PROCEEDINGS OF THE NATIONAL SILVICULTURE WORKSHOP

MISSOULA, MONTANA

SEPTEMBER 26-28, 1978

Silvicultural Examination, Prescription, and Related Activities

Division of Timber Management
USDA-Forest Service
Washington, D.C.

Introduction

The 1978 Silviculture Workshop was held in Missoula, Montana, September 26-28, 1978. The objective of the meeting was to discuss Silvicultural prescriptions, standards of certification for silviculturists, certification of planting and thinning projects, and other related items of interest. These proceedings includes the presentations that were available for publication.

TABLE OF CONTENTS

Subject: 1978 National Silviculture Workshop
Chairman: Robert E. Gillespie/Robert W. Pearl
Time: September 26, 27, and 28
Location: Missoula, Montana
Purpose of Meeting: Silvicultural Examination, Prescription, and Related Activities

September 26

8:00 a.m.	Call to Order Introduction of Participants	Gillespie, WO
8:05 a.m.	Welcome	Region 1
8:15 a.m.	Purpose of Meeting	Gould, WO
8:30 a.m.	Land Management Planning and Prescription Writing	Rex Hartgraves, NFS, WO
9:00 a.m.	Silvicultural Prescription and How it is Intergrated into the Environment Analysis	Don Potter, R-5
9:30 a.m.	Project Area Selection	Ray Johnston, R-5
10:00 a.m.	Break	
10:15 a.m.	Fire Considerations	Jim Loton, INT
10:45 a.m.	Insect and Disease Considerations	Don Pierce, R-1
11:15 a.m.	Wildlife and Timber Management Prescriptions Including a Timber Sale to Improve Winter Range	Ron Hamilton, R-4 George Gruell, R-4
12:00 NOON	Lunch	
1:00 p.m.	Integrated Transportation Planning	Victor Dekalb, WO
2:00 p.m.	Region 2 Report on Prescription Writing Process	Bob Jackson and Region 2 people
3:00 p.m.	Break	
3:30 p.m.	Essential Elements of Prescription Writing - Silvicultural Project	Bill Beaufait, R-1 with participation from group.
5:00 p.m.		
7:30 p.m.	(Optional attendance) Discussion of Planting Stock Needs into the 80's	Greathouse Gillespie Engle All Regions

September 27

8:00 a.m.	Qualifications and Grade for Prescription Writers	Bob Blomquist, R-9
8:30 a.m.	Prescription Coordination in Region 8	Karl Stoneking, R-8 Roger Dennington, R-8
9:30 a.m.	Certification of Silviculturtists Problems, Education, Value, and a Minimum Standard Proposal for WO	John Tappeiner, R-5
10:15 p.m.	Break	
10:30 p.m.	Discussion of Certification by Regions	
12:00 NOON	Lunch	
1:00 p.m.	Project Certification Comply with NFMA	Bill Tuttle, R-9
1:30 p.m.	GAO Report and Action Plan	Gillespie
2:00 p.m.	Reforestation and TSI Action Plan	LaMont Engle, WO
2:30 p.m.	Target Setting and Accomplishment	Budget Officer, WO
3:00 p.m.	Break	
3:15 p.m.	Herbicide Use	Walt Knapp, R-6
	Calculating Yields with and Without Herbicides Study on Alterntives	Ron Stewart, WO
4:00 p.m.	Other Intensive Forest Practices and Outline for Field Trip	

September 28

Field Trip

Attendance at 1978 Workshop

		Location
Norm Gould	Director, TM	WO
Tom Caston	Deputy R.F., Resources	R-1
Bob Gillespie	Asst. Director, TM	WO
Bob Pearl	Forester, Silvi. Systems, TM	WO
Bob Shackelford	Cooperative Forestry, S&PF	WO
Cliff Faulkner	Cooperative Forestry, S&PF	NA
Bill Balmer	Cooperative Forestry, S&PF	SA
Bob Damon	Group Leader, Sales	R-1
Bob Naumann	Silviculture, TM	R-1
George Roether	Director, TM	R-4
John Tappeiner	Silviculture, TM	R-5
Ray Weinmann	Director, TM	R-5
J. W. Barrett	Forester, RO	R-8
William J. Bryan	Director, Range-Tbr. Wildlife	R-8
Dick Fitzgerald	Group Leader, Silviculture, TM	R-8
Walt Knapp	Silviculturist, TM	R-6
Jack H. Usher	Director, TM	R-1
Walter Fox	Silviculture, TM	R-8
Don Beck	Research	SE
Karl Stongking	Inventory and Plans	R-8
William Locklear	Zone Silviculturist, Clearwater N.F.	R-1
Don Strode	Wildlife Specialist, WL	WO
Dave Wright	Inventories, TM	R-2
Bob Jackson	TM Plans	R-2
Clair Finley	Medicine Bow N.F.	R-2
Ken Ready	Silviculture, TM	R-4
George R. Wilson	District Silviculturist	R-1
Sam Gilbert	Silviculturist, Gallatin & Custer N.F.	R-1
John Joy	Silviculturist, Deerlodge N.F.	R-1
Bob Blomquist	Silviculture, TM	R-9
Mark Johannesen	Director, TM	R-3
Bill Chapparo	Silviculture and Management Plans	R-3
Dave Johnson	Silviculturist, TM	R-10
Lee Cromley	Timber Management	WO
John Hughes	Silviculture, TM	R-6
Orville Engelby	Sulviculture, TM	R-4
Bud Twombly	Plans and Silviculture, TM	R-6
Bob Feilzer	TM, Bitterroot N.F.	R-1
Joe Bednorz	Dist. Rngr, Nezperce N.F.	R-1
Carl Puuri	Silviculture, RM	R-6
Daniel Schroeder	Inventories and Plans	R-9
Jimmie Chew	TM Planner, Nezperce N.F.	R-1
Roger Dennington	District Ranger, Chickasawhay Dist.	R-8
Jim Baker	Project Leader, RWU-1117	SE

Name	Position	Location
Douglas Shaner	Silviculturist, TM	R-1
George Rogers	Silviculturist, Lolo N.F.	R-1
David N. Griffin	Silviculturist, Lolo N.F.	R-1
John Fiske	Silviculturist, TM	R-5
Debi J. Smith	Forester Trainee, Kootenai N.F.	R-1
Richard K. Babcock	Timber Planner, Bitterroot N.F.	R-1
Dick Deden	Timber Management Planning	R-1
Ray Johnston	District Ranger, Plumas N.F.	R-5
Don Potter	Silviculturist, Stanislaus N.F.	R-5
Jim Laux	Timber Management Planning	R-1
Pete Laird	Silviculture, TM	R-1
Donald A. Pierce	FIDM, S&PF	R-1
Paul S. DeBald	Research Forester	NE
Ken Gibson	Entomologist, FIDM, S&PF	R-1
Chris Risbrudt	Economist	FPL
Bob Cron	Retired	R-1
Roger Ward	Silviculturist, Clearwater N.F.	R-1
Bob Sanders	Silviculturist, Idaho Panhandle N.F.	R-1
Wes Kellie	Silviculturist, Lolo N.F.	R-1
Dwight Chambers	Silviculturist, Lewis & Clark N.F.	R-1
Larry O'Connell	Timber Assistant, Lewis & Clark N.F.	R-1
Jerry C. Worley	Silviculturist, Beaverhead N.F.	R-1
Lawrence Michalsky	TM Planner, Beaverhead N.F.	R-1
Rex Baumback	Inventory	R-10
Orm Doty	Timber Sales	R-3
Gerald Gottfried	Research Forester	RM
Ron Hamilton	Geneticist-TSI Specialist, TM	R-4
Carl L. Marsh	Silviculturist, Helena N.F.	R-1
Vick Applegate	Silviculturist, Helena N.F.	R-1
George Howe	Silviculturist, TM	R-1
Ronald Stewart	Res. Silviculturist, TMR	WO
Robert Dennee	Silviculture, Flathead N.F.	R-1

Purpose of Meeting

Land Management Planning and Prescription writing was discussed by Norman Gould, the director of Timber Management for the National Forest System.

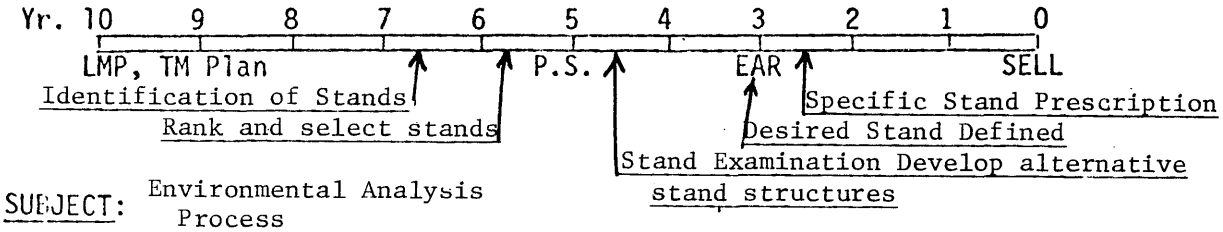
Following is an excerpt from a memorandum signed by Tom Nelson which as of September 20, 1978, sets the development of procedures from regulations - to plans - to prescriptions.

The proposed regulations for Section 6 of the National Forest Management Act were published in the Federal Register August 31, 1978. Public comment on this draft will be coming in over the next 90 days. The regulations will then be finalized and implementation will begin. Preparation of FSM and FSH material based on the draft regulations is underway, and this material will be issued soon after the final regulations are issued. The Lead Forest Program was initiated to get a jump on implementation, and to assist in the development of FSM and FSH material. Work has begun on Forest Plans on Lead Forests in each Region.

One of the major changes contained in the regulations and the principal challenge at all levels is the integration of functional and resource plans into the Forest Plan. The recent GAO audit alludes to 48 plans currently in existence which need to be integrated into the Forest Plan. Developing the processes and procedures to carry out this integration will be the most difficult and significant task in the entire implementation effort. It will require my attention and commitment and it will require yours. There must be close coordination between the NFS Staff Directors, their counterparts at the regional level, and on the Lead Forests.

Don Potter

TIMBER SALE PLANNING PROCESS



SUBJECT: Environmental Analysis Process

TITLE: Silvicultural Prescriptions

INSTRUCTOR: Potter

TIME PERIOD: 30 minutes

OBJECTIVE:
1) To understand the components of a silvicultural prescription for a timber sale.
2) Learn how to present the prescription in an environmental analysis so it can be used in the decision making process and applied on the ground.

REFERENCES: Silviculture Handbook, FSM 2471

OUTLINE	NOTES
I. Introduction A. We need to show line officers what the important silvicultural characteristics of a stand are, what the silvicultural alternatives are; and what the proposed silvicultural treatment is. B. We are presenting a model today that you can begin to incorporate in the E.A. process (i.e, ADVENT)	
II. The Silvicultural Prescription A. A prescription is an evolutionary process. The process begins prior to the position statement; it develops as data is being assembled for the E.A., and it continues beyond the post-sale period. It provides information at specific points in time, but it is continually undergoing evaluation and assessment. B. Stand Selection 1. Identification of timber types and stands in the project area - we need to start with the silvicultural needs of the stand. a. Available CIA data-Caution-this data applies to a strata not necessarily to a stand. b. Atlases or other evaluation of past activities (timber sales, plantations, and stand improvement activities).	

c. Field reconnaissance-Confirm typing and check decadence, insect and disease activity, and the effect of past sales.
d. Use of yield tables or other yield guides to evaluate stocking.(e.g., poor growth, poor stocking)
e. Eyeballing (filed estimation and evaluation--this fact should be stated)
f. Evaluation of known problems (e.g., critical soils,logging systems access)

2. Land use objectives and constraints (e.g., Standard Component vs. Travel Influence Zones & Special Component)
3. Specialist integration. (fuels, soil, hydrology, logging system, archaeology, wildlife, land uses, range, transportation, TM)
4. Consideration of priorities established in (B.1) above.
5. Access opportunities and access available.

C. Examination of the stand to develop a specific prescription-A good deal of what follows can be in District compartment files or attached and made a part of the appendix and referenced in the body of the EA.
1. Present stand structure.
a. Site and reference.
b. Age.
c. Species composition - % of species.
d. Distribution-BA/DBH
trees/DBH
(May be necessary to display by species or age)

TITLE: Silvicultural Prescriptions

NOTES

e. Growth BAG/DBH-may need by species
f. Percent of ground cover
(1) Overstory
(2) Understory

2. Predicted vegetation change
a. Display of the ~~regulating~~ environmental variables affecting the germination, establishment, and growth of the species ~~with access~~. in or adjacent to the stand
b. Discussion of the genetic potential of individual species, the impact of past history on the development of the present structure, and the successional processes taking place.
c. Discussion of stand structure without treatment in specified time periods generally 10, 25, and 50 years.

See note bottom of next page

D E. Desired stand structure after treatment.
1. Even-aged, two aged, and all aged, whether plant aggregations are to be merged or kept separate.
2. Age
3. Species Composition - %
4. Distribution - BA/DBH
#Trees/DBH
5. Growth - BAG/DBH
6. Percent ground cover by species
7. Discussion of factors considered in establishing desired stand structure.
a. Predicted vegetation changes
b. Growth and yield comparisons. (Yield tables)
c. ~~Management Constraints~~ land use objectives
d. Alternative stand structures
e. Future treatments
f. Technical feasibility
~~g. Alternative stand structures~~

See note above

F. Proposed Treatments
1. The silvicultural system. For example: Is the shelterwood method or a thinning proposed?
2. Proposed time sequence for each step in the prescription.
3. Cutting prescription for merchantable timber
a. Species
b. Stocking level desired if a thinning or different than desired stand and this is the first of a series of cuttings.

← John, from this point on I can "cut & fit". The time remaining. I plan to cover the first one (cutting prescription for merchantable Timber) in (cont.)

TITLE: Silvicultural Prescriptions

NOTES

c. Tree class
d. Risk rating
e. Damage and form assessment
f. Crown ratio
g. Size
h. Genetic gains

4. Plantation establishment - S.A.I. Plan
   a. Site preparation-amount & timing
   b. Species
   c. Seed zone, nursery, and storage instructions if artificial regeneration is planned.
   d. Planting date
   e. Spacing
   f. Follow-up treatments
      (1) Vegetation control
      (2) Damage, insect, and disease assessments
5. Precommercial thinning - S.A.I. Plan
   a. Species
   b. Stocking
   c. Tree Class
   d. Damage & Form assessment
   e. Genetic gains
6. Guidelines for evaluation of the attainment of the desired stand to be used by sale administrators, culturalists, and future silviculturalists.

G. Evaluation of proposed treatment
1. Alternative stand structures and treatments including an economic comparison of alternative proposals.
2. Approximation of the impact of the proposed treatment on adjacent aggregations.

(from previous page) detail if time permits and then cover the others.

only by assigning were looking for the same kind of detail in these other treatments. But I would like to leave the outline as it is here in case it gets printed up for the program, and people take it back with them to use for future reference

Logging damage

FOREST SERVICE U.S.D.A.

STAND RECORD CARD

(SEE FSM-2496.3)
R-5 2400-205 (REV. 3/77)

COMPARTMENT NUMBER											STAND NUMBER									
HUNDREDS				TENS					UNITS			HUNDREDS				TENS					UNITS				
7	4	2	1	7	4	2	1	0	7	4	2	1	0	7	4	2	1	0	7	4	2	1	0

BACKLOGS: REGULAR REFOR. | MAINT. REFOR. | THINNING | RELEASE

CUFT. SITE CLASS: 1 (225+) | (2) (65-224) | 3 (20-164) | 4 (35-119) | 5 (50-85) | 6 (20-49) | 7 (0-20)

FOREST TYPE: PP | DF | TRUE FIR | HDW. | OTHER

COMPONENT: BOARD | SPECIAL | MARGINAL | UNSUITABLE | OTHER

SPECIES RECORD: PP | JP | SP | DF | WF | (RF) | OTHER

LOCATION: COMP. NAME WIRE COMP. NO. S-11

STAND NO S-W194 COOR. (E-W) (N-S)

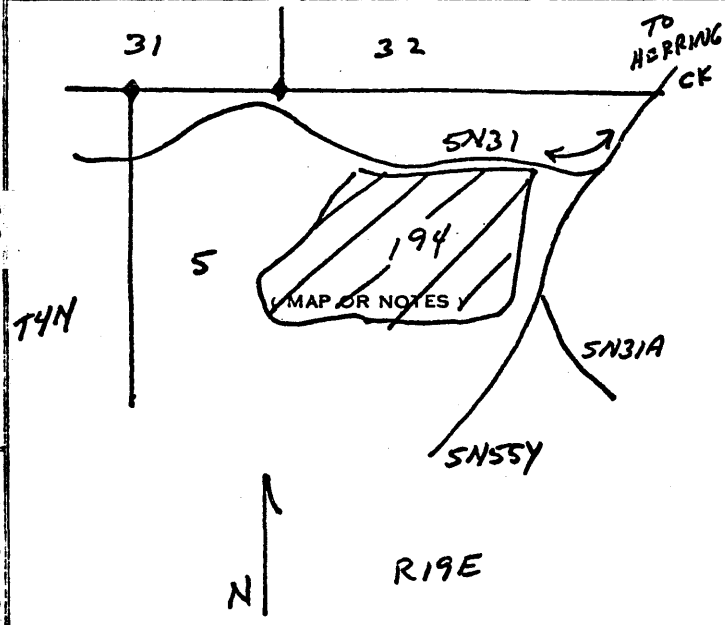
T. 4N R. 19E S. 5, NW¼ COUNTY NO. 109 MAP NO. 131

CHARACTERISTICS: ACRES 15 ELEV. 8,100.

ASPECT S-SE SLOPE % 10-20 STRATUM R4G

SITE: INDEX 55 (MEASURED/~~ESTIMATED~~), SPECIES RF

REFERENCE SCHUMACHER BUL 456 RUNNING SITE CLASS 1A



ACTIVITIES

PRESCRIBED BY	PRESCRIBED MM-YY	DESCRIPTION WORK PROCESS	DESCRIPTION METHOD	DESCRIPTION FUND	PLANNED MM-YY	PLANNED ACRES	ACCOMPLISHED MM-YY	ACCOMPLISHED ACRES	ACCOMPLISHED INIT.
KCJ	11-75	TSP	-	PM	11-75	15	11-75	15	KCJ
KCJ	11-75	TMD	-	PM	9-76	14	9-76	14	TCS
KCJ	11-75	HSH	420	XX	9-77	14	7-78	14	DV
KCJ	11-75	FMP	200	BB	10-77	14	10-78	14	DV
KCJ	11-75	RPN	200	KV	10-77	14	8-79	14	GM
GM	8-79	RPN	800	KV	81	14	8-81	14	HH
GM	8-79	RSE	-	KV	85	14	7-85	14	HH
HH	7-85	RSE	-	PM	90	14	8-90	14	BS
HH	7-85	HFH	420	XX	91	14	8-92	14	BS
BS	8-92	HTX	-	XX	94	14	11-94	14	BS

HARVESTS — ACTIVITIES / ACCOMP. / PLANNED

- CC
- ~~X~~
- OR STEP
- SEL.
- THIN
- SANI
- OTHER
- ~~MARK~~
- PLANT
- ~~SITE PREP.~~
- PRECOM THIN
- RELEASE
- ~~SLASH DISP.~~
- ~~EXAM.~~
- OTHER

REGENERATION STOCKING SURVEYS

SURVEY DATE	RF P	RF (N)	P	N	P	N	P	N
7/21/85		400						
8/27/90		2000+						
8/15/92		2000+						

PLANTING RECORD

SEED LOT NUMBER	M TREES	NUR.	AGE CLASS	TYPE	TREES /ACRE	MM-YY

PLANTING — DECADE 7 4 2 1 0 | YEAR 7 4 2 1 0

PRESCRIPTION:

PA#1 Shelterwood seed step cut to regenerate RF
- -high evaporative capacity for RF seedlings; possible windthrow RF seed trees; low soil water potential for RF seedlings .˙. leave 90 ft^2 BA/ac in 15-20 seed trees/ac.
- -Site prep by tractor pile and burn immediately after logging
- -Gopher activity may increase after cutting due to CEVE, CECO seed .˙. evaluate need to scarify seed bed when good seed crop present.
- -Evaluate stocking, needed brush control, and gopher damage prior to removing seed trees est. in 10 years

PA#2 -No treatment

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K C Jones 11/20/75

AGGREGATION DESCRIPTION

AGG NO	% STAND	LAYER	% COVER	SPECIES COMPOSITION SYMBOL	%	SYMBOL	%	SYMBOL	%	BASIS	BA/A (FT^2)	HT. (FT.)	DBH (IN.)	STEMS /ACRE	GROWTH (FT^2)(FT^3)	AGE	NOTES
1	95	1	60-80	RF	90	JP	10			BA	405	140	30	130		200+	
DATE (R-P)		2	30	CECO	70	CEVE	20	UF	10	C							
H-20-75		3															
2	5	1	20	RF	100					BA	20	140	30	4		200+	High water table. O_2 concentration too low.
DATE (R-P)		2	90	PTAQ	100									1000+			
11-20-75		3															
1	95	1	30-40	RF	100					BA	90	140	35	15-20		200+	
DATE (R-P)		2															
1980		3															
1	95	1	40	RF	100					BA	75		36	10-15		200+	Prior to seed tree removal. Some trees lost to wind.
DATE (R-P)		2	60	RF	35	CECO	25	CEVE	15		75	3		2000+		10	
1990-95		3		UF	25												
1	95	1	40	RF	100					C		3		2000+		10	Seed trees removed.
DATE (R-P)		2															
10-15-93		3															
		1															
DATE (R-P)		2															
		3															
		1															
DATE (R-P)		2															
		3															

ACME #152430

USDA - FOREST SERVICE

TIMBER HARVEST ACTIVITY RECORD-PRESALE DATA

(See R-5 Supplement to FSM 2496.3)

SALE NAME	ACRES	Est. Total Cut
WIRE	2000	10,000 MBF

COMPT. NAME	COMPT. NO.	STAND NOS.
WIRE	S-11	S-W194

CO. CODE	COMP. CODE	FUND	Prod. Class	FOR. TYPE
109				RF

CUTTING METHOD	LOGGING METHOD
NAME: SHELTERWOOD CODE	NAME: TRACTOR CODE

PA#1 - Remove trees in following priority: 1) trees expected to die in next 10 years, 2) Trees with missing or dead crowns, 3) Tree classes 6,7,4,2 (Dunning-R5 modification), 4) Trees with fire scars, butt rot affecting 50% of stem area, 5) Trees with open mistletoe infection 6) JP. If BA/ac drops below 50 ft^2/ac or number of shelterwood trees is 10/ac silviculturist to reevaluate prescription.

PA#2 - No treatment, avoid this area with equipment

MAP

Include North Arrow, Scale and G.L.O. or Coordinate Location on Map.

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AGGREGATION DESCRIPTIONS	AG NO.	% STAND	LAYER	% Cover	SPECIES COMPOSITION Symbol	%	Symbol	%	Symbol	%	Basis	B.A./A. (ft^2)	HT. (ft.)	D.B.H. (in.)	STEMS /ACRE	AGE
EXISTING	1	95	1	60-80	RF	90	JP	10			BA	405	140	30	130	200+
			2	30	CECO	70	CEVE	20	UF	10	C					
			3													
	2	5	1	20	RF	100					BA	20	140	30	4	200+
			2	90	PTAQ	100					C				1000+	
			3													
			1													
			2													
			3													
PLANNED	1	95	1	30-40	RF	100					DA	90	140	35	15-20	200+
			2													
			3													
	2	5	1	SAME AS ABOVE												
			2													
			3													
			1													
			2													
			3													

PRESCRIPTION COMPLETED		DESIGNATION COMPLETED	
BY: K C Jones	DATE 11/20/75	BY: T.C. Smith	DATE 9-15-76
CRUISE COMPLETED		Slash Treatment Plan Prepared	
BY: T.C. Smith	DATE 9-15-76	BY: D. Vaden	DATE 9/15/76
K-V-PLAN PREPARED		APPRAISAL COMPLETED	
BY: D. Marx	DATE 10/20/76	BY: O.J. Simpson	DATE 2/15/76

☆U. S. GPO: 1977—792-042

COORDINATION INFORMATION

MGM'T DIRECTION	
WILDLIFE	Gopher population needs to be controlled until area is stocked with 500+ trees/ac. over 3 feet in height.
REC.&VRM	
FUELS MGM'T	YUM during sale. P&B slash immediately after logging.
SOILS	Disc when seed crop present. 13
RANGE	
CULTURAL	
WATER	No treatment in PA#2
SAFETY	
REMARKS	

E.A.R. PREPARED BY: L. Skywalker DATE: 7/19/78 APPROVED BY: Sup R. Vien DATE: 7/31/78

TIMBER HARVEST ACTIVITY RECORD
POST-SALE DATA

SALE NAME	PURCHASER	CONTRACT NO.
WIRE	BIG SAW LBR. CO.	16-327

DATE	OPERATOR	COMPT. NO.	STAND NOS.
3/25/78	Mon M' Fork Logging Co	S-11	S-W194

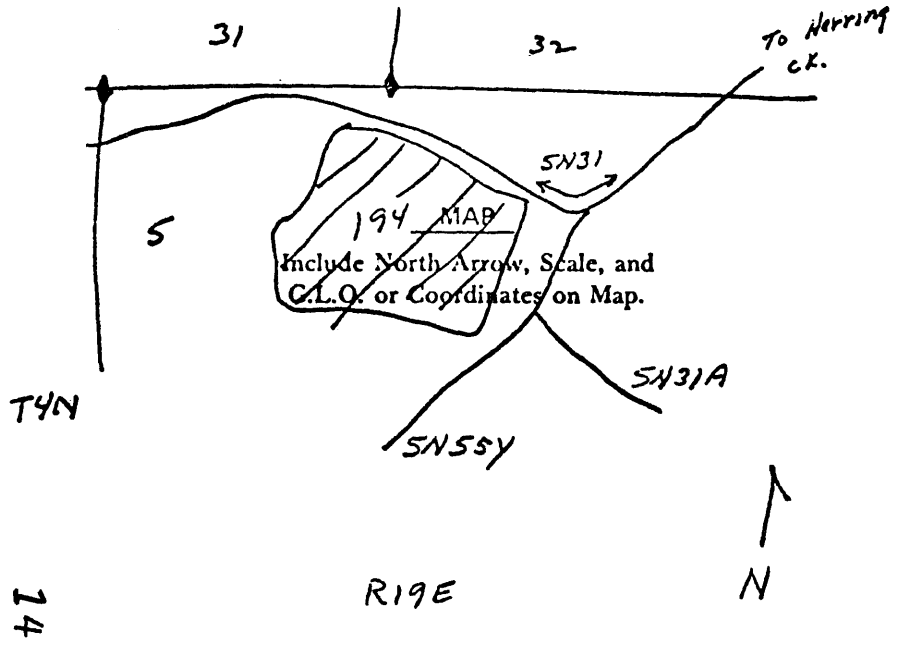
LOGGING PLAN AND PROGRESS, AND TREATMENT RECOMMENDATIONS:

PA#1 - logged 7/15/78
- piled 10/15/78 piled to be burned winter 78/79. Burned 1/21/79.
- poor cone crop - reevaluate need to scarify summer 79

K-V PLAN REVIEWED		SLASH TREATMENT PLAN ACTIVATED	
BY: D. Mark	DATE 9/1/78	BY: D. Vales	DATE 9/15/78

AGGREGATION DESCRIPTIONS AFTER LOGGING

AG NO.	% STAND	LAYER	% Cover	SPECIES COMPOSITION Symbol	%	Symbol	%	Symbol	%	Basis	B.A./A. (ft.²)	HT. (ft.)	D.B.H. (in.)	STEMS /ACRE	AGE
1	95	1	35	RF	100					BA	100	140	34	17	200+
		2	10	CECO	20	CEVE	30			C					
		3		UF	50										
2	5	1	20	RF	100					BA	20	140	30	4	200+
		2	90	PTAQ	100					C				1000+	
		3													
		1													
		2													
		3													



REFORESTATION ACTIVITY RECORD

(See R-5 Supplement to FSM 2496.3)

PROJECT NAME	ACRES	COMPT. NAME
WIRE		WIRE

COMPT. NO.	STAND NOS.	FUND	CO. CODE
5-11	5-W/94		109

COMP. CODE	Prod. Class	FOR. TYPE	BACKLOG
		RF	

PRESCRIPTION:

PA #1 - Shelter wood cut to regenerate RF ~~left~~ 90 ft² BA/-15-20 Trees/ac.
- Treat as pile & burn slash after logging.
- direct & remove CECO & CEVE & prepare seedbed if gopher activity increases

PRESCRIPTION BY:	DATE
K. C. Jones	11/32/75

TREATMENT LOG:

PA #1 - left 100 ft² BA/ac; 17 Trees/ac.
- slash treated piled & burned - 12/78
- directed & removed CECO, CEVE & prepared seedbed - 9/80
- Hand sprayed & controlled CECO, CEVE - 8/24/81

SITE PREP. CONTRACTOR	DATE
I. M. Feast Tractor Co.	9/24/80

CONTRACT NO.	COR	INSPECTOR
16-403	B. Settle	M. Haber

PLANTING CONTRACTOR	DATE

CONTRACT NO.	COR	INSPECTOR

AGGREGATION DESCRIPTIONS	AG NO.	STAND	LAYER	% Cover	SPECIES COMPOSITION Symbol	%	Symbol	%	Symbol	%	Basis	B.A./A. (ft.²)	HT. (ft.)	D.B.H. (in.)	STEMS /ACRE	AGE
EXISTING	1	95	1	35	RF	100					BA	100	140	34	17	200+
			2													
			3													
	2	5	1	20	RF	100					BA	20	140	30	4	200+
			2	90	PIAQ	100					C					
			3													
			1													
			2													
			3													
PLANNED	1	95	1	40	RF	40	CECO	10	CEVE	10	C		3		500+	10
			2		UF	40										
			3													
	2		1													
			2	5% alnus												
			3													
			1													
			2													
			3													

☆U. S. GPO: 1977—792-043

COORDINATION INFORMATION

MGM'T DIRECTION	
WILDLIFE	Noxious population needs to be controlled until area is stocked w/500+ trees/ac over 3 feet in height.
REC. & VRM	
FUELS MGM'T	
SOILS	
RANGE	
CULTURAL	
WATER	
SAFETY	
REMARKS	

F.A.R.	PREPARED BY:	DATE	APPROVED BY:	DATE

CHEMICAL USE RECORD

PLAN

Target Species	CECO CEVE		
Herbicide	2,4,5-T	Rate	4 #/ac a.i.
Carrier	water	Thickner	—
E.P.A. No.	264-289	Date FWGPM Approved	5/20/80
Application Method	Hand spray		

Contract

Contractor	—	Contract No.	—
Application Date	5/24/81	Time Start 0730	Time Finish 1215
Method of Application	Hand spray		

CHEMICAL

Name	2,4,5-T		
% Active Ingredient	66		
Trade Name	—		
Manufacturer	Amchem	Lot No.	4-112
Name of Person Handling Chemical	—		

MIX

Carrier	water	Date Mixed	5/24/81
Gal. Mix Per Acre	50 #/ac	Rate Per Acre	4 #/ac
Thickner		Mix Rate/100 Gal.	

PERSONNEL

JOB	NAME	EXPERIENCE
C.O.R.		
Inspector		
Helitack		

WEATHER

Time	Wind Speed	Direction	Dry Bulb	Wet Bulb	Rel Hum.
0730	0-5	SW			30
1215	5-10	W			20

PROJECT AREA SELECTION

BY RAY JOHNSTON - REGION 5

Good morning, Ladies and Gentlemen. I am Ray Johnston, District Ranger on the LaPorte District of the Plumas National Forest in California. Prior to my recent assignment on the Plumas Forest, I was Timber Sale Planning Forester and Silviculturist on the Groveland District of the Stanislaus Forest in California. I am also on the Regional Forester's Silviculture Examination Team. I feel honored to be able to speak with you this morning.

My topic is Project Area Selection. You may ask yourself, what does this have to do with silviculture? The explanation is a long one, but I'll try to be brief.

Our experience with Timber Sales in Region 5 has shown that the framework or process that we used to establish and schedule timber sales needed to be stronger. In response to this, a task force was set up, and a training course was developed for timber management and interdisciplinary specialists in Region 5. In the first half of the year, we presented seven oneweek courses to over 250 people. The purpose was to set Region standards for timber sale planning. The portions that Don Potter and myself presented concerned silviculture. Our idea was to present growth and yield goals at the inception of the project and carry it through to completion.

The sales we select for our five year Action Plan set the pace for development of our unregulated Forests. This scheduling also sets the priority for cutting in various forest types and eco-systems. The selection of the sale area also sets the pace for all other programs. Through this scheduling process, we select the land to be managed by vegetative manipulation.

If any of you have visited California, you would know that we still have a large volume of old growth timber. Also, we are in the initial stages of bringing our Forests to regulation. Much of our effort will take 100 to 200 years to accomplish.

Historically, we have cut much of the Forest on what I would call an extensive basis. By this, I mean we have attempted

to bring our Forest to regulation by exercising our professional judgment. Generally, we have not backed this up with growth and yield information.

The Stanislaus Forest completed a Timber Management Plan in 1974. This Plan surfaced the results of our extensive management. The risk cutting methods employed during the previous years had resulted in spotty natural reproduction. The only answer to keep the annual cut at its historic level was to increase regeneration cutting to 3,500 acres per year. This plan also set priorities for regeneration and sanitation cutting. It was the first timber management plan in California to tie timber sale stands selected for cutting to the management plan. Subsequent to this, several other plans have been written in this fashion. The Tahoe plan illustrates priorities, and the assignment of targets in each cutting method by District. This is further refined to reflect priority cut strata for each cutting method. I will explain our stratification system a little later.

To schedule this cutting by priority strata. our Districts are divided into compartments. These are Land Management compartments. They reflect transportation units (i.e., all the tributary timber to a given road network). They also are created to provide as homogeneous a silvicultural system as possible. We prefer not to have too many forest types in a compartment. They can be used to confine high use recreation areas in one compartment. Also, topography is a governing factor for boundaries. We ask that the boundaries be readily identifiable on the ground, and not too large (less than 5,000 acres). I have a map of the District compartment to demonstrate this to you.

Once the boundaries are set, we set a schedule of development (a ten-year plan). The idea behind this schedule is to provide a vehicle for the land manager (i.e., line officer) to establish an even flow of goods and services. This allows us to phase into programs that are new, expensive. or not proven. It allows us to balance our workload so we don't need 18 people in cultural work in one year and none the next. It also allows us to assess the impacts of political or administrative decisions on our annual growth and subsequently our annual harvest. It also allows us to make a fair evaluation of this situation years in advance of potential downfall of annual harvest.

I have some maps of a sale area and will attempt to explain the process used to produce silvicultural information for a

position statement. This document is a collection of known information used to provide the line officer with a group of possible project alternatives. It is prepared prior to entry of the sale in the five-year plan. This document is then used to schedule time of the silviculturist and other specialists in the Environmental Assessment process and timber sale scheduling.

The Corral Sale was planned for sale in 1977. The programmed harvest was 9.0 MMBD. The first map you see is the response layer. This is a stratification of vegetation types by forest type, crown size, and conifer density (P4N). This allows us to sample the strata rather effectively to determine needed growth and stocking information to make land management decisions. The response layer is made, along with a constraint layer that allows us to examine our silvicultural priorities in relation to administrative constraints.

The area is sampled for growth and yield using the Region 5 compartment inventory and analysis procedure. I will not explain the procedure in detail except to say that the sample is a L-shaped cluster plot with five sample points. We attempt to keep the standard error to within 10% of the basal area. Each strata has at least four cluster plots and these take about ½ day each to install. Each strata is sampled.

The data produced from the plots is used to rank strata for priority of cutting and to make paper silvicultural prescriptions. These prescriptions will then allow us to assess alternatives for the complete silvicultural prescription that Don Potter will present later.

The sale area on the Corral Sale has a large acreage in priority strata (1,400 acres). The information collected shows many attributes of the strata. The first chart is basal area per acre by tree class and diameter class. Note that the total basal area is low for ponderosa pine stands, 85 sq. ft. at 160 years. It should be 170 sq. ft. Also note a large portion of the growth is in trees over 25". The next data we ask for is basal area growth. This is also arrayed by DBH. We have developed as a part of our program to array the data in a butterfly graph which will give us a pictorial view of our data and show trends. Keep in mind that the error terms for individual sells are quite high but they do indicate trends. The graph on the board shows the butterfly arrangement between stocking and growth. At this point, we can begin to make some paper cuts to set priorities and test maximum growth potential. We compare these stands to a yield table. The P4N shows itself well below the desired 170 sq. ft. of basal area. The last ten years of growth projected forward shows a

short jump toward desired. If we carried the strata over. then we begin to feel sure that it will not achieve normal yield. This leads us to suspect regeneration is the needed treatment. We check our values per acre figures for yields per acre.

I have included several other strata in the butterfly graphic form. These tend to let us set cutting priorities for each strata. We then compare the paper plans with priority strata set by the forest plan. This begins the planning process we use to present meaningful silvicultural alternatives to the manager or line officer for his decision-making process.

The sale is presented in the position statement document prior to its entry into the five-year plan. This document has a listing of critical elements identified by the inter-disciplinary team and alternatives for the project. The silvicultural alternatives play a major role in the decision-making process. The Ranger and Line Officers examine the growth and yield information and set the selected alternatives to be examined during the EAR process. This alternative is broad in nature at this point and will be refined into many detailed alternatives for the EAR.

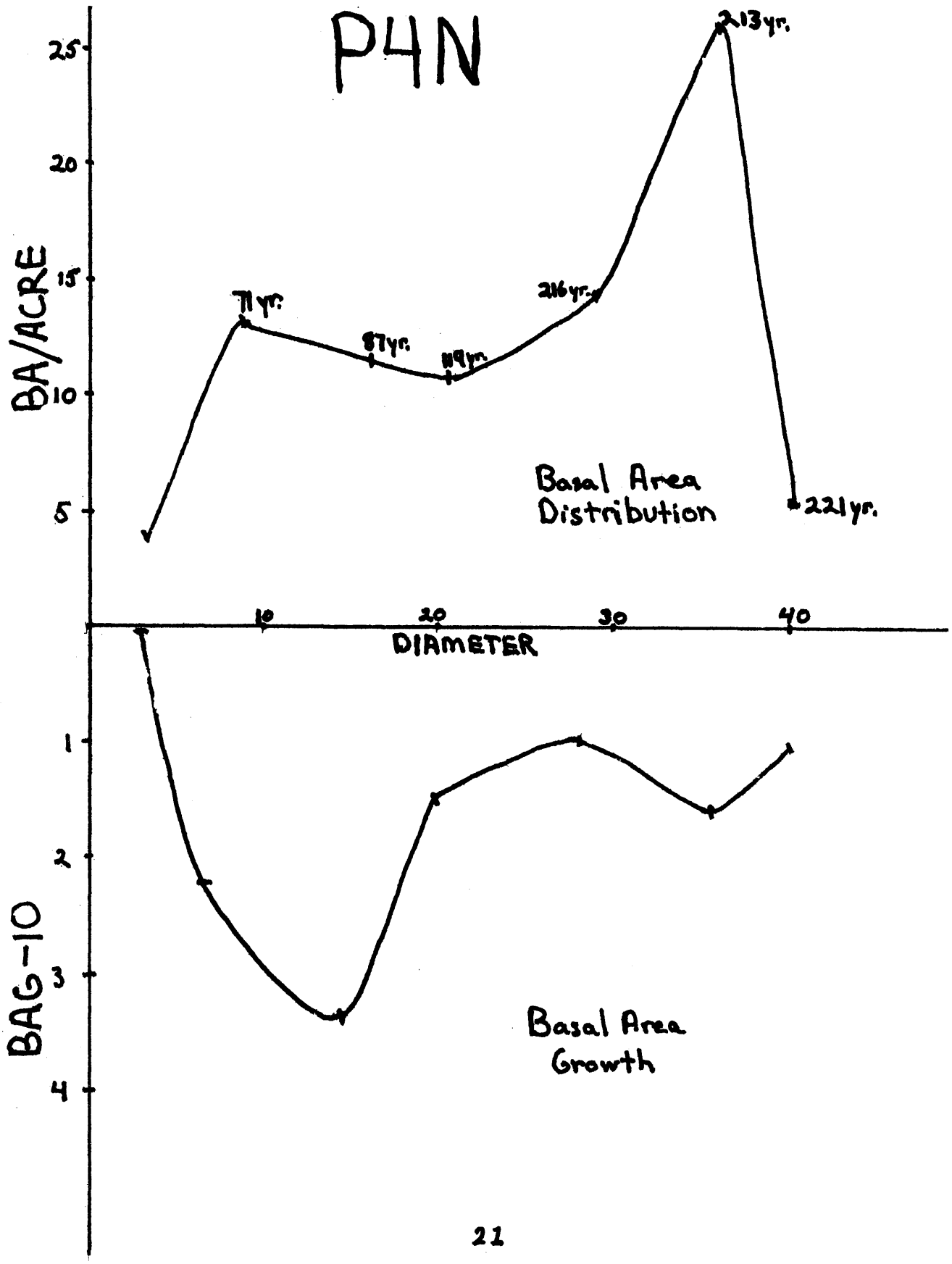
A sample would be as follows:

PROJECT	VOLUME	REGENERATION	SHELTERWOOD ACRES	SANITATION ACRES
Alternative #1	16.0	456	0	200
Alternative #2	12.0	325	50	100
Alternative #3	12.8	275	200	100
Alternative #4	6.2	150	0	0
Alternative #5	12.4	180	200	160

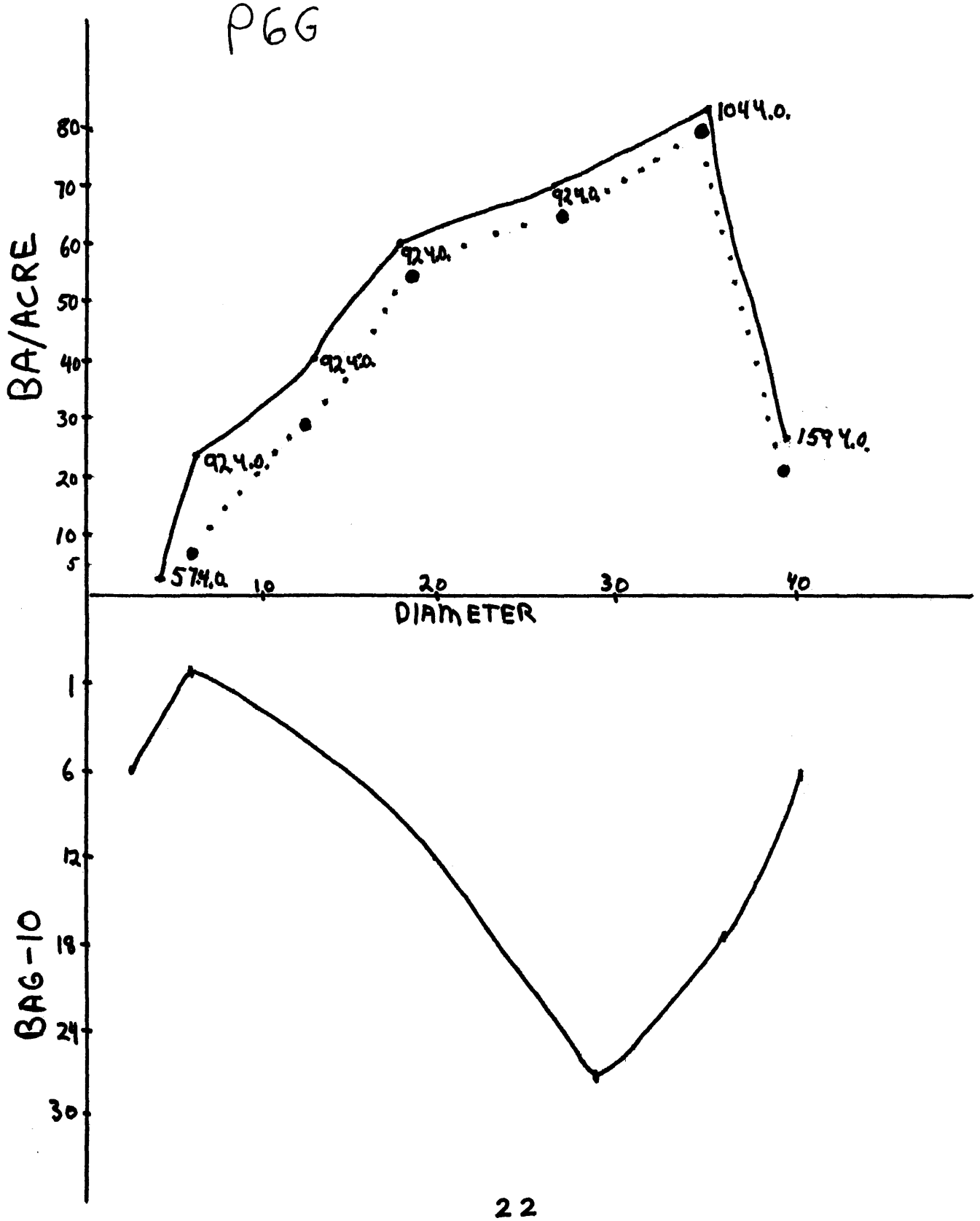
Each of these alternatives are identifiable and strata for cutting can be located on the ground. At this point. Don Potter will begin his work on the silvicultural prescription to identify exact treatments.

I would like to conclude with several thoughts. Project area selection is important to silviculture because the area chosen for harvest sets our silvicultural programs for years to come. Our plans for regulated forest and professional forestry hinge on our ability to develop the resources in an orderly fashion.

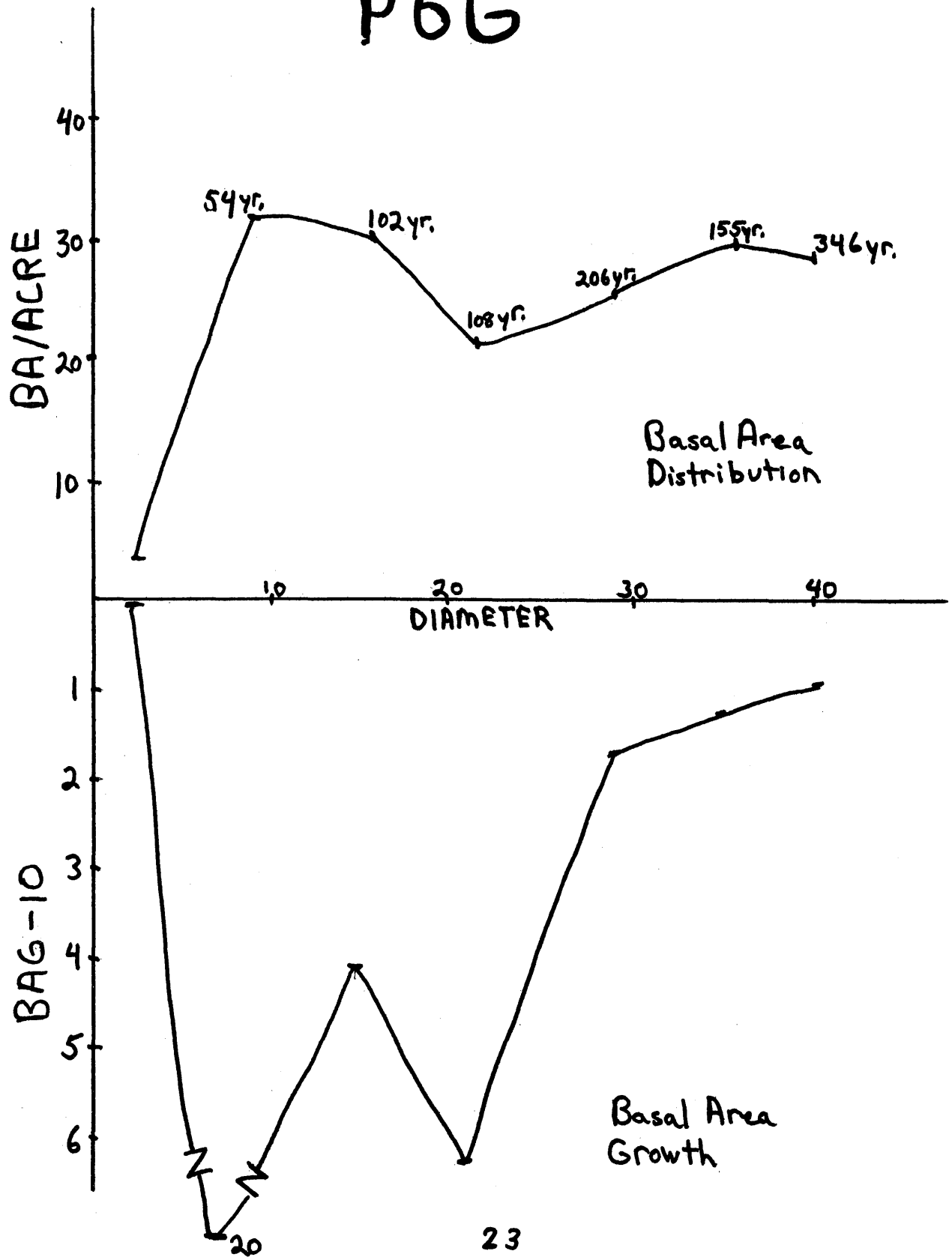
Also, this selection sets the framework for many of our other programs. Our compartment analysis system (CIA) provides the necessary data for the line officer to make a good decision for the best use of our resources.

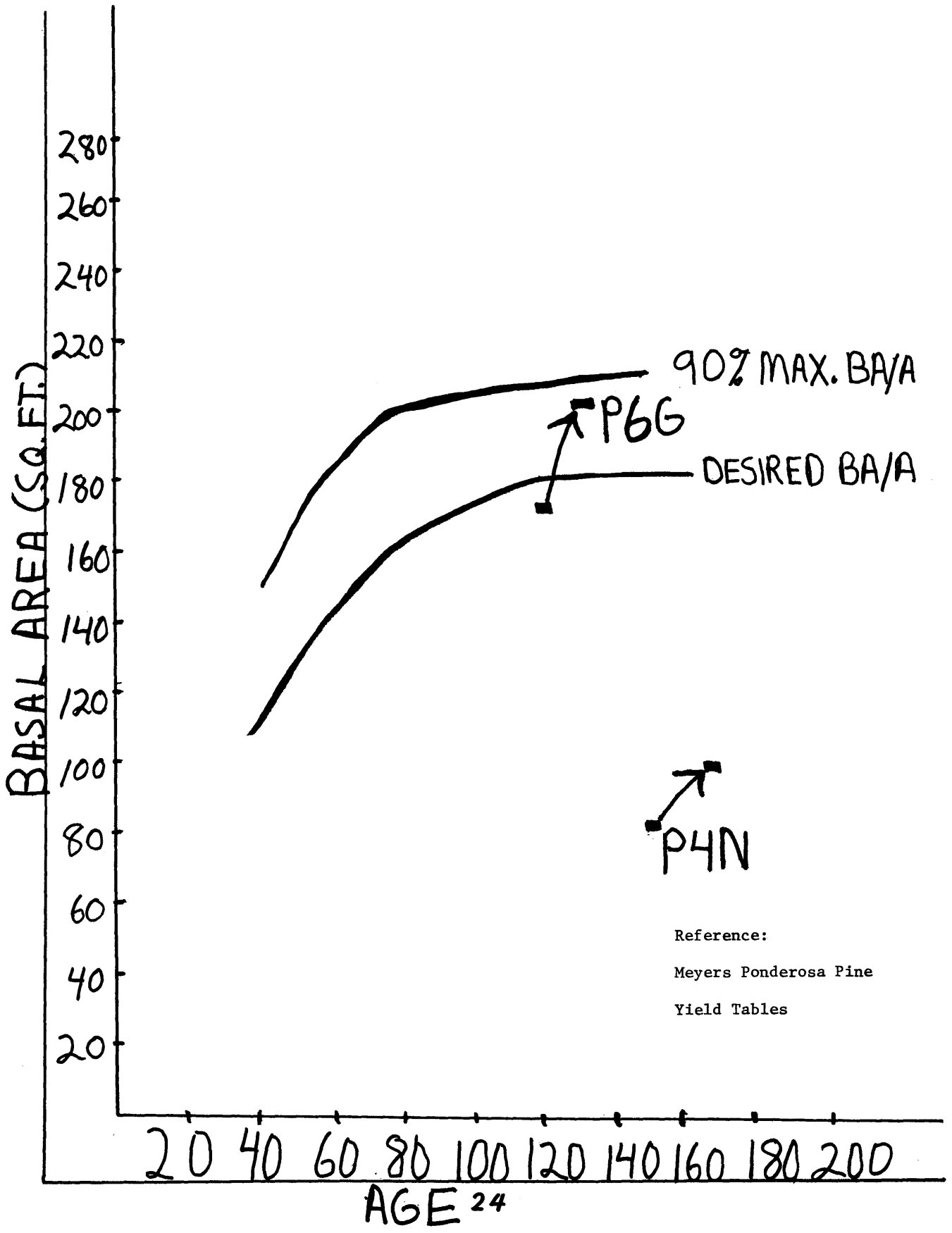

P4N
BA/ACRE
25
20
15
10
5
71yr.
87yr.
89yr.
216yr.
213yr.
221yr.
Basal Area
Distribution
10
20
30
40
DIAMETER
BAG-10
1
2
3
4
Basal Area
Growth

P6G


BA/ACRE
80
70
60
50
40
30
20
10
5
574.0
924.0.
924.0.
924.0.
924.0.
1044.0.
1594.0.
1.0
2.0
3.0
4.0
DIAMETER
BAG-10
1
6
12
18
24
30

P6G


BA/ACRE
40
30
20
10
54yr.
102yr.
108yr.
206yr.
155yr.
346yr.
Basal Area
Distribution
10
20
30
40
DIAMETER
BAG-10
1
2
3
4
5
6
20
Basal Area
Growth



Reference:

Meyers Ponderosa Pine

Yield Tables

Jim Loton, INT

FIRE CONSIDERATIONS

Ladies and Gentlemen! First of all, I would like to thank you for the privilege of speaking to you today. I have spent most of my career as a silviculturist and feel most at home in that capacity. I believe that my greatest rewards have come from seeing little trees growing rapidly and to know that in some small way that I may have had something to do with making it happen.

My current assignment involves integrating fire into resource management. I am Program Manager for a Research, Development, and Applications Program in Forest Fire Research. Traditionally, fire scientists have concentrated on research that was directed towards fire control objectives. However, the nature of our current assignment places us right square between those involved with fire management and those involved in resource management. I have enjoyed the license to become involved in wildlife management, range management, and other nontimber aspects of land management. This does not mean I have forgotten the silvicultural problems involving fire, and we do have some problems. It is some of those problems that I would like to share with you today. I am not sure that I have many answers. One of my objectives here today is to share with you some of my concerns and to solicit a lively discussion.

I have been asked to speak about fire considerations in silviculture. There is nothing new about the role of fire in silvicultural practices. Some of the early forest research in the U. S. involved the use of fire in southern pine cultural practices. In fact, much of what I

have to say has been said before, but I believe that my concerns are serious enough to warrant the time. What are some of these fire problems that we who practice silviculture must consider?

Generally speaking, there are four main areas where we must consider fire in silvicultural practices:

--Ecological Role of Fire in Specific Ecosystems

--Establishing Levels of Protection

--Using Fire as a Tool

--Fuels Management

One of the reasons that it is difficult to integrate fire into timber management is that it is a communications problem. We have two worlds. One is the world of the fire manager. The other world is that of the silviculturist. Each has its own set of objectives, budget, everyday problems. To be fully integrated each party must understand something of the other's world and to modify his set of objectives accordingly. We all know that fire can greatly effect the forest ecosystems and we should know that our silviculture practices can greatly effect the occurrence and behavior of fire.

We do have some new demands on us. The National Forest Management Act of 1976 has placed a great deal of emphasis on integrated land management planning and has set up new rules for playing the ball game. We have pressures on our professional skills like we've never before had to face. Almost simultaneously we have had a revised fire policy that calls for fire managers to work with land managers like they've never before

had to do. In a nutshell, both of these sources of direction in our management calls for highly trained professionals who are basing their decisions on a scientifically based rationale.

The Ecological Role of Fire in Forest Ecosystems

Why must this be considered? For the same reasons you base your silvicultural prescriptions on the silvical characteristics of the species you are managing. It is the knowledge base of the natural ecosystem. Understanding the role that fire played in the natural ecosystem assists you in making the decisions for the three management categories that follow:

(1) Establishing Levels of Protection,

(2) Using Fire as a Tool in Silviculture,

(3) Fuel Management

Establishing Levels of Protection

You may ask why must the silviculturist be involved in setting levels of protection? That's fire's job! Let us examine this a bit. Who is in a better position to set these levels than those interested in delivering the crop of wood when promised? The fire manager? You've just had 40 years of that experiment. And he gave you all the traffic would bear. Only OMB balked and started asking questions.[1/] See figure 2. The public scrutiny called for in NFMA of 1976 will not

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1/"1. Determine what the increases in real costs have been over the F.Y. 1964-1975 period and what has accounted for these increases.

2. Determine the desirability of individual practices and procedures based on appropriate factors and values of costs and results.

3. Determine whether management procedures are capable of selecting appropriate firefighting strategies and limiting use of firefighting funds to approved activities."

From (USFS Evaluation of Fire Management Activities on the National Forests, 1977).

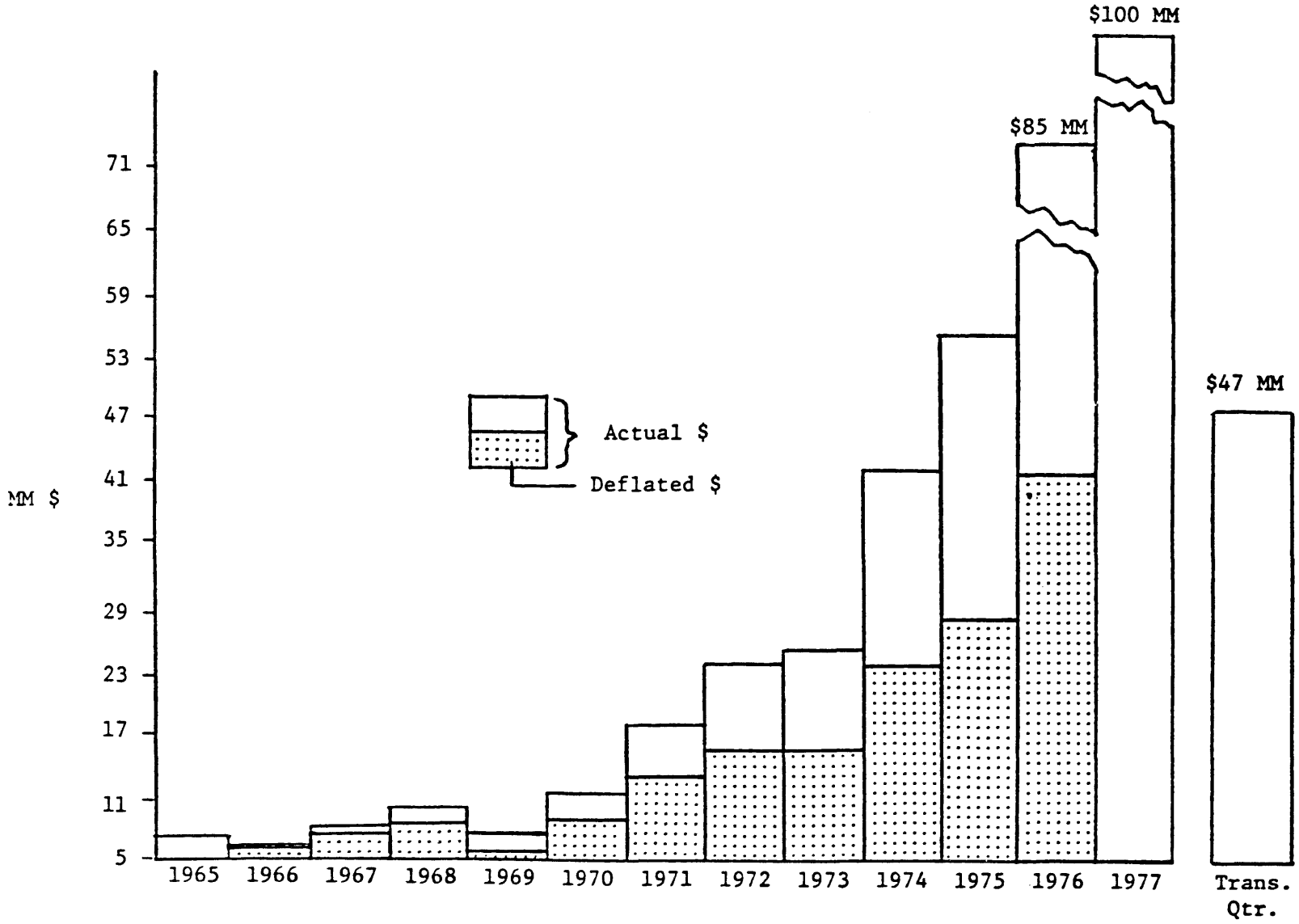

FIGURE 2. PRESUPPRESSION EXPENDITURES (FFF)
from (Evaluation of Fire Management Activities on the National Forests, 1977)

permit a blank check anymore. You are being called upon to integrate with the fire manager in an interdisciplinary manner just how much protection you need.

Let me give you an example of what happens when a vested interest is looking after something that you should be deciding. My point here is that fire managers should not be deciding how much protection you need. For example, you may be long on a particular age class and loss of 1000 acres of the surplus age class may have far less impact than in a deficient age class. You, Mr. Timber Manager, should be setting how much loss you can tolerate. Today's procedures do not permit answers like "No loss" or to "minimize losses." We must be explicit in our management and the fire manager is correctly being asked to base his fire management objectives on land management objectives. How much protection would you be willing to pay for if you were paying the bill? If we're integrated, you are paying the bill.

Using Fire as a Tool in Silviculture

Silviculturists have long used fire as an aid to prepare seedbeds, control disease, fuel bed, wildlife, range, and to alter succession. With current feelings about the use of herbicides, the high cost of machinery and labor, and concern for environmental quality fire still remains a viable alternative as a management tool.

Except for the need for summary papers and state-of-the-art guides for specific forest types, I see one of the largest problems in the use of fire as a management tool remains the problem of meeting air quality

standards. I will comment further on this when discussing fuel management. It is air pollution from burning logging slash that seems to cause the greatest concern.

Fuel Management

We have always had problems in handling slash, particularly in our overmature forests with poor utilization. Yet, there is probably no greater apportunity in fire management for altering fire occurrence or fire behavior than a properly designed and executed fuels management program.

Forest Service Policy

Just what is Forest Service policy on this subject

FSM 5150

"Fuel Management is the manipulation or reduction of fuels to meet forest protection and management objectives while preserving and enhancing environmental quality. Fuels are defined as live and dead vegetative material which is detrimental to accomplishment of protection and management objectives. These fuels occur naturally or result from management activities.

"5150.2--Objective. The objective of fuel management is to obtain fuel conditions which permit protection forces to meet fire control objectives established to ensure a sustained, high level of productivity of renewable resources, using methods which maintain environmental quality.

"5150.3--Policy. Prepare fuel treatment plan for each project which generates fuels or is undertaken to reduce natural fuels. Projects which cannot provide adequate fuel treatment to meet protection, management, and environmental objectives will not be undertaken."

These statements are quite explicit in the official stance regarding fuel management. However, where do we really stand in this matter? In recognition of problems in fuel management, Brush Disposal Activity Reviews were held in Regions 1, 5, and 6 in 1976. A management contract between Regional Offices and the Washington Office called for an action plan to address the problems. These reviews were prompted by Fire Management's concerns that slash treatment and other land management objectives are not being fully achieved by the Brush Disposal Program. These concerns in Region 1 were:

--The acreage of untreated slash backlog appeared to be increasing.

--Untreated logging slash was involved in several major wildfires.

--The costs of slash treatment are rapidly increasing.

--Timber purchasers have complained about the lack of continuity of slash treatment requirements and inconsistent cost allowances between units with similar management situations.

Some highlights of the situation are revealing in how fuel management and silviculture are intertwined. Treatment of logging slash is no small matter. F.Y. 1975 costs in Region 1 were nearly $4 million and targets involved some 65,000 acres. Events are rapidly changing. The traditional approach involved clearcutting on the easiest logging chances. When we did create slash on steeper slopes it was the result of partial cuts and we lived with the problem, i.e., these areas were placed under extra protection. Even though slash disposal on gentle terrain could be successfully handled, somehow we still managed a backlog. And to further complicate matters slash did not deteriorate as expected. As a result, the Region

changed its policy regarding extra protection and called for physical treatment. The lesson had been costly.

Funding has been a problem. Because of an early policy of a $2 per M bd.ft. administrative limit and a combination of new standards and increasing costs of treatment, the Region inherited a Brush Disposal Program deficit of $9 million.

Further changes in silvicultural prescriptions have complicated matters. A combination of partial cutting, logging on steep slopes, and sophisticated cable and helicopter yarding systems have led to complications in handling slash. And if that were not sufficient in creating new fuel management challenges, strong concerns over air quality have had a significant impact on the acreage that can be burned on any given day.

The Brush Disposal Activity Review commended the Region for advances made including the Regional Silviculturist Certification Program (although certified silviculturists still lack training in fuel management).

Problems include the following general problem areas:

1. National and Regional Logging residue treatment objectives and standards are not being met.
2. Logging residue management planning is inadequate.
3. Slash treatment projects and programs are not receiving meaningful evaluation, quantity receives more emphasis than quality.
4. Present budgeting and accounting system does not provide managers with meaningful allocation, expenditure, and accomplishment data.

5. Funds are often insufficient to accomplish planned slash treatment.

6. There is a significant backlog of untreated, unfinanced slash treatment.

7. Forests and Districts lack fuel management expertise.

8. Research questions remain unanswered:

-Fuel Inventory Data

-How much slash should be left

-Cost effectiveness

-Soil compaction

-Smoke and Human health

9. The role of ED&T Centers in dealing with slash management is not understood.

10. The role of National Forests in dealing with State and private lands is not understood.

These problems do not have easy, quick answers. However, the role of silviculturists is certainly involved inasmuch as you are the primary manipulators of forest ecosystems. And what you manipulate is indeed fuel.

The Role of Research

How can we in research help? Part of the problem is that progress in technology transer comes in a sporadic manner. We cannot say that it isn't taking place and we cannot say that we're doing all we can. At times it seems to be similar to Mark Twain's weather--Everyone is talking about it but no one seems to know what to do about it.

One of the ways we have tried to accomplish this task is to place NFS personnel among the researchers. We have both NFS and CLM coordinators at the NFFL on the RD&A Program and we're learning more everyday about how to utilize these people.

What about the products? Let me just provide some "for examples."

Ecological Role of Fire

We have state-of-the-art papers coming out by vegetative types addressing the role of fire in sagebrush/grass (Wright, H.A.), Pinyon/Juniper (Wright, H.A.), Prairie Grasslands, Ponderosa Pine (Wright, H.A.), Larch/Douglas-fir and for the geographic areas: Lolo National Forest, Northern Idaho, and East Side Forests in Montana. In addition, we have Steve Arno's work (1976) on Fire History in the Northern Rockies. We realize more is needed, but we feel this is a good, healthy beginning.

Establishing Levels of Protection

As mentioned earlier, the fire ecology information and fire history methodologies are bases upon which to begin to establish levels of protection. These will be a series of publications some of which are due from the printers and many of which are in the publication pipeline.

Work underway includes a study to develop a methodology for assessing the effects of management on forest fire occurrence and a forest planning simulator that predicts fire impacts on plant and animal communities.

Using Fire as a Tool

Again, the fire ecology and state-of-the-art summaries will provide the ecological knowledge base and known techniques for using fire. To provide a framework, Bill Fischer has standardized planning of fire use. Fischer, William C. 1977. Planning and Evaluating Prescribed Fires--A Standard Procedure.

We feel that we have some darn practical aids in fuel management. One of the most useful is already published. "User's Guide to Debris Prediction and Hazard Appraisal." (Brown, J. K. 1977)

The technique is easy to use. Existing computer programs for processing stand examinations are used to predict debris from planned cut trees. The predicted debris is added to debris already present and fire behavior is estimated for the total fuel complex. Behavior is predicted for several wind speeds, based on specified top diameter limits, skidding method, and cutting scheme.

Fischer has developed a photo series to aid in estimating slash hazard for North Idaho Thinning Slash and Natural Fuels in Montana. These are in process.

As we did for planning the use of fire, we are also writing up guides for fuel management planning.

This is just a sample of how we are trying to help at the Northern Forest Fire Laboratory. The real plea I would like to make is that as silviculturists you have a responsibility in fire management that you should not neglect. You are the best ones to decide how to set levels of protection, how you want to use fire as a tool, and how to manipulate vegetation to affect the fuel management job. Do not expect fire managers to do it for you. He is a professional, but cannot be expected to do your job. In order for fire management to be fully integrated both silviculturists and fire managers must pool their professional skills in the interdisciplinary framework that the NFMA calls for.

Thank you for your attention.

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Donald Pierce, R-1

FIDM INTEGRATION THROUGH THE PRESCRIPTION

Today I don't intend to talk much about the specific insect and disease considerations that go into a prescription report. You can better learn that for your area of the country through contacts with your Forest Insect and Disease Management (FIDM) staff. I would rather tell you about a need that we in FIDM have that I believe the silviculturists can help us with--the need to better integrate FIDM considerations with all forest resource planning.

Our contact with forest management has traditionally been through timber management. This is understandable since insects and diseases have great influence on how trees grow. Too, we have found that through timber options that remove the most timber in the shortest time, our goals of reducing insect and disease losses have been met. But times have changed, and we in FIDM need to broaden our perspective. We are now supported by research that often gives us various options for dealing with pests while at the same time considering the various resource values of the land. We need to help all resource groups attain their objectives by prescribing pest management alternatives that are compatible with management goals and direction.

I believe the silviculturist is the person to help us accomplish this. We could try harder to coordinate with the various resource groups and specialists, and will in appropriate circumstances, but often this would be inefficient. The silviculturists are at the front end of the land management process. They are generally the first to visit a

stand or unit of land to be managed. What they do or don't do has a large influence on the short- and long-range management of the land. You are the focal point that we in FIDM need to work through. But only if you are willing to change!

We cannot hope to broaden our integration with other resource units through you if you remain a commodity-timber oriented group believing that silviculture relates only to production of wood. I am not pointing specifically at you in this room, for I am sure that many of you agree. However, as a discipline, and particularly at the field level, the attitude prevails that the silviculturist is there to get the wood out at the least possible cost. In the process many other resource values--values that the public wants and expects--are often overlooked or even destroyed.

The Wildland Planning Glossary defines silviculture as:

1. Generally the science and art of cultivating (i.e., growing and tending) forest crops, based on a knowledge of silvics.

2. More particularly the theory and practice of controlling the establishment, composition, and growth of forests.

The first statement stresses growing crops. I prefer the second that implies that silviculture is the tending of forests so that the land manager will have healthy trees to use in a variety of ways.

The July 11, 1978, issue of Northern Region News contained an article by Regional Forester Torheim titled "Where is the Northern Region Heading?" In the section where he discussed the timber resource, Mr. Torheim had this to say: "Future timber management efforts consider the management of trees, rather than timber." And a few sentences

later--"The tree must now be considered more than just a source of raw material. It has a role in outdoor recreation, watershed management, and wildlife habitat." And later--"Harvests are now designed and planned by wildlife and fisheries biologists, landscape architects, soil scientists, hydrologists, and recreation specialists as well as foresters." I would add that insect and disease specialists are or should be involved in the planning.

We are certainly being told through recent legislation such as the National Forest Management Act of 1976 that it is time to do a better job of integrating management of the forest resources. Top management has received the message, but apparently the word has not yet reached the field level. You in this room could do much to see that this is done. A good starting place would be to clearly define silviculture as a job of growing and tending trees so as to benefit all forest resources.

Revising our concept of silviculture will, in turn, require some revision of the silviculture prescription process.

As I understand the process as it is generally followed in the field, when a silviculturist goes out to examine a stand he is guided by management constraints and objectives found in documents such as the FSM and Regional, Forest, and District plans. These in general terms describe management goals and guidelines plus the what, where, when, and how, and coordination requirements for that land.

The silviculturist must also have stand inventory data and any reports prepared by other disciplines that relate to conditions on the ground. It is at this point where insect and disease management should first be considered.

Our FIDM people conduct detection surveys, impact surveys, and perform biological evaluations for the major pests to be found on most forested lands. Maps are prepared and reports written. These should be on file at the District Office (we often find they are never distributed beyond the SO), and the silviculturist should be thoroughly familiar with them. They will give a picture of present and past insect and disease occurrence in the stand. Such occurrence is probably closely related to site factors and stand conditions--the silviculturist should try to identify these associations and determine what they are trying to tell about that stand; e.g., the presence of root disease centers may indicate that more organic material should be left on the ground for moisture retention or nitrogen accummulation. Maybe tussock moth is telling us that our sites are overstocked. Bark beetles may be saying this and other things about our management of the stand. The silviculturist, using his silvical skills and knowledge of field conditions, needs to consider such things in preparing alternatives for vegetative treatment.

When the silviculturist needs help in interpretation of insect and disease conditions, he should notify the District Ranger who will in turn contact his local FIDM group for assistance. We are there to help. We are part of the Supervisor's staff--so use us! Because a forester has been through CEFES or a similar program does not make him an entomologist or pathologist. Such programs should make him aware of problems and alert him to when he needs help in dealing with those problems. Our FIDM specialists will provide the help.

Back to our silviculturist. He has now visited the stand and, based on his field knowledge and complementary data, is now prepared to write the prescription that will guide both the short- and long-term management of the land--for the good of the American people.

Again, the intent of today's direction is to fully consider all resource values. Planning is being done by interdisciplinary teams. However, the silvicultural prescription reports that I have read are primarily the work of one person. That person is a specialist in silviculture but is still acting as a general forester and attempting to make resource judgments that are best left to other specialists or to coverage in an environmental analysis report.

The silviculturist is assuming the role of ID team leader. A report is presented to the line officer that proposes one course of action, described in detail, and only briefly covers other alternatives that were considered. The treatment of alternatives is shallow. Alternatives are not presented as options for consideration. The prescription writer has not done completed staff work.

The line officer does not know if the solution presented by the silviculturist is valid. Does it fall within the decision polygon? Where is it within the polygon? The silviculturist may have done an excellent job in presenting the biological, economic, technical, and legal aspects, but is certainly not qualified to speak to the social/ political side. This side of the polygon is not a hard line--its range is variable and must be determined anew for each proposal. It is a line

responsibility (as represented by the ID Team) to determine the range of this line. Also, if the silviculturist did not fully coordinate with other disciplines or did not properly interpret management direction, his prescription may not fall within the area of sound decision.

What I and others propose is that the silviculturist devote his time and efforts to describing the condition of today's stand--in silvical terms; i.e., species, stems per acre, basal area. Then propose a set of alternative treatments and describe what the future stand will be after these treatments. Tell how long it will take to reach this future state and what the costs will be. Describe the risks involved--here again insects and disease should be considered. Additional expertise that may be needed to further define an option should also be identified in the report.

The silviculturist should also identify the option that he supports. This should be the option that, in his opinion, best falls within the decision area of the polygon.

At this point the silviculturist would turn over the report to the line officer who would in turn subject the options to study by an ID team. The silviculturist would not bow out at this point, however, but would work with the team, perhaps as its leader, in selection of an option. The silviculturist has an important role as a team member. He has the knowledge of silvics--of trees and how they grow--and that information will be the basis upon which other ID team members will make their input. Also, additional expertise, such as an FIDM specialist, may be called in to assist the team at this point. The final product of this silviculturist/ID team/specialist effort should be the selection of one of the

options presented or the development of a new option. When the line officer signs off, he can be pretty well assured that his decision is well within that polygon.

If this system were followed, the silviculturist would have more field time available--time for dealing with the growth and tending of trees and with closely related insect and disease considerations. More time could be devoted to working on the fixed sides of the decision polygon, particularly the biological side. The ID team will handle the other concerns. A better final product will result and, from a selfish viewpoint, forest insect and disease management will receive broader consideration.

In summary, there is a need to broaden our present emphasis on integrated management. The silviculturist would seem to be the person to best do this because he is working with the basics--stand data and stand manipulation. The silvicultural prescription report seems an appropriate vechicle for pulling it all together.

Changes will be necessary. The manual may need some revision. The outline for the SPR needs to be changed. Most of all, a change in philosophy is needed in our field level silviculturists. They must see their role as specialists in "controlling the establishment, composition, constitution and growth of forests"--for whatever resource the public values from the land.

We in FIDM would welcome these changes and stand ready to assist in their implementation.

Ronald C. Hamilton, R-4

The Habitat Improvement Sale - A Timber Sale to Benefit Wildlife

Objective: To explain the reasons for the Habitat Improvement Timber sale on the South Fork of Fork of Salmon River Drainage, Payette National Forest. Define the timber sale prescription and follow-up information to be obtained by the tri-partite studies.

Background Information: The project area is located near Camp Creek on the South Fork of the Salmon River. The project area was chosen to evaluate the affect of timber harvest and increased wildlife use on plant succession. The project was formulated after studies which had begun in 1959 were assembled and evaluated by the University of Idaho, Idaho Department of Fish and Game, and Payette National Forest personnel.

The Studies: In 1959 and 1960 a series of studies were initiated in the South Fork of the Salmon River. The Forest Service studies consisted of a series of browse utilization transects (line intercepts) Parker 3-step transects and a big game exclosure. The Idaho Fish and Game Department, during the same period (1959-1975), conducted big game tagging recovery, hunter harvest numbers, and hunter harvest periods. In 1976, a report prepared by the Payette National Forest formally synthesized the information obtained in studies into the unpublished administrative report, "Vegetational Changes Related to Winter Big Game Use and Natural Succession on the South Fork Salmon River Planning Unit." This report along with several others were used in developing the Land Management Plan for the South Fork of the Salmon River Unit.

During the same period (1960-1975), the University of Idaho conducted various vegetation studies in the area. The University recently published this information in a technical report titled, "Successional Trends in Ponderosa Pine-Bitterbrush Communities Related to Grazing by Livestock and Wildlife and to Fire." This report also appeared in the Journal of Range Management Vol. 31, No. 1, January 1978.

Study summaries and other pertinent data can be found in the appendix of this report.

Other Developments: In the late 1950's and early 1960's, several timber harvest operations were conducted in the South Fork of the Salmon River, a forest highway was also developed to a recreation complex at Warm Lake. The timber harvesting operation resulted in several roads being developed, including roads used for jammer logging.

The harvest operations were primarily even-aged silviculture systems, principally clear cut, seed tree and shelter wood. Logging equipment used was some combination of tractors, jammers, loaders and various high lead-skyline systems.

During this same period, the South Fork of Salmon had at least one large fire, called the Poverty Flat Fire (920 acres). The burned area was salvage logged and had areas contour trenched to "provide watershed protection."

In the mid-1960's, the area experienced two storms that were considered to be in the 50 to 100 year intensity level. These storms were rain on snow events occuring after summers of slightly above average rainfall. The results of these storms was extensive damage to the river system due to natural slumps, road fill and contour trench failures. The sediment produced greatly affected the anadromous fish habitat. The floods and resultant damage caused stoppage of all Forest Service soil disturbing activities in the drainage particularily timber harvesting and road development.

The South Fork area is a part of the Idaho Batholith, a large granitic stock encompassing much of Idaho and portions of adjacent States. While the composition of the granite in the batholith varies, the portion in the area of the Habitat Improvement Sale is primarily quartz-monzonite. This rock type air slacks along the feldspar inclusions leaving the more resistant quartz groups. Weathering leaves a highly erosive coarse sand with little clay to provide binding. Total soil depth is usually two feet and is very poorly developed, having principally two soil horizons A or AC and C. The land type in the area of habitat sale is terrace or alluvial fan lands. Those land types are some of the levelest lands in the South Fork, ranging from 10 to 20 percent, while most slopes exceed 45 percent.

The logging closure of South Fork of the Salmon River has been lifted since filing the EIS and development of the LMP; but the overall management philosophy is one of going very slowly, especially in land disturbing activities such as timber harvest. The principal objective of the plan is to maintain or enhance water quality and provide anadromous fish habitat. Numerous management units within the plan also recognize big game winter and summer habitat needs and the need for timber management. It is in the area identified as critical winter and spring range that the Wildlife Habitat Improvement Sale was made.

Results of the Studies: The synthesis of the past studies published by the Forest Service made several recommendations, in summary those affecting the project were as follows:

D. 1/ The increase in available browse is not due to any change in weather; but is the result of past management practices.

E. Utilization of browse plants by big game animals approaching 50 to 60 percent of the yearly growth is not detrimental to the health of seral shrubs.

F. Progression from seral vegetation to climax vegetation is actually a fairly rapid change where bitterbrush is seral and all disturbance is eliminated.

1/ Letters assigned, are the same as those in the report.

I. There is opportunity through vegetational management to directly influence big game habitat.

The several studies in the area indicated that while bitterbrush use averaged 52 percent during the 1962 to 1977 period, the number of plants was relatively constant until big game use was excluded. In the big game exclosure study, kinnikinnick rapidly expanded and occupied the sites along with some other brush species less desireable to elk and deer. The hoof action and the use of the bitterbrush continued to allow the bitterbrush to effectively compete for a longer period than when use was excluded.

On an area of private land adjacent to a study site, clear cuts were made and a seed production area was developed which was thinned to wide spacing. Bitterbrush plants remained for longer periods and were healthier in these areas due to the longer periods of direct sunlight and reduced moisture competition during the mid summer. On similiar areas, fire, big game trampling and feeding, and timber harvest can maintain the desireable conditions for bitterbrush growth longer than by excluding anyone of these factors.

The Project: In June of 1975, the Idaho Department of Fish and Game recommended that the Payette National Forest"...sell as much timber as possible in strategic areas to try and increase the production of browse species utilized by big game animals during the winter." Idaho Fish and Game stated that natural succession of the timber overstory to sawlog size reduced the bitterbrush production potential. After consultation with both the Idaho Fish and Game Department and the University of Idaho, a project area was chosen which would allow testing of the recommendation. The area also was sufficiently stable to maintain water quality, control erosion and in general meet the constraints of the South Fork Land Management Plan. An interesting side light of the project is that it placed back on the side of management two previous antagonists to any activity in the South Fork area. (Again, it depends on who's ox is gored).

The project itself proposes to remove most of the large overstory ponderosa pine and commercially thin some small sawtimber stands to increase light levels to the ground and reduce ground vegetation especially kinnikinnick so that bitterbrush plants may reestablish and compete. The principal harvest system proposed is shelterwood with the current entry being the seed cut.

Vegetation classification using the Daubenmire habitat type system indicates that the harvest area is principally a Douglas Fir/Common Snowberry habitat type with kinnickinnik phase. Minor habitat types are ponderosa pine/bitterbrush and Douglas-fir/elksedge. In the Douglas-fir/snowberry habitat type the major seral component of the habitat type is moderate densities of ponderosa pine with bitterbrush in the understory.

Design of the sale is principally to test various site preparation and harvesting densities. After some initial studies the most suitable method will be chosen to manipulate the three habitat types for elk and deer. Although past studies and older harvest areas indicate some results, none were sufficiently clear to say that any one combination is best. In most areas a combination of treatments had not been applied.

Facts about the sale area: Gross area within the sale is 160 acres, the area to be cut over is 78 acres. Average size of the trees to be cut is about 22 inches DBH and 4.5 merchantable 16 foot logs in height. Average number of trees cut per acre 7.7. Net cut volume 365MBF. Net volume cut per acre 4.7 MBF.

Approximately eighteen acres will be precommercially thinned after logging, five acres will be seeded to bitterbrush, three acres will be planted to Scouler willow using cuttings. Approximately 50 percent of the cut over area will be piled and burned. Forty acres will be site prepared for natural regeneration. All of the above work is planned as Forest Service work, mostly KV financed.

The University of Idaho, the Idaho Fish and Game Department, and the Forest Service will complete the following studies:

1. Deer census-trend counts previously established.

2. Utilization of bitterbrush and Idaho Fescue to be evaluated each spring.

3. Pellet group surveys.

4. Vegetation compositon and production surveys each summer.

Other studies include:

a. Long-term photo-point studies showing pre/post logging conditions.

b. Permanent vegetation composition transect measured three and five years following the logging, which is getting underway this fall. A complete report will be published cooperatively by the agencies involved.

Summary: While it is difficult to say at this point the exact result of the Habitat Improvement Sale, several parallels may be drawn and can be applied:

1. Most game animals and other wildlife species occupy a specific niche or niches in the Forest. For big game these can usually be portrayed as a specific seral position or vegetation condition of the habitat type or types used.

2. By recreating those seral conditions, specific wildlife groups may be favored. In the case of the Habitat Improvement sale, it is Mule Deer and Elk.

3. By applying treatments at variable intervals throughout the rotation of a timber stand, vegetation conditions for most wildlife species may be developed and maintained over time.

4. Maintaining the appropriate condition or seral stages favorable for any wildlife species throughout the development of a timber stand is not possible; therefore, it is necessary to create a series of treatments over a broad area such as a watershed to maintain species diversity of both animals and plants.

5. Wildlife management which requires timber manipulation to accomplish a specific habitat objective is compatible with multiple use timber management goals and is best prescribed by the trained vegetation manipulation specialist, The Silviculturist.

6. Treatments for wildlife purposes while producing timber will not always meet the highest volume output goals; but generally both goals are compatible on the same area if highest production levels of both are not required.

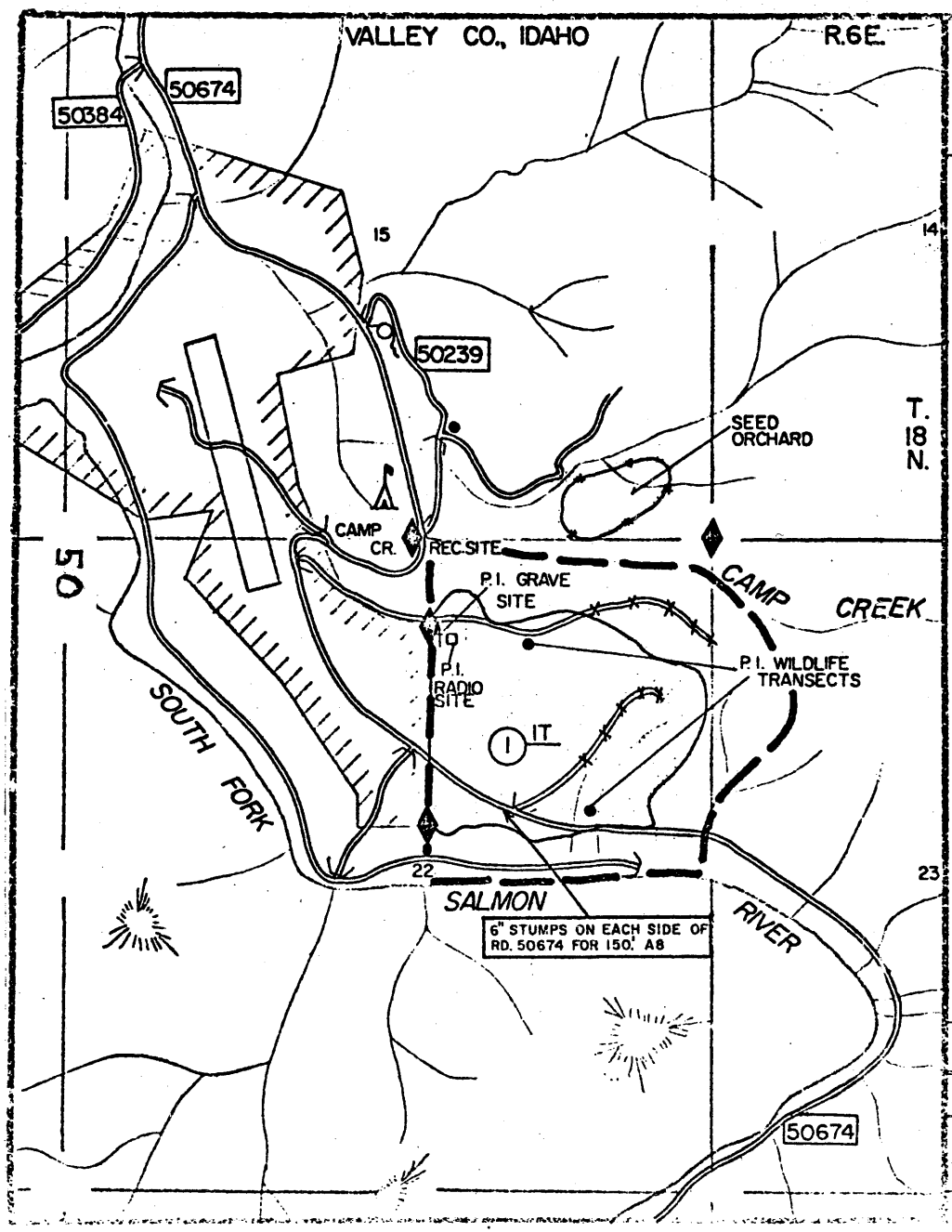
Some items that must be considered separately for each sale:

1. Each big game winter range must stand on its own when management is being considered. Because of its critical nature, management changes brought about by silvicultural activities need to proceed slowly as each acre supports a very large number of animals and in the west these lands are often marginal with management characteristics requiring such things as helicopter or skyline logging systems.

2. The accomplishment of the silvicultural objectives while accomplishing the wildlife management goals must be habitat specific with cultural treatments aimed at attainable seral conditions.

APPENDIX

Table of Contents



SALE AREA MAP LEGEND

SALE NAME	FOREST	DISTRICT
HABITAT IMPROVEMENT	PAYETTE	KRASSEL

- SALE AREA BOUNDARY, B1.1
- (1) UNIT NUMBER, B1.1
- 50000 EXISTING TRANSPORTATION SYSTEM ROAD, B5.12
- EXISTING ROAD
- (1) IT INDIVIDUAL TREE UNIT, B2.3
- PROTECT KNOWN SURVEY MONUMENT, B6.23
- P.I. PROTECT IMPROVEMENT, B6.22
- RADIO SITE
- † GRAVE SITE
- WILDLIFE TRANSECT
- EXISTING ROAD, HAULING PROHIBITED, C5.12

PURCHASER SLASH RESPONSIBILITY TABLE (C6.7*)

DESCRIPTION OF UNITS	TYPE OF DISPOSAL	ACRES
UNIT 1	C Lop	78
Landings, camps	B,L Machine pile	Unest.

Map By: A. Smith Date: 5/14/76(rev 7/7/78) Scale: 4" = 1 Mile

Summary of Data

Camp Creek Utilization Transect - % Use Determined by Twig Measurement

Spring Year of Use	Species			Combined
	Bitterbrush	Willow	Hawthorn	Utilization
1957	40%	24%	23%	37%
1958	41%	58%	0%	45%
1959	40%	20%	15%	37%
1960	45%	6%	12%	40%
1961	58%	20%	12%	45%
1962	66%	91%	0%	69%
1963	43%	72%	0%	37%
1964	69%	62%	17%	66%
1965	64%	71%	42%	65%
1966	47%	28%	8%	42%
1967	57%	57%	25%	57%
1968	43%	34%	40%	41%
1969	41%	46%	42%	42%
1970	37%	21%	Not Sampled	34%
1971	37%	41%		38%
1972	53%	54%		53%
1973	44%	18%		37%
1974	56%	48%		54%
1975	62%	67%		63%
19 Year Average	50%	44%		47%

Indicated Days of Use From Transect Pellet Count

Spring Year	Number of Animal Days per Acre	
	Deer Days	Elk Days
1957	29.3	0
1958	70.0	1.5
1959	24.6	0
1960	35.4	3.1
1961	21.5	.7
1962	27.6	6.2
1963	14.6	1.5
1964	17.7	2.3
1965	17.7	.5.4
1966	13.8	1.5
1967	14.6	0
1968	14.6	7.6
1969	13.0	3.8
1970	6.9	0
1971	13.1	2.3
1972	33.0	6.2
1973	19.2	2.3
1974	32.3	9.2
1975	29.2	6.9
19 Year Average	23.2	3.2

SUMMARY OF PARKER 3-STEP TRANSECTS

Buckhorn Bar Inside Exclosure
Transect 6-1-1
Habitat Type = Douglas-Fir/Snowberry - Kinnikinnick Phase

	1959	1964	1975
Total Plant Cover:	37	43	56
% of Plant Cover:			
Pine Grass (Calamagrostis rubescens)	38	32.5	2
Bitterbrush (Purshia tridentata)	23	14	38
Snowberry (Symphoricarpos alba)	7	2	13
Idaho Fesque (Festuca idahonensis)	5.5	7	-
Alumroot (Heuchera spp.)	2.8	-	-
Elk Sedge (Carex geyeri)	-	5	-
Hawk Weed (Hieracium spp)	-	2	4.5
Kinnikinnick (Arctostaphylos uva-ursi)	2.8	23	33
Anenome spp.	2.8	-	-
Yarrow (Achillia millefolium)	2.8	-	-
Rosa spp.	11	2	2
Potentilla spp.	-	5	-
Strawberry (Fragaria spp.)	-	-	3.5
Antennaria spp.	5.5	7	3.5
Shrub Intercept (inches)			
Rose	18	Not measured	-
Bitterbrush	90	"	270
Snowberry	2	"	63
	110		333
Cluster Summary			
Bare Soil	3	0	0
Erosion Pavement	0	0	0
Rock	0	0	0
Litter	52	48	43
Moss	8	9	1
Plant Cover	37	43	56

Buckhorn Bar Outside Exclosure
Transect 6-1-3
Habitat Type = Douglas-Fir/Snowberry - Kinnikinnick Phase

	1959	1964	1975
Total Plant Cover:	20	28	17
% of Plant Cover:			
Pinegrass (Calamagrostis rubescens)	45	35.7	5.9
Bitterbrush (Purshia tridentata)	10	10.7	35.3
Idaho Fesque (Festuca idahonensis)	25	25	11.8
Eriogonum	5	-	-
Poa spp.	-	7	-
Junegrass (Koeleria cristata)	-	7	-
Snowberry (Symphoricarpos albus)	-	-	5.9
Hawkweed (Hieracium spp.)	-	-	29.4
Dwarf Huckleberry (Vaccinium caespitosum)	-	-	5.9
Kinnikinnick (Arctostaphylos uva-ursi)	5	3.6	-
Spirea (Spiraea betulifolia)	5	-	5.9
Antennaria	5	10.7	-
Shrub Intercept (Inches)			
Bitterbrush	68	-	81
Spirea	9	-	-
Snowberry	-	-	14
Rose	-	-	2
	77		97
Cluster Summary			
* Bare Soil	15	7	0
Litter	58	60	83
Moss	7	5	0
* Plant Cover	20	28	17

* The increase in litter and the decrease in plant cover can be attributed to a ponderosa snag that fell across the transect, almost parallel to it.

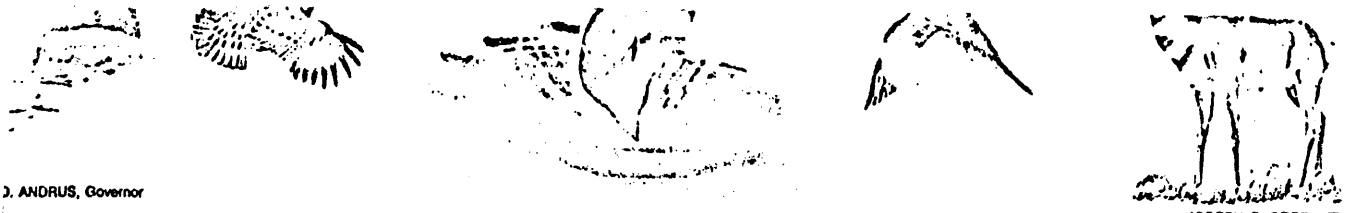
SUMMARY OF PARKER 3-STEP TRANSECT

Buckhorn Bar Area
Transect 6-1-2
Habitat Type = Ponderosa Pine/Bitter Brush

	1959	1964	1975
Total Plant Cover:	9	7	15
% of Plant Cover:			
Bitterbrush (Purshia tridentata)	33.3	28.6	86.7
Idaho Fesque (Festuca idahonensis)	33.3	42.9	-
Needlegrass (Stipa spp.)	33.3	-	-
Bluegrass (Poa spp.)	-	14.3	-
Sheep Sorrel (Rumex acetosella)	-	14.3	13.3
Shrub Intercept (inches)			
Bitterbrush	31	-	153
Snowberry	3	-	-
Cluster Summary			
Bare Soil	39	13	51
Litter	49	71	34
Moss	3	9	0
Plant Cover	9	7	15

This transect is located on a south slope; the other two transects are located on the flat at Buckhorn Bar. Soil movement is advanced here; the soil is very loose and sandy. The 0.0' and 50.5' stakes had to be reestablished after considerable effort to find the originals. Soil movement may have caused their disappearance or they may have been removed by man or animal. Gopher activity is evident on this transect.

Ground cover is sparse on this transect, and plant cover is even less. The shrubs that are here are heavily hedged; this indicated fairly heavy game use. It appears that overall the trend for big game browse is stable on this transect.



IDAHO FISH AND GAME DEPARTMENT

Region 3
109 W. 44th
Garden City, Idaho 83704
384-3725

JOSEPH C. GREENLEY
Director

POST OFFICE BOX 25
600 SOUTH WALNUT STREET
BOISE, IDAHO 83707

June 12, 1975

Mr. Ned Pence, District Ranger
Krassel Ranger District
Payette National Forest
McCall, Idaho 83638

Dear Ned:

This letter is to confirm what John Gahl and Paul Hanna recommended concerning the location of the browse transects in your district.

The transects appear to be placed on representative portions of the South Fork winter range. However, due to natural succession the timber overstory has reached sawlog size on all of the areas decreasing the potential of the sites. We recommend that you sell as much timber as possible in strategic areas to try and increase the production of browse species utilized by big game animals during the winter.

Sincerely,

DEPARTMENT OF FISH AND GAME
Joseph C. Greenley, Director

James F. Keating
Regional Supervisor

cc: Gahl

-- May 1978

James Peek
College of Forestry, Wildlife and
Range Sciences
University of Idaho

Evaluation of Camp Creek Habitat Improvement, South Fork Salmon River

I. Justification

The bitterbrush winter ranges along the South Fork Salmon River include stands which are successional stages presently dominated by Ponderosa pine. These successional states likely occur in Douglas fir/snowberry/kinnickinnick habitat types which , as they progress to climax, lose the important bitterbrush plants and become less satisfactory mule deer and elk winter range. U.S. Forest Service and Idaho Fish and Game Department have approved a timber sale in one such stand on Camp Creek which is designed to retard the successional advance and rejuvenate bitterbrush.

The purpose of this investigation is to document responses of vegetation and big game resulting from habitat alterations. Recognizing that evaluations must occur over a period of years, and that limited time and man power are available, we propose use of pellet surveys and browse utilization surveys to determine big game use trends, and vegetation composition/production surveys to determine trends in vegetation.

II. Schedule of work

This schedule is proposed for annual evaluations. U.S. Forest Service (FS), Idaho Fish and Game Dept. (FG) and University of Idaho (UI) personnel will be involved as indicated.

1. Deer census-trend routes which have been established in the South Fork by FG will be continued (FG, with FS and UI cooperating).
2. Utilization of bitterbrush and Idaho fescue will be evaluated in late April-May (FS, with FG and UI cooperating).
3. Pellet group surveys will be run in June-early July (UI, with FG, FS cooperating).
4. Vegetation composition/production surveys will be run in June-early July (UI, with FS, FG cooperating).

III. Methods

1. Production/standing crop of bitterbrush
   a. Heights of 20 bitterbrush plants (nearest cm) will be obtained on each site.
   b. Two diameters at right angles to each other will be taken across the crown of twenty bitterbrush plants.
   c. Aerial stem weight/bitterbrush plant will be derived from the regression $Y = -383.47 + 0.1834$(canopy area) for each site.
   d. Number of bitterbrush plants/m^2 will be determined by counts in 20-40m^2 plots on each site.
   e. Number of twigs on 20 bitterbrush plants will be counted on each site.

f. Twig numbers/m^2 will be determined by multiplying d x e.

g. 50 twig lengths will be measured on each site.

h. Twig weight/m^2 will be derived from conversion of twig length to weight and multiplying by f.

2. Production of Idaho fescue

a. Ten 2x5 dm plots will be clipped and weighed (nearest gm) on each site.

3. Vegetation composition

a. Twenty 2x5 dm plots will be established on each site.

b. Canopy coverage and frequency of herbaceous species will be determined using Daubenmire's method which is standardized and well-known.

4. Utilization of bitterbrush

a. Lengths of 50 browsed and 50 unbrowsed twigs will be measured (cm.) on each site.

b. Estimates of % twigs browsed on 20 plants on each site will be made (nearest %).

c. Mean twig weight removed will be measured using an equation of twig weight on twig length.

d. $\%\ \text{Utilization} = \frac{\text{Mean twig weight} - \text{Mean twig weight removed}}{\text{Mean twig weight}} \times 100\%$

5. Utilization of Idaho fescue

a. Number of plants grazed of 100 sampled on each site will be recorded.

b. Heights of 50 grazed and 50 ungrazed plants will be obtained on each site.

c. A height-weight regression will be derived to predict utilization.

6. Pellet group frequency distributions

a. Fifty 0.01 acre circular plots will be staked on each site.

b. Pellet groups (deer and elk) will be counted in spring and cleared on each plot.

IV. Study plan and data analysis

1. Initial year (1978)

a. Determine production and composition in representative sites within the site.

b. Photopoints will be established to show pre-logging conditions.

c. No permanent plots will be established until after the logging is completed.

2. Subsequent years

a. All data will be taken from permanently established plots.

b. Comparisons of treated and adjacent untreated areas will be made if conditions allow.

3. Data analysis will be done by the agency primarily responsible (see II), with results made available to all concerned as quickly as possible.

4. Progress reports and final report will be written with cooperation and approval of all agencies involved before they are released for distribution.

5. The investigation will continue until it is mutually agreed that sufficient data have been obtained to adequately evaluate the responses of vegetation and big game use to the treatment.

WEATHER DATA

Complete year long weather data is not available on the winter range. However, data is available at McCall which should indicate severity of the winter. Annual precipatation is available starting October 31, 1967 at Camp Creek and back to 1918 at McCall. This data is pertinent to document severity of winters and any climatic change.

Winter Severity
(McCall Station)

Winter	First Snow Fall	Depth Dec. 1	Maximum Depth	Total Snow	Date of Melt
1956-1957	11/1/56 (10")	7"	45" (2/5)	160"	4/13/57
1957-1958	11/13/57 (3")	6"	45" (2/13)	169"	4/26/58
1958-1959	11/3/58 (1")	0"	39" (2/19)	125"	4/13/59
1959-1960	11/22/59 (6")	0"	44" (3/9)	153"	4/8/60
1960-1961	11/11/60 (3")	12"	32" (3/12)	138"	4/3/61
1961-1962	11/20/61 (4")	12"	41" (3/2)	186"	4/11/62
1962-1963	11/18/62 (2")	8"	20" (1/31)	77"	3/17/63
1963-1964	11/8/63 (8")	10"	69" (3/12)	188"	4/25/64
1964-1965	11/12/64 (6")	5"	53" (2/29)	187"	4/13/65
1965-1966	11/20/65 (2")	1"	40" (2/14)	138"	4/4/66
1966-1967	11/9/66 (2")	2"	55" (3/12)	226"	4/18/67
1967-1968	11/23/67 (6")	12"	47" (2/1)	156"	3/30/68
1968'1969	11/8/68 (5")	17"	66" (2/6)	227"	4/10/69
1969-1970	11/17/69 (1")	0"	41" (2/6)	138"	4/14/70
1970-1971	11/1/70 (1")	20"	71" (1/15)	256"	4/22/71
1971-1972	11/1/71 (8")	18"	38" (2/15)	169"	4/1/72
1972-1973	11/8/72 (1")	5"	27" (2/13)	76"	3/29/73
1973-1974	11/2/73 (1")	14"	48" (2/2)	237"	4/19/74
1974-1975	11/18/74 (3")	5"	59" (3/22)	---	4/29/75

Camp Creek Precipitation Readings

1 Year Period	Total Inches	Period	Total Inches
1/8/68-12/11/68	18.85	12/7/71-11/29/72	24.10
12/11/68-12/5/69	19.10	11/29/72-12/6/73	25.40
12/5/69-1/5/71	31.75	12/6/73-11/26/74	21.90
1/5/71-12/7/71	27.60	11/26/74-11/12/75	22.90

12 Month Average = 24.42

George E. Gruell, INT

RELATIONSHIPS BETWEEN PLANT SUCCESSION AND WILDLIFE HABITAT CONDITION

During the ten year period 1967-1977, while employed as a Wildlife Biologist on the Bridger-Teton National Forest in western Wyoming, I conducted investigations on relationships between plant succession and wildlife habitat condition. Today, I would like to give you an overview on what was learned and how this information can aid us in our efforts to improve wildlife habitat.

Vegetation was put in historic perspective by retrieval and retake of over 100 photographs spanning the period 1878-1942. These scenes graphically show successional changes at elevations between 6,000 and 10,000 feet. The following slides are representative of this photo record.

Location	Vegetative Type	Date Original Photograph	Date Rephotographed	Time Interval
Lower Slide Lake	Douglas-fir	about 1900	1970	70 years
Hoback-Snake R.	" "	" 1905	1970	65 "
Cliff Creek	Lodgepole pine	1878	1968	90 "
Slate Creek	" "	1905	1970	65 "
Swift Creek	Mixed conifer	1906	1968	62 "
Turpin Meadow Vic.	" "	1878	1968	90 "
Randolph Mtn.	" "	1906	1968	62 "
Turpin Hill	" "	1899	1971	72 "
Goosewing Creek	Mixed conifer-aspen	about 1890	1970	80 "
Camp Creek	" " "	1900	1970	70 "
Willow Creek	Mixed conifer	about 1900	1970	70 "
Stinking Springs	Douglas-fir	1878	1968	90 "
" "	" "	1920	1968	48 "

Interpretations are as follows:

Slide	Discussion
Slide Lake	A typical example of succession change on the lower Gros Ventre River in Wyoming. The area burned in 1879. After nearly 100 years, conifers once again dominate the slope.
Junction of Hoback and Snake Rivers.	This locality at the junction of the Hoback and Snake Rivers also burned in 1879. Shade intolerant shrubs on the distant slopes at left predominated at the turn of the century. Today, these shrubs are either dead or in a decadent condition.
Cliff Creek	Here is an earlier scene showing a slope which apparently burned around the mid-1800's. Intolerant shrubs predominated in 1878. In 1968, after 90 years, they have been largely replaced. Note the mosaic created by this wildfire.
Slate Creek	The distant slope and midground here on Slate Creek in the Gros Ventre River drainage apparently burned in the late 1800's. Note the

Slide	Discussion
Slate Creek (cont.)	increase in mountain big sagebrush. This is the usual successional sequence on non-forested lands in western Wyoming.
Swift Creek	These mixed conifer stands in the Hoback Basin burned in the mid 1800's. Observations indicate intolerant shrubs grew in abundance at the turn of the century. Note the young aspen stands in the early scene. Today, the shade intolerant shrubs are either dead or in a senescent condition.
Above Turpin Meadow	The preceeding scenes represent a cross-section of successional changes in western Wyoming. These scenes consistently show that the early landscape was a mosaic of various aged vegetation. The burn in the scene apparently occurred around the mid-1800's. The next scene was taken from the distant mountain at upper right.

Slide	Discussion
Randolph Mtn.	A burn is also evident, but this one occurred after 1878 since it is not visable in the previous slide. Note that the aspen stand at left was in an initial stage of growth in 1906.
Turpin Hill	The early scene in this sequence shows conditions following burning in 1879. Aspen clones were rejuvenated by this fire. Note even-aged aspen in distance and midground. This fire apparently removed sagebrush. Very little was in evidence in 1899, whereas today it predominates in midground.

Slide	Discussion
Goosewing Creek	This early Owen Wister photo shows aspen in initial succession around 1890. The spruce swags suggest the stand was in an advanced stage of succession when it burned in 1872. The burn date was indicated by fire scarred trees.
Camp Creek	Succession on the Lower Hoback River. Note increased density of conifer on the distant slopes. The next scene was taken from a point upstream at right.
Willow Creek	Floodplain vegetation around the turn of the century was well represented by deciduous shrubs and trees. Today, spruce dominate the floodplain. Note changes on the far ridge at right.
Stinking Springs (1878)	Fire scar evidence suggests that Douglas-fir on this slope burned in 1872. In 1878 herbs and shrubs predominated.
Stinking Springs (1920)	Forty-two years later from a different angle. Shrubs and herbs still persist. Considering the young stage of conifer growth, it is

Slide	Discussion
Stinking Springs (1920) (con.)	probable that canopy closure did not take place for another 10 years or more.
Succession model	Here is a generalized conception of forest succession over 100 years. Wildlife in general are a product of early succession when forbs, grasses, and shrubs dominate. This can be a decade or two or more than 60 years. Good wildlife habitat is a mix of various aged vegetation. Some species, however, require old growth.
Ice Creek - advanced succession	As indicated by the comparative slides, a majority of today's landscape in Wyoming is in advanced succession. In my view, this Montana scene is typical of current conditions in forested areas throughout the Rocky Mountains. On the whole, conifers are out-competing shade intolerant understory plants. This is a direct result of a reduction in fire frequency.
Scouler willow in 1945 - O'Keefe Creek burn	Scouler willow is one of these plants. This shrub is quite important to various wildlife species. It provides forage for big game, nesting and feeding opportunities for birds and cover for small mammals.

Slide	Discussion
Decadent Scouler willow on Burnt Mtn.	With closing of the forest canopy, Scouler willow becomes decadent.
Dead Scouler willow - Wyoming	-- and ultimately dies.
Dead Scouler Willow - Mont.	-- This example is in Montana.
Gilespe Creek	As evidenced on old burns and recent timber sales, we have an opportunity to rejuvenate Scouler willow by cutting and/or prescribed fire. This sale was cut in 1966 and burned in 1967.
Snowbrush ceanothus - Burnt Mtn.	Snowbrush ceanothus is another important shrub, particularly on winter game ranges. It has died out over wide areas because of successional changes.
Snowbrush ceanothus - 1945 O'Keefe Cr. burn	Here is an example of competition from conifers.
Snowbrush ceanothus - Swift Cr.	A dead ceanothus plant in an area which burned more than 100 years earlier. The seeds of this plant lay dormant in the soil for long periods.

Slide	Discussion
Snowbrush ceanothus - 1934 Cabin Cr. burn	Dormancy is broken by heat in excess of 140° followed by a cold period.
Snowbrush ceanothus - Sweetwater burn	This stand regenerated after a wildfire 10 years previous. We have much opportunity to re-establish this plant by prescribed fire or--
Snowbrush ceanothus - Greys R. timber sale	by clearcutting and broadcast burning. Broadcast burning is preferable over pile and burn because it allows a more even distribution of heat.
Aspen - Spread Cr.	Aspen and associated vegetation are very important to wildlife. This tree has been on the decline in the northern Rockies for some time. This is an extreme example of decadence.
Aspen - LaBarge Cr. drainage	Most aspen stands are mature or decandent. Young stands are usually restricted to areas of disturbance.
Aspen on Big Piney R.D.	In most instances, aspen is seral to conifer. The evidence of past fire is sometimes obvious. Much of the time it is not.

Slide	Discussion
Aspen - LaBarge Cr. drainage	This mixed conifer-aspen stand is ready for burning or cutting and burning.
Aspen - Sweetwater R.	A timber sale in this locality followed by burning would allow regeneration of aspen and other shade intolerant shrubs. Aspen has largely disappeared because of successional changes and utilization by beaver.
Aspen - sagebrush	A typical aspen stand in western Wyoming. Sagebrush is a heavy component of the associated vegetation.
Aspen - sagebrush	The deterioration of these stands has allowed the invasion of sagebrush.
Aspen - Breakneck R.	Where sagebrush is a significant part of the ground cover, prescribed fire can be used to advantage. Here is an example of a prescribed burn on the Gros Ventre River drainage.
Aspen - Bare Cr.	Aspen regenerates well following fire if livestock and/or game use is not excessive. These stands regenerated after a 1941 burn.

Slide	Discussion
Aspen - Fremont L.	This aspen stand regenerated following a fire ten years previous.
Mtn. Mahogany	Mountain mahogany is an important source of forage for big game. Most stands are of advanced age and current growth is often unavailable.
Mahogany - fire	Many mountain mahogany stands are even-aged, having regenerated from seed following burning or cutting.
Mahogany regeneration	An example of mountain mahogany regeneration following a small wildfire. Regeneration was successful despite heavy winter game use. Evidence like this indicates an opportunity to regenerate this shrub under prescribed conditions.
Bitterbrush - Lander Vic.	Concern is often expressed over the burning of bitterbrush, particularly in the spring. This important forage plant sprouts from the crown or regenerates from seeds which are oftentimes in rodent caches. This plant has crown sprouted and is a year old.

Slide	Discussion
Bitterbrush - Blackrock R.D.	Little bitterbrush was destroyed in this hot September burn in 1966. Evidence such as this suggests opportunities to regenerate bitterbrush if we utilize good prescriptions.
Redstem ceanothus - Clearwater R.	Some shrubs such as redstem ceanothus grow rapidly from seed following burning. This robust plant on the Clearwater River is only two years old.
Selection logging - no burning	A study on the Clearwater has shown no response from redstem ceanothus and little from other shade intolerant shrubs after cutting and no burning. Note the fuel loading. This is a poor prescription in the context of wildlife habitat management and fire management.

Wildlife biologists are recognizing the role of disturbance in improving wildlife habitat. Recent biologist input on a Seeley Lake Ranger District sale has resulted in modification of a prescription from small patch cuts in larch (1.5MMBF) to 10-15 acre clearcuts in lodgepole pine (3.5-4.0 MMBF). The wildlife habitat objectives on this sale are to open up a closed forest. This will provide forage for deer, elk, and moose; make small ponds more inviting to waterfowl, etc.; stimulate regeneration of aspen for bird habitat; and increase diversity.

To a large measure, improving wildlife habitat means setting succession back. There is much opportunity to do this by use of prescribed fire timber harvests, and burning. The challenge is to select habitat types or plant communities with good growth potentials for understory plants and utilize good prescriptions. The RD&A Program, Northern Forest Fire Laboratory will be working toward this end by developing guidelines that can be used by land managers.

A Discussion of the Transportation Planning Support being provided for Integrated Forest Planning

by Victor DeKalb
Transportation Planning and Operations Engineer
Washington Office

INTRODUCTION

With relation to transportation and silvicultural prescriptions, several recent reviews and reports have indicated problems that are found between about 1974 and 1977. During recent months, many of these problems have been resolved, and much of the integration and interdisciplinary approach that I will be discussing has been initiated. However, there is a lot of difference between agreeing to initiate a new process and forming the habit of operating in the new manner. More attention is needed, since we are still experiencing the following oversights on a number of National Forests:

1. The type of harvest, the regeneration schedule, and many sale activities are not adequately spelled out so that transportation systems can be planned for efficient operation.

2. Some prescription writers and information collectors do not demonstrate that they know when other specialists should be used.

3. Transportation layouts for timber purposes do not recognize other resources. An interesting facet of this problem is that we now have a Forest plan which emphasizes wildlife as a resource, and yet the transportation system was designed for timber purposes in order to pay for transportation to serve the wildlife.

4. Roads are being listed in timber sales as temporary (non-specified) when they will be kept on the system.

5. Some compartment planning is showing transportation routes that do not relate to the total transportation system or integrate with other compartments.

Regional staff in Timber Management Planning is working diligently with Engineering Staff to eliminate or minimize these problems.

This paper will discuss how transportation analysis support is being increased and integrated with overall planning.

We are taking several actions to increase the capabilities of transportation analysts on Forests.

1. We have developed Job Performance Requirements for a Forest Transportation Analyst. These are attached. The requirements are listed in the approximate order of analysis steps. The role has been defined as:

> "to identify, analyze, and evaluate alternative transportation systems which provide for the planned management of the land."

This includes a single road segment or an area as large as a National Forest.

2. Based on these Job Performance Requirements and related skill tests, we have developed a set of training modules which will provide basic analytical transportation planning training to Forest Analysts. We are providing National training for 60 analysts this coming spring. Several Regions will be providing additional training for approximately 40 more analysts. This accelerated effort to provide basic skills should increase the effectiveness of transportation support.

3. We are developing a Transportation Planning and Analysis Handbook. Chapters cover Forest strategic planning, tactical planning, and technical (project) planning in the specialty of transportation analysis. The handbook covers processes. It recommends considerable integrated evaluation to provide support for the production of goods and services. A draft will be available to the Regions in about a month, with an interim directive following shortly thereafter, and the final handbook published in about 6 months.

4. In cooperation with the Land Management Planning Group and others, we are revising manual material in 1900 and 7700 to reflect the direction in the National Forest Management Act. This will also provide a link between the National Forest planning and project planning.

5. Perhaps the most important action is the effort to integrate transportation planning with other specialties, as discussed below.

BACKGROUND

I have spent a number of years learning about the relationship of transportation to the production of Forest goods and services. In 1942, my introductory Forestry course had several exercises on road layouts for Forest management. In those days, a favorite tool was the colored pencil. This kind of process is still useful today.

In the 1950's, I remember making transportation plans for three different Forests and working very closely with the Timber Management Forester in road layout. In those days, we were not looking for an efficient transportation system. We had certain rules of thumb and experience in the woods which allowed a layout that would get out the logs.

In the 1960's, transportation planning took an interesting turn. It was found that funds were allocated for road construction based on the calculated need for completing the road system on the Forest. This formula encouraged many creative Forest staffs to develop transportation plans with most intensive road systems. On the ground, the wood's boss and the project sales officer built roads where they would best fit the logging chance. This sometimes resulted in roads that were several hundred feet apart and "Jammer roads" that made a hillside look like a Venetian blind. Production of timber was related to "meeting the quota." Engineers and timber managers lost most of the analytical habits developed in college.

About 1968, we began a program to provide formal University training for transportation planning specialists. You have many of them with you as Regional Transportation Planning Specialists. These people returned from the advanced training with sophisticated techniques for transportation planning. This technical background allowed them to evaluate more simple methods and develop easy but analytically correct methods for use on the ground. They also developed training courses and presentations which have helped all of us to provide cost-effective mobility for the goods and services in our National Forests. Sophisticated technology was sometimes used where it really didn't fit.

These last 10 years have been a long, hard pull to convert urban transportation planning technology to meet the needs of the National Forests.

Out of these efforts, a combination of hand and computer methods have emerged that seem to be useful for most levels of planning. The computer technology is in its infancy and will soon be more capable of reflecting the true situation that exists on the ground.

During the early 70's, Regions reported that careful analytical techniques on six projects had saved $15 million in road construction and operation costs. The use of such techniques on many other projects in the Forest Service probably saved many times this amount.

Another area that has provided benefits during the last several years is the analysis of the economics of skidding versus road construction. In flat areas, several Regions have reduced the number of miles of road on a timber sale by 90 percent. Of course, areas with rugged topography would still reflect a considerably higher density.

Recently, we have heard Forest Supervisors and Rangers making statements like "our transportation planner saved 25 miles of road on that basin" or "our good transportation planning has reduced the road system in Bear Creek from 150 miles to 50." In several Forests, the transportation planners are now overloaded with analysis projects

FOREST PLANNING

We are now beginning to work within the context of the National Forest Management Act, Section 6. This part of the Act requires that Forest plans will be made by an interdisciplinary team and will integrate resource planning.

The development of regulations for this Act has taken considerable time of timber and transportation planners in the Regional and Washington Offices. The directives system requires additional effort during the coming months.

The development of the regulations and the consideration of a land management planning process are not restricted to the development of the Forest plan. The Chief's office has been integrating the total planning process from RPA through Forest planning and to project planning for program planning and budgeting.

Capital investment considerations for all of these areas include the cost of the road investment. In the 1975 RPA, transportation costs consist of over 70 percent of the production of goods and services over the 40-year planning period. Capital investment for roads was four times as much as the next most costly investment, which was timber stand revegetation and treatment.

In reviewing the several levels of planning as they relate to the transportation system and the future method of integrating transportation with all resources, we should consider the standard nomenclature recently placed in FSM 1900. The kind of planning activity is described with three names:

Strategic
Tactical
Technical (Project)

An additional level of planning can be called Operational or Work planning.

In the Forest Service, we also have the following levels of planning:

National Planning (RPA)
Regional Planning
Forest Planning
Program Budgeting

Each of the various levels of planning include the three kinds of planning activities listed. National Planning, Regional Planning, and the first portion of the Integrated Forest Plan are primarily strategic; while the second portion of the Forest Plan is tactical. Technical or Project Planning and Operations Planning are considered for program budgeting, and will usually be the areas where functional planning will continue.

For Forest Planning, Forests are divided into three kinds of areas:

Capability Areas
Analysis Areas
Management Areas

These are sub-areas of a National Forest and relate to compartments for timber management planning and transportation analysis areas for transportation planning.

An important question in this new process is how much of the functional plan will be included in a Forest plan. This is what I will be covering in the next few minutes for transportation planning. We will need to develop these products on an integrated basis with interdisciplinary evaluation. Thus, the transportation or timber stand analyst is now required by law to relate to transportation, fire, wildlife, range, watershed, etc.

Attached to this paper is a table which displays the probable areas of study and outputs for the transportation planning part of Forest planning.

STRATEGIC PLANNING [1/]

The first column is the strategic plan for the Forest. This is Part 1 of the Forest plan. It covers those roads which require mobility and speed over "just" access. For roads, this is the Forest arterial system and part of the Forest collector system. It also includes all those roads that are required for complete integration of the public and the Forest Development System.

Goals and objectives for the Forest plan and a reasonable projection of investments for RPA require fairly detailed economics. Analysis may also be necessary to determine capability, suitability, and what timber areas have marginal economics. These detailed evaluations will probably be done by sampling and, for fragile or highly-controversial areas, will have to be done in a form adequate enough to explain to the decisionmaker and the public. This work is done by the interdisciplinary team, and the trade-off between transportation corridors providing mobility and needs for timber production over the next cutting cycle may require considerable interaction on high production Forests.

1/ The planning process presented here is subject to change based on Lead Forest experience.

An important transportation consideration of Forest planning is to determine certain investments needed on public road systems that access National Forests. These investments are those which are caused by the production of goods and services from the Forest. This evaluation may also consider the production of energy such as coal and oil. These costs of Forest-generated construction on public access roads will be included in the RPA estimates of need.

The minimum products for transportation that will be shown as part of the Forest Plan, Part 1, are:

1. A map showing all the corridors for arterial and major collectors which require speed as a consideration of road location. This usually will be 10 to 15 percent of the total Forest transportation system.

2. A map showing needed public roads providing access to the Forest.

3. A layout of major transportation analysis areas.

4. Along with an indication of the transportation analysis areas, a node will be placed along the related mobility corridor and it will show the amount of resources, the approximate miles of roads, the cost of the road investment, and similar data for each transportation analysis area.

The concept of a transportation analysis area is somewhat new in the Forest Service. For major transportation analysis areas, the land is divided into large blocks. Boundaries are delineated that minimize the connecting links of the system between areas. These may be barriers such as rivers, logical road connections such as state highways, or administrative boundaries. This would probably be the area tributary to Forest collectors that involve over 50,000 acres. In these areas, lump estimates will usually be made of transportation system economics and effects. Estimates can be developed from sampling or from actual layouts, depending on the difficulties and complexities involved. Transportation analysis areas should have the same boundaries as capability or analysis areas in the Forest plan. They should also be coincident with the timber stand or compartment boundaries. The development of area boundaries will take considerable interdisciplinary discussion to provide a logical breakpoint for an integrated analysis.

Along with the maps will be tables, displays, and graphs that show the effects of various management alternatives in an integrated form. Transportation analysts, as well as timber and other functional analysts on the interdisciplinary team, will develop these documents to adequately evaluate the differences between alternatives. In this situation, transportation planning will truly serve all resources.

TACTICAL PLANNING

The Forest Plan, Part 2, is mostly tactical and provides a 10-year plan for carrying out the direction produced in the Forest Plan, Part 1. For transportation, this is described in Column 2 of the attached table. In the Forest Plan, Part 2, the Forest collector road corridors needed during the next 10 years are determined and shown. Forest local roads are usually not specifically located but handled in the aggregate. This analysis will probably require the delineation of smaller transportation analysis areas with nodes along the collectors to properly display investments and effects of local roads. Only that collector system and transportation analysis area system that will be built during the following 10 years will be evaluated and displayed. This will require more detailed analysis in work papers than that included in final plan documents.

This phase is similar to the usual work that prescription writers are now doing on Forests. The final minimum requirements for this plan, as well as the information collected and evaluated, will have to be worked out carefully between the transportation planner and the various resource specialists. This portion of the Forest plan has not been well thought out by Forest Service personnel. It is being considered in the Lead Forest Program and will require a considerable amount of Regional specialists' time to develop rationale methods for this part of the planning effort.

TECHNICAL (PROJECT) PLANNING

The third column of the table indicates that work which most of us have been involved in during the last several years and called project planning. This is now "technical planning." Technical planning will be included in some of the areas in the tactical plan that are to be developed early in the period.

For transportation purposes, technical (project) planning covers up to 40 thousand acres. It should consider all road routing within a logical transportation analysis area to ensure that the total system provides effective service for the resources that it serves. In many Forests, this does not require sophisticated methods, but does require that:

A network analysis be made by hand or by computer,
An intensive economic analysis be made, and
Scheduling of sales be developed.

This will ensure that sales are moving along in accordance with good silviculture practices, and that the transportation system is being constructed in accordance with efficient transportation support.

We must also consider the scheduling of sales to keep the road system at a minimum. In unique situations, this can include the sequencing of sales so that single-lane roads may be used instead of two-lane roads.

Technical planning will consider all resources, and requirements for fire and pest protection. The management of the road system, including the closing of certain roads, will be evaluated.

An analysis of the economics of skidding versus road construction is necessary. This will often reduce the amount of roads needed over the densities previously considered minimum. Any reduction in road mileage will usually reduce environmental damage. However, analysis may indicate the reverse, that carefully constructed roads may have less environmemtal damage than skidways or temporary rods. The preconstruction activity review in 1976 found situations where the work done to put a temporary road to bed was washed out, and erosion was much worse than that on a well designed permanent road.

Technical planning usually results in Environmental Analysis Review. The transportation portion of this review will be covered by a Facility Impact Report which considers the problems and mitigating requirements of roads and road systems for project areas.

Careful road planning, location, design, and construction have now received special emphasis in law. Section 10 of the National Forest Management Act requires two actions concerning roads:

> 10 (b) Unless the necessity for a permanent road is set forth in the forest development road system plan, any road constructed on land of the National Forest System in connection with a timber contract or other permit or lease shall be designed with the goal of reestablishing vegetative cover on the roadway and areas where the vegetative cover has been disturbed by the construction of the road, within ten years after the termination of the contract, permit, or lease either through artificial or natural means. Such action shall be taken unless it is later determined that the road is needed for use as a part of the National Forest Transportation System.
>
> 10 (c) Roads constructed on National Forest System lands shall be designed to standards appropriate for the intended uses, considering safety, cost of transportation, and impacts on land and resources.

SUMMARY

These new methods of integrated Forest planning using interdisciplinary teams should solve most of the problems which were discussed earlier. However, this integrated approach will take several years of effort to change old habits. For transportation planning, recent experiences have shown that careful analysis can:

1. Reduce the number of miles of roads needed to serve most timber sales.

2. Provide road systems that serve all timber prescriptions, including re-entry and revegetation.

3. Relate the transportation system to all resources and to protection.

In order to do this, we must fix in our habits several concepts:

1. Integrated planning at all levels.

2. Intelligent use of interdisciplinary planning which blends the skills of a variety of specialists towards a common objective. In my experience, such blending is not easy and will need considerable work.

3. The concept of transportation analysis areas must be worked into the planning system.

4. Iteration or the re-adjusting of different specialized evaluations until the best solution is reached is needed more often.

5. Sensitivity analysis should be applied in order to collect information and do in-depth analysis at the level that is necessary to evaluate differences between alternatives. This skill is quite deficient in the Forest Service.

This brief overview should provide insight into the integration of transportation analysis with Forest prescriptions that you can use when working with Forests and with transportation specialists.

JOB PERFORMANCE REQUIREMENTS

FOR A

TRANSPORTATION ANALYST

A Transportation Analyst is a journeyman-practicioner usually assigned to a national forest, but who may be assigned to a regional office or ranger district office.

The role of a Transportation Analyst is to identify, analyze and evaluate alternative transportation systems which provide for the planned management of the land. In each planning activity involving transportation analysis, the Transportation Analyst is expected to perform each of the following tasks. For most tasks, the specific requirements and applicable standards of accuracy and detail vary with both the level of planning (i.e., strategic, tactical,or technical) and the situation being considered. In each case, the transportation analyst is expected to know and apply the appropriate analysis techniques and established performance standards for prevailing conditions.

DUTY 1. SPECIFY IN WRITING THE SCOPE OF ANALYSIS:

Task 1.1 State clearly what the analysis is intended to accomplish

1.11 Cite laws, regulations and Forest Service policies which are of particular concern in the conduct of the specific analysis.

1.12 State the nature of the completed product that will result from the analysis.

Task 1.2 Describe and document the land area, uses, time frame and external factors to be considered in the analysis.

1.21 Establish the land area and included transportation facilities of concern. Show on a map of appropriate resolution.

1.22 Specify the particular land uses and traffic types to be considered.

1.23 Specify the time frame of interest for each traffic type.

1.24 Specify the principal external factors and groups which affect the area and uses under consideration.

1.25 Specify the principal external factors and groups affected by the area and uses under consideration.

Task 1.3 - Prepare a schedule and allocate manpower and other resources to meet due dates for completion of the transportation analysis.

DUTY 2. STATE IN WRITING THE TRANSPORTATION PROBLEMS, ISSUES, OBJECTIVES AND EVALUATION CRITERIA TO BE ANALYZED:

Task 2.1 Compile data from records which describe the performance and deficiencies of the existing transportation system.

2.11 Compile data from accident records.

2.12 Compile data on the condition of facilties, highlighting failures and major deficiencies (slope failures, restricted bridges, excessive grades, slippery surfaces, chronic breaches of management plans for an area, etc.)

Task 2.2 Document transportation problems and issues perceived by management, forest users, nearby communities and others.

Task 2.3 Document existing management direction, resource objectives and constraints affecting possible transportation solutions.

Task 2.4 List the specific criteria to be used for the evaluation of alternatives and specify how each criterion is to be measured or described.

DUTY 3. COMPILE NECESSARY DATA FOR ANALYZING EXISTING TRANSPORTATION CONDITIONS (IF AN EXISTING TRANSPORTATION SYSTEM IS IN PLACE):

Task 3.1 Compile necessary inventories for the study area and its included transportation system.

3.11 Compile an inventory of the existing transportation system; measure relevant service characteristics through a field survey or from secondary sources. Display the inventory on maps of suitable scale.

3.12 Compile an inventory of the locations of resource outputs and user activities of concern. Display the inventory on maps of suitable scale.

3.13 Code the existing transportation system in network form, including all travel modes of concern. Display the network on a map of suitable scale.

Task 3.2 Compile necessary data concerning existing forest uses.

3.21 Compile data on existing traffic for transportation facilities of concern, by season and type of user.

3.22 Compile data on levels of resource output and user activities for each traffic generator in the network.

3.23 Estimate the number of trips generated by type of user at each traffic generator in the network.

3.24 Estimate the existing origin to destination travel desires by type of user.

Task 3.3 - Validate the traffic estimates obtained from the origin to destination travel desires by comparing them with actual counts at particular locations on the transportation network.

DUTY 4. FORMULATE AND DOCUMENT THE TRANSPORTATION ALTERNATIVES TO BE ANALYZED:

Task 4.1 Specify in writing the alternative resource prescriptions and land management options to meet strategic goals, objectives and targets.

Task 4.2 For each strategic resource and land management alternative, perform a rough analysis of transportation problems and needs.

4.21 Roughly estimate trips generated at each traffic generator.

4.22 Roughly estimate origin-to-destination travel desires by user type.

4.23 For each strategic resource and land management alternative, assign travel desires to links of the existing system (if one exists). Roughly estimate and describe in writing the costs, impacts and quality of transportation service provided.

4.24 For each strategic resource and land management alternative, assign travel desires to logical corridors regardless of the locations of any existing transportation facilities. Identify in writing, the locations of potentially important travel corridors to serve the particular strategic targets.

Task 4.3 Based on the above findings, and in light of the information compiled in tasks 2.1-2.3, specify in writing the detailed transportation alternatives to be analyzed.

DUTY 5. ANALYZE TRANSPORTATION ALTERNATIVES:

Task 5.1 Estimate costs and quality of transportation service for each transportation alternative.

5.11 Represent transportation alternatives in network form; include all travel modes of concern. Display the network on a map of suitable scale.

5.12 Based on current costs or cost indices, estimate and tabulate vehicle speeds (or travel times) and unit costs for each link or each type of link in the network.

5.13 Based on current costs or cost indices, estimate and tabulate the annual costs of maintenance and traffic control for each link or each type of link in the network.

5.14 Based on current costs or cost indices, estimate and tabulate the costs and timing of any construction or reconstruction for each link in the network.

5.15 Identify and tabulate vehicle restrictions (sizes, uses, etc.) for each link in the network.

Task 5.2 Analyze different logical combinations of transportation alternatives, subject to each of the given resource and land management alternatives.

5.21 For each combination, estimate and tabulate the likely resource outputs and levels of user activity at each node, the associated generation of trips, and the traffic volumes, by user type, on the corresponding network.

5.22 Where applicable, estimate and tabulate the monetary value of resource outputs and user benefits.

5.23 Estimate and tabulate the total user, construction, and maintenance costs.

5.24 Estimate and tabulate the consequences relative to each of the quantitative, non-monetary evaluation criteria specified in Task 2.4.

5.25 Describe in writing the consequences relative to each of the qualitative evaluation criteria specified in Task 2.4.

5.26 Estimate and then tabulate or describe in writing the sensitivity of the above results to uncertainties in assumptions.

DUTY 6. EVALUATE TRANSPORTATION ALTERNATIVES:

Task 6.1 Summarize and document the results of analysis to facilitate comparison among alternatives, using all of the evaluation measures and indicators specified in Task 2.4.

6.11 Perform economic analysis to obtain accepted economic indicators (i.e. Present Worth, Benefit-Cost Ratio, Internal Rate of Return) at 10% interest rate. Display the outcome in tabular form.

6.12 Express quantitative, non-monetary effects in terms of the adopted measures and summarize the comparison among alternatives in tabular and/or graphical form.

6.13 Express qualitative effects in terms of the adopted indicators and summarize the comparisons among alternatives in tabular and/or narrative form.

Task 6.2 Identify and highlight in graphical, tabular and narrative form the most important comparisons and tradeoffs among alternatives

6.21 Extract and separately display information for evaluation criteria where there are major variations among alternatives.

6.22 Identify and separately display the important tradeoffs among evaluation criteria, where it is necessary to forfeit some degree of satisfaction of certain evaluation criteria in order to achieve acceptable satisfaction of other criteria.

6.23 Summarize and display in graphical, tabular and narrative form the sensitivity of important comparisons and tradeoffs to uncertainties in assumptions (including the interest rate).

Task 6.3 Perform and document financial feasibility analysis for each transportation alternative

6.31 Calculate and display in tabular or graphical form the time stream of needed funds in each budget category.

6.32 Identify sources of revenues and estimate the time stream of revenues by source and kind. Display the revenue time stream in tabular or graphical form.

6.33 Summarize the financial feasibility of the alternative in narrative form.

Task 6.4 As needed, prepare visual aids and presentations

DUTY 7. PREPARE FINAL STUDY DOCUMENTATION AND HELP IMPLEMENT THE SELECTED ALTERNATIVE:

Task 7.1 Transmit needed inputs to programming and budgeting activities

Task 7.2 Update transportation inventories to reflect prescriptions and program decisions

7.21 Specify the functional classes of all facilities and make reference to the pertinent findings of the transportation analysis.

7.22 Specify the maintenance levels of all facilities and make reference to the pertinent findings of the transportation analysis.

7.23 Specify the design standards of all facilities and make reference to the pertinent findings of the transportation analysis.

7.24 Specify the needed traffic control measures on all facilities and make reference to the pertinent findings of the transportation analysis.

Task 7.3 Write and distribute revisions for all affected planning and policy documents

Task 7.4 Prepare final study documentation

LEVELS OF TRANSPORTATION PLANNING

HANDBOOK CHAPTER NO.	12	13	14
PRODUCT	Forest Plan (Phase 1)	Forest Plan (Phase II)	E.A.R. or Equivelent
LEVEL	Primarily Strategic	Primarily Tactical	Technical
TIME PERIOD	10-40 Years	Up to 10 Years	0-5 Years
INTENT	Forest-Wide Policy Goals and Objectives	How and Where Forest-Wide Policy, Goals and Objectives Will be Met in Next 10 Years	Specific Projects to Implement Policy, Goals and Objectives
TRANSPORTATION CONSIDERATIONS	1. General accessibility needs for Forest	1. Establish priorities for studies	1. Identification of tertiary system
	2. Probable level of Service for needed accessibility	2. Identification of secondary system within TAA's. (Needed for next 10 years).	2. Confirm secondary system
	3. Goals for Transportation system	3. Confirm Primary System	3. Identification of specific operating characteristics & use controls for each road
	4. Identification of primary system	4. Estimate of tertiary system needs	4. Estimation of probable development costs
	5. Identification of Transportation Analysis Areas (TAA)	5. Establish travel management objectives for each TAA.	
	6. Objectives for secondary system	6. Objectives for tertiary system	
	7. Estimate of costs for all Transportation	7. Estimate of 10 year Costs for all Transportation	
PLANNING EMPHASIS FOR ROADS	Arterials and collectors requiring mobility over access	Collectors needed in next 10 years & estimate of local needs during same period	Develop Criteria for Specific Road Design

Dav Wright

PRESCRIPTION WRITING PROCESS

IN

REGION 2

The 10,500,000 acres of commercial forest land in the Rocky Mountain Region plays an important role in making up a part of the total land area (19,780 acres) for the Region. Major wildlife species use this commercial forest land to obtain both food and cover, while people obtain valuable wood products from these same lands. There are, of course, many other uses of these forested acres. Broad management direction is contained in the Regional Plan and is refined in the Forest Plan (Forest Land and Resource Management Plan). Attainment of these broad goals and objectives and their application and refinement to specific areas of land (compartments and stands) is a part of the stand examination and prescription writing process.

The objective of compartment examination is to provide natural resource information for forested and other resource lands at the intensity required to reach these refined management decisions. The data collected should provide adequate information to:

1) Confirm component classification or identify areas where reclassification is necessary.

2) Identify timber resource treatment opportunities.

3) Prescribe treatment.

4) Establish priority of treatment by areas.

The compartment prescriptions prepared from the compartment examination data forms the bridge between the Timber Management Section of the Forest Land and Resource Management Plan and action plans. Compartment examinations provide site specific information permitting the setting of stand tending priorities within the framework of the Forest Land and Resource Management Plan.

Region 2 developed their present compartment examination and prescription program in 1973-1974 and in 1975 examined 280,000 acres. We are now examining and prescribing for about 750,000 acres per year. To meet our own stated objectives, this information is needed as soon as possible, in fact, right now.

Inventory procedures and data collected for prescriptions and TM Plan preparations are the same in Region 2. Sampling design and intensity will of course vary, but the method of data collections and the actual data measurements are the same. Thus, a National Forest while collecting and compiling data for compartment examinations on a short term basis, is also collecting data that can be used for preparing the timber management portion of the Forest Plan.

Flexibility is also provided in our Region 2 compartment examination procedures, gearing the amount and type of data collected to the management objectives for a particular area. Basically, we use four levels of data collection to meet varying degrees of management direction. These levels of data collection and their corresponding management directions are:

Level I, consisting of photo and map compilation of stand data. It is used on a broad basis for land management planning and for verification of land classification in the Timber Management Plan.

Level II, consisting of photo and map compilation of Stand data and estimates of tree data. The amount and reliability of the tree data can vary from estimates to partial measurements. This level of information is used to verify pre-prepared stand prescriptions, for regeneration surveys, and to determine stocked vs. nonstocked and productive vs. nonproductive.

Level III, consisting of photo and map compilation of stand data and tree data without high sampling intensity. This level of data is used to collect stand information where tree attributes are needed, but treatment will not occur during the current plan period. Tree volume data has a low statistical reliability.

Level IV, consisting of photo and map compilation of stand data and tree data with a high sampling intensity. This level of data collection is used to prepare silvicultural prescriptions, for determining treatment priorities and for preparing potential yield and programmed harvest statements used in the timber management plan portion of the Forest Plan.

These levels (and objectives) are those currently in use in Region 2. They could, of course, change upon implementation of the final regulations resultant from the National Forest Management Act of 1976.

INVENTORY PROCEDURE

To provide you a better understanding of our compartment prescription process, I would like to first briefly describe our inventory procedures. Our Stage II inventory is divided into two phases; the office phase and the field phase. The office phase consists of delineating stands by type and stand size on the air photos for an area to be inventoried. Other attributes, such as density, soil type, slope, etc., may be used to delineate stand boundaries. Stand acres are determined on the photo and balanced to predetermined compartment totals. Sample points to be ground measured are then located on the photos using a grid. Points are located on the basis of one point per ten acres, with a minimum of 3 points and maximum of 20 points per stand. This photo information is then entered on a form for recording stand information. Other information about the stand, such as ownership, legal description, slope, aspect, soil type and TM plan component is entered from maps or other records. A basal area factor is then selected for the particular stand that will produce an average of 4-6 trees per point. The stand is now ready to be ground sampled.

Tree attributes are measured on the ground and recorded for each point. Attributes measured are:

Species	10 year radial growth
DBH	DBH - Age
Total Height	Defect
Terminal Ht. Growth	Crown Ratio
Crown Class	Tree Position
Damage	Mistletoe Rating
Cone Serotiny	Tree History

This tree and stand information is then keypunched, edited and a production run made producing stand tables and other stand data. This stand data, along with data for other stands in the compartment, is now ready to use for a compartment prescription.

I mentioned previously that Stage II data, in its present format in Region 2, has been collected since 1973. During this period, a variety of different formats for compartment prescriptions have been used, ranging from just filling out forms to preparation of detailed narratives. Generally, prescriptions were written for each individual stand, but not necessarily for all stands in a given compartment. With the Region's compartment examination program increasing almost 300 percent since 1975, the need for a standardized and simplified format became evident.

Present Compartment Prescription Procedure

Our present compartment prescription consists of two parts: (1) a narrative description and a narrative prescription; and, (2) three

forms which summarize data for each stand in a format that allows comparison with other stands within the compartment. Additionally, various maps and photos may be included in the appendix. Completion of the three forms is required for all compartment prescriptions. The narrative sections are completed as necessary for the more complex areas where prescriptions may vary significantly from the standard silvicultural treatments covered in the Timber Management portion of the Forest Land and Resource Management Plan. A sample prescription for compartment number 111111 on the Black Hills National Forest, using the three stand forms is included at the end of this section. The information on these forms is gathered from the computer generated Stage II stand analysis printout, which is also enclosed. Because of the need to conserve space, computer printouts of Stage II stand analysis are only included for Stands 19 and 21.

The prescriptionist has the computer printouts available before preparing the compartment prescription. He, or she, also has the maps and photos of the area and will visit the compartment either before or during the writing of the prescription. In most cases, other disciplines will participate in preparing or reviewing the prescription. The degree of interdisciplinary input needed for the prescription is, to an extent, identified in the broad management direction and constraints spelled out in the Forest Plan. Additionally, the prescription process provides the means to compare the measured stand data against existing management direction to determine the amount of interdisciplinary help that is needed.

The following is a discussion of the data entrees on the three prescription forms:

FORM I - STAND DESCRIPTION SUMMARY

This form summarizes the main data elements from the stand analysis for up to five stands within the compartment. If a compartment contains more than five stands, additional forms must be used. The information on Form I is available in the computer generated stand analysis for each stand; however, the information for each stand is generated separately and, therefore, comparison and analysis of all stands within a compartment is difficult. Form I facilitates this comparison. I should also point out that we do intend to rewrite our stand analysis program to generate the Stand Description Summary in this format. Presently, we do it by hand.

The circled numbers to the right of the data elements on the Stand Description Summary, Form I, correspond to the circled numbers on the Stage II Stand Analysis for Stand 19.

Many of the data elements of Form I are self-explanatory and will not be discussed here. Those data elements that are unique or need further explanation are discussed.

(4) This is a stand size computed on plurality of trees. A stand with less than 300 seed/saps per acre and less than 40 square feet of basal area in poletimber size trees and larger, is nonstocked.

(5) Type of survey - This entry indicates the level of survey and the reliability of the data. This is an intensive survey level 4 (94) and it is being performed for stand examination (3).

(6) Ground land use class - Ground land use classes are combinations of commercial and noncommercial and/or productive forest land with reserved or nonreserved status. Note that even though Stand 22 is growing less than 20 cu. ft./ac./year, it is still considered CFL as the growth rate of 17.6 cu. ft./ac. is actual growth and not potential.

(7) Component TM Plan - This ties the particular stand to the TM plan and is a direct link to the management direction of the TM Plan (FLRMP). Stand 19 was originally inventoried as a part of the Special Component, however, because the slope is over 40%, it actually falls into the Marginal Component. If slope problems could be overcome, treatment would then be based upon prescriptions for the Special Component.

(12) Soil Erosion - Conditions of erosion are:

Class	I	Slight
	II	Active
	III	Intense
	IV	Destructive

The rating of active erosion for stand 20 indicates the need for specialized soil scientist input in preparing the prescription.

(13) Stand Age - An age is computed for the stand based on the calculated stand size. For example, if the stand size was calculated to be sawtimber or poletimber, the weighted average of all trees 5.0 inches d.b.h. and larger would determine the stand age.

(14) Survey Yield - This is a calculated annual yield in cubic feet per acre attainable in a fully stocked stand at the age of

culmination of mean annual increment. Yields may be substantially higher with thinning and other intensive management. Item (19), growth, is on-the-ground measurement of periodic increment.

(15) Site index - Different site indexes are calculated for different species.

(16) Structure - This is the prescriptionist's estimate of the number of stories in the stand based upon examination of the stand tables. This is an important estimate as the prescription in many cases will differ for stands with or without a manageable understory.

(17) - (27) Volume, BA, Growth and number of stems is entered from the stand table for hardwood and softwood species. Growth is based on radial growth measurements, height growth calculation, and field tallied mortality trees. At least one growth tree is measured for each 2 inch d.b.h. class. Hardwood trees, as the oakbrush in these stands, are not measured for growth trees, thus growth reflects net cubic foot volume per acre for softwood species only.

FORM II - TIMBER RESOURCE PLAN AND OTHER RESOURCE COORDINATION SUMMARY

Information on Form II provides a direct link with the management direction in the Timber Management section of the Forest Land and Resource Management Plan. The broad timber management prescriptions, as they apply to each individual stand, are extracted from the Forest Plan and entered here. You will note that no treatments are planned in Stands 19 and 22 during the plan period. The Timber Management objectives of the Forest Plan for this Forest are geared toward reduction of basal area in overstocked stands to reduce susceptibility to damage from epidemic mountain pine beetle attacks. Stands with lower basal areas and, thus, a lower susceptibility to damaging attacks are not planned for entry during the first 10-year period. Because Stands 19 and 22 are well below BA 80, they are less susceptible to attacks and no harvest is planned.

Form II also serves as a red flag by identifying coordination requirements and constraints spelled out in the Timber Management section of the FLRMP. The prescriptionist is, therefore, made aware of the need for further interdisciplinary input in preparing the site specific stand prescriptions. In this example, further assistance is required of a landscape architect, recreation specialist and, in the case of Stand 20, a silviculturist or geneticist.

Prescriptions in the Forest Plan are necessarily broad and may cover stands or groups of stands that occur over a wide range of situations. Form II provides this broad Forest Plan information for the prescriptionist to compare to the data summarized on Form I. He asks himself the question - "Will this broad Forest Plan prescription, when applied to these stands, achieve the overall land management objectives?" In this example, the answer is yes; however, in many instances there is also a need to localize the prescription to the individual stand.

One purpose of displaying data (Form I) and Prescriptions (Form II) for all stands in a compartment, is to evaluate the cumulative effect of applying prescriptions to all stands in a contiguous area. For example, it is possible that individual stand prescriptions for lodgepole pine could provide for clearcutting each stand. However, when examined within the context of a compartment, it could be undesirable (or even violate management direction) to clearcut this much contiguous area at one time. In this case, modifications to the broad Forest Plan prescription would obviously be necessary.

FORM III - STAND PRESCRIPTION SUMMARY

After examination of the data of Form I, and comparison with the broad prescriptions of Form II and the necessary interdisciplinary input, the prescriptionist is ready to prepare the precise prescriptions for each stand and for the compartment as a whole. This is accomplished on Form III and, if needed, in a supplemental narrative. Entries on Form III reflect the developed prescription that will accomplish land management plan objectives. Additionally, cut and leave volumes per acre and basal areas per acre are computed for each stand. Total stand harvest volumes are computed and added together to provide a compartment total. Entries can be made on Form III for other cultural treatments such as reforestation, understory control, thinning and timber stand improvement.

SUMMARY

Use of the 3-stand prescription forms and a supplemental narrative, if needed, provides Region 2 prescriptionists a flexible prescription tool that can be used to prepare and record stand description and prescriptions. It is used in conjunction with a computerized inventory and stand analysis. In the future we intend to revise our computer program to print out the information in a summary format similar to our compartment prescription forms.

COMPARTMENT PRESCRIPTION

Spearfish Canyon
Compartment Name

111111
Number

Black Hills
Forest

Spearfish
District

Examination Date 8/29/78

Prescriber D. Jones Date 8/29/78

Reviewed _____ Date _____

Approved _____ Date _____

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INTRODUCTION AND DESCRIPTION

Spearfish Canyon Compartment 111111 lies along the west slope of Spearfish Canyon extending from U.S. Highway 85 to the canyon rim about 1,000 feet above. Spearfish Creek parallels the highway and the compartment boundary for the 1/4 mile length of the compartment. The compartment lies in the transition zone between the lower Ponderosa pine-oakbrush types and the higher pure ponderosa pine stands. There are five stands in the compartment, comprising 309 acres.

Vegetation is ponderosa pine sawtimber with an understory of varying density, of oakbrush and aspen. Slopes are generally moderate, but steepen as they approach the canyon rim.

Sawtimber was harvested from all stands several times between 1940 and 1960, under old marking guides of retaining at least 50% of the overstory. In 1964, the remaining overstory was removed. The area is highly visible from the heavily traveled Spearfish Canyon Highway. All stands but one (Marginal) are in the Special Component.

Forest Land Management Plan direction is to manage this compartment to maintain and enhance the scenic quality of the area. Vegetative cover is to be maintained. Trees may be carried past normal rotation up to age 160.

STAND DESCRIPTION SUMMARY
FORM I

Compartment No. 111111 Forest Black Hills

Stand No.	(1)	19	20	21	22	23
Acres	(2)	91	18	30	51	119
Type	(3)	PP	PP	PP	PP	PP
Stand Size	(4)	ST	Nonstocked	ST	ST	ST
Type of Survey	(5)	Intensive	Intensive	Intensive	Intensive	Intensive
Ground Land Use Class	(6)	CFL	CFL	CFL	CFL	CFL
Component, TM Plan	(7)	Special	Special	Special	Special	Special
Revised Component		Marginal	Special	Special	Special	Special
Slope Position	(8)	Dry Flat	Wet Flat	Wet Flat	Dry Sidehill	Wet Flat
Elevation	(9)	--	--	--	--	--
Slope	(10)	60	40	30	20	30
Aspect	(11)	East	East	East	NW	W
Soil Erosion	(12)	Slight	Active	Slight	Slight	Active
Stand Age	(13)-2	69	12	79	72	71
Survey Yield	(14)-4	46	35	44	67	23
Site Index	(15)-4	69	52	73	86	42
Structure	(16)-4	2 Story	1 Story	1 Story	2 Story	2 Story
Wind Risk Class	--		--	--	--	--
Softwood/Acre						
Volume MBF	(17)-5	4.164	.481	8.565	5.472	6.740
BA	(18)-5	54	15	113.3	61.2	85.0
Growth CU FT/A	(19)-3	20.7	11.3	42.6	17.6	51.3
No Stem S/S	(20)-5	133	150	0	300	475
No Stem Poles	(21)-5	43.5	27.3	34.3	10.9	26.9
No Stem St	(22)-5	42.4	3.2	80.7	54.2	83.7
Hardwood/Acre						
Volume MBF	(23)-6	--	--	--	--	--
BA	(24)-6	5.8	--	--	20	--
Growth CU FT/A	(19)-3	--	--	--	--	--
No Stem S/S	(25)-6	1833.4	--	--	480	775
No Stem Poles	(26)-6	--	--	--	34	--
No Stem St	(27)-6	--	--	--	0	--

STAND PRESCRIPTION SUMMARY
FORM III

Compartment # 111111 **Prescribed by:** D. Jones **Date** 8/29/78

Stand #	19	20	21	22	23
Acres	91	18	30	51	119
Type & SSC	PP ST	NS PP	PP ST	PP ST	PP ST
Prescription	No entry till 2nd decade.	Site preparation for natural regeneration on selected small patches. 1/4 Acre in size. Scarified with chopper.	3-Step Shelterwood Intermediate Retain Overmature scenic trees Reduce B.A. by 28 sq. ft. per acre.	No entry till .2nd decade.	3-Step Shelterwood Intermediate Retain portion of overmature trees for scenic purposes. Cut aspen to get sprouting. Spray oakbrush.
Harvest					
Cut/Acre MBF			2.5	--	.700
Cunits			5	--	1.4
BA			38	--	10
Species			PP		PP
Products			ST-RW		ST-RW
Leave/Acre BA			75		75
TSI					
Leave/a GSL					
# Stems					
Cut/a # Stems					
Avg. DBH					
Plant					
Species					
# trees/a					
Site Prep.		4 Acres			
Understory Control					Oakbrush
Type					Root plow-Spray
Detailed Presc. attached			Yes		Yes
Total Stand Harvest					
MBF			75		83
Cunit			150		167
Total Compt. Harvest					
MBF					158
Cunits					317

TIMBER RESOURCE PLAN AND OTHER RESOURCE COORDINATION SUMMARY
FORM II

Compartment number 111111

Stand #	19	20	21	22	23
Acres	91	18	30	51	119
Type & SSC	PPST	NS (PP)	PP ST	PP ST	PP ST
TM Plan					
RAM Class	PA 2	PNS	P 2	PB 2	PB 2
Prescription	No Entry Scheduled in TM Plan	No Harvest Entry Scheduled. Site prep. for Natural Regeneration	3-Step Shelterwood Intermediate cut Remove 1/3 B.A.	No Entry Scheduled this Decade in TM Plan	3-Step Shelterwood Intermediate cut Remove 1/3.B.A.
Yield/Acre MBF	----	----	2500	----	700
Other Resource Plans					
Coordination and Constraints	----	Small areas of soil disturbance to prepare seedbed for natural regeneration.	Retain portion of older overmature trees for scenic purposes.	----	Retain portion of older overmature trees for scenic purposes.
Protection Measures					
			Skid to landing away from road.		Skid to landing away from road.

STAND PRESCRIPTION

Compartment 111111 Acreage 309
Stand Numbers 19, 20, 21, 22, 23,
Forest Types PPST, NS
Age 69-79

History

Previous to 1940, these stands contained large volumes of large over-mature ponderosa pine sawtimber which was 200+ years old. Between 1940 and 1960, at least two harvests took place removing about 1/2 the volume of the old overstory in each entry. In 1964, an overstory removal was made and all the remaining overstory trees removed. It is probable that the amount of oakbrush in the understory has increased as a result of these past harvests. One Stand (20) of 18 acres, had a heavier than average volume removed and is presently understocked with growing stock trees.

There is no history of fire, TSI, or other cultural treatments. Old skid roads are located throughout the compartment.

Long-Term Objective

With the exception of one stand, this compartment is within the Special Component of the Timber Management section of the Forest Plan. Stand 19 is within the Marginal Component. Long-term management objectives are to maintain and enhance the scenic quality of the stands through maintenance of a varied vegetative cover. Rotation age for stands in the Special Component is 130 years. These stands are presently 70 to 80 years old.

A three-step shelterwood silvicultural system is to be used. The first entry will be an intermediate cut with 10-30% of the basal area removed. The next entry will be a preparatory cut made at age 90, with the seed cut at age 130. The initial intermediate entry is designed to reduce the basal area to GSL 80 to improve the vigor of the trees and their resistance to epidemic mountain pine beetle attacks.

The proposed treatments will maintain a forested appearance and make the stands less susceptible to insect attack.

Prescribed Treatment - This Entry

No entry is to be made in Stands 19 and 22. Stand 20 has small scattered areas that are understocked. These areas of 1/4 to 1/2 acre will be scarified with a rolling chopper to prepare seedbeds for

natural regeneration. This work can be accomplished at the same time slash is disposed of in other stands. Establishment of regeneration in Stand 20 will increase stocking to full level and maintain a forested appearance over the entire stand.

Stands 21 and 23 will receive an intermediate cut of a three-step shelterwood. From 10 to 30 percent of the basal area of the trees 5" d.b.h.+ should be marked for removal. Marking should favor better formed trees, removing those with forks and broken tops first. The few scattered overmature trees in the overstory should be retained for scenic purposes. Landings should be laid out during marking so that skidding can be to landings away from Highway 85. Mark all trees within landing areas.

Detailed marking instructions are to be prepared in conjunction with the landscape architect.

Logging will take place in the fall and early winter. Slash disposal, by piling and burning in the seen area, will be in the spring.

The expected results of this treatment are:

1. The maintenance of continuous vegetative cover.

2. Reduced basal area and more vigorous, insect resistant stands.

3. Maintenance of different size and age class trees to provide visual variety.

Cleanup will be 100% in the seen area, although the treated stands will have a less dense appearance, post-harvest operations will not be discernable.

STAGE II STAND ANALYSIS BLK HILLS H26 SPEARFISH CANYON DATE 082878 PAGE 2

OL/ID 111111 19 SPEARFISH CANYON INDV RUN NET MERCH FACTORS PAGE TYPE 1

COMPARTMENT	STAND	COMPUTED TYPE & STANDSIZE		YR OF ORIGIN
111111	19 (1)	PONDEROSA (3)	SAWTIMBER (4)	1901

SUMMARY OF HEADER INFORMATION

FIELD DATA:

GROUND LAND USE CLASS	20 (6)
TYPE OF SURVEY	943 (5)
DATE OF SURVEY	678
SAMPLE KIND	7
NO. OF SAMPLE POINTS	9
BASAL AREA FACTOR	20
FIXED PLOT SIZE	300
GROWTH PERIOD	0
SLOPE PERCENT	60 (10)
SLOPE POSITION CLASS	5 (DRY FLAT) (8)
ASPECT	3 (E) (11)
EROSION CONDITION CLASS	1 (12)
PLANT COMMUNITY	A EB01
STAND ORIGIN	1
SEED SOURCE	1

PHOTO AND MAP DATA:

PHOTO IDENTIFICATION	FC24460811173274
PI LAND USE CLASS	0
PI TYPE	0
PI STAND SIZE CLASS	0
LEGAL LAND DESCRIPTION	005N002E19
GEO-CELL	0
ELEVATION MIDPOINT	0 (9)
SOIL-MAP-UNIT	
RANGE ALLOTMENT NUMBER	0
RECREATION-COMPOSITE	

OFFICE DATA:

STATE	46
COUNTY	81
DISTRICT	11
OWNERSHIP	11
WATERSHED	0 0
M.U.M. ZONE	4
PLANNING UNIT	0
LAND USE TREND	1
RAM-TIMBER-CLASS	P12
ECO-LAND-UNIT	0

AREA DATA:

STAND AREA ACRES	91.0 (2)
NON-FOREST-NCFL:CODE	0
STANDARD COMPONENT:CODE	0
STANDARD COMPONENT:ACRES	0
SPECIAL COMPONENT:CODE	610
SPECIAL COMPONENT:ACRES	91 (7)
MARGINAL COMPONENT CODE	0
MARGINAL COMPONENT ACRES	0
UNREGULATED COMPONENT:CODE	0
UNREGULATED COMPONENT:ACRES	0

TOW

DL/ID 111111*--19 - SPEARFISH CANYON INDV RUN NET MERCH FACTORS PAGE TYPE 2
SAMPLE POINTS 9 SAMPLE TREES 47

- PER ACRE MEASUREMENTS BY TREE CLASS -

MEASUREMENT	DESIRABLE	ACCEPTABLE	GROWINGSTK	CULL	LIVE	SND DEAD	TOTAL	CV%(TOTAL)	SE%(TOTAL)	70%CI(TOTL)
TREES(0IN+)	167.	75.	242.	1891.	2133.	0.	2133.	187.	59.	1401.
BASAL(5IN+)	24.	24.	49.	7.	56.	0.	56.	59.	19.	12.
CUBIC(5IN+)	582.	541.	1123.	49.	1173.	0.	1173.	59.	19.	244.
SCRIB(9IN+)	2074.	2041.	4115.	0.	4115.	0.	4115.	60.	19.	868.
INT (9IN+)	2488.	2354.	4842.	0.	4842.	0.	4842.	59.	19.	993.

- PER ACRE DEAD STEM FUEL LOADING IN TOTAL STEM CUNITS -

SOUND DEAD(5IN+)-STANDING	-DOWN	NONSOUND DEAD(1IN+)-STANDING	-DOWN	TOTAL
.00	.00	.85	.00	.85

- PERCENT OF LODGEPOLE TREES (5IN.+) PER ACRE WITH -

OPEN-CONES	CLOSED-CONES	NO-CONES
0.	0.	0.

- PER ACRE STAND AVERAGES -

STORY	DBH	HEIGHT	AGE	STEMS	BA	CUNITS(5IN+)	MBFSCRIB(9IN+)
UND	2.9	18	46	81	4	.29	.000
OVR	6.7	38	71	186	51	11.43	4.115
TOT	9.5	46	69	100	56	11.73	4.115

- STAND CLASSES -

RISKCLASS	CONDCLASS
4	70

- LIVE MISTLETOE TREES/ACRE -

DBH	LODGEPOLE	DOUGFIR	PONDEROSA	OTHERS
0-4.9	0.	0.	0.	0.
5-8.9	0.	0.	0.	0.
9IN+	0.	0.	0.	0.

- RESTRICTED STOCKING PERCENT/ACRE -

DES%	ACC%	GROWINGSTK%	CULL%	ALL%	OVERSTK%
33.	26.	60.	15.	75.	0.

- PERCENT OF NONSTOCKED POINTS PER ACRE DUE TO -

OTHER OTHER	>75%HIGH BRUSH	>75%LOW BRUSH	>75% SOD	>75% DUFF	>75% SLASH	>25%NONSTK NOT-OVRTOP	>25%NONSTK OVERTOPPED
0.	0.	0.	11.	0.	0.	0.	0.

- PERCENT OF NONSTOCKABLE POINTS PER ACRE DUE TO -

OTHER OTHER	RKYMTN JUNIPER	BEDROCK BOULDERS	POOR-SOIL DRAINAGE	SOIL DEPTH	SOIL EROSION	CLAY CONT
0.	0.	0.	0.	0.	0.	0.

- PER ACRE GROWING STOCK GROWTH AND MORTALITY -

ANNUAL PER ACRE GROWTH BASED ON 6 TALLIED GROWTH TREES

MEASURE	INGROWTH	ACCRETION	GROSS	MORT	LOGGING	NET
CUBIC(5IN+)	.0	20.7	20.7	.0	.0	20.7
SCRIB(9IN+)	.0	92.2	92.2	.0	.0	92.2
STEMS(5IN+)	.00			.00	.00	

ANNUAL PER ACRE MORTALITY BY CAUSE

MEASURE	INSECT	DISEASE	FIRE	ANIMAL	WEATHER	SUPPRESSED	UNKNOWN
CUBIC(5IN+)	.00	.00	.00	.00	.00	.00	.00
SCRIB(9IN+)	.00	.00	.00	.00	.00	.00	.00
STEMS(5IN+)	.00	.00	.00	.00	.00	.00	.00
STMS(1-4.9)	.00	.00	.00	.00	.00	.00	.00

- NUMBER OF LIVE STEMS PER ACRE DAMAGED BY -

DAMAGE	0-4.9IN	5-8.9IN	9IN+
1-NO DAMAGE	2000.0	8.8	24.6
73-BROKEN TOP	.0	13.5	1.0
90-ROUGH TREE	.0	10.3	.0
25-STEM ROT	.0	14.1	2.4
74-DEAD TOP	33.3	11.3	3.2
71-LEANING	.0	.0	2.8
79-SWEEP&CROOK	.0	.0	7.8

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- P E R A C R E S T A N D S U M M A R Y O F L I V E G R O W I N G S T O C K T R E E S -

DIAMETER	TOT STM	HWD STM	AVG DBH	AVG HT	TOT BA	HWD BA	TOT CUB	HD CUB	TOT SCB	HWD SCB	TOT INT	HWD INT	SFT DBH AN.INC	HWD DBH AN.INC	SFT HT AN.INC	HWD HT AN.INC	SFT AGE	HWD AGE
0- .9	33.3	.0	.0	2.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.300	.000	18.	0.
1- 1.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
2- 2.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
3- 3.9	66.7	33.3	3.6	28.0	4.7	2.8	0.	0.	0.	0.	0.	0.	.03	.00	.000	.000	60.	0.
4- 4.9	66.7	33.3	4.1	29.0	6.3	3.1	0.	0.	0.	0.	0.	0.	.03	.00	.000	.000	60.	0.
5- 5.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.07	.00	.359	.000	40.	0.
6- 6.9	20.1	.0	6.4	42.1	4.4	.0	74.	0.	0.	0.	0.	0.	.07	.00	.359	.000	40.	0.
7- 7.9	8.1	.0	7.1	38.0	2.2	.0	42.	0.	0.	0.	0.	0.	.06	.00	.217	.000	60.	0.
8- 8.9	5.4	.0	8.7	41.0	2.2	.0	32.	0.	0.	0.	0.	0.	.06	.00	.217	.000	60.	0.
9-10.9	12.1	.0	10.0	48.8	6.7	.0	124.	0.	343.	0.	382.	0.	.16	.00	.637	.000	41.	0.
11-12.9	8.5	.0	11.9	59.3	6.7	.0	154.	0.	594.	0.	700.	0.	.09	.00	.329	.000	73.	0.
13-14.9	11.3	.0	13.4	58.9	11.1	.0	249.	0.	1040.	0.	1243.	0.	.08	.00	.262	.000	68.	0.
15-16.9	5.2	.0	15.4	65.9	6.7	.0	180.	0.	776.	0.	949.	0.	.12	.00	.355	.000	85.	0.
17-18.9	2.6	.0	17.5	73.5	4.4	.0	136.	0.	666.	0.	779.	0.	.00	.00	.000	.000	0.	0.
19-20.9	2.0	.0	20.3	70.3	4.4	.0	132.	0.	697.	0.	790.	0.	.00	.00	.000	.000	0.	0.
21-22.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
0-99.9	242.0	66.7	.0	.0	59.9	5.8	1123.	0.	4115.	0.	4842.	0.	.00	.00	.000	.000	0.	0.

105

(16)

- P L A N T E D T R E E S P E R A C R E -

GROWING STOCK	CULL
0.	0.

- S I T E T R E E I N F O R M A T I O N -

SPECIES	DBHAGE	TOTAGE	HEIGHT	CLASS	SURVEY YIELD	MAXIMUM GROSS YIELD(HANN)	SITE/BASE USING TOTAL TREE AGE BRICKELL	ALEXANDER	HORNIBROOK	SITE/BASE USING DBH AGE ALEXANDER	MINOR	EDMINSTER
PONDEROSA P.	54.	69.	46.	1.	36.	65.	35./50	0./100	65./100	0./100	72./100	0./100
PONDEROSA P.	41.	56.	51.	1.	51.	77.	46./50	0./100	72./100	0./100	100./100	0./100
PONDEROSA P.	85.	100.	71.	1.	50.	76.	45./50	0./100	71./100	0./100	80./100	0./100
AVERAGE												
PONDEROSA P.	60.	75.	56.	1.	46.	73.	42./50	0./100	69./100	0./100	84./100	0./100

(14) (15)

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- P E R A C R E S T A N D T A B L E S U M M A R I E S -

SPRUCE(93,94,96) (20-22) (18) (17)

	STEMS						BASAL AREA				CUBIC VOLUME				SCRIBNER VOLUME			LOWR STM CUBIC		
DIAMETER	DES	ACC	SND CULL	RNT CULL	SALV	MORT	DES	ACC	CULL	SND DEAD	DES	ACC	CULL	SND DEAD	DES	ACC	SND DEAD	DES	ACC	SND DEAD
0- .9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1- 2.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3- 4.9	33.3	.0	.0	.0	.0	.0	3.2	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5- 6.9	8.8	.0	.0	.0	.0	.0	2.2	.0	.0	.0	52.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7- 8.9	.0	8.1	.0	.0	.0	.0	.0	2.2	.0	.0	0.	42.	0.	0.	0.	47.	0.	0.	0.	0.
9-10.9	.0	3.6	.0	.0	.0	.0	.0	2.2	.0	.0	0.	43.	0.	0.	0.	158.	0.	0.	38.	0.
11-12.9	.0	2.8	.0	.0	.0	.0	.0	2.2	.0	.0	0.	44.	0.	0.	0.	182.	0.	0.	39.	0.
13-14.9	2.4	2.0	.0	.0	.0	.0	2.2	2.2	.0	.0	52.	53.	0.	0.	235.	252.	0.	46.	47.	0.
15-16.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17-18.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19-20.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21-22.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0- 4.9	33.3	.0	.0	.0	.0	.0	3.2	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5-99.9	11.2	16.5	.0	.0	.0	.0	4.4	8.9	.0	.0	104.	182.	0.	0.	235.	641.	0.	46.	124.	0.
0-99.9	44.6	16.5	.0	.0	.0	.0	7.7	8.9	.0	.0	104.	182.	0.	0.	235.	641.	0.	46.	124.	0.

PONDEROSA(122)

	STEMS						BASAL AREA				CUBIC VOLUME				SCRIBNER VOLUME			LOWR STM CUBIC		
DIAMETER	DES	ACC	SND CULL	RNT CULL	SALV	MORT	DES	ACC	CULL	SND DEAD	DES	ACC	CULL	SND DEAD	DES	ACC	SND DEAD	DES	ACC	SND DEAD
0- .9	33.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1- 2.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3- 4.9	.0	33.3	33.3	.0	.0	.0	.0	2.0	2.9	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5- 6.9	.0	11.3	10.3	.0	.0	.0	.0	2.2	2.2	.0	0.	22.	20.	0.	0.	0.	0.	0.	0.	0.
7- 8.9	.0	5.4	.0	.0	.0	.0	.0	2.2	.0	.0	0.	32.	0.	0.	0.	0.	0.	0.	0.	0.
9-10.9	8.5	.0	.0	.0	.0	.0	4.4	.0	.0	.0	81.	0.	0.	0.	185.	0.	0.	72.	0.	0.
11-12.9	2.5	3.2	.0	.0	.0	.0	2.2	2.2	.0	.0	60.	49.	0.	0.	240.	171.	0.	54.	44.	0.
13-14.9	4.7	2.2	.0	.0	.0	.0	4.4	2.2	.0	.0	106.	38.	0.	0.	415.	138.	0.	94.	34.	0.
15-16.9	5.2	.0	.0	.0	.0	.0	6.7	.0	.0	.0	180.	0.	0.	0.	776.	0.	0.	160.	0.	0.
17-18.9	1.3	1.4	.0	.0	.0	.0	2.2	2.2	.0	.0	51.	85.	0.	0.	224.	442.	0.	45.	76.	0.
19-20.9	.0	2.0	.0	.0	.0	.0	.0	4.4	.0	.0	0.	132.	0.	0.	0.	697.	0.	0.	119.	0.
21-22.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0- 4.9	33.3	33.3	33.3	.0	.0	.0	.0	2.0	2.9	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5-99.9	22.2	25.4	10.3	.0	.0	.0	20.0	15.6	2.2	.0	478.	359.	20.	0.	1840.	1448.	0.	425.	273.	0.
0-99.9	55.5	58.7	43.6	.0	.0	.0	20.0	17.5	5.1	.0	478.	359.	20.	0.	1840.	1448.	0.	425.	273.	0.

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-PER ACRE STAND TABLE SUMMARIES-

ASPEN(746)

DIAMETER	STEMS DES	ACC	SND CULL	RNT CULL	SALV	MORT	BASAL AREA DES	ACC	CULL	SND DEAD	CUBIC VOLUME DES	ACC	CULL	SND DEAD	SCRIBNER VOLUME DES	ACC	SND DEAD	LOWR STM CUBIC DES	ACC	SND DEAD
0- .9	.0	.0	66.7	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1- 2.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3- 4.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5- 6.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7- 8.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9-10.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11-12.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13-14.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15-16.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17-18.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19-20.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21-22.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0- 4.9	.0	.0	66.7	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0-99.9	.0	.0	66.7	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

HARDWOODS E XCEPT ASPEN

DIAMETER	STEMS DES	ACC	SND CULL	RNT CULL	SALV	MORT	BASAL AREA DES	ACC	CULL	SND DEAD	CUBIC VOLUME DES	ACC	CULL	SND DEAD	SCRIBNER VOLUME DES	ACC	SND DEAD	LOWR STM CUBIC DES	ACC	SND DEAD
0- .9	.0	.01	533.3	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1- 2.9	.0	.0	166.7	.0	.0	.0	.0	.0	3.6	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3- 4.9	66.7	.0	66.7	.0	.0	.0	5.8	.0	5.8	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5- 6.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7- 8.9	.0	.0	.0	14.1	.0	.0	.0	.0	4.4	.0	0.	0.	29.	0.	0.	0.	0.	0.	0.	0.
9-10.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11-12.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13-14.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15-16.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17-18.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19-20.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21-22.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0- 4.9	66.7	.0	1766.7	.0	.0	.0	5.8	.0	9.5	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5-99.9	.0	.0	.0	14.1	.0	.0	.0	.0	4.4	.0	0.	0.	29.	0.	0.	0.	0.	0.	0.	0.
0-99.9	66.7	.0	1766.7	14.1	.0	.0	5.8	.0	13.9	.0	0.	0.	29.	0.	0.	0.	0.	0.	0.	0.

END OF PRINTOUT

DL/ID 111111*—21—SPEARFISH CANYON —INDV RUN—NET MERCH FACTORS—PAGE TYPE 1—

- COMPARTMENT -	- STAND -	- COMPUTED TYPE & STAND SIZE -	- YR OF ORIGIN -
111111	21	PONDEROSA SAWTIMBER	1904

- SUMMARY OF HEADER INFORMATION -

FIELD DATA:

GROUND LAND USE CLASS	20	
TYPE OF SURVEY	943	
DATE OF SURVEY	678	
SAMPLE KIND	7	
NO. OF SAMPLE POINTS	3	
BASAL AREA FACTOR	20	
FIXED PLOT SIZE	300	
GROWTH PERIOD	0	
SLOPE PERCENT	30	
SLOPE POSITION CLASS	4	(WET FLAT)
ASPECT	3	(E)
EROSION CONDITION CLASS	1	
PLANT COMMUNITY	8 EB01	
STAND ORIGIN	1	
SEED SOURCE	1	

PHOTO AND MAP DATA:

PHOTO IDENTIFICATION	FC16460811173274
PI LAND USE CLASS	0
PI TYPE	0
PI STAND SIZE CLASS	0
LEGAL LAND DESCRIPTION	005N004E19
GELO-CELL	0
ELEVATION MIDPOINT	0
SOIL-MAP-UNIT	
RANGE ALLOTMENT NUMBER	0
RECREATION-COMPOSITE	

OFFICE DATA:

STATE	46
COUNTY	81
DISTRICT	11
OWNERSHIP	11
WATERSHED	0 0
M.U.M. ZONE	4
PLANNING UNIT	0
LAND USE TREND	1
RAM-TIMBER-CLASS	P22
ECO-LAND-UNIT	0

AREA DATA:

STAND AREA ACRES	30.0
NON-FOREST-NCFL:CODE	0
STANDARD COMPONENT:CODE	0
STANDARD COMPONENT:ACRES	0
SPECIAL COMPONENT:CODE	610
SPECIAL COMPONENT:ACRES	30
MARGINAL COMPONENT CODE	0
MARGINAL COMPONENT ACRES	0
UNREGULATED COMPONENT:CODE	0
UNREGULATED COMPONENT:ACRES	0

DL/ID 111111*—21 SPEARFISH CANYON INDV RUN — NET MERCH FACTORS — PAGE TYPE 2
SAMPLE POINTS 3 SAMPLE TREES 21

- PER ACRE MEASUREMENTS BY TREE CLASS -

MEASUREMENT	DESIRABLE	ACCEPTABLE	GROWINGSTK	CULL	LIVE	SND DEAD	TOTAL	CV%(TOTAL)	SE%(TOTAL)	70%CI(TOTL)
TREES(0IN+)	77.	38.	115.	0.	115.	0.	115.	29.	16.	25.
BASAL(5IN+)	73.	40.	113.	0.	113.	0.	113.	10.	6.	9.
CUBIC(5IN+)	1500.	782.	2282.	0.	2282.	0.	2282.	12.	7.	212.
SCRIB(9IN+)	5599.	2966.	8565.	0.	8565.	0.	8565.	25.	14.	1625.
INT (9IN+)	6768.	3450.	10218.	0.	10218.	0.	10218.	24.	13.	1842.

- PER ACRE DEAD STEM FUEL LOADING IN TOTAL STEM CUNITS -

SOUND DEAD(5IN+)-STANDING	-DOWN	NONSOUND DEAD(1IN+)-STANDING	-DOWN	TOTAL
.00	.00	.25	.00	.25

- PERCENT OF LODGEPOLE TREES (5IN.+) - PER ACRE WITH -

OPEN-CONES	CLOSED-CONES	NO-CONES
0.	0.	0.

- PER ACRE STAND AVERAGES -

STORY	DBH	HEIGHT	AGE	STEMS	BA	CUNITS(5IN+)	MBFSCRIB(9IN+)
UND	8.6	37	88	17	7	.86	.000
OVR	13.7	49	77	98	107	21.96	8.565
TOT	12.9	47	79	115	113	22.82	8.565

- STAND CLASSES -

RISKCLASS	CONDCLASS
4	40

- LIVE MISTLETOE TREES/ACRE -

DBH	LODGEPOLE	DOUGFIR	PONDEROSA	OTHERS
0-4.9	0.	0.	0.	0.
5-8.9	0.	0.	0.	0.
9IN+	0.	0.	0.	0.

- RESTRICTED STOCKING PERCENT/ACRE -

DES%	ACC%	GROWINGSTK%	CULL%	ALL%	OVERSTK%
73.	40.	113.	0.	113.	0.

- PERCENT OF NONSTOCKED POINTS PER ACRE DUE TO -

OTHER OTHER	>75%HIGH BRUSH	>75%LOW BRUSH	>75% SOD	>75% DUFF	>75% SLASH	>25%NONSTK NOT-OVRTOP	>25%NONSTK OVERTOPPED
0.	0.	0.	0.	0.	0.	0.	0.

- PERCENT OF NONSTOCKABLE POINTS PER ACRE DUE TO -

OTHER OTHER	RKYMTN JUNIPER	BEDROCK BOULDERS	POOR-SOIL DRAINAGE	SOIL DEPTH	SOIL EROSION	CLAY CONT
0.	0.	0.	0.	0.	0.	0.

- PER ACRE GROWING STOCK GROWTH AND MORTALITY -

ANNUAL PER ACRE GROWTH BASED ON 5 TALLIED GROWTH TREES

MEASURE	INGROWTH	ACCRETION	GROSS	MORT	LOGGING	NET
CUBIC(5IN+)	.0	42.6	42.6	.0	.0	42.6
SCRIB(9IN+)	.0	204.0	204.0	.0	.0	204.0
STEMS(5IN+)	.00			.00	.00	

ANNUAL PER ACRE MORTALITY BY CAUSE

MEASURE	INSECT	DISEASE	FIRE	ANIMAL	WEATHER	SUPPRESSED	UNKNOWN
CUBIC(5IN+)	.00	.00	.00	.00	.00	.00	.00
SCRIB(9IN+)	.00	.00	.00	.00	.00	.00	.00
STEMS(5IN+)	.00	.00	.00	.00	.00	.00	.00
STMS(1-4.9)	.00	.00	.00	.00	.00	.00	.00

- NUMBER OF LIVE STEMS PER ACRE DAMAGED BY -

DAMAGE	0-4.9IN	5-8.9IN	9IN+
1-NO DAMAGE	.0	17.7	59.2
18-FORKEDABOVE	.0	.0	6.1

DAMAGE	0-4.9IN	5-8.9IN	9IN+
72-FORKEDWITHIN	.0	.0	15.4

DAMAGE	0-4.9IN	5-8.9IN	9IN+
73-BROKEN TOP	.0	16.5	.0

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PER ACRE STAND SUMMARY OF LIVE GROWING STOCK TREES

DIAMETER	TOT STM	HWD STM	AVG DBH	AVG HT	TOT BA	HWD BA	TOT CUB	HD CUB	TOT SCB	HWD SCB	TOT INT	HWD INT	SFT DBH AN.INC	HWD DBH AN.INC	SFT HT AN.INC	HWD HT AN.INC	SFT AGE	HWD AGE
0- .9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
1- 1.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
2- 2.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
3- 3.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
4- 4.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
5- 5.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
6- 6.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
7- 7.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.03	.00	.067	.000	73.	0.
8- 8.9	34.3	.0	8.4	37.0	13.3	.0	171.	0.	0.	0.	0.	0.	.03	.00	.067	.000	73.	0.
9-10.9	10.7	.0	10.7	47.0	6.7	.0	120.	0.	323.	0.	365.	0.	.12	.00	.369	.000	50.	0.
11-12.9	8.1	.0	12.3	53.0	6.7	.0	136.	0.	491.	0.	577.	0.	.12	.00	.358	.000	55.	0.
13-14.9	24.0	.0	14.3	51.9	26.7	.0	552.	0.	2175.	0.	2586.	0.	.14	.00	.360	.000	56.	0.
15-16.9	28.8	.0	15.9	52.7	40.0	.0	859.	0.	3572.	0.	4366.	0.	.11	.00	.248	.000	66.	0.
17-18.9	4.1	.0	17.3	47.0	6.7	.0	128.	0.	535.	0.	654.	0.	.00	.00	.000	.000	0.	0.
19-20.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
21-22.9	5.0	.0	22.0	58.1	13.3	.0	317.	0.	1469.	0.	1670.	0.	.00	.00	.000	.000	0.	0.
23-24.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	.00	.00	.000	.000	0.	0.
0-99.9	115.0	.0	.0	.0	113.3	.0	2282.	0.	8565.	0.	10218.	0.	.00	.00	.000	.000	0.	0.

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PLANTED TREES PER ACRE

GROWING STOCK	CULL
0.	0.

SITE TREE INFORMATION

SPECIES	DBHAGE	TOTAGE	HEIGHT	CLASS	SURVEY YIELD	MAXIMUM GROSS YIELD(HANN)	SITE/BASE USING TOTAL TREE AGE BRICKELL	ALEXANDER	HORNIBROOK	SITE/BASE USING DBH AGE ALEXANDER	MINOR	EDMINSTER
PONDEROSA P.	50.	65.	47.	1.	39.	67.	38./50	0./100	66./100	0./100	79./100	0./100
PONDEROSA P.	55.	70.	53.	1.	44.	82.	41./50	0./100	74./100	0./100	83./100	0./100
PONDEROSA P.	56.	71.	58.	1.	48.	94.	44./50	0./100	80./100	0./100	90./100	0./100
AVERAGE												
PONDEROSA P.	54.	69.	53.	1.	44.	81.	41./50	0./100	73./100	0./100	84./100	0./100

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- P E R A C R E S T A N D T A B L E S U M M A R I E S -

PONDEROSA(122)

	STEMS						BASAL AREA				CUBIC VOLUME				SCRIBNER VOLUME			LOWR STM CUBIC		
			SND	RNT						SND				SND			SND			SND
DIAMETER	DES	ACC	CULL	CULL	SALV	MORT	DES	ACC	CULL	DEAD	DES	ACC	CULL	DEAD	DES	ACC	DEAD	DES	ACC	DEAD
0- .9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1- 2.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3- 4.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5- 6.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7- 8.9	17.7	16.5	.0	.0	.0	.0	6.7	6.7	.0	.0	85.	86.	0.	0.	0.	0.	0.	0.	0.	0.
9-10.9	10.7	.0	.0	.0	.0	.0	6.7	.0	.0	.0	120.	0.	0.	0.	323.	0.	0.	107.	0.	0.
11-12.9	8.1	.0	.0	.0	.0	.0	6.7	.0	.0	.0	136.	0.	0.	0.	491.	0.	0.	122.	0.	0.
13-14.9	17.9	6.1	.0	.0	.0	.0	20.0	6.7	.0	.0	403.	149.	0.	0.	1579.	596.	0.	361.	134.	0.
15-16.9	18.5	10.3	.0	.0	.0	.0	26.7	13.3	.0	.0	629.	230.	0.	0.	2670.	901.	0.	563.	206.	0.
17-18.9	4.1	.0	.0	.0	.0	.0	6.7	.0	.0	.0	128.	0.	0.	0.	535.	0.	0.	114.	0.	0.
19-20.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21-22.9	.0	5.0	.0	.0	.0	.0	.0	13.3	.0	.0	0.	317.	0.	0.	0.	1469.	0.	0.	300.	0.
23-24.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25-26.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27-28.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29-30.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31-99.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0- 4.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5-99.9	76.9	38.0	.0	.0	.0	.0	73.3	40.0	.0	.0	1500.	782.	0.	0.	5599.	2966.	0.	1267.	640.	0.
0-99.9	76.9	38.0	.0	.0	.0	.0	73.3	40.0	.0	.0	1500.	782.	0.	0.	5599.	2966.	0.	1267.	640.	0.

END OF PRINTOUT

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Bill Beaufait, R-1

ELEMENTS OF A SILVICULTURE PRESCRIPTION

This is a discussion topic. Each Region may have a slightly different version of what must be included in a silvicultural prescription. We will use the Northern Region's guidelines only as an outline for our oral comparisons.

QUALIFIED PRESCRIPTION - WRITERS

But first, prescription writing is a highly professional activity. We have tried to respond to Forest Service Manual direction (FSM 2478, 2431) that only qualified persons write or review prescriptions. The Northern Region's programs of Continuing Education in Forest Ecology and Silviculture (CEFES) and Certification have now processed over 150 candidates.

On September 25, we began our seventh year of CEFES. We're full partners with Region 6 as they begin their Silviculture Institute this year. We share the same rigorous examination requirements for certification. Our standard is demonstration of a Master degree level of competence in writing and defending actual silvicultural prescriptions.

Silviculturists in the Northern Region are being reexamined and recertified every four years. Refresher sessions and up-to-date technical knowledge are required for recertification. We have a 15-20 percent rate of failure in both original certification and recertification examinations. Most unsuccessful candidates are finally certified after an additional year of study and experience.

A prescription can be no better technically than its author. Multiple-use forest management requires sensitive, innovative and often complex prescriptions. Each element of a silvicultural prescription demands knowledge of a different discipline and command of the vocabulary of that discipline.

NORTHERN REGION GUIDELINES

In 1976, a panel of Certified Silviculturists took time from their prescribing duties on Ranger Districts to write the Region One guidelines. They defined a prescription, stated four basic purposes and outlined seven basic elements. That document is now Regional Supplement No. 190 to the Forest Service Manual.

Together we will explore each section of these guidelines. Are they appropriate in other Regions? Have we overlooked anything? Your comments and suggestions will help in our continuous reappraisal of our prescription-writing efforts.

A paper presented to the National Silviculture Workshop, Missoula, MT., September 25 - 29, 1978, William R. Beaufait, Regional Silviculturist.

4. Treatment. The details of the recommended treatment and the expected results must be outlined. Enough information should be given to serve as a basis for preparation of marking guides and field layout and to serve as a set of directions for accomplishing the treatment. Examples of details which may be included are:

a. Type of treatment.

(1) Timber cutting: Intermediate, salvage, or regeneration cut by method. Indicate stand composition and density of the resultant stand.

(2) Site preparation by method and intensity.

(3) Reforestation by method, species, stocking level desired, and year the desired stocking level is to be achieved.

b. Logging method proposed.

c. Methods for site preparation, hazard reduction, and protection to manageable understory.

d. Insect and disease protection and/or control.

e. Effect of the treatment on the site such as soil compaction and nutrient loss.

f. Genetic implications and tree improvement goals (see FSM 2475.03, R-1 Supplement).

g. Effect of the treatment on wildlife populations and their use of the area.

h. Effect of treatment on use of the area by man, his visual and other values.

i. Needs and possible methods for livestock use and control.

5. Long-term Prescription. Because treatment planned now will affect management of the resulting stand for an entire rotation, all prescriptions shall tentatively schedule and project all treatments and returns from the present through the next regeneration period. Anticipated losses to wildfire, insects, and diseases should be included.

6. Economic Comparisons. All prescriptions shall include a brief economic analysis or reference one made for the same treatment on a similar local site. This analysis will compare returns on the investments to be made in the recommended treatment with deferred action and other possible alternative treatments. Currently available ADP programs include INVEST III and MULTIPLOY.

7. Alternatives. Viable alternatives, including deferring treatment for a given period of time, should be described briefly. The reasons for not recommending the alternative should be listed.

D. Length of the Silvicultural Prescription. The length of the silvicultural prescription is less important than its effectiveness in fulfilling its four basic purposes. Nevertheless, the time required by the prescription process is a common concern to Silviculturists and line officers. Where available, land type and ELU numbers may reference considerable specific data. Tables, charts, and graphs may be used to display stand data with a minimum of narrative. Many ADP programs available through Forest or District terminals will reduce the time needed for growth projection, economic analysis, fuel loading calculations, and visual presentation.

Dan Schroeder

STAND PRESCRIPTIONS IN REGION 9

Stand prescriptions in Region 9 are part of our compartment examination (COMPEX) process which culminates in an approved environmental analysis report. Since 1971 we have examined and prescribed treatments for approximately (7.7 million acres) 70% of our ownership.

A stand prescription is written from field data and/or review of stand records. Stand examiners normally prescribe treatments from plots distributed throughout the stand. The stand prescriber takes most of the plots, but occasionally a less experienced forester or forestry technician will help with data collection.

Stand prescriptions are made only by certified stand prescribers. Plot and stand data can be collected by individuals qualified for taking silvicultural data when working for a certified stand prescriber. Only professional Foresters in grade GS-9 or higher who have had at least one year of timber management experience in Region 9 will be selected for training as certified stand prescribers. The one year of experience must include field and office work in timber sale, TSI, and reforestation activities.

Qualifications. In order to qualify for certification, the following conditions of training and experience must be met.

1. Training. Stand prescribers must be trained in:

a. Silvicultural examination techniques as shown in this handbook.

b. Preparation of silvicultural prescriptions as presented in Forest Guidelines.

c. Other possible training needs as suggested in FSM 2478.

2. Experience. Stand prescribers will demonstrate their experience by:

a. Knowing and understanding the multiple use aspects that could affect stand prescriptions.

(1) Being familiar with Forest and District Land Use Plans.

(2) Knowing what the coordinating equirements are and where they apply.

b. Locating and understanding all informational source documents available, listed in 231 of FSH 2409.21d.

c. Understanding the present land use classification system.

d. Being able to prepare aerial photographs for stereo viewing and interpretation.

(1) Interpreting photos by recognizing tones, textures, crown size and shape for different species or species groups and stocking levels on the basis of crown closure.

(2) Delineating stand boundaries on the basis of age, tree size, type, aspect and slope of land, and in some cases, stand treatment.

e. Locating examination travel routes which will provide representative stand data and provide the best opportunity to observe stand conditions along the route.

f. Having a thorough knowledge and understanding of the Forest's Silvicultural Guides and the silvics of the trees in the area.

g. Understanding genetic principles as they pertain to silvicultural systems and seed source control.

h. Being familiar with Forest logging practices to include product merchantability, standards of utilization, logging methods, equipment normally used, and minimum operable volumes.

i. Knowing and understanding the Timber Sale Contract.

j. Being familiar with local timber stand improvement and reforestation techniques, needs and policies.

k. Knowing the geology and soil types of the area, especially as they pertain to species suitability and erosion potential.

l. Being aware of the forest transportation system and having a working knowledge of the principles of forest road location.

m. Being familiar with wildlife habitat needs.

n. Showing an understanding of, and sensitivity to, aesthetics and special features (historical, archeological, etc.).

o. Understanding and using the Automatic Data Processing system to the extent that he has:

(1) Properly submitted Compartment Header and Stand Tally Sheets to ADP,

(2) Interpreted ADP printouts and properly corrected edit errors.

Certification requirements are:

A. Meet qualifications for training.
B. Possess a working level knowledge of R-9 landscape management training.
C. Attend a formal compartment prescription training course. This is a two part course which combines classroom and field exercises which cover material on evenaged and unevenaged management, silvicultural practices, coordination with other resources and compartment examination procedures. The training is handled jointly by Regional Office and forest personnel.
D. Demonstrate an understanding of the Unit Management Plan and silvicultural guides applicable to forest types recognized in their current timber management plan to the satisfaction of the Forest Certifying Officer. The Certifying Officer will check the prescribers understanding and application of methods and the quality for stand prescription. The following stand data will be checked: type-size-density (TSD), stand condition and management objective. A standard for certification will be set by certifying officer.

To maintain certification each certified prescriber will be given an annual competency check on at least one compartment by the Forest Certifying Officer. He will determine from the results of the yearly check and from other evidence whether the forester needs refresher training in order to retain his active standing. Because District Rangers review and recommend approval of all prescriptions on the District, they personally will participate in at least one compartment prescription each fiscal year including field examinations. They will also either field check or delegate a representative to field check each certified prescriber's work annually.

Forest Timber Staff Officers or Forest Silviculturists will conduct training or refresher training sessions as needed to insure consistently high quality compartment prescriptions and to certifiy additional prescribers.

Each stand is given a silvicultural and interdisciplinary (ID) prescription. The prescriptions are identical for many stands because the silvicultural prescription adequately provides for the multiple use needs of the planning unit. Depending on the land management plan the silvicultural prescription can be

deferred or modified. The ID prescription should consider all resource needs of the planning unit and will provide the basis for future work planning.

Specialist input is given for all stands needing coordination between timber and other resources. Input is obtained prior to field examination and after on-the-ground or other advice is required.

Dan Schroeder

PROJECT CERTIFICATION TO COMPLY WITH NFMA
Bob Blomquist - R-9

In this presentation I want to outline for you how we in R-9 intend to proceed with a program of certification of silvicultural treatments. To do this:

*I will cover some definitions and assumptions.

*I will go through the flow-charts and explain the various steps.

*I will explain where some more detail has to be worked out before the program can be implemented.

When I have finished with that you should all have a firm understanding of the process, but more than likely most of you will be as confused as I am.

At that point then I want to pose a few questions for discussion, and I will ask whoever is going to be responsible for the certification program in the W.O. to be the moderator.

Back to the business at hand.

The first question is: Why certification?
I quote from the NFMA.

> Section 4. Reforestation
> "....All national forest lands treated from year to year shall be examined after the first and third growing seasons and certified by the Secretary in the report provided for under this subsection as to stocking rate, growth rate in relation to potential and other pertinent measures. Any lands not certified as satisfactory shall be returned to the backlog and scheduled for prompt treatment...."
> National Forest Management Act

Incidentally, this is not only the authority, it is also the only firm direction we had upon which to develop our program and procedures.

And firm it isn't, so we then get into the other questions of what, how, who and when.

First some important definitions, then the assumptions.

The definitions that I have included were extracted from the Management Information System Handbook.

What better source? It also reinforces the suspicion that we are more and more becoming slaves to the computer: Now were going to their "bible" to find out what it is we're doing - or supposed to be doing.

Well anyway! the definitions:

DEFINITIONS

EVALUATION SURVEY: The examination process which follows the execution of the prescribed management actions. It is used to determine first if the prescribed action was carried out as intended and second if in retrospect the prescribed action was correct. A determination is made if any immediate follow-up action is required to effect the planned stand condition or to correct improperly applied actions, incorrect prescriptions, or actions which failed to achieve minimum prescribed standards. Data is collected to update stand statistics and provide the basis for current and future stand analysis. Included in this process are reforestation stocking evaluations and survival counts, and timber stand improvement evaluations.

CERTIFICATION OF REGENERATION AREAS: The written certification that a regenerated area has attained a stocking level above a defined minimum in terms of number and distribution of acceptable species, whether planted, seeded, or natural. Before an area of deforested land may be certified as satisfactorily stocked, the re-established tree seedlings must have survived and be thriving three or more full growing seasons.

CERTIFICATION OF RELEASE AND THINNING: The written certification that the treatement met the treatment prescription objectives. In the case of thinning it normally will mean certifying that the stocking of desired residual trees meets prescribed standards. For release it normally will mean certifying that stocking of free-to-grow trees of desirable species meets prescribed minimums.

These definitions are part of the answer to What? It defines what is to be done, but not what areas need certification. In answer to that we have assumed the following:

> Areas that have been regenerated by either natural or artificial means.
>
> Areas that have received a release treatment.
>
> Areas that have received a non-commercial thinning treatment.

We are now past the questions why and what, let's go to When. The answer to that seemed pretty simple and clear cut: "after the first and third growing seasons." It's not that we weren't satisfied with that, it's just that - as is so often the case - things that seem to be simple and clear cut often aren't.

What we have come up with for timing of evaluation surveys is this:

> Regeneration areas and hand release of conifer projects will be examined after the first and third growing seasons.
>
> Precommercial thinning areas and other release* areas will be examined after one growing season. Additional surveys may be scheduled if necessary.

*other release means other than hand release of conifers.

So now are you satisfied with the why, what and when?

> If so we can follow through on the flow charts and see if it does what we said we were going to do.

Assume this certification process will begin October 1, 1978, then the dates shown on the flow charts will make sense.

Now let's get the process started. There is a slightly different procedure for regenerated areas and for release and precommercial thinning.

Let's go through the process for the regenerated areas first.

REGENERATED AREAS: (See Exhibit 1)

Step 1: Identify all areas regenerated since September 30, 1974, and those that have not received a final evaluation survey.

Step 2: Program evaluation surveys for Fiscal Year 1979 for all areas identified in step 1 that completed at least 3 years of growth by September 30, 1978.

Step 3: Program evaluation surveys for Fiscal Year 1980 for all areas identified in step 1 that completed 2 years of growth by September 30, 1978 (this will be 3rd year survey).

Step 4: Program evaluation surveys for Fiscal Year 1979 for all areas identified in step 1 that completed 1 year of growth by September 30, 1978.

Step 5: Accomplish evaluation surveys in Fiscal Year 1979 for those areas programmed in steps 2 and 4.

Step 6: Those areas identified in step 2 that have attained a stocking level above a defined minimum in terms of number and distribution of acceptable species will be considered satisfactorily stocked and certified as such. Those areas not satisfactorily stocked will be rescheduled for treatment based on priority guidelines.

Step 7: Reporting of evaluation surveys and certification will be accomplished following R-9 TMIS codes and guidelines.

Now can we go on to precommercial thinning and release?

PRECOMMERCIAL THINNING AND RELEASE (See Exhibit 2)

Step 1: Identify all areas that received precommercial thinning or release after September 30, 1976. This is similar to Step 1 for regeneration areas except we don't go back as far.

Step 2: Program evaluation surveys for Fiscal Year 1979 for all areas identified in step 1 that have not already received a survey.

Step 3: Accomplish evaluation surveys in Fiscal Year 1979 for those areas programmed in step 2.

Step 4: Those areas identified in step 2 that meet the treatment prescription objectives will be considered satisfactorily treated and certified as such (except for hand release of conifers). Those areas not satisfactory will be rescheduled for treatment based on priority guidelines.

Step 5: Reporting of evaluation surveys and certification will be accomplished following R-9 TMIS codes and guidelines.

Step 6: Program evaluation surveys for Fiscal Year 1980 and 1981 for hand release of conifer areas identified in step 1, depending on length of time since treatment.

We've now gone over the procedures that will be used to make the evaluation surveys. Let's say a few words about the reporting.

REPORTING OF CERTIFICATION

Step 1: Forest extract from District data base a listing of stands reported as certified during the current fiscal year.

Step 2: Listing is sent to District Ranger who checks over list and verifies the certification. Inaccuracies are lined out. The final list is then signed by the District Ranger and returned to the Forest Supervisor who corrects data base.

Step 3: The Forest Supervisor consolidates the listings from the District Rangers and submits the following information to the Regional Forester.

a. Certified acres planted or seeded

b. Certified acres of natural regeneration with site preparation

c. Certified acres of natural regeneration without site preparation

d. Certified acres of release

e. Certified acres of precommercial thinning

The Forest Supervisor will also transfer this data to a certification worksheet to be kept at the forest level in order to keep track of certification acres.

Step 4: Regional Forester consolidates data from Forests and submits certified acres to the Chief.

The proposed R-9 Supplemental TMIS codes are shown in Exhibit 3.

We have now tracked through the process but have left a few gaps. The gaps are primarily the anwsers to How? These are the areas where I mentioned at the outset that I would explain where more detail is needed. Bob Gillispie made the point quite clearly on Monday, we need to have criteria against which we measure success.

DEFINE MINIMUM STOCKING AND DISTRIBUTION:

This level will be determined from the current applicable silvicultural guide and forest land management plan objectives.

DEFINE INTENSITY OF SURVEY:

The intensity and specific method of doing the individual surveys will be dependent upon the objectives of the treatment prescription.

Still unanswered is the question of Who?

This is a question we haven't answered.

We do submit that:

The qualifications of the individual doing the work will depend on how detailed the instructions for the job are. Detailed survey instructions may allow for some or all of the surveys to be contracted to the private sector.

So there you have it. But before I entertain any questions - or raise any, as I promised to- I thought you might be interested in a quick estimate we made of the anticipated workload we might be talking about. It totals 135,000 acres.

ANTICIPATED WORKLOAD

Once the procedure is established and functioning it is estimated the following number of acres will need surveys annually.

Regeneration (1st and 3rd year combined)	-	86,000 acres
Precommercial thinning (1st only)	-	11,000 acres
Conifer hand release - no chemical (1st and 3rd)	-	20,000 acres
Other release	-	18,000 acres
Total estimated annual surveys		135,000 acres

O.K. Now the questions, or things that need additional discussion.

The ensuing discussion brought out the following points:

An administrative decision has been made that no other reforestation backlog will be recognized except that associated with the "magic" date of 7/1/75.

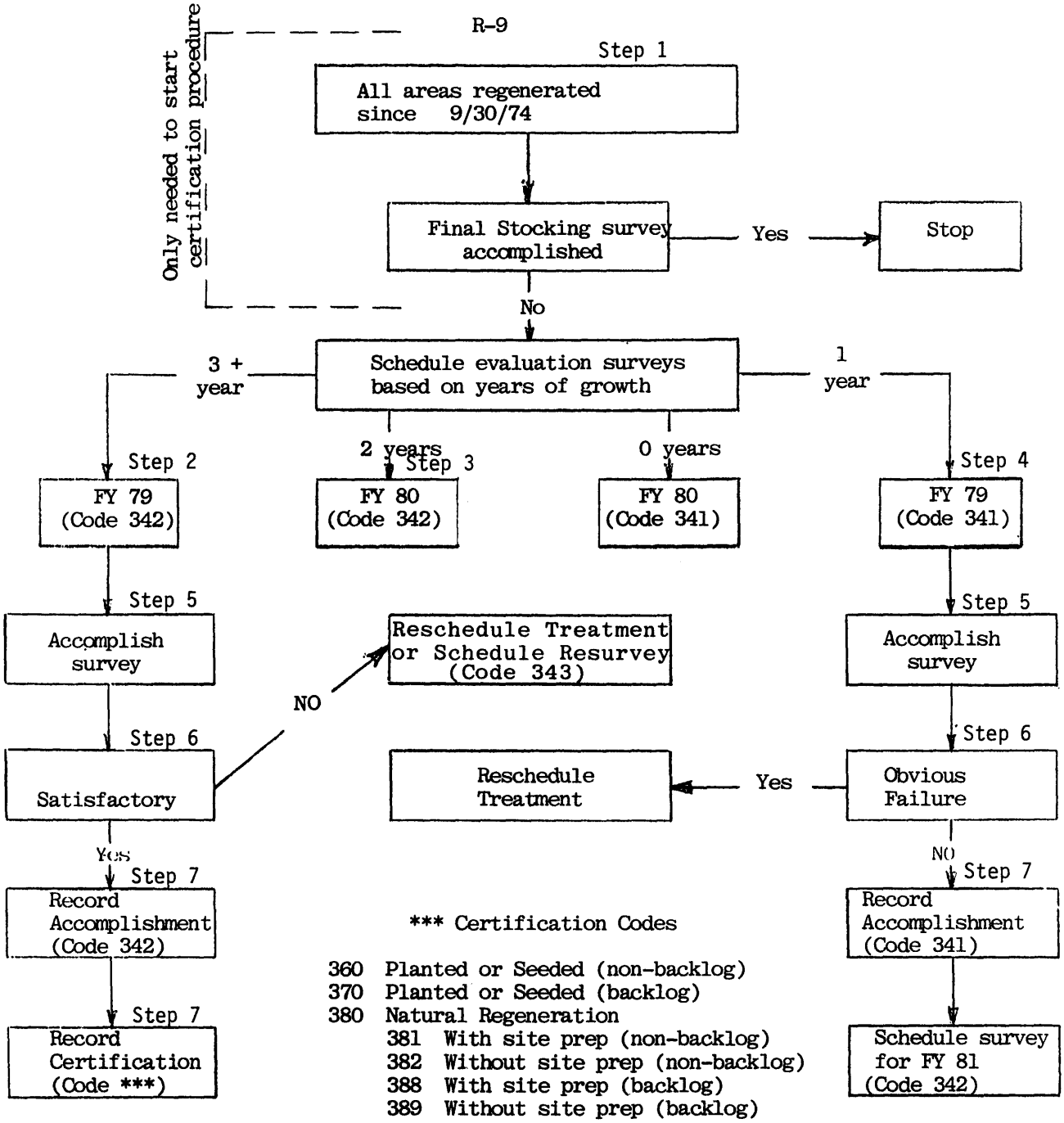
An additional category is being considered for certifying treatment but not success.

All treatments since 10/1/76 (the approximate date of NFMA) must be certified.

EXHIBIT 1

Initiation of Certification Procedure

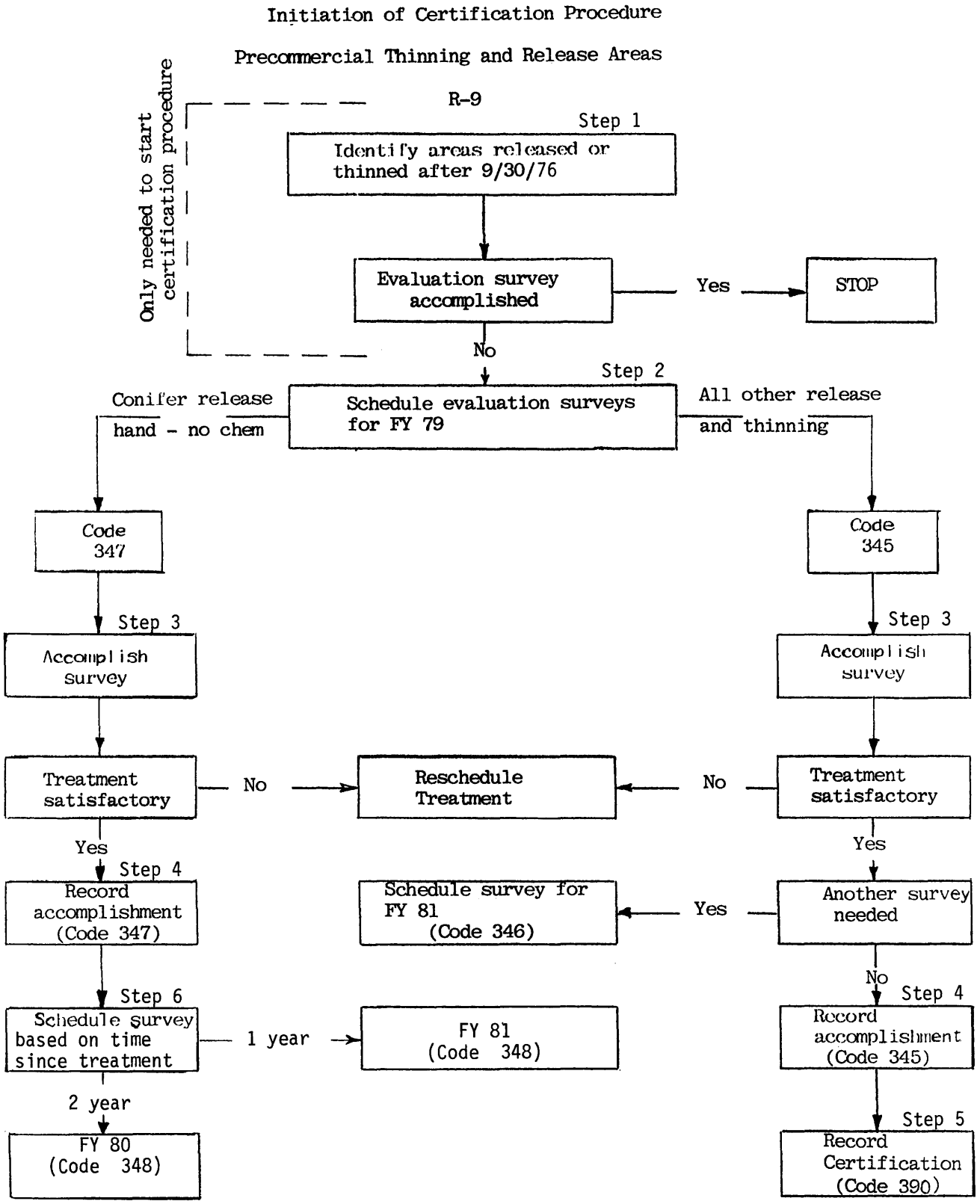
Regeneration Areas



*** Certification Codes

360 Planted or Seeded (non-backlog)
370 Planted or Seeded (backlog)
380 Natural Regeneration
381 With site prep (non-backlog)
382 Without site prep (non-backlog)
388 With site prep (backlog)
389 Without site prep (backlog)

EXHIBIT 2


Initiation of Certification Procedure
Precommercial Thinning and Release Areas
R-9
Only needed to start certification procedure
Step 1
Identify areas released or thinned after 9/30/76
Evaluation survey accomplished
Yes
STOP
No
Step 2
Schedule evaluation surveys for FY 79
Conifer release hand - no chem
All other release and thinning
Code 347
Code 345
Step 3
Accomplish survey
Step 3
Accomplish survey
Treatment satisfactory
No
Reschedule Treatment
No
Treatment satisfactory
Yes
Yes
Step 4
Record accomplishment (Code 347)
Schedule survey for FY 81 (Code 346)
Yes
Another survey needed
No
Step 6
Schedule survey based on time since treatment
1 year
FY 81 (Code 348)
Step 4
Record accomplishment (Code 345)
2 year
Step 5
FY 80 (Code 348)
Record Certification (Code 390)

PROPOSED R-9 SUPPLEMENTAL TMIS CODES

340 Post Treatment Examination Analysis
- 341 Reforestation stock/survival *(1st year survey)*
- 342 Reforestation stock/survival *(3rd year survey)*
- 343 Reforestation stock/survival (re-survey)
- 345 Timber stand improvement *(1st year survey)*
- 346 Timber stand improvement *(re-survey)*
- *347 Conifer release-hand-no chemical (1st year survey)*
- *348 Conifer release-hand-no chemical (3rd year survey)*

360 Certification of Planted and Seeded Areas (non-backlog)

370 Certification of Planted and Seeded Areas (backlog)

380 Certification of Natural Regeneration
- 381 With site preparation (non-backlog)
- 382 Without site preparation (non-backlog)
- 388 With site preparation (backlog)
- 389 Without site preparation (backlog)

390 Certification of Release and Thinning
- *391 Release*
- *392 Pre-commercial Thinning*

*Denotes Region 9 changes

Discussion on Prescription Coordination in Region 8

I. Introduction to Region 8's Silvicultural Examination Process — Karl Stoneking

II. A Walk Through of Silvicultural Examination Procedures with Emphasis on Coordination — Roger Dennington

III. Discussion of Specific Phases of R8's Prescription Coordination — Karl Stoneking

I. Introduction to Region 8's Silvicultural Examination Process

In Region 8, we have prescriptions with in place data covering about 95% of CFL land. Silvicultural examinations are done on 1.15 MM acres each year, i.e., 1100 to 1200 compartments a year. The silvicultural exams are done by Foresters, GS-9 and up with at least 1 year of timber management experience. They have attended a two-week training session on silvicultural examinations. Besides the timber management aspects, coordination and protection of other resources are covered at this training. Other training includes visual resource management and silvicultural workshops for specific timber species.

The forester does the silvicultural examination job and the write-up. He then has the personal knowledge and can use fully his professional judgment on what should done. This is the key to our procedure.

The silvicultural exam is the tool by which the objective of the Timber Management Plan or Land Management Plan is turned into annual programs of work. That is, the annual program planning information, for a District and Forest, comes from the actions planned in the silvicultural examination and prescription reports. In addition to the timber activities (sales, reforestation, TSI) annual planning information for land lines, R/Ws, roading, wildlife habitat work comes from our prescriptions.

The silvicultural exam is the means by which we--

--describe and map all productive land. This includes the reserved and deferred land.

--prescribe silvicultural treatments for all regulated forest land. That is, we want to determine if a silvicultural treatment is needed, and if so, what should the treatment be.

--keep a Continuous Inventory of Stand Conditions (CISC). CISC is our stand data file, whereby at any point in time, we have a current or up to date description and timber prescription for the regulated forest land.

--locate and identify acres where proposed silviculture treatments may conflict or enhance other land resources and uses. We determine the specific modifications neeed to enhance or protect the other resources, particularly those of soil, water, featured wildlife species, and aesthetics.

--obtain site specific data and information for the development of our timber sale program. The annual program harvest comes from these reports.

--provide site specific information concerning road access and land line needs.

--show, visibly for review, all the above and that the concern for the environment was an integral part of the decision-making process.

II. A Walk Through of Silvicultural Examination Procedures with Emphasis on Coordination

Compartment prescriptions are the cornerstone of our timber management on the National Forest in Region 8. No other document comes close to being "the one" that brings it all together for a given unit of National Forest land. It is in these prescriptions that we translate all the guidelines, policies, laws, and concepts that govern into an action plan that is the last step of planning before we get the job done. One tire company put it quite well in a commercial of yester year when they said "this is where the rubber meets the road." So it is with prescriptions. Prescriptions are where we bring our act together. The results of good (or bad) prescriptions are the results our stewardship of public land will be judged upon. We all recognize the far reaching effects - both to enhance or impair - that timber management activities have on other resources.

With this in mind, I'd like to hurriedly take you through the prescription procedures as we apply them to National Forest land in Mississippi with particular emphasis given to coordination with other resources. Other resources as applied here include soil, water, recreation, VRM, wildlife, range, and the cultural resources.

A great deal of the coordination with other resources takes place before the prescription is prepared. This coordination is in the form of management guides such as--

--FSH 2609. R8 Wildlife Habitat Management Handbook
--The Transportation System Plan
--Erosion Control Guides
--Landline Survey & Maintenance Plan
--Soils Resource Inventory - Southern Region
--Approved Timber Management Plans
--Approved Land Management or Unit Plans
--Guide for Streamside Management on the NF in MS
--FSH 2309.22 R8 Visual Resource Management Handbook

These plans and guides are a product of an ID Team approach. Public input is reflected in many of them. We require as a matter of policy that any deviation from them be clearly justified and documented in the prescription. Impacts and consequences resulting from any proposed activity, whether consistent or inconsistent with these guides must be adequately mitigated in the prescription.

The prescription preparation generally follows this route. First, the prescriber assembles all the maps, photos, historical data, and guides that will be used. After making a general overview of the area to be examined, the area is stand mapped in the office using aerial photograph interpretation skills. The prescriber then selects proposed and tentative regeneration areas based on the 1/ "pre-selection of regeneration areas" laid out in the TM plan. These are reviewed with the Ranger for concurrence or selection of other alternatives. This step is normally a good idea to help overcome some of the inexperience that prescribers may have and hopefully reduce the frustration of making major changes following the write-up.

Pre-planned travel routes are selected that will permit collection of accurate data and cause the prescriber to see those situations that have complex coordination problems.

During the course of the field examination and subsequent write-ups, advice from staff specialist is requested as needed by the prescriber.

The report is written with close consultation with the aforementioned guides and policy sources. A pencil draft of the report is circulated around through the district staff which includes folks responsible for sales, silviculture, wildlife, range, water, soils, and VRM Management.

Comments are returned to the prescriber with the prescription. These recommendations are incorporated into the prescription if the prescriber agrees. If not, consultation with the district staff member involved occurs. The Ranger resolves any unresolvable conflicts.

1/ Pre-selection is a process of determining approximately where and how much regeneration will occur in a Compartment during a ten-year plan period. The stands, or parts of stands, pre-selected for regeneration are identified in the TM plan.

A field review with the Ranger and other staff members will take place if the office review turns up controversial or questionable proposed activities.

The office review process is repeated by the Forest ID Team. Their comments are sent back to the district with the prescription and with instruction to either (1) type the prescription up and return for approval, or (2) incorporate the recommended changes and return for a second review.

Once or twice a year the ID Team will make a field review for those prescriptions pending at that time.

After approval, the jobs such as road surveys, rights of way acquisition and landline surveys are initiated. Just prior to the start of timber marking, the prescription is reviewed with the marking crew technicians to insure they understand and follow the prescription as it is written. During the preparation of the sale contract and the annual work plans that include jobs planned in the prescription, it is important the prescription be consulted to pick up the coordination requirements.

Other key points to consider are:

1. The prescription must be easy to read. If it takes wading through page after page of manuscript to determine the key coordinating points, it is likely some will be overlooked.

2. Say what needs to be done and do what it says.

3. Review prescriptions carefully before execution. Policy and coordinating requirements may have changed in the intervening months since approval.

4. Don't be afraid to amend a prescription to correct #3 above. The amending process should have ID Team review and Supervisor's approval unless it is deemed of minor consequence. The Ranger may otherwise make the change.

5. Develop an attitude in other resource staff specialists that they are to be positive and not negative in suggestions. Don't allow a "they v. us" concept to develop between district and Supervisor Office personnel.

6. Keep certification of prescribers or silviculturists strong and creditable.

7. Rangers cannot turn the prescription job over to others and only function as a signer on the "recommended line."

8. The prescription is an EAR and must meet the minimum requirements of such.

III. Discussion of Specific Phases of Region 8's Process

1. A lot of coordination with other resources is built into the long-range plans, policies, and direction for resource management. For example, a working group's regeneration acreage objectives are the result of pre-selecting for a 10-year period what stands will be regenerated. (The final selection occurs in the silvicultural exam process). This pre-selection process considers the wildlife species habitat which is to be featured, visual resource, transportation system and soil and water concerns. Other examples, are the coordination guides for wildlife habitat management, for streamside areas, for managing the visual resource, and for transportation system.

2. The order that compartments are to be entered (worked over) is set up in the TM Plan or Land Management Plan. This order of entry accomplishes several things:

   a. It provides a means of examining and prescribing treatments for all stands at least once during the planned period and then scheduling activities and treatments.

   b. The compartments are arranged so as to provide a fairly even flow of yields and provide a planned approach to transportation system development.

   c. Silvicultural exams are done 3 years ahead of the year they are scheduled to be entered.

3. A variation that occurs in our stand examination process is some prescribers make a preliminary recon of the compartment before studying the photographs. In this pre-recon, they drive accessible roads in or next to the compartment and verify roads and trails previously located on photographs or maps. In mountain or hilly terrain, viewing the area from an accessible vantage point is helpful in seeing the lay of the land, variation in forest types, accessibility, barriers, and use of private land. The time spent in scouting the area often results in location of efficient travel routes and proper selection of data collection intensity levels for each stand.

4. During the stand examination process, a prescriber will encounter a situation that requires assistance from another resource specialist (soil scientist, landscape architect, and hydrologist). He will have that specialist visit with him that special situation to work out a solution to the problem. Generally, these problem areas involve the visual resource, road locations and stream crossings, equipment limitations for sale and SAI work.

   Often, a prescriber will get together with a specialist and visit areas on the district to discuss application of guides. They will look at specific problem areas and discusss what treatments and how they can be carried out. This interchange then forms the basis to handle future problem situations.

5. The review of silvicultural examinations and prescription reports take many forms in R8. It boils down to the emphasis in which the line officer wishes to put on the process. All supervisors have prescription reports reviewed by all the S.O. staff. (Prescriptions are approved by the Forest Supervisor). Due to the number of prescriptions the Forest Supervisor approves each year, on-the-ground review of each one is not possible. Some on-the-ground is necessary and generally it consists simply of selecting several prescriptions and the Supervisor, his staff plus the Ranger and his staff, together visit the compartments. The review takes place at least two years ahead of the year scheduled for entry.

   Each Forest, I believe, has a different procedure for this review. Some Supervisors take their whole staff to the District to review the year's prescriptions, others have the Ranger bring the year's prescriptions into the S.O. for one big meeting, and others have the prescritions come into the S.O. as they are completed and then they are passed around to his staff.

6. Just prior to execution of the actions planned in the silvicultural exam, a review is again made of the prescription to see if the actions planned are still proper. Even with this short lead time on our prescriptions, we still have to sometimes modify the actions because of changes in regulations, policy, or procedures. This review is done so that the written plan for the action and what is happening on the ground is the same.

7. Follow-up reviews to evaluate completed actions of a prescription are done. The purpose of this evaluation is to see if the resource specialist enhancement or protection measures actually accomplished what it was planned to do. Also, was there areas in planning the action that could be strengthened? The ID team and/or staff make this review together with the prescriber so it can broaden the experience of all.

FOREST SERVICE STANDARDS FOR SILVICULTURE CERTIFICATION

John C. Tappeiner II - Region 5, California

Regions within the Forest Service have been training personnel via certification or other programs to qualify them to write silviculture prescriptions for forest stands. However, there are no national standards to act as guides in formulating training/education programs and in defining what skills and knowledge are required of a qualified sivilculturist. This presentation is intended to stimulate discussion about the need for standards for silviculture certification and about what the standards might be.

Observations and Assumptions

Based on my involvement in silviculture and silviculture certification, I have six assumptions which I find basic to training in silviculture in the Forest Service. Several of them were touched on by previous speakers from the other Regions.

1. Silviculture prescriptions are needed for a variety of purposes based on the needs of the various resources. A silviculturist must be able to manage forest vegetation for purposes including wildlife, aesthetics, hydrology, as well as for timber management. The prescriptions must include a thorough analysis of the ecosystem of which the vegetation is a part. They must be defensible, and they will frequently undergo close scrutiny.

2. "Certified Silviculturists" must demonstrate the ability to develop prescriptions for ranger district projects. Simply attending a training session is not enough. Experience in various timber management activities such as sale administration, planting, site preparation, TSI, sale layout is necessary background and part of training in silviculture.

3. Undergraduate education and early Forest Service training alone are not sufficient to sustain silviculturists through their professional career. Generally, undergraduate students and young foresters do not have the necessary background and experience to enable them to retain and use the silviculture information which they have been given. Therefore, continuing education and updating are necessary from time to time to achieve a high level of silviculture expertise.

4. Certification will evolve to a zone/vegetation basis. There is too much variability in vegetation and resource and administration considerations for a very general program. Therefore, each Region will have to have its own program and probably the National Forests will have to establish standards and at least minimal training of their own.

5. The certification programs will vary considerably among the Regions because of:

a. The nature of the vegetation and the background in research and experience in its management.

b. The availability and expertise of the people to do the educating and training.

c. The philosophy and background of the people responsible for the program.

6. Implementation and actual carrying out of the prescriptions will probably not be done by certified silviculturists; rather, a lot of this work may be done by inexperienced, part-time employees. A good prescription does not insure proper implementation, and additional training is needed for those who carry out the details of the prescription.

Need for National Standards

Most Regions have begun training/education programs in silviculture, so perhaps there is no need for service-wide standards. Some of the advantages, however, might include:

a. Review of the current programs to draw on their strengths and experiences will help to improve programs overall.

b. Setting standards at the national level would help to solidify the need for a high professional quality of silviculture in the Forest Service. The skills/knowledge inventory could help show that forest vegetation management is a highly professional job. Perhaps it would help us to get grade in silviculture positions based on technical competence and experience rather than on administrative capabilities or workload.

c. It would help facilitate movement of silviculturists among Regions by providing a common basis for training and a way to show how programs differ and what experience or knowledge transfers may need to gain.

Attached is a list of subjects which I consider to be a core of silviculture knowledge. It is divided into two parts: a) information which I feel is necessary for all Forest Service silviculturists, and 2) information pertaining to a particular Region or forest type. Ideally, all silviculture programs would cover the service-wide information as well as that necessary for their own local projects. Important areas of information such as hydrology, fuels and fire, and visual quality are not included here since this information may be provided in training sessions other than silviculture.

Also, this presentation does not attempt to identify the experience which may be needed to be a qualified silviculturist, and this needs to be done.

National Training In Silviculture

Regional silviculture certification programs are designed primarily to provide silviculturists who can write prescriptions on Forest and Districts projects. These programs probably will not provide a background and depth of information which is needed in setting guides and standards and implementing programs at the Regional level and in the future at the Forest level. Therefore, the Forest Service might consider implementing advanced education/training in silviculture similar to that provided in logging systems and timber management planning. The subject matter for such a program could be the Forest Service-wide material listed in the attachment. In addition, those selected for this program would specialize in a particular area such as regeneration, use of herbicides, growth and yield/mensuration, economic analysis, etc.

A Review of the Material Pertinent to Silviculture Certification:

FOREST SERVICE-WIDE	REGION/FOREST
A. General Silviculture	
1. Growth and yield a. Rotation - tree - stand b. Stand density effects Stand growth - tree characteristics & economics c. Thinning - thinning and stand growth - thinning grade - effects on rotation d. Growth of evanage unevenage and irregular stands. e. Growth models and yield tables - mathematics - use of yield tables - application of growth models f. Relationships to timber management planning	1. Growth by species, forest-type, and site. a. Stand structures b. Commercial and precommercial density and stocking guides c. Pathogen, insect effects d. Thinning guidelines e. Application of existing yield tables and growth models.
2. Silviculture systems a. Standard terminology b. Review of classical silviculture systems 1 - even age systems - clearcut - seed tree - shelterwood methods - coppice 2 - unevenage systems c. Historical and social review of	2. Prescription writing a. Regional policy b. Application of the systems to forest types. c. Application of silviculture systems to old growth or untreated stands d. Marking guidelines for sanitation, shelterwood, thinning, and unevenage or irregular stands.

silvicultural systems. d. Prescriptions & Forest management strategies	e. Need for modification of systems. f. Operational environment in relation to silviculture systems.
3. Regeneration a. Principles of potential dominance and site occupancy. b. Techniques of site prep and release - mechanical and chemical 1 - herbicides made of action 2 - Principles of toxicology, environmental monitoring, decomposition and fate of herbicides. c. Methods of artificial regeneration 1 - Production and use of bare root and container stock. 2 - Principles of care of planting stock d. Use and evaluation of natural regeneration (seed production through 5th year establishment) e. Principles of site selection	3. Regeneration a. Selection of planting site. b. Response of important shrubs, grasses and trees to fire, mechanical and herbicide treatments. c. Use of herbicides - regional techniques and policy. d. Regional nurserys and production and handling of planting stock. e. Techniques of planting and evaluation of plantation success. f. Techniques for obtaining natural regeneration by forest types. g. Seed production of major forest species. - seed crop periodicity - indicies of seed soundness and ripeness h. Regional seed collection and handling policies.

B. General Ecology and Physiology

1. Principles of population ecology. Application to plant, wildlife, insect, and pathogen populations.	1. Local plant and animal populations by forest types, region, habitat type, etc.
2. Principles of succession, climax vegetation.	2. Prediction of vegetation changes with and without treatment for important vegetation by forest type, etc.
3. Vegetation classification, and description. 4. Evaluation of microclimate (above and below ground).	3. Local examples of microclimate modification by silviculture treatments or systems.
5. Individual tree growth. a. Patterns of photosynthesis and water	4. Examples of local plant water potential, photosynthesis, and growth.

potential
b. Patterns of wood formation
c. Growth of shoots, leaves cambium, bark, roots
d. Nutrition

5. Tree vigor, risk, and crown classification systems for local species. Ability of trees to respond to overstory removal.
6. Local examples of effects of forest management on nutrient cycling.

6. Structure and function of forest stands.
   a. Biomass accumulation
   b. Biomass and nutrient distribution by stand components
   c. Mineral cycling

C. Soils and Fertilization

1. Soil formation and taxonomy gen. principles
   a. Classification systems
   b. Relationships of soil forming factors.
   c. Identification of parent material.
2. Soil structure and texture.
3. Water potential in relation to structure, texture and soil depth.
4. Soil fertility
   a. CEC
   b. pH and nutrient availability.
   c. base saturation
   d. nitrogen and phosphorus storage

1. Identification of local forest soil and parent material.
2. Water potential in important forest soils in relation to regeneration and growth.
3. Fertility of local forest soils; response to fertilization.
4. Local or regional techniques for estimating site.

D. Genetics and Tree Improvement

1. Review of basic genetics
   a. Population genetics
   b. Mendelian genetics
   c. Heritability of important characteristics
      1) tree form
      2) vigor
      3) disease resistance

1. Regional tree improvement programs.
   a. Design and theory
   b. Program implementation
2. Application of Regional program to silviculture projects
3. Local provenance tests, etc.

2. Types of tree improvement programs. Comparisons.

3. Effects of silviculture systems and management practices on gene conservation.

E. Forest Pathology and Entomology

1. Important diseases and insects by plant species and forest type.
   a. Life cycle
   b. Recognition
   c. Effects on stand growth or silviculture practices.
   d. Control by silviculture practice.
   e. Other control.
   f. Standards for evaluation.

2. Examples.
   a. Mistletoes.
   b. Stem decay fungi (logging and fire damage).
   c. Root disease.
   d. Rust fungi.
   e. Bark beetles.
   f. Defoliators.
   g. Tip moths.
   h. Disease and insect complexes.

F. Economics

1. General Theory
   a. Economic efficiency
   b. Time adjustment
   c. Investment theory
   d. Soil expectation value
   e. Internal rate of return
   f. Cost benefit analysis

2. Forest Service Policy
   a. Application
      - Region
      - Forest
   b. Predicting future values
   c. Rates of return

1. Application to District projects.

2. Use in EAR and project selection and evaluation.

G. Reference Material

1. General principles of silviculture

2. Use of economics in silviculture prescriptions and unit project planning.

1. Local information on the ecology of important forest types.

2. Silviculture research documents for local species and forest types (best references).

3. Information on local soil types.

4. Disease and insect information by local species and forest type.

SLIDE PRESENTATION - By Carl Puuri, Silviculturist, RO, R-6

PROCESS AND STATUS OF SILVICULTURIST CERTIFICATION IN REGION 6

After a slow start in the area of silviculturist certification, we in Region 6 can now say that the Region has a viable certification program.

Until 2 years ago R-6 had no certification program, but since September 1976 we have moved into the program very enthusiastically and aggressively. In the next few minutes, with the aid of a few slides, I'll briefly describe R-6's Continuing Education and Silvicultural Certification Program. I will also describe where we are now in relation to where we plan to go in the area of certification.

In R-6 silvicultural prescriptions are required for all timber stand treatments involving:

1. Timber harvest.

2. Reforestation.

3. Timber stand improvement.

In the Region, by Regional direction, the District Ranger is accountable for all prescriptions on his Unit. The Ranger's authority to approve prescriptions may be delegated to certified silviculturists. Therefore, we need a certification program.

The objective of certification is to identify people with a specified level of education and experience in the silvicultural field and also with a demonstrated competence to prescribe for silvicultural treatment.

Certification requirements include a current education. The education must be current with the state of the art of silviculture. The Region provides candidates Continuing Education opportunities to maintain and promote currency. Two separate education programs have been utilized by the Region.

1. R-6 Silviculture Institute Program with University of Washington and Oregon State University.

2. R-1 CEFES Program.

Both with graduate level education.

The R-6 certified silviculturist must also possess journeyman level experience in silviculture.

As a minimum we require:

1. Three seasons experience in reforestation.

2. Three seasons experience in TSI.

3. Three years experience prescribing for timber harvest.

In other words--whiskers plus an education are needed.

The third requirement is a demonstrated competence to prescribe for silvicultural treatment. We feel that there are people who may have an excellent education and experience but yet cannot put things into perspective sufficiently to develop sound prescriptions.

Therefore, we have the candidate for certification prepare a detailed prescription for a timber stand.

This is followed by a meeting between the candidate and a certifying panel consisting of experts in the silviculture-related fields plus a line officer. This panel reviews the candidate's thought process. The candidate must demonstrate an ability to use his experience and education in developing a sound prescription.

Approximately 80 percent of the people who enter the program successfully attain certification.

Region 6 certification periods are:

1. 4-Year - Meets all requirements.

2. 1-Year - Minor deficiencies have been identified by the panel. These deficiencies are to be corrected before meeting the panel again for a 4-year certification attempt.

R-6 Certification Status - I mentioned earlier that we had a slow start in certification. We feel that we must have 130 certified silviculturists in the Region to meet the Chief's direction requiring that all prescriptions be prepared or approved by a certified silviculturist. We now have 32 certified silviculturists.

We have a number of people in the process toward certification. 17 people will complete the CEFES program by November 1978 in CEFES VI. 25 people enrolled in R-6's Silviculture Institute Program--complete September 1979. There are 13 additional people in R-1's CEFES VII--completion November 1979. Project that by early 1980, R-6 will have 65 certified silviculturists or 50 percent of our 130 goal.

It is a slow and costly program, but the product of the program will be worthwhile.

Target Setting and Accomplishment

Much has been said and written in the last few years about setting reforestation and timber stand improvement objectives and attainment. The most recent emphasis is the Action Plan to accomplish the recommendations of the Chief's study "Evaluation of Reforestation and TSI on the National Forests". LaMont has just talked with you about this. I won't belabor this action plan except to say that the Chief is interested in seeing that this action plan is carried out and the programs improved.

(If this hasn't been said too many times before during the session, it is encumbent on each one of you to review this evaluation and action plan and get on with its implementation.)

Have handouts:

- Tables 6, 7, and 8 of the Evaluation of Reforestation and TSI on the National Forests, which shows targets, accomplishments and costs for the past few years thru FY 1976 and the Transition Quarter.

- Reforestation and TSI Comparison of Targets to Attainments, FY 1977 and FY 1978.

(Point out the continuing failure to meet targets.)

What are some answers? How can performance be improved?

- Assure realistic cost estimates and output capability when programs are developed.
    - RPA and short-term program plans
- Forecast changes in methods and costs
- Develop more expertise in planning.
    - Availability of nursery stock
    - Accurate inventory data
    - Productivity considered - stratify by site class - "most bang for the buck."
- Use of YACC and YCC.

(You may think of additional points for discussion)

In addition to the Action Plan, direction has come from at least two other sources to assure the reforestation and TSI job gets done:

- NFMA - Requires elimination of backlog by 1985, etc.
- Reprograming guidelines from the Appropriation subcommittees.
    - Must have Congressional approval to reprogram more than $250,000 or 10%, whichever is less, between budget line items. (Listing of line items attached)

In summary, must develop better long and short term program plans. Must accomplish the targets with the dollars appropriated.

Reforestation & Timber Stand Improvement
Comparison of Targets to Attainments
Fiscal Year 1977 and 1978

	1	2	3	4	5	6	8	9	10	Total
Reforestation (Acres)										
P&M - FY 1977 - Initial Targets	11,839	24,938	12,030	10,120	18,170	27,655	65,401	29,451	20	199,624
- Final Targets	11,996	21,328	7,771	10,120	18,645	28,412	61,940	29,451	20	189,683
- Attainment	11,256	20,316	6,697	9,661	18,205	26,514	50,312	33,830	-0-	176,691
FY 1978 - Initial Targets	21,567	16,206	7,822	9,869	18,330	37,860	64,347	29,999	-0-	206,000
- Final Targets	21,567	11,684	6,429	9,869	18,330	37,860	57,000	34,874	-0-	197,213
- Attainment (EST)	9,205	9,240	6,515	7,815	16,484	31,360	58,816	33,968	7,445	180,848
KV - FY 1977 - Initial Targets	32,635	6,430	11,057	10,408	18,558	112,665	69,878	25,088	1,550	288,269
- Final Targets	32,635	3,636	3,757	4,469	16,154	112,665	69,878	22,091	1,550	266,835
- Attainment	27,953	3,983	4,411	5,326	16,019	113,149	46,204	21,621	304	238,970
FY 1978 - Initial Targets	27,637	4,141	3,723	10,491	21,940	101,842	62,618	20,935	1,125	254,452
- Final Targets	27,637	3,730	3,634	10,491	21,940	101,842	48,366	17,680	228	235,450
- Attainment (EST)	17,914	1,593	2,601	6,865	14,444	83,467	49,376	19,158	3,319	198,737
Timber Stand Improvement (Acres)										
P&M - FY 1977 - Initial Targets	15,898	22,446	46,343	6,349	33,384	81,889	58,879	47,022	3	312,213
- Final Targets	11,891	22,372	44,647	6,349	23,184	62,161	55,320	46,009	3	271,936
- Attainment	14,246	28,212	44,423	7,802	13,814	60,408	45,983	42,150	363	257,401
FY 1978 - Initial Targets	20,134	18,168	31,674	11,855	28,055	60,129	75,327	41,658	-0-	287,000
- Final Targets	20,134	18,168	31,674	11,855	28,055	60,129	57,281	45,515	-0-	272,811
- Attainment (EST)	8,984	12,753	25,666	9,528	23,198	48,412	57,857	52,483	-0-	238,881
KV - FY 1977 - Initial Targets	20,482	15,358	43,231	10,724	23,890	58,826	17,344	12,192	2,434	204,481
- Final Targets	20,482	11,680	42,231	10,724	20,150	58,826	17,344	11,069	2,434	194,940
- Attainment	11,151	13,141	44,976	12,386	15,984	51,764	8,817	10,509	2,101	170,829
FY 1978 - Initial Targets	14,868	13,900	35,917	10,997	28,920	47,127	14,998	10,701	2,700	180,128
- Final Targets	14,868	13,900	35,917	10,997	28,920	47,127	13,740	10,918	2,730	179,117
- Attainment (EST)	9,744	12,790	20,791	11,320	23,971	41,555	11,083	14,668	2,831	148,753

PD&B - 9/20/78

Table 6

Acreage Accomplishment - P&M Reforestation (M Acres)

	1969	1970	1971	1972	1973	1974	1975	1976 & TQ	Total 1969-TQ
Region 1									
Target	22.5	19.5	16.8	34.5	29.1	22.4	21.1	31.0	196.9
Accompl.	19.3	14.9	18.5	27.3	26.2	23.1	24.7	29.7	183.7
% of Target	86	77	110	79	90	103	117	95	93
Region 2									
Target	11.5	7.9	6.0	7.5	8.0	7.6	6.7	11.2	66.4
Accompl.	6.8	7.2	4.6	5.3	5.2	6.2	5.8	7.5	48.6
% of Target	59	92	77	70	65	82	88	67	73
Region 3									
Target	4.2	6.2	6.0	7.1	8.5	9.2	8.8	14.6	64.6
Accompl.	4.3	3.1	3.3	4.0	5.0	9.1	7.5	11.5	47.8
% of Target	102	50	56	57	59	99	86	79	74
Region 4									
Target	11.9	9.3	10.4	10.0	12.4	10.6	16.4	12.2	93.2
Accompl.	8.9	7.0	6.3	6.9	6.2	6.4	15.7	13.0	72.4
% of Target	75	75	61	69	66	61	96	107	78
Region 5									
Target	25.3	19.0	19.3	27.6	18.9	9.0	14.3	12.1	145.5
Accompl.	21.1	18.5	14.1	18.2	18.3	9.6	14.4	15.9	130.1
% of Target	83	97	73	66	97	106	101	131	89
Region 6									
Target	15.8	20.0	24.8	35.7	40.6	25.4	20.8	28.1	211.2
Accompl.	15.4	16.6	20.4	21.2	22.1	18.2	19.9	25.3	159.1
% of Target	97	83	82	59	54	71	95	90	75
Region 8									
Target	70.0	69.1	93.0	119.5	84.3	48.4	59.9	66.4	610.6
Accompl.	60.8	62.9	82.1	92.2	71.6	44.9	53.6	57.0	523.1
% of Target	87	91	88	77	85	93	89	86	86
Region 9									
Target	51.0	44.7	51.0	57.9	48.5	32.6	29.1	31.5	346.3
Accompl.	42.2	41.1	42.7	41.0	43.2	31.9	32.0	35.1	309.2
% of Target	83	92	84	71	89	98	110	111	89
Region 10									
Target	--	--	R-10 has had a very minor P&M Reforestation Program that is included					--	--
Accompl.	--	--	in the totals, but it is not separated out here.					--	--
% of Target	--	--						--	--
TOTAL									
Target	212.2	195.7	227.3	299.8	250.2	165.1	177.0	208.1	1,735.4
Accompl.	178.8	171.4	192.2	216.1	199.7	149.5	173.7	194.9	1,476.3
% of Target	84	88	85	72	80	91	98	94	85

TABLE 7

ACREAGE ACCOMPLISHMENT
P&M Timber Stand Improvement (M Acres)

	1969	1970	1971	1972	1973	1974	1975	1976 & TQ	Total 1969-TQ
Region 1									
Target	4.3	8.6	19.0	53.4	32.0	46.5	33.8	37.7	235.3
Accompl.	8.5	14.3	16.4	29.9	20.4	25.9	29.2	30.3	174.9
% of Target	196	166	86	56	64	56	86	80	74
Region 2									
Target	6.5	3.5	2.7	7.4	7.7	3.9	10.3	13.3	55.3
Accompl.	4.6	1.8	.8	3.1	5.1	4.6	9.9	6.5	36.4
% of Target	70	52	31	42	87	119	97	49	66
Region 3									
Target	13.0	10.5	10.9	32.0	25.0	22.8	42.6	29.3	186.1
Accompl.	11.8	10.3	12.2	23.6	19.0	22.4	51.1	40.9	191.3
% of Target	91	99	112	74	76	98	120	139	103
Region 4									
Target	5.8	7.0	5.6	10.4	6.2	2.9	5.8	9.3	53.0
Accompl.	3.5	4.3	5.2	5.2	1.9	2.9	6.0	12.9	41.9
% of Target	60	62	93	50	31	100	104	138	79
Region 5									
Target	14.2	17.2	22.0	31.4	22.8	11.4	46.3	30.8	196.3
Accompl.	14.4	13.4	13.0	16.9	11.9	12.3	32.9	45.2	160.0
% of Target	101	78	59	54	52	108	71	146.7	82
Region 6									
Target	41.4	24.0	42.8	75.0	50.5	54.7	80.1	85.9	454.4
Accompl.	30.7	25.5	21.7	26.4	39.6	30.8	65.6	91.6	331.9
% of Target	74	106	51	35	78	56	82	107	73
Region 8									
Target	25.5	18.6	25.0	35.0	45.9	46.8	59.7	62.7	319.2
Accompl	19.0	19.0	23.6	50.6	40.4	33.8	48.9	57.8	293.1
% of Target	74	102	94	145	88	72	82	92	92
Region 9									
Target	45.8	38.1	40.0	41.0	40.3	29.7	37.9	42.2	315.0
Accompl.	30.0	34.6	23.0	34.9	32.1	28.5	32.1	46.8	262.0
% of Target	66	91	58	85	80	96	85	111	83
Region 10									
Target									
Accompl.	R-10 has had a very minor P&M TSI Program that is included in the totals, but it is not separated out here.								
% or Target									
Total									
Target	156.5	127.5	167.9	286.8	230.6	219.4	317.8	311.4	1817.9
Accompl.	122.4	123.4	115.8	191.8	170.4	161.1	276.1	332.2	1493.2
% of Target	78	97	69	67	74	73	87	107	82

Table 8. Summary of Field Reforestation and TSI Program Costs Per Acre

	Fiscal Year										
	1966 [3]	1967	1968	1969	1970	1971	1972	1973	1974 [4]	1975 [4]	1976 + TQ
	Dollars										
REFORESTATION [1]											
P&M FS [2]	80.72	80.74	79.42	82.23	105.93	101.08	146.26	138.90	138.75	160.59	222.66
	(80.72) [6]	(77.51)	(73.07)	(77.36)	(86.73)	(76.82)	(102.38)	(91.67)	(83.25)	(86.72)	(113.56)
KV FS [2]	85.78	88.53	82.85	93.40	97.70	120.22	126.99	122.23	116.15	147.93	188.75
	(85.78)	(84.99)	(76.22)	(82.19)	(79.14)	(91.37)	(88.89)	(80.73)	(69.69)	(79.88)	(96.26)
Total [2]	83.31	84.98	81.47	88.47	100.60	112.14	134.94	128.77	124.60	153.32	203.73
	(83.31)	(81.58)	(74.95)	(77.85)	(81.49)	(85.23)	(94.46)	(84.99)	(74.78)	(82.79)	103.90

	Fiscal Year										
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976 + TQ
	Dollars										
TSI [5]											
P&M FS [2]	25.35	25.59	28.62	28.48	29.83	40.80	47.40	51.08	63.82	62.09	71.65
	(25.35)	(24.57)	(26.33)	(25.06)	(24.16)	(31.01)	(33.18)	(33.71)	(38.29)	(33.53)	(36.54)
KV FS [2]	30.75	31.88	35.67	40.85	47.16	55.80	59.30	57.06	60.61	67.25	75.49
	(30.75)	(30.60)	(32.82)	(35.95)	(38.20)	(42.41)	(41.51)	(37.66)	(36.37)	(36.32)	(38.50)
Total FS [2]	28.36	28.97	32.86	36.05	39.88	49.96	53.06	54.11	62.13	64.07	73.16
	(28.36)	(27.81)	(30.23)	(31.72)	(32.30)	(37.97)	(37.14)	(35.71)	(37.28)	(34.60)	(37.31)

1/ All 033 obligations divided by acres planted and seeded.
2/ Excludes WO obligations.
3/ Tree improvement costs segregated and not included hereafter.
4/ Includes naturally regenerated areas on prepared sites.
5/ All obligations divided by acres released, thinned, pruned, and fertilized.
6/ Dollars in parenthesis are in terms of real 1966 dollars.

EVALUATING THE IMPACT OF LOSS OF HERBICIDES ON FOREST MANAGEMENT

by

R. E. Stewart and Walter H. Knapp[1/]

INTRODUCTION

Increasing public concern about the safety of herbicides, especially 2,4,5-T in forest management has resulted in various administrative and regulatory restrictions on use of these chemicals. Recent court decisions and regulatory review actions by the Environmental Protection Agency suggest that additional limitations on herbicide use are likely. The potential impact of such decisions on economic efficiency of forest management and forest productivity, however, is largely unknown.

Analyses of effects from cancelling use of 2,4,5-T or all herbicides on forest lands were conducted for the National Forest System throughout the United States and the State of Oregon, a major timber producing area with a large present use of 2,4,5-T. The methods used and results from both analyses are presented in this paper.

METHODS

Methods used to estimate effects of alternative management practices were similar for both analyses and were based on a technique used in the Region 6 Environmental Impact Statement for Vegetation Management with Herbicides

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1/ Principal Research Silviculturist, Division of Timber Management Research, WO and Silviculturist, Timber Management, Region 6, respectively.

the ponderosa pine and Douglas-fir types in Region 5; four vegetation types of the Douglas-fir region in Region 6; the loblolly pine, shortleaf pine, and white oak/red oak/hickory types in Region 8; and conversion of jack pine, aspen, and northern hardwoods to red pine in Region 9.

Four area analyses were conducted for the State of Oregon (Figure 1). The northwestern area was analyzed for the Douglas-fir/red alder/salmonberry type included in the Region 6 Forest Service assessment. Similarly, the southwestern area was analyzed for the Douglas-fir/tanoak/madrone and Douglas-fir/tanoak/chinquapin types and the Cascade Range analysis was based on the Douglas-fir/vine maple/ceanothus type. Ponderosa pine/ceanothus/manzanita, a type not included in the Region 6 assessment, was analyzed for eastern Oregon. Assessment teams were composed of small groups (3 to 6) silviculturists from forest industry, the Forest Service, and Oregon State University in each area.

Five alternatives were considered for the National Forest System assessment: (1) all methods available, present silvicultural investment level; (2) no 2,4,5-T, investment level increased to obtain equivalent effectiveness; (3) no 2,4,5-T, present investment level; (4) no herbicides, investment level increased to obtain

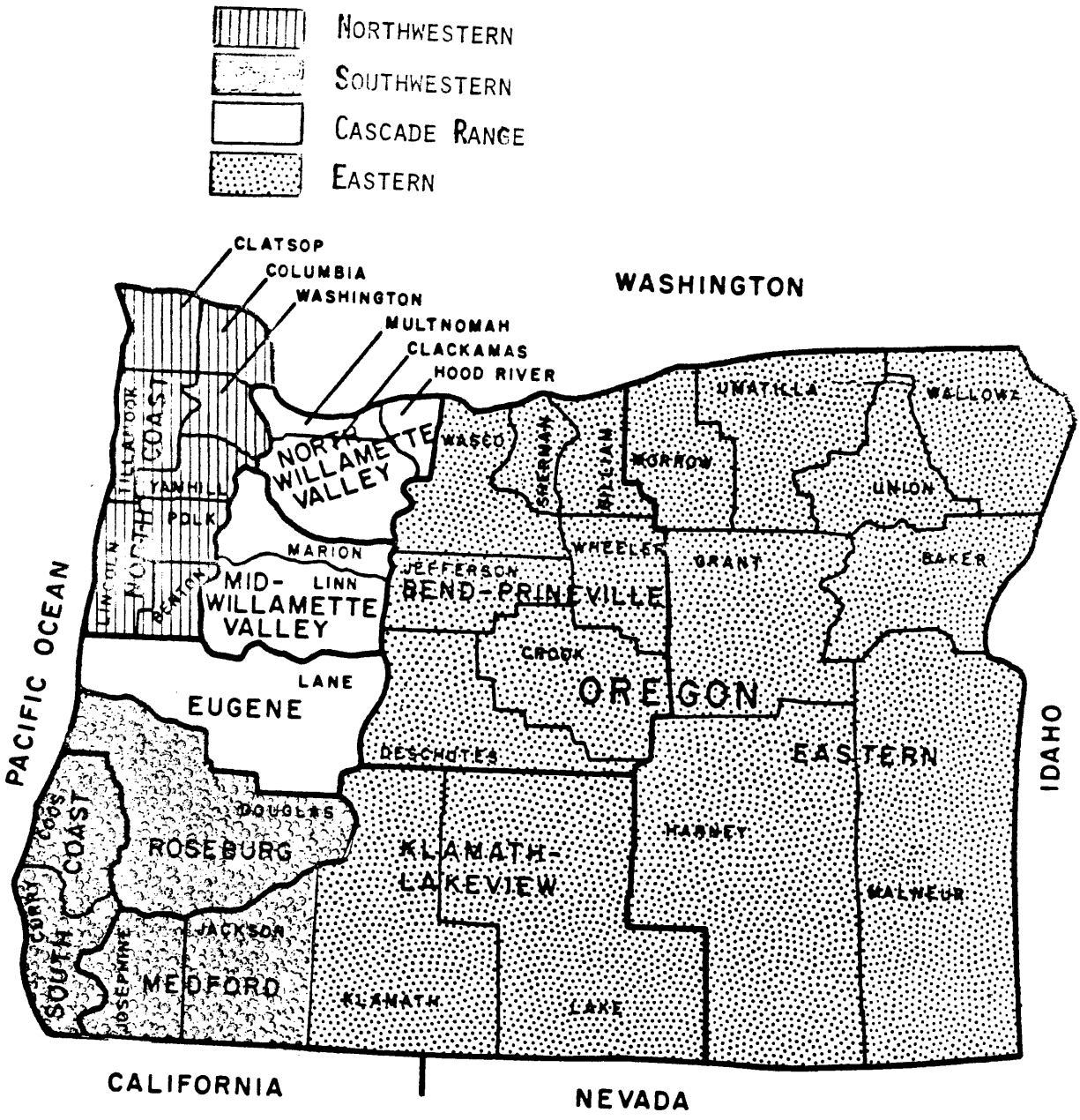

FIGURE 1. MAP OF OREGON SHOWING FOUR MAJOR GEOGRAPHIC AREAS.

equivalent effectiveness; and (5) no herbicides, present investment level. Alternatives 2 and 4 determine the increased silvicultural costs necessary to maintain present forest productivity while 3 and 5 determine the impact of restrictions on productivity if costs remain constant. Two alternatives, management with or without 2,4,5-T, were considered in the Oregon assessment. Silvicultural prescriptions without 2,4,5-T were based on the best available or most likely alternatives without regard to cost or productivity impacts.

Economic efficiency of the various alternatives as measured by present net worth and benefit/cost ratio was calculated on the basis of a 6 5/8 percent rate of return on investment as recommended by the Water Resources Council although other rates could also be justified. Costs of various silvicultural activities were assumed to increase at the rate of inflation and were not compounded. In contrast, stumpage values were allowed to increase at a real rate of 2 1/2 percent per year beginning at the 1980 RPA value. Historically, Douglas-fir stumpage price rose 3 1/2 percent annually and southern pines 3 1/5 percent annually between 1910 and 1970 (USDA Forest Service 1974).

RESULTS

The survey of Regional silviculturists in the National Forest System developed a schedule of project costs for various silvicultural practices as shown in Table 1. The silviculturists also estimated the proportion of commercial forest land in each Region that would require use of 2,4,5-T or any herbicides as a part of present management. The proportions needing 2,4,5-T ranged from 27 percent in the Pacific Coast section (Regions 5 and 6) to only 3 percent in the North (Region 9). About 45 percent of the commercial forest land in Regions 5 and 6 would use herbicides while only 6 percent would need treatment in the Rocky Mountains, Table 2. Silviculturists in Oregon estimated that 2,4,5-T is potentially needed for management on 75 percent of the commercial forest land in the northeastern and southwestern areas of the State, 50 percent in the Cascades, and only 19 percent in eastern Oregon.

Growth of the National Forest timber types analyzed would decline 11 percent if 2,4,5-T were banned and 32 percent if all herbicides were banned and silvicultural investment remained at present levels. Productivity could be maintained following loss of 2,4,5-T if investments increased 23 percent or $38 per acre; an increase of 11.8 percent or $196 per acre would be needed if all herbicides were lost. When applied nationally, total roundwood supply from the National Forests could be

TABLE 1. Costs of various silvicultural practices on National Forest lands by section in 1977.

Purpose and method	North	South	Rocky Mountains	Pacific Coast
	dollars per acre			
Hazard Reduction				
Broadcast burn	--	--	5-71	100-455
Machine pile and burn	--	--	35-80	160-150
Jackpot burn	--	--	25-45	35-50
Site Preparation				
Broadcast burn	14	3	15-71	--
Disc	50	40	83	45-70
Shear and windrow	--	90	90-110	60-125
Broadcast spray				
aerial	32	20	16	39-60
ground	--	32	--	79-125
Tree injection	62	50	--	42
Felling	162	150	48	200
Spray and scarify	--	--	--	120
Planting				
Manual	133	60	118-190	70-158
Machine	--	45	118	85
Release				
Broadcast spray				
aerial	32	20	15-20	26-60
ground	--	32	--	90-153
Tree injection	62	50	--	42
Manual	162	150	4-18	135-618
TSI				
Manual	--	11-60	60-122	60-122
Injection	--	50	60	60-100
Animal Damage Control				
Caging	--	--	--	130-180
Fencing	--	40	10-15	--
Baiting	--	--	35	16

TABLE 2. Estimated proportion of National Forest commercial forest lands using 2,4,5-T or any herbicide for management by section.

Section	Area of commercial forest land	Proportion of National Forest land needing treatment with:	
		2,4,5-T	Any herbicide
	million acres	percent	
North	10.4	3	15
South	10.8	22	43
Rocky Mountains	39.8	6	6
Pacific Coast	30.9	27	45

maintained without 2,4,5-T for an added cost of about $6.1 million per year (Table 3). At present investment levels, supply might decline by 52 million cubic feet. Without herbicides, $48.1 million additional investment would be required or roundwood supply could decline by 245 million cubic feet.

The Oregon assessment estimated potential yields would decline by 14 percent in the northwestern area, 17 percent in the southwestern area, 7 percent in the Cascades, and 4 percent in eastern Oregon if 2,4,5-T could not be used. This represents an average decline of 11 percent for the entire state on all commercial forest lands. Changes in silvicultural costs and timber yields on potential 2,4,5-T use areas in Oregon are shown graphically in Figure 2. Projected impacts of loss of 2,4,5-T on roundwood supply and employment (based on 7.51 jobs per million board feet primary and 15.02 jobs per million board feet secondary employment) are shown in Table 4.

The results of the Oregon assessment suggest that likely practices adopted by silviculturists in Oregon following loss of 2,4-5-T would result in 191 million cubic feet less wood available for harvest annually on a sustained yield basis. This could result in 19,542 fewer jobs in the wood products industry (both primary and secondary employment).

TABLE 3. Impact of loss of 2,4,5-T or all herbicides on roundwood supply, added silvicultural costs, and lost revenue from the National Forests.

Year	Total roundwood supply			Total added cost		Total Lost revenue[d]	
	With all methods[a]	Without 2,4,5-T	Without herbicides	Without 2,4,5-T[b]	Without herbicides[c]	Without 2,4,5-T	Without herbicides
	million cubic feet			million dollars		million dollars	
1980	2,519	2,467	2,274	6.1	48.1	48	229
1990	2,714	2,662	2,456	6.1	48.1	62	302
2000	2,917	2,864	2,643	6.1	48.1	82	403
2020	2,929	2,876	2,654	6.1	48.1	134	658

[a]From Table 37, p. 52 Outlook for Timber in the United States.

[b]Based on 159,628 acres per year, $38 per acre added cost and costs increasing at the rate of inflation.

[c]Based on 245,487 acres per year, $196 per acre added cost and costs increasing at the rate of inflation.

[d]Based on 1980 RPA stumpage values increasing at a real rate of 2 1/2 percent per year.

TABLE 4. Estimated impacts of loss of 2,4,5-T on roundwood supply and forest industry based employment in the State of Oregon.

Area	Annual supply			Average employment loss, 1980-2000		
	Present[a]	2,4,5-T	Difference	Primary	Secondary	Total
	million cubic feet			man days		
Northwestern	300	258	42	1546	3091	4637
Southwestern	563	467	96	3235	6469	9704
Cascades	530	493	37	1145	2289	3434
Eastern	400	384	16	589	1178	1767
State Total	1,793	1,602	191	6515	13027	19542

[a]Based on present intensities of management or level "A-1" from Beuter et al. (1976).

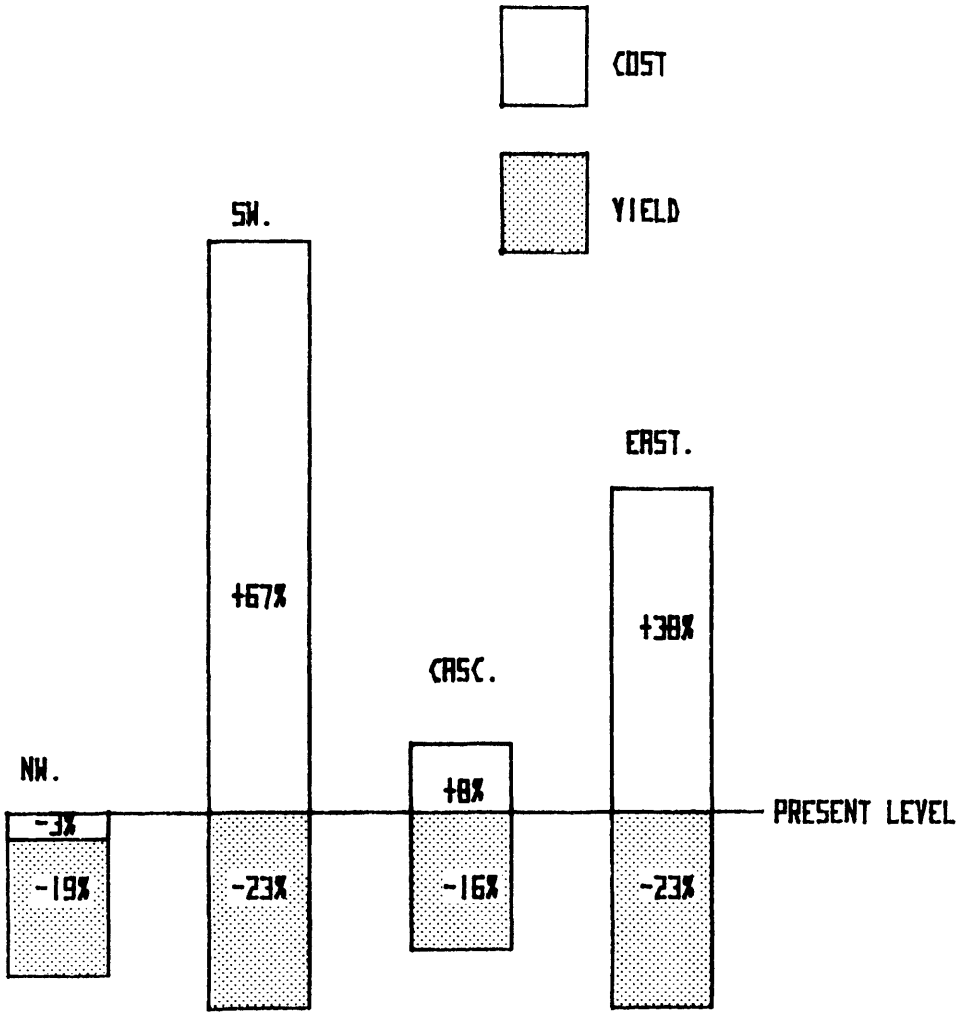

FIGURE 2. CHANGES IN SILVICULTURE COSTS AND TIMBER YIELDS ON POTENTIAL USE AREAS IF 2,4,5-T IS UNAVAILABLE.

Obviously, increased costs without corresponding increased productivity results in less efficient management. In both the National Forest System and State of Oregon assessments, substitutions of alternative vegetation management methods for 2,4,5-T reduced the return on investment. For example, loss of 2,4,5-T or all herbicides would result in the following changes in economics of loblolly and shortleaf pine management:

Alternative	Loblolly pine		Shortleaf pine	
	Present net worth	Benefit cost	Present net worth	Benefit Cost
	$/acre		$/acre	
All methods, present costs	779	8.55	411	5.28
No 2,4,5-T , costs increased	770	7.85	392	4.41
No herbicides, costs increased	747	6.53	237	1.88

For the State of Oregon, loss of 2,4,5-T would reduce present net worth by $350 per acre at a discount rate of 6 5/8 percent. Reduced economic efficiency of forest management on the National Forest has important implications in relation to Section 6 of the National Forest Management Act (NFMA) of 1976[2/].

2/ See Section 219.10d (2) (B), p. 39054 and pp. 39057-39058, Federal Register 43(170). August 31, 1978.

Both studies show that loss of 2,4,5-T would have significant impacts on forest land management. The analysis of alternatives on National Forest System lands also suggests that banning use of all herbicides in forestry would result in major reductions in wood supply and increases in forest management costs.

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