NAME
NOM Forest Eng. Course

NO.
Outlines

Carl Riecke, 16 Sept 75

NF: Karl Riecke

1. C B Analysis

RAM is too complicated, gadgetry

2. Moore, Knetsch

3. Investment decisions. -- e.g. building road
   - Length
   - Sizing (standard)
   - Timing
     - When to begin.
     - Staging
     - How long

4. O.c., social costs,
   - Multiple use
   - Same production
   - Externalities

5. Grazing o.c. & comp.

(Note tax bias)

Engineers & foresters, ca. 25-30.

3 days in a row.

Day 1: Straight teaching -- & evening assignment

Day 2: Apply tools to problems, & report back (Could use govt. offices)

Day 3: Criticize & discuss findings

Big issues to forest administrators

1. Length of roads. Patch-cutting.

2. "Attendant" of roads. (means durability, and protecting environment)

~~3.~~

3. Multiple use of roads.

Require wider roads when let in people w/o radios.

4. Interest rates
(Inflation)

Feb 11-19 - 2 -

20 people

Case Study.

1. Stein R. Done, See Report on decisions.
2. Canoe R. To be done.

Issues

1. What value to place land used for roads? (Value of land flooded out by B.C. Hydro)
2. ~~Se~~ To build or not to build.

   When to build. (2-4 lead time)

   Where to build

   For whom to build -- what functions. How share costs, avoid X-subsidy). (L. Ronacher could talk)

3. "Cash flow analysis." To Karl this means w/o considering externalities
4. Risk of avalanches (use flood control analogy, risk analysis)

4½. Grazing vs. trees.
5. Choice of i.r.

6. Sensitivity analysis (to i.r.)

7. Length of roads

8. Should forestry be used as revenue base?

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1. Volume; time; i.r. used; anticipated ~~Damage~~ price.

BM

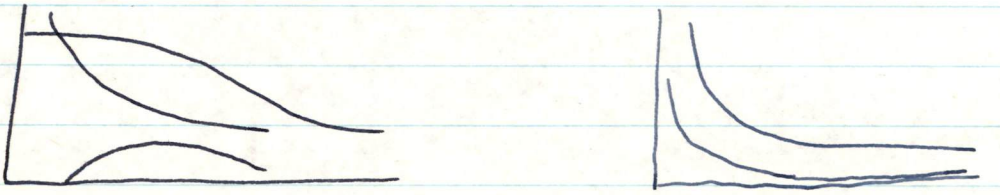
1. Stein R.

2. I send memo as needed

Models needed, Forest Engineering course. (Name each model crisply)

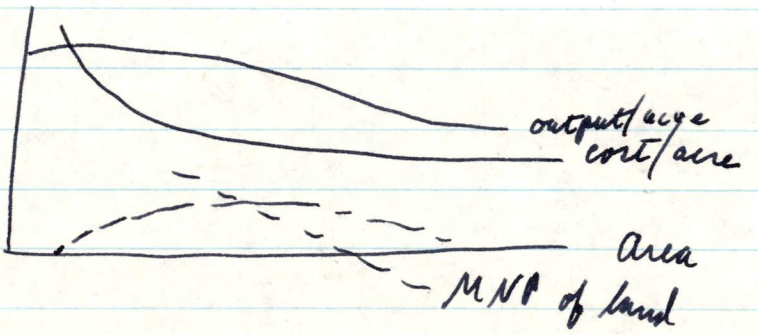
1. Cash flow anal., table.

2. Opt. life of an "engineering block" (or forest show, etc)



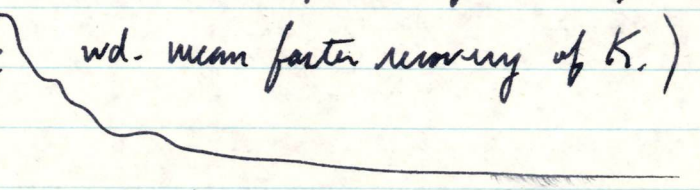
Also tabularly, and algebraically.
Effect of patch-cutting – raise PV of cap. costs. Make curve steeper, move max to right, & also make it smaller.

3. Opt. area of forest show. MNP of land



(N.B. For more land, roads must last longer (or capac. be Δd). Thus, smaller shows)

4. Moving PV; ripening wd. mean faster recovery of K.)



5. Math of fmcc: 4 basic formulae

6. Comparing grazing vs. forestry

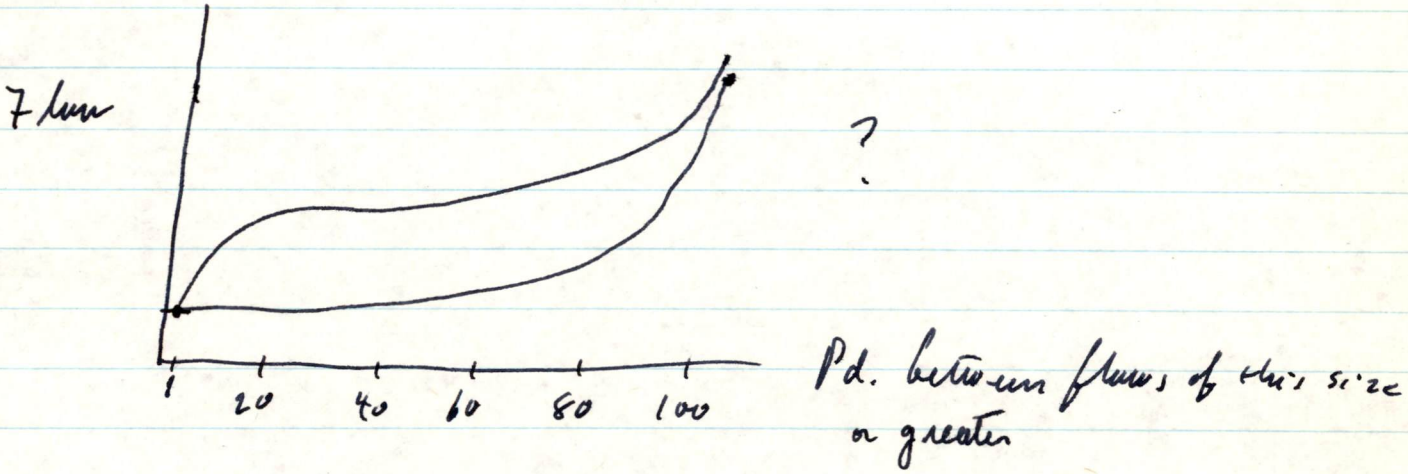
7. Opt. life of tree

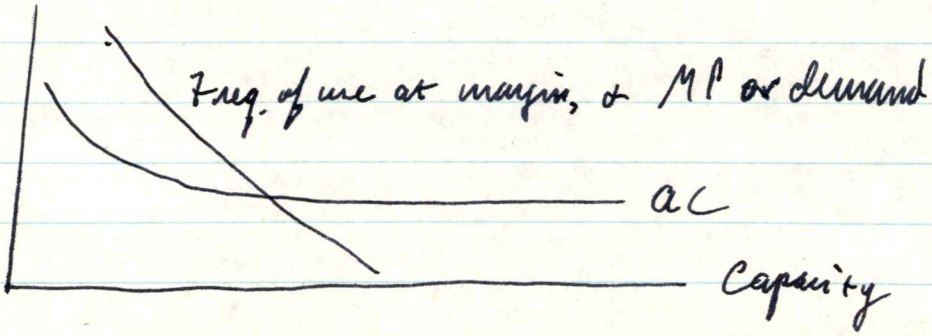
8. Opt. life of road

9. Probability -- some model.

E.g.

a. Given mean flow & dispersion, how much capacity to build? Same problem for water storage; flood control capacity; and avalanche protn, size of culverts, etc.



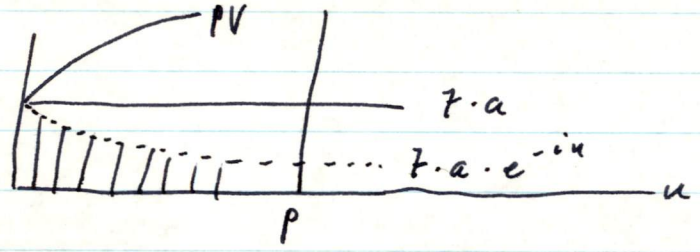


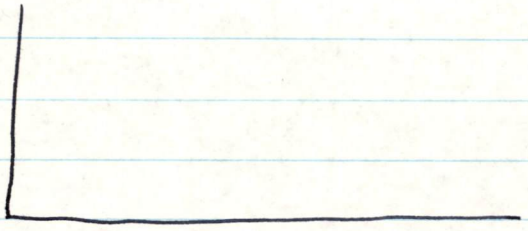
To measure productivity, take freq. of use, and as the probable time of use, take $\frac{1}{2}$ the pd. or $\frac{1}{2 \cdot \text{Freq.}}$

Thus if $F = \frac{1}{10}$, $P = 10$, $P/2 = 5$

No, too crude. Rather, let a = annual productivity if used

$$\text{Pr. Value} = F \cdot a \frac{1 - e^{-i \cdot 10}}{i}$$



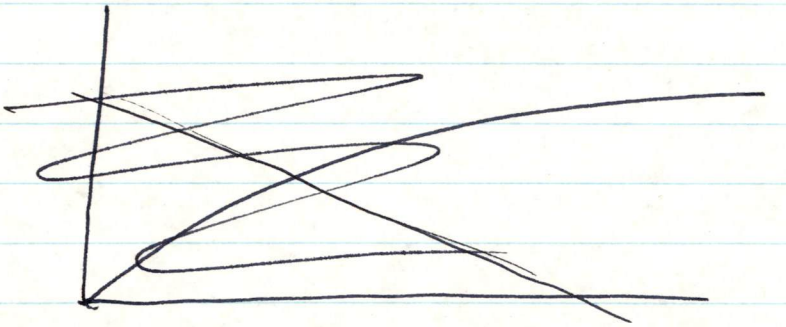


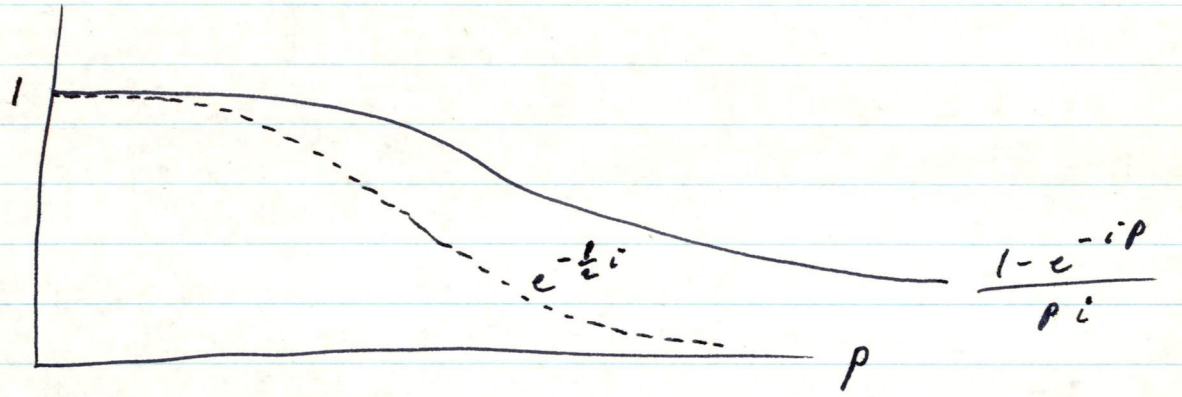
Cf. 2 alt. methods.

A. ~~$\left(Pd/2\right) e^{-i\frac{P}{2}}$~~ $\quad PV = a e^{-i\frac{P}{2}}$

B. $PV = Fa \frac{1 - e^{-iP}}{i}$

Which is greater? Let $a = 1$





$$e^{-\frac{P}{2}i} \overset{?}{<} \frac{1-e^{-iP}}{Pi} = \frac{e^{iP}-1}{\frac{e^{iP}}{Pi}}$$

$$Pi\, e^{\frac{Pi}{2}} \overset{?}{<} e^{iP} - 1$$

$$Pi \overset{?}{<} e^{\frac{Pi}{2}} - e^{-\frac{Pi}{2}}$$

yes, bas. rt. side grows exply.

Thus, for very large P, method A would seriously understate value of capacity.

E.g. let $P = 100$, $i = .05$

A. $e^{-50i} = .09$

B. $\frac{1 - e^{-100i}}{i} = 19.85$

$\frac{19.85}{100} = .198$

Thus, (A) understates PV of protection mgmt-capacity by 50%.

(Check lit., see how Eckstein etc. handle this)

Curve this, ~~for~~ on common scale & semi-log scale & log-log scale.

Further factor needed to avoid serious error. Call this, goes on in perpetuity, and capacity has a life, too. It goes on

~~As divide PV by $1 - e^{-iL}$, where L is life of capac.~~ for life of K, $\equiv k$.

So here is final formulation

R_p = value of damages or losses saved every P years.

d = economic life of ~~capacity~~ incremental capacity.

$$PV = \frac{R}{P} \frac{1 - e^{-di}}{i}$$

d may be less than P and still be productive.

d and P are independent.

Now, cf. this method vs. using higher i.r. to allow for risk.

10. Amortizn. schedules: SL, SF, etc.

11. Appraisal procedures ~~are~~ w.r.t. capl.

E.g. if TFL required to patch cut, and build road way ahead, he gets reimbursed slowly. But then is he stuck for interest?

12. L'Hopital's Rule

13. How long to build for

A ~~13.~~ Elasticity of warranted cost w.r.t. added life.

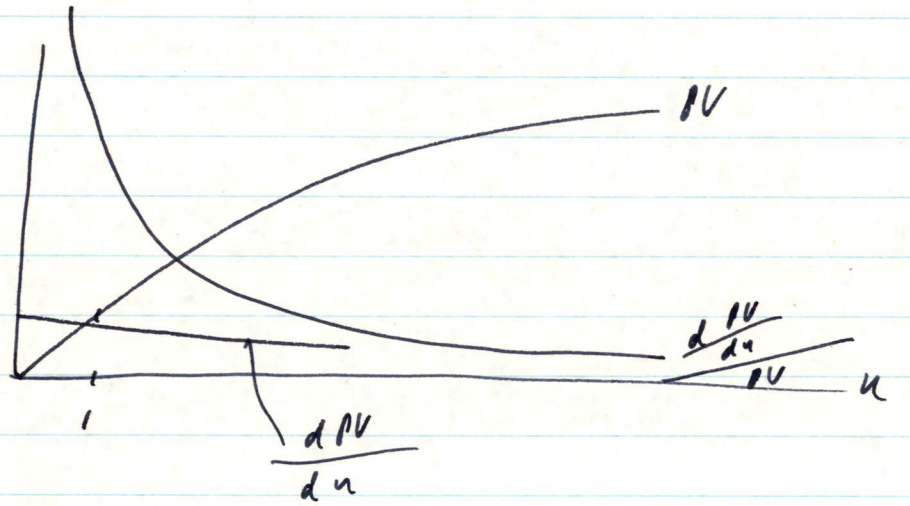
$$\frac{\frac{d\,PV}{dn}}{PV} \div \frac{dy/dn}{n}$$

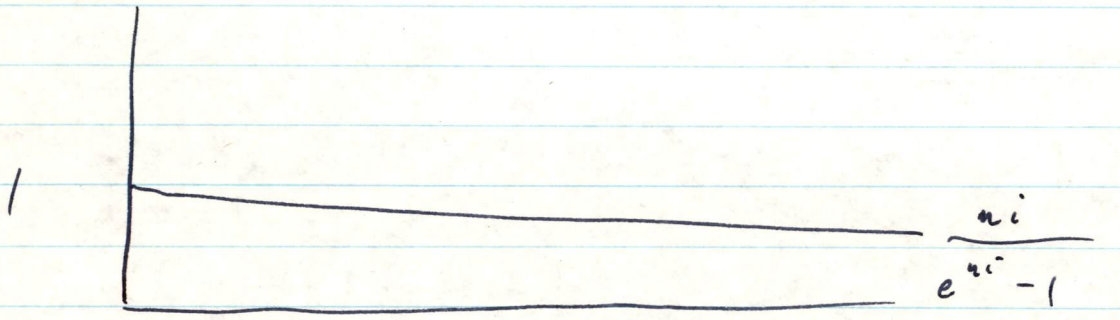
$$PV = \frac{1 - e^{-in}}{i}$$

$$\frac{d\,PV}{dn} = \frac{1}{i}\left(- - ie^{-in}\right) = e^{-in}$$

$$\frac{\frac{d\,PV}{dn}}{PV} = \frac{e^{-in}}{\frac{1-e^{-in}}{i}} = \frac{i}{e^{in}-1}$$

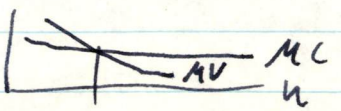
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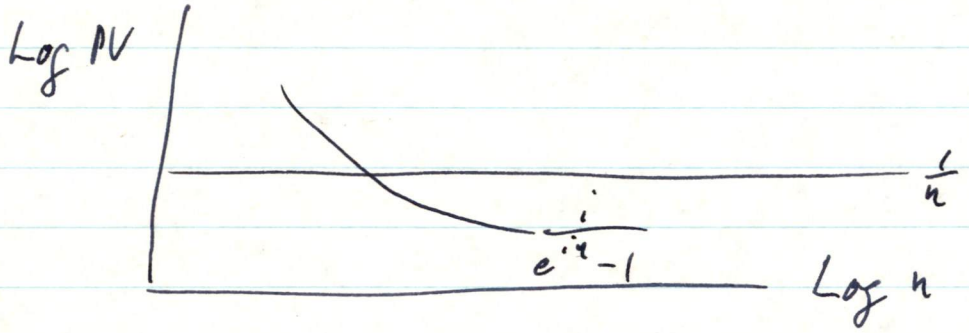


This is a useful approach to show how limited are virtues of longevity.

But more generally, tells you how ~~the~~ long to build for: how much added cost for how much added life.

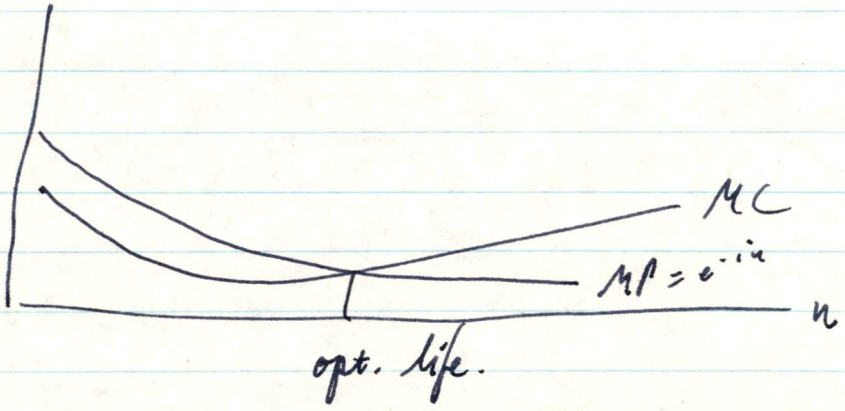


Then, plot on log-log scale, etc.



And add a land cost.

B. Basic model



C. Precede (B) by forest life.

Transmit thru opt. book inventory

Then go to B, road or other life.

1. Trade off

a. R.O.W - width

i) Land cost

Valuation of land
ROW cost v. Cap. cost. Routing choices

ii) Capl. cost.

~~Life~~ Timing; When; staging; life.
Width
Length.
Standard (of speed)

iii) ~~Flood protection~~, washout protn.. Risk.
Risk avoidance by middle mgrs.

b. Multi-use of roads.

Recon
Developmental leading sector role.
Maint costs, avoid X subsidy

c. Env. protn, Streams, rec. & con.

d. Taxn. of roads

0. "Objective function". Purpose. What maximize.

1. Go or no go

2. When to begin. Ripening

3. How long

a. Construction period

b. Logging period. (A.C.; "guidelines", e.g. 50% on first pass, bec. the Stein may be small part of PSYU)

To find: trends; status of PSYU cut, etc.

To find: guidelines used in Kamloops Forest Distr. for Stein, & P.G. for Canoe

c. Reforestation.

TSHL, 7-10 years for "proper restocking";

≡ 33%. (TSHLs began in 1969).

Will get data on reforestn.

TFLs reforest w/in 2 years, bec. cost is taken as a cost in appraisal. Also, ACE.

d. Standard of construction, re durability; flood protn.

Road costs

1. "Stumpage offset."

2. "Ledger system": Amortize road over several years so much per unit as wood is hauled out.

Notice - it's expensed on inc. tax.

Roads lead their use by a year.

Valuation. Hydro r.o.w. for power. 200 - 300' wide.

Issues, Stein & Carmac Rivers.

Begin w. 2 basic tools. 1. Cap. thy. } then apply.
2. MNP thy. }

When to build: to begin: staging; countin. pd.
Where to build -- routing options. K vs land cost.
How long to build -- length.

St. and ends:

Width
Speed limit
Life -- K vs. opg cost
Env. protn.

Area of each show -- determined by spurs, etc.

Peaking capacity for disasters etc.

Multi-use. Logging; recrn; leading sector for gnrl. use.
Sharing costs.
Organizational risk -- motivation problems of middle mgrs., how avoid conservative bias?

Taxn. of roads

Choice of i.r.

Rate of cut from eng. blocks.

Bob Willingham (228-2127) 228-4264 (NEW NO.

30 ~~trust~~ people

50% ~~$$$%~~ repeaters

Mostly coastal; but Stein uses interior units. (i.e. conversion factor, chip volumes, etc.)

Taxes. 1) Is an operation submarginal if it would go in the absence of taxes?

2) Are there multipliers? Do they justify losing?

Wood is "overmature", but not "decadent" in Stein

~~$$$~~ $66^2 = .1$ acre

$66 \times 66 \times 10 = 1$ acre

$8 \times 8 = 64 = \frac{1}{681}$ acre

---

40 year cutting period planned on Stein.

What price is needed (over 40 years) to justify developing? ~~Pay~~ Distribution matters

Idea - include short-lease qns. in course?

Day 1 Feb. 17 2:3/4 hrs.

Schofield on BCA

1. Def. of B & C
   Tangibles & intangibles
   Primary & relary
   (Non-efficiency considerations ~~#~~ Distributive)
2. Valuation
   Quantify intangibles
   Demand curves

3. Decision criteria.
   PV, internal rate, B/C

4. Discount rate

5. Uncertainty & risk. (brief treatment)

~~4:30~~
~~3 PM~~

Course outline ~~by~~ Monday PM (by Wed)

Gunter will pick up

Suggested readings.

1. Ecs of Utilizn. of Comm. Timberland, N. Cal.
2. Ec. Decision analysis.
3. Schofield outline, CBA
4. Outline for my presentation
5. .. .. Walter. Recrn. vs lumber, trade-offs.
6. Go through reprints, e.g. from civil servants course.

ECONOMIC ANALYSIS FOR FOREST ENGINEERING

A dialogue between economists and Forest Service middle-managers February 17 - 19, 1976, Student Union Building

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and
University of Victoria

TUESDAY, FEBRUARY 17

9.00 - 11.45 Professor John Schofield, Department of Economics, University of Victoria

"Basics of Cost-Benefit Analysis"

12.00 - 1.00 French lunch, "Sauve-qui-peut"

1.00 - 2.00 Break into 5 6-person committees to prepare statements on how applying principles to recent, current or future decisions might have changed or change them. It is also fair to suggest how the cases might change the principles.

A. Definition of Benefits and Costs
B. Valuation principles
C. Decision criteria - what to maximize?
D. Priorities - which project comes first?
E. Selecting the class of the road.

2.00 - 3.15 Committee spokespersons report to group
Hold strictly to 15 minutes each.

3.30 - 4.30 Response by Professor Schofield and staff.

WEDNESDAY, FEBRUARY 18

9.00 - 10.15	Professor Gerald Walter, Department of Economics, University of Victoria "The Economic Management of Multiple Use Forests"
10.30 - 11.45	Professor Thomas Lambe, School of Public Administration, University of Victoria "Interest, inflation, and risk".
12.00 - 1.00	English Lunch "On Your Own"
1.00 - 2.00	Break into same committees, same rules

A. Pricing policy for road users: recoupment and allocation.

B. Prices as conversion factors among forest outputs

C. Present worth as a decision criterion

D. Selecting an interest rate

E. Allowing for risk

2.00 - 2.45	Committee C, D, & E spokesmen report to group
2.45 - 3.30	Professor Lambe and staff respond
3.30 - 4.00	Committee A & B spokesmen report
4.00 - 4.30	Professor Walter and staff respond

THURSDAY, FEBRUARY 19

9.00 - 11.45	Dr. Mason Gaffney, Executive Director B. C. Institute for Economic Policy Analysis "Project Design, Economic Optimization, and Forest Service Policies"
12.00 - 1.00	Mexican Lunch, "Sal si puedes"
1.00 - 2.00	Same committees, same rules A. Could the Stein be viable? How? B. Economic life vs. Allowable Cut and Guidelines C. Road standards - are they economically optimal? D. Washout protection - how much is warranted? E. Reforestation - can the investment pay?
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4. Valuation of timber stand, & site.

Rotation age.

4. Multi - use of roads

Allocate costs among uses.

To find: data on recreation demands.
(Jack Krutsch?)

General direct: agric., mining, stream