

Root Disease Survey Ram's Dell Tract

OSU Extension
Forestry



Root Disease Survey of the OSU Ram's Dell Forest Tract – March 6, 2003

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Summary

In July 2001 and February 2002, the 96-acre OSU Ram's Dell Forest Tract was surveyed by Master Woodland Managers and other family forest owners for laminated root rot caused by *Phellinus weirii*. A total of 97 permanent plots were established at 200-ft intervals across the entire survey area. About 10% of the area was found to be visibly affected by laminated root rot. Most (68%) of the tree species are Douglas-fir at 114 trees/acre and 120 ft² basal area/acre, mostly in the 10-19.9 in. diameter classes. Other species present, in order of abundance, include western redcedar, red alder, bigleaf maple, grand fir, western hemlock, cascara, black cottonwood, and Pacific yew. Much of the area was overstocked resulting in suppression mortality in the Douglas-fir (5%).

In October 2002, 8 months after our initial survey, about 20 acres were either commercially thinned or received small clearcuts. We recommend that root rot areas be either thinned or patch cut if they have not been so treated. Openings should be planted with a mixture of tree species including Douglas-fir and the permanent plots monitored to determine the mortality rates from root disease and other causes by seedling species. We also recommend that tree wound severity due to the thinning operation be determined on the permanent plots.

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Introduction

The Ram's Dell Forest Tract is a 96 acre forested area donated to OSU in 1994. It is located approximately 5 miles NE of Mollala, OR (T5S, R3E, and Sec. 20). The forest is composed mostly of second-growth Douglas-fir. Some of the area is infested with laminated root rot. Knowing precisely where the root disease is located and its severity will greatly facilitate forest management. Also, knowing disease characteristics and location can be used as an educational and research tool and thus meet the mission of the Ram's Dell tract.

Laminated root rot, caused by the fungus *Phellinus weirii*, is one of the most destructive forest diseases in Oregon, especially in western Oregon where Douglas-fir is the principal host (Thies and Sturrock 1995). It has been estimated that laminated root rot occurs on 8% of commercial forestland in Washington and Oregon and causes 40 to 70% reduction in wood volume in affected areas. The fungus decays root systems, causing growth loss, death, and windthrow. Laminated root rot can be difficult to detect, especially in young forests. Infected stands typically have trees that have been killed over several years, in some cases, decades. Dead trees and sometimes live infected trees often are toppled by wind and are scattered in forest openings. Infected roots often display a white surface mycelium called ectotrophic mycelium and rotten wood that typically separates into sheets along annual rings; hence the name "laminated

root rot.” Other root diseases, such as Armillaria root disease caused by *Armillaria ostoyae*, are often found associated with laminated root rot in westside forests.

Several tree species are tolerant, resistant, or immune to laminated root rot in western Oregon (Filip 1999). Tolerant species, such as western hemlock and noble fir, usually become infected with the fungus but generally do not die but either windthrow or have severe butt rot. Resistant species such as ponderosa pine, white pine, and western redcedar, may become infected but rarely die, windthrow, or get butt rot. Immune species, such as maple and alder, are never infected and completely stop the spread of disease through root contacts or grafts.

The effects of commercial thinning on laminated root rot have not been well studied. Thies and Sturrock (1995) recommend against commercial thinning “if the disease is present in 20% or more of the stand.” Depending on management objectives, there are three thinning strategies that they recommend:

- Thin through without regard for disease especially if a final harvest will occur in 15 years.
- Use buffer-strip removal that harvests all highly susceptible tree species within the disease centers plus all trees within 50 feet of visibly infected trees or stumps. This may reduce spread into healthy portions of the stand.
- Avoid cutting trees within 50 feet of visibly infected trees or stumps when losses to windthrow will exceed mortality losses to disease.

Being a research and education forest, the Ram’s Dell tract affords the opportunity to study and demonstrate one or more of the above thinning strategies.

In October 2002, eight months after the area was surveyed, about 20 acres of the Ram’s Dell Tract was either commercially thinned to basal areas 100 or 140 ft², or received small clearcuts, mostly in blocks 2, 3, and 4 (see appendix).

Survey Objectives

The objectives of our survey were to: 1) determine the location of major root disease centers on the entire 96-acre tract and 2) establish permanent plots to quantify current and future tree mortality and growth losses due to laminated root rot. Also, this report will provide some recommendations for management of the area especially regarding laminated root rot that can be used for both research and demonstration to aid family forest owners and other non-industrial private woodland owners.

Methods

The survey was conducted on July 9 and 10, 2001 and February 26 and 27, 2002. The survey group consisted of woodland owners and Master Woodland Managers. On the first survey transect for each survey period, the entire group worked together to learn how to recognize laminated root rot and to become familiar with the data collection procedures. After a few plots were established, the group was divided into 3 to 4-person crews. Each crew was assigned a transect to survey. Each crew had the following equipment to do the survey: compass, diameter tape, logger’s tape, 20-BAF prism, numbered aluminum tags and nails, hatchet or hammer, pulaski, plot poles and tags, tatum or clipboard, water-proof data sheets, block map with transects and plot locations, and laminated root rot identification card (see appendix).

The 96-acre Ram's Dell tract was divided into four blocks to facilitate the survey (Fig. 1). Each block was then surveyed by walking a series of parallel transects in a north-south direction. Transects were approximately 200 ft. apart. A permanent sample plot was established every 200 ft. along each transect. Sample plots consisted of a 20-BAF variable-radius plot and a concentric 0.01-acre fixed-area circular plot. Each plot center was marked with a 3 ft. long $\frac{3}{4}$ in. dia. PVC pipe. A plot number was attached to each pipe.

All living plot trees ≥ 5 in. dbh were numbered consecutively starting with the first tree to the right of true north and proceeding clockwise. Only trees ≥ 5 in. dbh (4.5 ft. above ground line) were recorded in variable-radius plots. Only trees ≥ 6 in. in height but < 5.0 in. dbh were recorded in fixed-area plots. All trees ≥ 5 in. dbh were marked with a numbered aluminum tag placed at dbh (uphill side) and facing the plot center. The following data were recorded (see data card, Fig. 7) for each plot tree (including seedlings and dead trees): block no., plot no., tree no. (if present), tree species, dbh (nearest 0.1 inches), health (healthy, live-infected [*Phellinus*], dead, stump, or windthrown), years since death (1-5, 5-10, or >10 years), and cause of death (*Phellinus*, *Armillaria*, other, or unknown).

In addition, the approximate boundaries of tree mortality caused by laminated root rot within 100 ft. of the transect were drawn on a block map as the transects were followed (Fig. 2). Once all the maps from each crew were assembled, root rot boundaries were drawn across each transect for the entire block.

In the office, data were entered into an MS Excel program and the following were calculated for each block and the entire tract: trees/acre and basal area (ft.²)/acre by tree species, diameter class, and tree condition including laminated root rot.

Results

Block 1

Block 1 was the largest unit surveyed (about 40 acres) and is located in the upper west side of the Ram's Dell tract. A total of 34 permanent plots were established. Most (50% t/ac and 73% BA/ac) of the tree species are Douglas-fir with some (16% t/ac and 8% BA/ac) western redcedar and small amounts of grand fir, western hemlock, red alder, black cottonwood, bigleaf maple, Pacific yew, and cascara (Table 1). About 47 seedlings (<1.0 in. dbh) per acre were found, mostly (68%) western redcedar but some (19%) bigleaf maple seedlings were also present. About 65 saplings (1.0-4.9 in. dbh) per acre are Douglas-fir, grand fir, maple, cascara, and cedar, but many (33%) of the Douglas-fir saplings are dead, probably through suppression. Some Douglas-fir stumps, primarily in the 5.0 to 9.9 in. dbh class, were found.

Most (62%) trees in block 1 are in the 10.0 to 19.9 in. diameter class; the remainder are mostly in the 5.0 to 9.9 in. class. Mortality caused by suppression accounts for 12% of the trees/ac but only 3% of the BA/ac. Although no plot trees with mortality caused by laminated root rot were found in sample plots, about 20% of the area is visibly affected by laminated root rot, the most visibly affected of the four blocks surveyed (Fig. 3).

Block 2

Block 2 is about 10 acres, the smallest block surveyed, and is located in the northeast corner of the Ram's Dell tract. A total of 13 permanent plots were established. Much (46% t/ac and 29% BA/ac) of the tree species are Douglas-fir with some (24% t/ac and 21 % BA/ac) red alder, and small amounts of western redcedar, grand fir, black cottonwood, bigleaf maple, and

cascara (Table 2). No seedlings (<1.0 in. dbh) were found in block 2, testimony to the dense overstory canopy that shades out even the shade-tolerant species. About 92 saplings (1.0-4.9 in. dbh) per acre are mostly (58%) dead Douglas-fir, with some live cascara and cedar. Many (33%) of the red alder saplings are also dead, probably through suppression.

Most (91%) trees in block 2 are in the 5.0 to 19.9 in. diameter class; the remainder are mostly in the 20.0 to 29.9 in. class. Mortality caused by suppression accounts for 15% of the trees/acre but only 3% of the BA/acre. Although no mortality caused by laminated root rot was found in sample plots, about 5% of the area is visibly affected by laminated root rot (Fig. 4).

Block 3

Block 3 is about 20 acres and is located in the center of the Ram's Dell tract. A total of 20 permanent plots were established. Most (72% t/acre and 73% BA/acre) of the tree species are Douglas-fir with some (14% t/acre and 12% BA/acre) western redcedar and bigleaf maple and small amounts of grand fir, western hemlock, red alder, and cascara (Table 3). About 100 seedlings (<1.0 in. dbh) per acre were found mostly (50%) western redcedar but some grand fir, western hemlock, and bigleaf maple were also present. About 80 saplings (1.0-4.9 in. dbh) per acre are Douglas-fir, grand fir, hemlock, red alder, and cedar, but many (40%) of the Douglas-fir saplings are dead, probably through suppression. Some Douglas-fir stumps, primarily in the 20.0 to 39.9 in. dbh class, were found.

Most (84%) trees in block 3 are in the 5.0 to 19.9 in. diameter class; the remainder are mostly in the 20.0 to 29.9 in. class. Mortality caused by suppression accounts for 10% of the trees/acre but only 3% of the BA/acre. Although no sample trees with mortality caused by laminated root rot were found in sample plots, about 5% of the area is visibly affected by laminated root rot (Fig. 5).

Block 4

Block 4 is one of the larger units surveyed (30 acres) and is located at the south end of the Ram's Dell tract. A total of 30 permanent plots were established. Most (59% t/acre and 74% BA/acre) of the tree species are Douglas-fir with some (12% t/acre and 9% BA/acre) red alder and small amounts of grand fir, western hemlock, western redcedar, and bigleaf maple (Table 4). Seedling (<1.0 in. dbh) species are about half grand fir and half western redcedar but only at about 7 seedlings/acre. About 43 saplings (1.0-4.9 in. dbh) per acre are Douglas-fir, grand fir, red alder, and cedar, but most (62%) of the Douglas-fir saplings are dead, probably through suppression. Some Douglas-fir stumps, primarily in the 20.0 to 29.9 in. dbh class, were found.

Most (85%) trees in block 4 are in the 5.0 to 19.9 in. diameter class; the remainder are mostly in the 20.0 to 29.9 in. class. Mortality caused by suppression accounts for 14% of the trees/acre but only 3% of the BA/acre. Mortality caused by laminated root rot represents about 4% of the trees/acre and 4% of the basal area/acre. Root rot-caused mortality was mostly (93%) found in the 5.0 to 19.9 in. diameter class. About 10% of the area is visibly affected by laminated root rot. Some *Armillaria* root disease was detected in Douglas-fir near the southern border of the block (Fig. 6).

Recommendations

As mentioned previously, about 20 acres of the Ram's Dell tract received either small patch cuts or was commercially thinned in October 2002. We recommend that all plots in blocks 2, 3, and 4 be revisited and data collected on the incidence and severity of tree wounding for all plot trees as a result of the commercial thinning. Data collected should include wound height above ground, wound area, and wound depth for each new wound. Broken or damaged crowns or roots should also be recorded. Also, tagged trees that were harvested should be recorded thusly. In patch cuts, original plot centers should be reestablished and data recorded for planted seedlings in all plots.

Because of the high basal areas throughout the Ram's Dell tract, we recommend that the remaining non-root diseased areas be thinned. This will relieve the stress on residual trees and increase growth rates. Most of block 3 was thinned, an area that was in need of density management.

We recommend that all root disease areas be treated by thinning or by patch-cutting and replanting with root-disease-tolerant species. Thinning could be tried in lightly infected areas as was done in block 3. Patch cutting could be done in the more severely infected areas such as in Block 1 or was done in Block 4. If patch cutting, retain all species besides Douglas-fir and grand fir and plant with a mixture of tree species including cedar, hemlock, alder, cottonwood, maple, white pine, and Valley ponderosa pine. Although no pine was found in the Ram's Dell Tract, ponderosa pine is resistant to laminated root rot and does well in the Willamette Valley. It may be a little high in elevation to plant ponderosa pine at Ram's Dell, but that would be useful information for landowners with similar ground. Likewise, white pine is resistant to laminated root rot and does well at higher elevations than at Ram's Dell. Because of white pine blister rust, only rust-resistant seedlings should be planted.

If thinning, retain all non-fir species if possible. Otherwise leave the best-formed firs. We recommend thinning lighter than normal in root-diseased areas because of root-disease caused mortality that will probably occur.

References

- Filip, G.M. 1999. Ecology, identification, and management of forest root diseases in Oregon. EC 1512 OSU Extension Service, Corvallis. 11p.
- Thies, W.G. and R.N. Sturrock 1995. Laminated root rot in western North America. USDA For. Serv. Res. Bull. PNW-GTR-349. 32p.

Table 1. Tree characteristics by size class and species, Block 1, 34 plots, Rams Dell Tract.

Dbh (in.)	Douglas-fir			Grand fir	Hem lock	Cedar	Red alder		Maple	Cotton wood	Yew	Cas cara	Tot
Trees/acre	H	D-OT	ST	H	H	H	H	D-OT	H	H	H	H	
Seedlings <1.0 in.	0	3	0	0	0	32	0	0	9	0	0	3	47
Saplings 1.0-4.9 in.	9	3	0	6	0	12	0	3	3	0	0	29	65
5.0-9.9	13.8	12.5	4.3	0	4.4	16.3	0	2.2	4.0	0	0	4.2	61.7
10.0-19.9	40.1	0	0	0.7	2.0	2.7	5.2	0	2.7	0	0.7	0	54.1
20.0-29.9	9.5	0	0	0.2	0	0.3	0.3	0	0.7	0.2	0	0	11.2
30.0-39.9	1.2	0	0.1	0.1	0	0.3	0	0	0	0	0	0	1.7
>40.0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0.2
All >5.0 in	64.7	12.5	4.4	1.0	6.4	19.7	5.5	2.2	7.4	0.2	0.7	4.2	128.9
BA/acre	91	4	1	2	4	10	6	1	6	1	1	1	128

H = healthy-appearing; D-OT = Dead other, probably suppression; ST = stump

Table 2. Tree characteristics by size class and species, Block 2, 13 plots, Rams Dell Tract.

Dbh (in.)	Douglas-fir			Grand fir	Hem lock	Cedar	Red alder		Maple	Cotton wood	Yew	Cas cara	Tot
	H	D-OT	ST				H	D-OT					
Trees/acre													
Seedlings <1.0 in.	0	0	0	0	0	0	0	0	0	0	0	0	0
Saplings 1.0-4.9 in.	0	54	0	0	0	8	0	15	0	0	0	15	92
5.0-9.9	54.6	35.0	0	0	0	11.2	31.4	0	7.3	0	0	0	139.5
10.0-19.9	46.3	0	0	0	0	8.2	25.3	0	0.7	2.4	0	0	82.9
20.0-29.9	9.9	0	0	0.6	0	3.2	1.3	0	0	1.9	0	0	16.9
30.0-39.9	0.3	0	0	0	0	1.7	0	0	0	0	0	0	2.0
>40.0	0	0	0	0	0	0	0	0	0	0	0	0	0
All >5.0 in	111.1	35.0	0	0.6	0	24.3	58.0	0	8.0	4.3	0	0	241.3
BA/acre	92	6	0	2	0	34	38	0	3	8	0	0	183

H = healthy-appearing; D-OT = Dead other, probably suppression; ST = stump

Table 3. Tree characteristics by size class and species, Block 3, Rams Dell Tract.

Dbh (in.)	Douglas-fir			Grand fir		Hem-lock	Cedar		Red alder		Maple	Cascara		Total
Trees/acre	H	D-OT	ST	H	D-OT	H	H	H	H	D-OT	H	H	D-OT	
Seedlings <1.0 in.	0	0	0	15	5	15	50	0	0	0	10	0	5	100
Saplings 1.0-4.9 in.	20	30	0	5	0	15	5	5	0	0	0	0	0	80
5.0-9.9	38.5	16.1	0	3.5	0	2.9	8.6	0	0	0	10.9	4.5	0	85.0
10.0-19.9	43.2	0	0	0.6	0	0.6	1.5	4.6	0	0	0	0	0	50.5
20.0-29.9	15.0	0	0.3	1.1	0	0.2	0.9	0	0.3	0	0.6	0	0	18.4
30.0-39.9	0.6	0	0.5	0	0	0	0.5	0	0	0	0	0	0	1.6
>40.0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0.2
All >5.0 in	97.3	16.1	0.9	5.2	0	3.7	11.6	4.6	0.3	0.3	11.5	4.5	0	155.7
BA/acre	110	4	5	5	0	3	13	4	1	1	5	1	0	151

H = healthy-appearing; D-PW = dead with *Phellinus weirii*; D-OT = dead other, probably suppression;
ST = stump

Table 4. Tree characteristics by size class and species, Block 4, Rams Dell Tract.

Dbh (in.)	Douglas-fir						Grand fir	Hem-lock	Cedar	Alder	Maple	Total
	H	D-PW	D-AO	D-OT	ST	H						
Trees/acre												
Seedlings <1.0 in.	0	0	0	0	0	3	0	0	3	0	0	6
Saplings 1.0-4.9 in.	7	0	0	27	0	3	0	0	7	0	0	43
5.0-9.9	32.9	3.4	0	24.5	0	0	3.9	1.8	5.0	0	0	71.5
10.0-19.9	52.7	3.5	0	1.7	0.5	1.1	1.3	0	16.1	7.0	0	83.9
20.0-29.9	20.9	0.5	0.3	0	1.4	0.7	0	0.6	0	0.3	0	24.7
30.0-39.9	1.8	0	0	0	0.2	0.3	0	0.2	0	0	0	2.5
>40.0	0.1	0	0	0	0.1	0	0	0.1	0	0	0	0.3
All ≥ 5.0 in	108.4	7.4	0.3	26.2	2.2	2.1	5.2	2.7	21.1	7.3	0	182.9
BA/acre	149	5	1	7	8	6	2	5	18	8	0	209

H = healthy-appearing; D-PW = dead with *Phellinus weirii*; D-AO = dead with *Armillaria ostoyae*; D-OT = dead other, probably suppression; ST = stump

Table 5. Tree characteristics by size class and species, all blocks, Rams Dell Tract.

Dbh (in.)	Douglas-fir						Grand fir		Hem-lock		Cedar		Red alder		Maple		Cascara		Cotton wood		Yew		Total
	H	D-PW	D-AO	D-OT	ST	H	H	D-OT	H	D-OT	H	D-OT	H	D-OT	H	D-OT	H	D-OT	H	D-OT	H	D-OT	
Trees/acre	0	0	0	1	0	6	1	3	22	0	0	0	0	0	4	0	1	0	0	0	0	0	38
Seedlings <1.0 in.																							
Saplings 1.0-4.9 in.	8	0	0	23	0	6	0	4	9	1	3				1	10	2	0	0	0	0	0	67
5.0-9.9	30.3	1.1	0	20.0	1.5	0.7	0	4.9	8.0	5.8	0.8				4.6	2.4	0	0	0	0	0	0	80.1
10.0-19.9	45.5	1.1	0	0.5	0.1	0.7	0	2.3	1.3	11.2	0				3.2	0	0	0.3	0.2	0.3	0.2	0.2	66.4
20.0-29.9	14.2	0.1	0.1	0	0.5	0.6	0	0.5	0.5	0.3	0.1				0.5	0	0	0.3	0	0.3	0	0	17.7
30.0-39.9	1.1	0	0	0	0.2	0.1	0	0.2	0.2	0	0				0	0	0	0	0	0	0	0	1.8
>40.0	<0.1	0	0	0	0.1	0	0	0	0.1	0	0				0	0	0	0	0	0	0	0	0.2
All >5.0 in	91.1	2.3	0.1	20.5	2.4	2.1	0	7.9	10.1	17.3	0.9				8.3	2.4	0	0.6	0.2	0.6	0.2	0.2	166.2
BA/acre	113	2	<1	5	4	4	0	2	12	14	<1				6	<1	0	1	0	1	<1	<1	163

H = healthy-appearing; D-PW = Dead with *Phellinus weirii*; D-AO = dead with *Armillaria ostoyae*; D-OT = Dead other, probably suppression; ST = stump

Figure Captions:

Figure 1: Map of the 90-acre Rams Dell Forest Tract divided into four survey blocks.

Figure 2: Diagram of a root disease infection center showing healthy-appearing trees (green), dead trees (red), and a disease boundary.

Figure 3: Block 1 (2 pages) showing the location of survey lines, permanent plots (numbered), and root diseased areas (hatching).

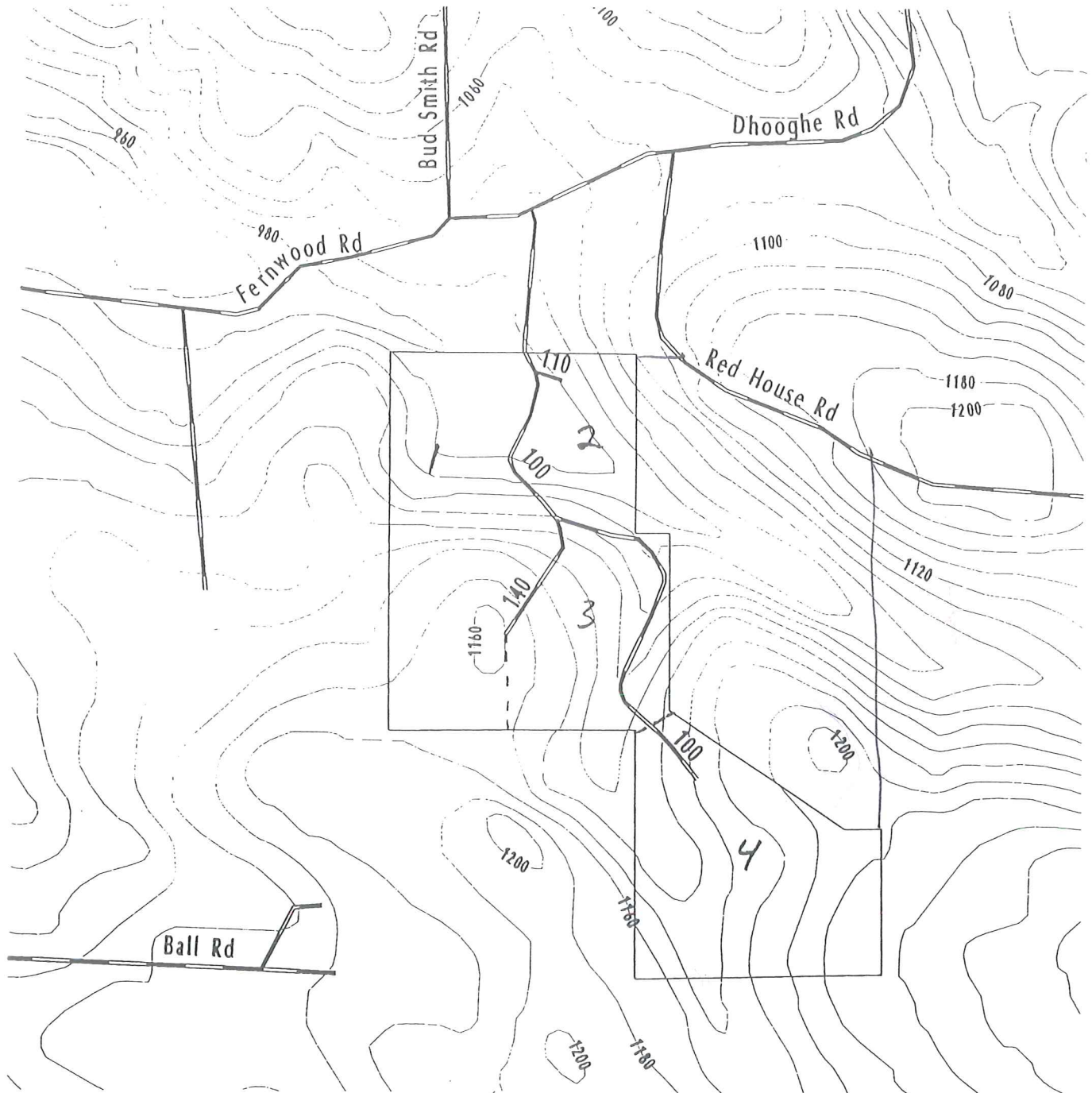
Figure 4: Block 2 showing the location of survey lines, permanent plots (numbered), and root diseased areas (hatching).

Figure 5: Block 3 showing the location of survey lines, permanent plots (numbered), and root diseased areas (hatching).

Figure 6: Block 4 showing the location of survey lines, permanent plots (numbered), and root diseased areas (hatching).

Figure 7: Sample data card used for the survey.

Ram's Dell Forest



Scale - 1:9,600



Notes: Map prepared by Oregon State University Research Forests.
November 06, 2000

Fig. 1

- Contour
- Stand Boundary
- Road

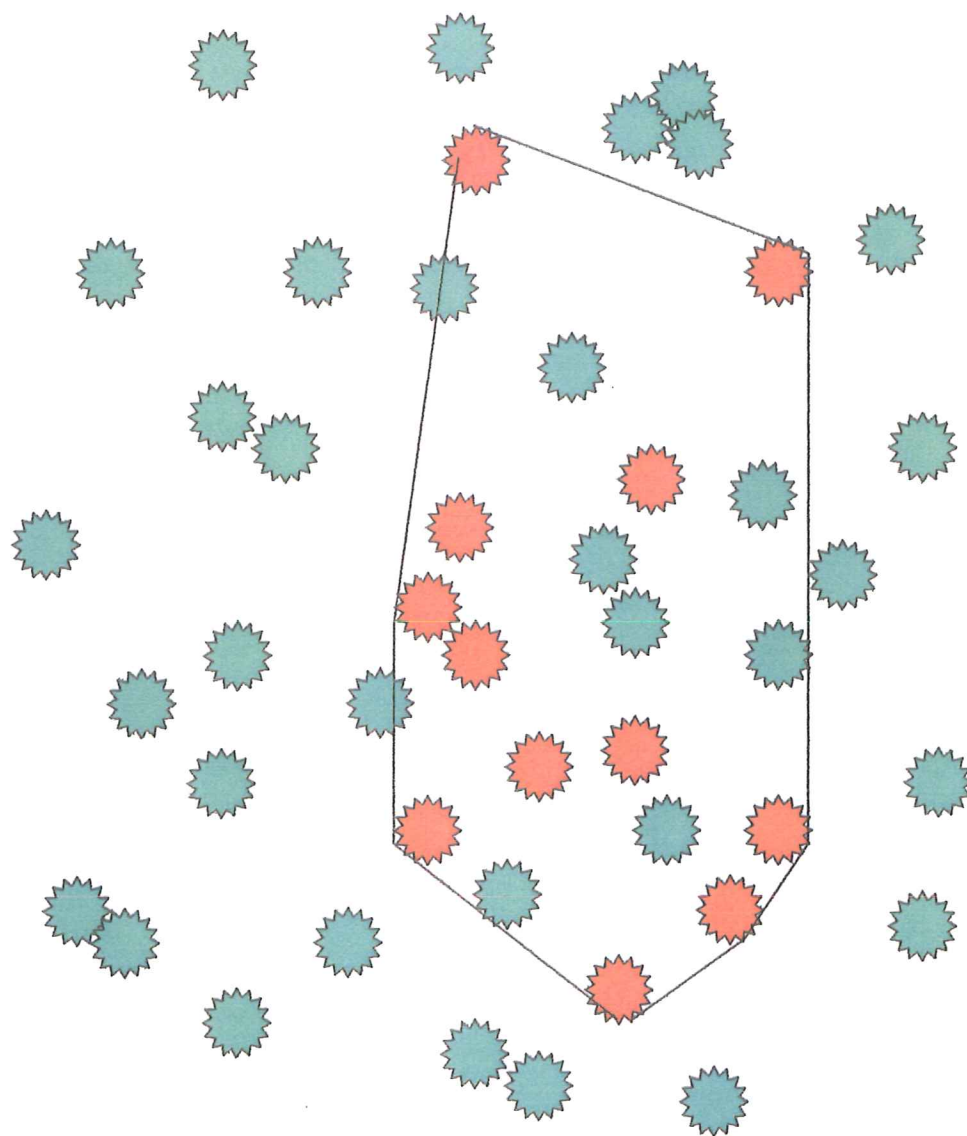




Fig. 2 Root disease infection center showing healthy-appearing trees , dead trees , and disease boundary.

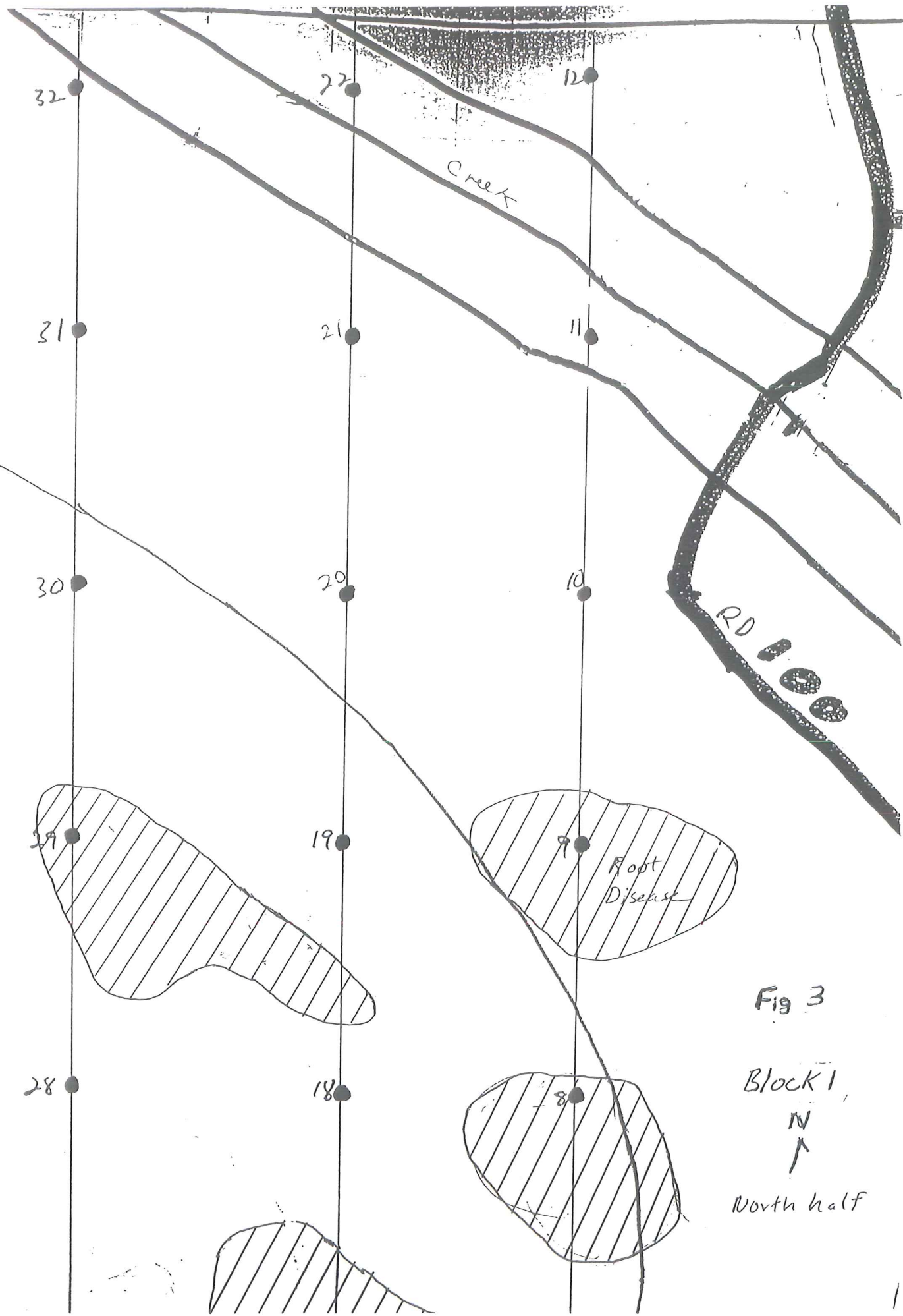
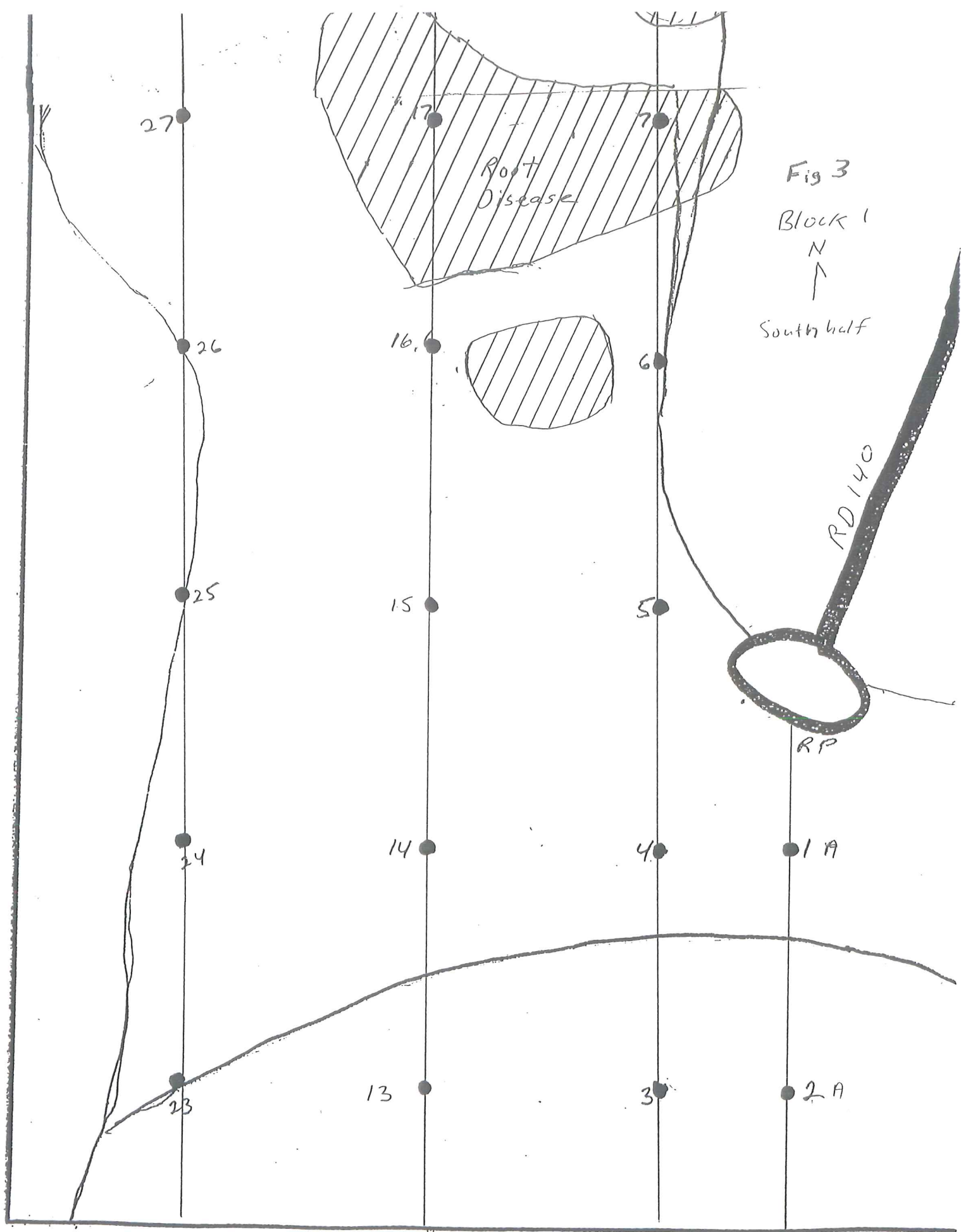


Fig 3

Block 1,
N
↑
North half



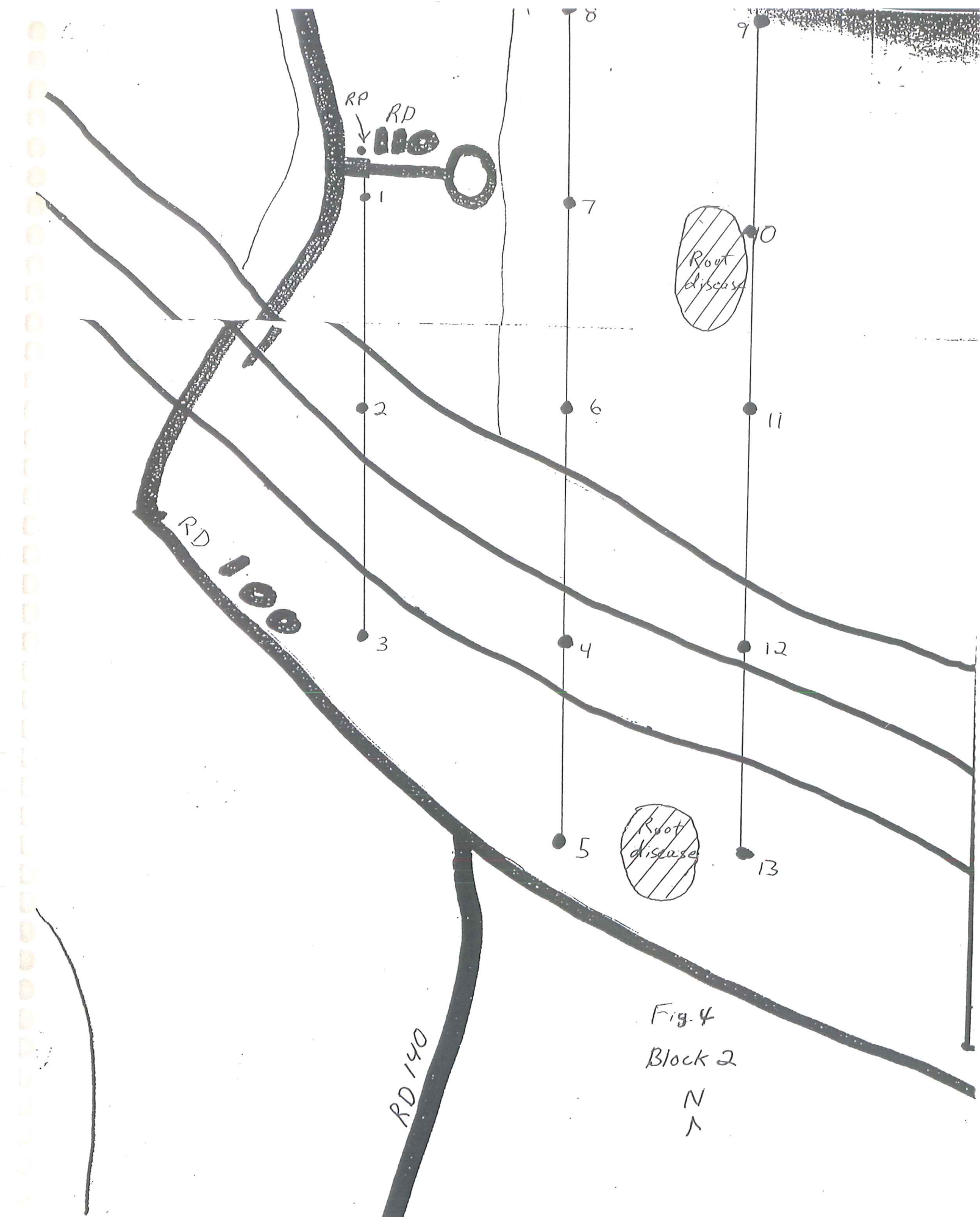


Fig. 4
Block 2
N
^

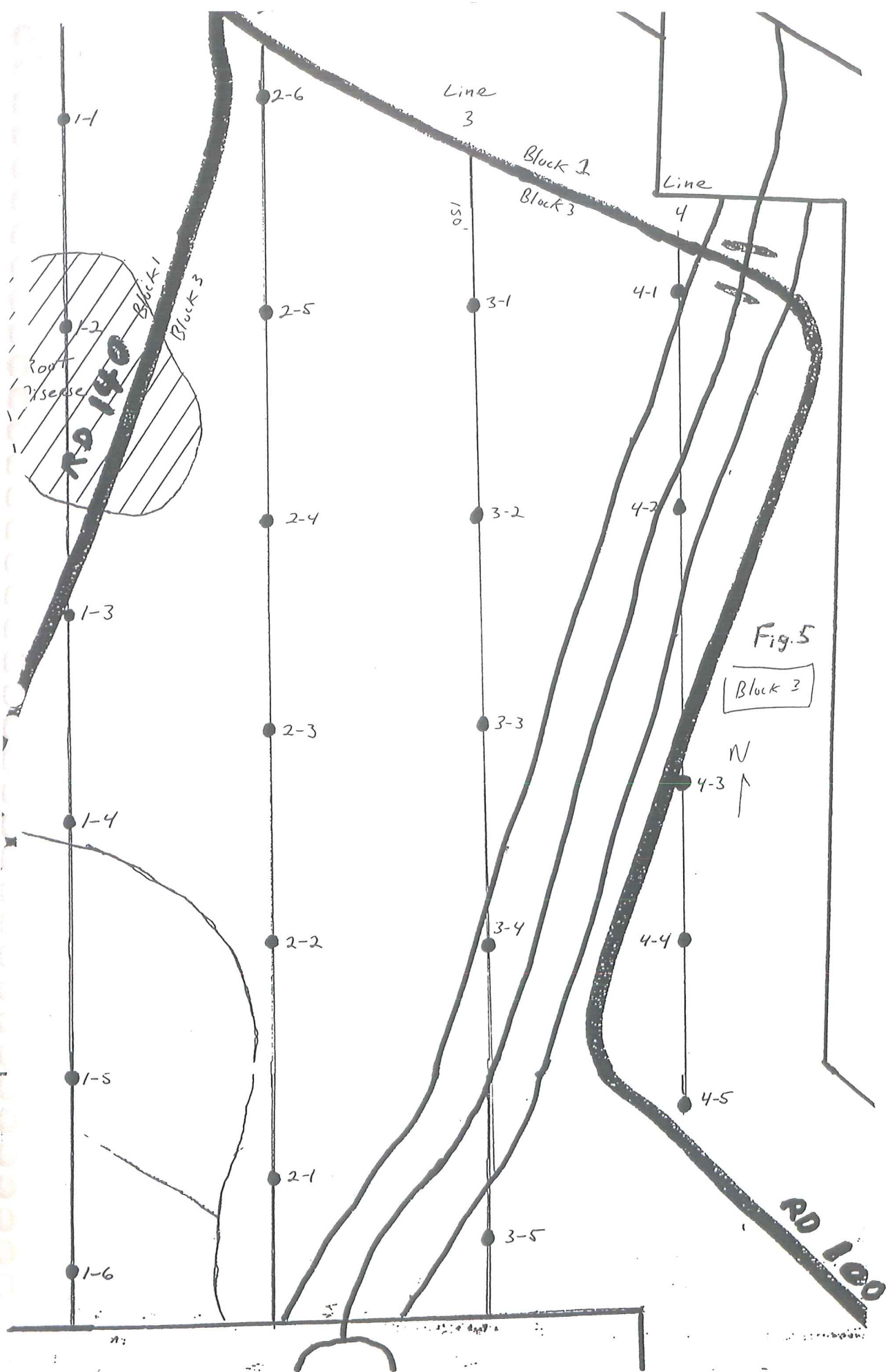
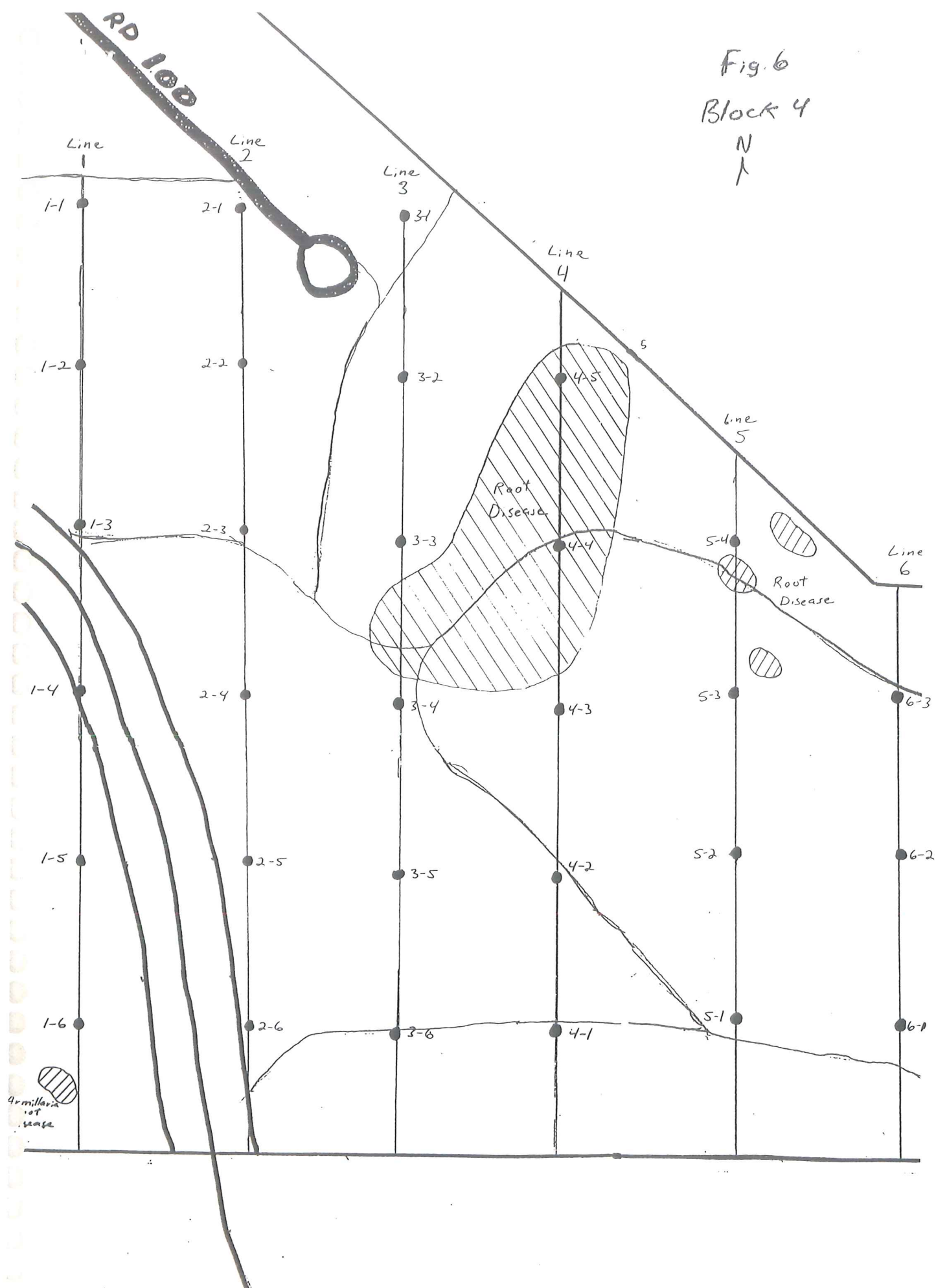


Fig. 6
Block 4
N
↓



RAMS DELL ROOT ROT DATA CARD

BAF___ Fixed=(0.01ac, 11.8ft) Crew___ Date___ Page___

[illegible]

Tree Species: DF =Doug-fir; GF=grand fir, WH=west hemlock, WC=west redcedar, RA=red alder, BM=bigleaf maple
Health: H=healthy, LI=live infected, D=dead, ST=stump, WT=windthrown
Years dead: 1=1-5 yrs, 2=5-10 yrs, 3= >10 yrs

Appendix
Ram's Dell Root Rot Survey Procedures

- 1) Establish a sample plot every 200 ft. along transects and mark with a PVC pipe (bury 1 foot below soil). Place a numbered plot tag around each pipe. Number plots consecutively starting with number 1.
- 2) Each sample plot will consist of a variable-radius plot and a fixed-area circular plot.
- 3) Place the prism over the plot pipe to establish a **variable-radius plot**.
- 4) In variable-radius plots, record only "in" trees greater than or equal to 5 inches dbh. Record every other borderline plot tree.
- 5) Start with the first tree to the right of true north and procedure clockwise until all "in" trees are recorded.
- 6) For **stumps**, simulate dbh with your hands above the stump and check if "in" with the prism. Dbh equals diameter inside bark on the stump.
- 7) For **windthrown trees**, measure dbh at 4.5 feet above the approx. soil line on the stem.
- 8) Mark each live tree ≥ 5 in. dbh with an aluminum tag at dbh (measured on the uphill side) but the tag facing plot center. Place nail only about halfway into the tree.
- 9) Establish a **fixed-area circular plot** around each plot pipe by measuring a radius of 11.8 ft. from the pipe.
- 10) In fixed-area plots, record all trees greater than or equal to 6 inches in height but less than 5 inches dbh. Do not tag trees less than 5 inches dbh.
- 11) For each plot tree including seedlings and dead trees, record block no., plot no., tree no. (if present), tree species (see card), dbh (nearest 0.1 in.), health (see card), years dead (see card), and cause of death (*Phellinus*, *Armillaria*, other, or unknown).
- 12) For **seedlings** (trees less than 1.0 in. dbh), only count the seedlings by species and condition. For example, record as "5S" if there were 5 seedlings in the plot. Do not tag seedlings.
- 13) As you walk the transects, draw on the block map the approximate boundaries of any laminated root rot centers that you cross or see from the transect (within approx. 100 feet).

RAM'S DELL TIMBER SALE

T5S, R3E Sec. 20, WM

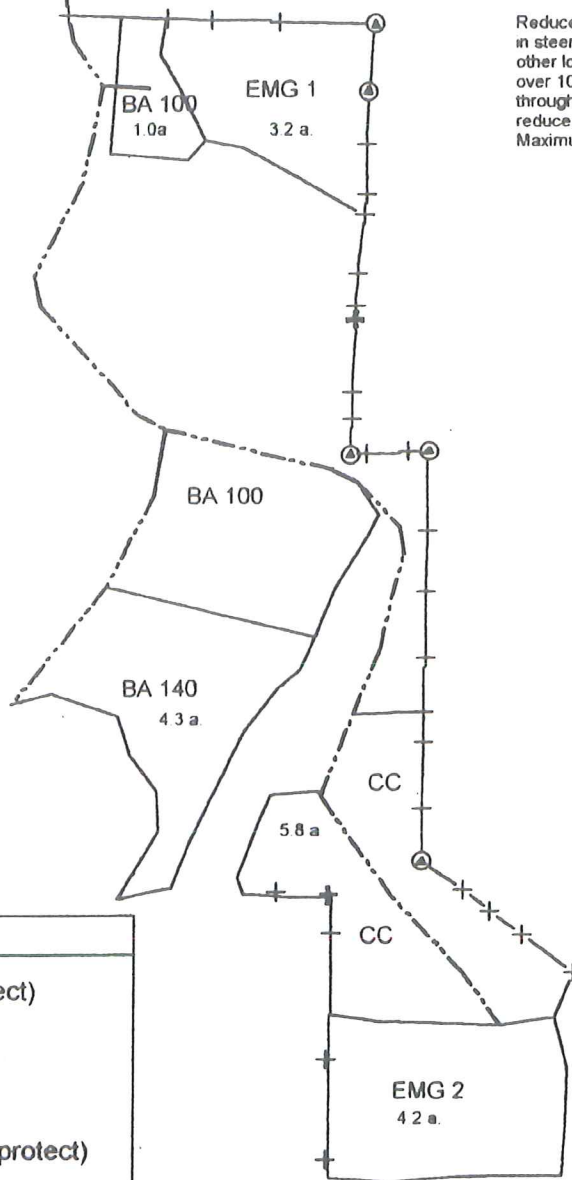
Clackamas County, Oregon

Ram's Dell Tract

College Forests, College of Forestry

Oregon State University

To Fernwood Rd.



Reduced Tire Pressure not to exceed 95 psi in steering axle and not to exceed 71 psi in all other load bearing tires is required on all vehicles over 10,000 GVW on all haul roads October 15 through June 30 to avoid subgrade damage and reduce maintenance.
Maximum speed limit is 15 MPH on all Tract Roads

LEGEND

- ⊗ Set Monument (protect)
- Road
- + Section Corner
- + Property Boundary
- + Set Section Corner (protect)
- EMG Marked to Harvest
- BA 100 Residual Basal Area
- CC Clear Cut