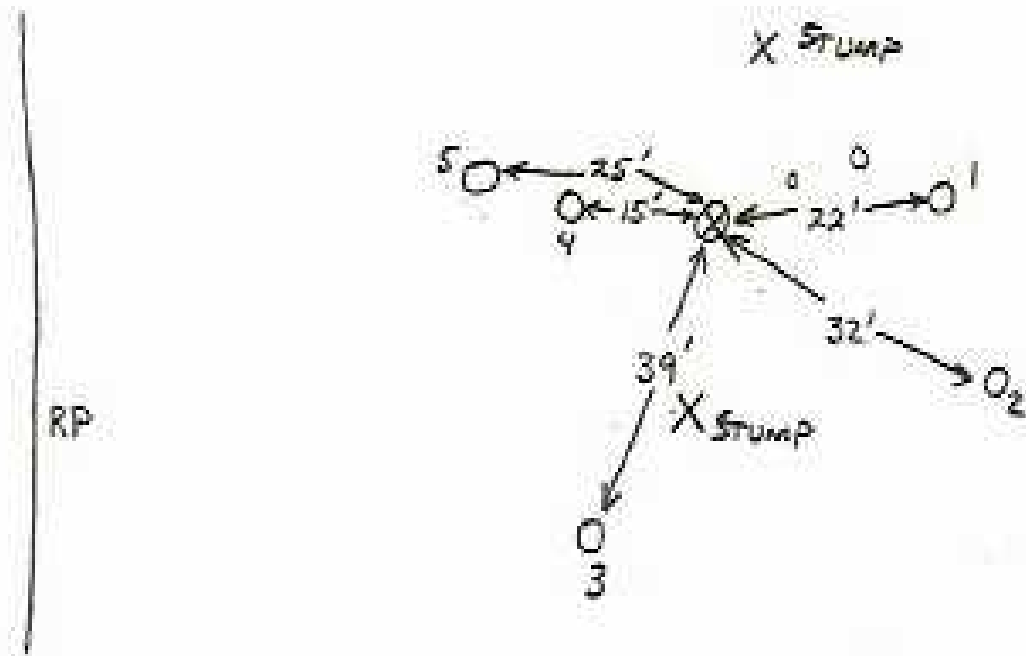
MAP OF INDIVIDUAL TREES:

Candidate Comparisons and Infection Potential

RECORD TYPE 2											DECLIN. 17.5 E
TREE	AGE	HT	DOB	DIAMETER		CROWN		HAWKSWORTH RATING			DISTANCE
				DIB	BT	RATIO	UPR	MID	LWR	TOT	TO SOURCE
DMR	99	102	24.3	---	1.90	70	0	0	0	0	
1		70	14			50	1	2	2	5	<10 FEET
2		80	18			75	0	1	2	3	<20 FEET
3		90	18			50	0	2	2	4	<25 FEET
4		60	10			50	1	1	2	4	<5 FEET
5		110	30			65	0	2	2	4	<15 FEET
6											
7											
INFECTION RATIO (average Hawksworth rating of comparison trees to DMR tree)							4.0 to 0				
								NUMBER OF LADDERS	4	ECOTYPE	EP
REMARKS											

Additional Factors

MAP OF INDIVIDUAL TREES:





**Wild Stand
Candidates
Were Selected**



Susceptible
Controls
Provided
the Last Group

Cones Were Collected and Planting Stock Produced



Dwarf Mistletoe Resistance Evaluation Plantation



OBJECTIVES

- Determine Levels of Dwarf Mistletoe Resistance Between Three Candidate Groups – Are They Different?
- Estimate Heritability Levels and Relative Value of Parent Trees (Assuming resistance is controlled by multiple genes)

Layout

- 5 Blocks
- 5 Seedlings per Family
- 3 Groups
 - Susceptible Control – 10 Families
 - Resistant Candidate – 14 Families
 - Controlled Crosses of Candidates – 20 families

Round-1 Inoculation



Inoculation



Inoculation
Tracking

Inoculation



Evaluation



Swelling

Female Plant Broom



Plant Emergence



Results From Round 1

Percent of Seed Producing Infections

Groups	Lots	Sum	Mean	Variance
Controls	10	74.07	7.41	7.72
Selects	14	55.83	3.99	8.24
Crosses	20	55.89	2.94	8.01

One-way ANOVA

Using Results From Round 1

Source	SS	df	MS	F	P-value
Between Groups	134.65	2	67.33	8.39	0.0008
Within Groups	328.98	41	8.02		

Current Infection Rates by Inoculation Round

Block	R – 1 5 seed	R – 2 10 seed	R – 3 20 seed	R – 4 20 seed
1	3.43%	2.18	0.75	
2	7.60	1.92	0.55	
3	4.81	2.74	0.63	
4	5.58	1.40	0.34	
5	4.55	1.00	0.33	

When Fast Growth Isn't a Good Thing



List of Contributors

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- James Allison
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