Raymond D. Ratliff, Susanville

E. J. Woolfolk, Chief, R&MWR

R&M Programs (Harvey Valley—Herbage Utilization)

The long delay in acknowledging receipt of your 1961 Harvey Valley utilization data is regretted. I intended to discuss the subject with you on your recent detail to this office, but didn’t find the time.

It appears that you have done a fine job, Ray, of setting down the procedures followed and summarizing the resulting data. If these results are to ever get beyond the storage files, you will need to prepare some sort of a manuscript for publication. You could do this one of several ways—write two papers (one on the procedure and one on results), write one to include both aspects, forget the procedure and write one on herbage utilization during a drought year, or maybe even go down to the species level and report the variations observed between vegetation types on a seasonlong unit, a unit grazed the first half and a unit grazed the last half. I think this last suggestion might be a good approach.

Just before Mert went on leave last week, he indicated that he had not yet looked at your material. Therefore, these suggestions are being made without benefit of his advice.

You might think some on this subject, Ray, and go ahead if the idea appeals to you, then we can discuss the whole matter on April 11 or 12. Your records are returned herewith.

E. J. Woolfolk

Enclosure

EJWoolfolk:ils
TO: Director, Pacific Southwest Forest and Range Experiment Station

FROM: R. M. DeNio, Director
Division of Range Management

DATE: March 1, 1962

SUBJECT: Management

Reference is made to Mr. Rummell's and Mr. Woolfolk's discussion in regard to Mr. Hormay's work for the Division of Range Management in F.Y. 63. Unless we hear differently from you we will plan the budget the same as for F.Y. 62.

We must apologize for this office's lack of communication with Hormay this past year. We can assure you that it was not lack of interest in his work nor lack of appreciation of the job which was being done. We fully intend to participate more closely in this project in the coming year. We have been pleased with the comments and interest shown by the Region after Hormay's visits.

In our memo of February 7 to Regional Foresters we requested that they advise you of their need for services of Mr. Hormay. We anticipate that you will receive numerous requests from the Regions. We hope that a rather full schedule during the field season will be worked out for Hormay. Mr. Smith of this office is planning to spend at least two weeks in the field with Mr. Hormay this summer, preferably a week in two different Regions. At this time Smith is scheduled for a trip to Region 4 June 12-20, 1962. It is hoped that Hormay can arrange his schedule to Region 4 to coincide with Smith's trip. Region 4 will be requested to consider a combination trip in their plans as well. Smith will make arrangements to fit his schedule into Hormay's time in another Region after receiving Hormay's field schedule.

A year ago Hormay suggested that he prepare a training course on the principles of rest-rotation. We are interested in this program and are looking forward to reviewing a curriculum if it has been prepared.

In the past year there has developed a need for some material explaining rest-rotation and other deferred use systems of grazing management which can be used for I&E purposes and also training. It is suggested that Hormay keep this problem in mind, prepare an outline, and get some illustrative photographs for a brochure on grazing management systems,
as a part of his work during F.Y. 63. We should not confine this publication to the situation at Harvey Valley but perhaps tie it in to over-all planning of rotation systems and use other range areas as examples of where the different systems can be applied.

Enclosed is a copy of a memo from Region 1 which will be of interest to Mr. Hormay.

Enclosure
Mr. A. L. Hormay  
Pacific Southwest Forest & Range Expt. Station  
c/o Dean's Office  
1 Giannini Hall  
Campus  

Dear Gus:  

After going over California Brushlands with an editor I found that several of your comments were helpful. Among other things, the title of the report which you proposed was adopted.  

So many reviews of the paper have been made by well qualified persons that the proposed changes made in organization, topic arrangement, etc. seems to be nullified. However, I was glad to get these various reactions.  

Sometime I'd like to chat with you about plant keys. I find that the key in this report is readily workable and about as brief as it can well be. Until a better key can be made we'll have to go along with this one. An outstanding weakness in Dayton's Important Western Browse Plants, it seemed to me, was the fact that there were no keys.  

Thanks for your comments.  

Sincerely,  

[Signature]  

A. W. Sampson  
Professor of Forestry Emeritus  

AWS:pba  
cc: E. J. Woolfolk
Chief, Forest Service  
Attention: R. M. DeNio and K. W. Parker  

Keith Arnold, Director, by  

Range and Wildlife Habitat Programs  

Attached, in accordance with Mr. DeNio's letter of March 1, is a major heading outline of the proposed training course. It is designed for Forest Service personnel but can be adapted to other audiences. The full course entails roughly 3 days of indoor classroom activity and 2 days of field work. The classroom part is the most important, and where field observations are not feasible will constitute the course. Even this part can be cut back for particular audiences. But at least 2 days' time is needed in any serious training effort. Photographs, color slides, and charts will be used in the classroom work.

Nothing short of a course like this will suffice to get the principles of rest-rotation grazing across. Preparation of I&E material on grazing management systems should await exposure of Service personnel to this course. Eventually, I believe, forest and region personnel will want to prepare their own brochures. Mr. Hormay can help in their preparation.

Funds for travel and supplies for the extension project were exhausted in October of last year. The program for the coming fiscal year promises to be somewhat heavier than last year so a larger budget than provided last year will be needed. In addition, funds will be needed this fiscal year for visual aids, charts, etc., for the training course. About $200 will be needed for this purpose.

We suggest a travel budget of $3,500 for F.Y. 1963. Also, funds will have to be provided for Hormay to travel to R-4 in June to meet Mr. Smith. He could also go to R-3 this F.Y. if funds for such a trip were provided.

We would like your comments on the outline, along with any suggestions for its improvement.

Fred W. Bacon

Attachments.

xcw-WO

ALHormay/EJW:dn
Training Course
Rest-Rotation Grazing Management
(For Forest Service Personnel)

Classroom Work

I. Introduction
   A. Forest Service responsibility in management of national forest ranges. Regulation G-2.
   B. Importance of grazing in multiple use management.
   C. Purpose and scope of training course.
   D. Training approach.

II. Character of western range lands.
    A. Vegetation, topography, climate.
    B. Types of ranges.
    C. Importance of bunchgrass type.

III. Condition of ranges.
    A. Meaning of condition.
       1. Vegetation
       2. Soil
    B. Examples of condition.
    C. Causes of condition.

IV. The range management problem.
    A. Vegetation production.
    B. Livestock production.
    C. Specific objectives in management of grazing.
    D. Management tools.
V. Vegetation production.

A. Background for understanding.
   1. Plant growth requirements.
   2. Soil requirements.

B. Grazing management theories.
   1. Proper use (degree).
   2. Graze-rest.

C. Rest-rotation grazing system.
   1. Significance of rest.
   2. Design of system.
      Examples.
   3. Special features.
      (a) Forage reserves.
      (b) Soil fertility, improvement.
      (c) Place of cultural practices.

VI. Livestock production (under rest-rotation grazing).

A. Background for understanding.
   1. Seasonal trend in forage nutritive values.
   2. Effect of grazing on seasonal forage yield.

B. Factors affecting:
   1. Stocking.
   2. Season of grazing.
   3. Livestock distribution and handling.

C. Application of factors.
   1. Season-stocking.
VII. Multiple use considerations. 1/2 Hour

A. Watershed.
B. Timber production.
C. Wildlife (Fish and Game).
D. Recreation.

VIII. Economic considerations. 1/2 Hour

A. Cost and returns.
   1. Increased range productivity.
B. Cost sharing other interests.

IX. Planning rest-rotation grazing management (for allotments). 1/2 Hour

A. Consider multiple use problems.
B. Delimit area suitable for livestock grazing.
C. Design grazing management scheme and plan cultural treatments.
D. Determine present and potential grazing capacity.
E. Consider economic questions and special problems.
F. Check plan for soundness and practicability with permittee and others directly concerned.
G. Initiate management.

X. Information needed for planning rest-rotation grazing. 1/2 Hour

A. Maps

Vegetation-soil types.

Area used and usable by livestock; by game.

Key grazing areas.

Cultural treatment areas.

Range facilities.
B. Vegetation types.

Area.

Species composition, density, yield, vigor.

Utilization.

Condition-trend.

Grazing capacity.

C. Soil types.

Descriptions.

Suitability for cultural practices.

Condition-trend.

D. Plant species.

Forage value - palatability.

Phenology - key species.

XI. Appraisal of results. 1/2 Hour

A. Range condition trend.

B. Forage utilization.

C. Livestock weights.

XII. Practice in designing rest-rotation grazing systems. 7 1/2 Hours

Specific allotments.

20 Hours, Total.
Field Work

Subjects: 16 Hours

I. Plant succession.

II. Range condition.

III. Range utilization.

IV. Key areas, key species.

V. Range trend.

VI. Multiple use problems.

VII. Other.
PACIFIC SOUTHWEST
UNITED STATES GOVERNMENT  FOREST AND RANGE EXPERIMENT STATION
F. O. Fox 245, Berkeley 1, California

Memorandum

TO : E. J. Woolfolk, Chief, RM&WHR

FROM : A. L. Hormay, Range Conservationist

DATE: March 15, 1962

SUBJECT: R&WH Programs (Research program work schedule A. L. Hormay
March 15, 1962 to March 15, 1963)

The following bears primarily on the research phase of my assignment. The range extension program is still too indefinite to permit even general scheduling except for the tentative commitments to Region 5 and Region 4, and work on the range training course. These are included in the calendar on page 3.

Old studies
This year, like last year, I plan to round up old studies for publication as well as work on special studies related to rest-rotation grazing management. In addition to the paper on 2,4-D spraying, I hope to complete a manuscript on cattle data (accuracy of weights, number of animals needed for group comparisons, etc.) by the end of May. The data have been in the machine processing mill for some time and the first output of results is expected early next week.

The main body of data from the bitterbrush study on the Blacks Mountain Experimental Forest, dealing with the effect of protection from cattle grazing on reproduction and growth of bitterbrush, has also been turned over for processing. However, I understand the data cannot be punched on cards before July 1 because of prior scheduling of other work. Additional data has to be collected on this study this year involving about 4 man-days work. This information will not be processed by machine.

At our recent research program meeting, Everett Doman and his group expressed interest in the effect of logging and forest regeneration on grazing capacity, and on bitterbrush in particular. I have data from Burgess Spring in the file bearing on these subjects. Remeasurement of plots would provide a picture of trends over a 26-year period. The bitterbrush plots probably could be remeasured in about 10 days; I could do this alone. The grazing capacity plots, however, would take an estimated 40 man-days' time and the services of two men. What do you think? This would provide two meaty publications.

Special studies
To date I have planned to work on but two studies bearing on rest-rotation grazing--one, techniques for measuring vegetation composition and density, and the other, techniques for measuring range utilization. These procedures are used in appraising results from rest-rotation grazing. So far I have found time to work only on the vegetation composition-density study. I see no prospect of going beyond this, this year.
I have been firming up ideas on a photographic and a grid method of measuring vegetation composition and trend. Inability to get on the ground and follow through on scheduled photographs and measurements, because of other commitments, has slowed progress, particularly on the photographic method. However, I have accumulated sufficient leads on the grid method to feel I can formulate the procedure and start checking it out this coming season. It is rather essential that I get measurements of the vegetation in early growth, at full development, and in the fall after it is grazed. I am planning my field schedule accordingly and hope I can hold to it. I am preparing a study plan for this coming work.

I would like assistance in setting up and completing my black and white photograph file. I am going to need it more than ever in connection with the range training course. The need is for clerical help that can stay with the job until completed. About $100 will be needed for prints for the photo file and for the photograph methods study this fiscal year.

Can you set these up for slack time during the summer? The girls are pretty busy right now (4/30) and will be then the 7/1. OK if they can do this when most offices are in the field. Wait as long as possible in TY for expert of 7/10 - then check with DN.
<table>
<thead>
<tr>
<th>Date &amp; Place</th>
<th>Project</th>
<th>Work days</th>
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<tbody>
<tr>
<td><strong>March 15-May 22</strong></td>
<td><em>(Travel time 5 days)</em></td>
<td>field research</td>
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<tr>
<td>Berkeley</td>
<td>1. Cattle weights, manuscript</td>
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<td>2. Study plan, grid method</td>
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<td></td>
<td>3. Photograph file</td>
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<td>4. Range training course</td>
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<tr>
<td>Field</td>
<td>5. R-5 toe point</td>
<td>3</td>
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<tr>
<td><strong>May 23-June 6</strong></td>
<td><em>(Travel time 15 days)</em></td>
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<tr>
<td>Field</td>
<td>1. Bitterbrush Blacks Mountain</td>
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<td></td>
<td>2. Vegetation techniques</td>
<td>6</td>
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<tr>
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<td>3. Size-up of job remeasuring Burgess</td>
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<td>Spring timber plots</td>
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<td><strong>June 7-10</strong></td>
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<td><strong>June 11-21</strong></td>
<td>Extension R-4</td>
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<td><strong>June 22-July 8</strong></td>
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<tr>
<td><strong>July 9-13</strong></td>
<td><em>(Travel time 5 days)</em></td>
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<tr>
<td>Field</td>
<td>R-5 toe point</td>
<td>3</td>
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<tr>
<td><strong>July 14-22</strong></td>
<td>Not scheduled</td>
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<tr>
<td><strong>July 23-Aug 3</strong></td>
<td><em>(Travel time 12 days)</em></td>
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<td>Field</td>
<td>Vegetation technique</td>
<td>8</td>
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<tr>
<td><strong>Aug 4-29</strong></td>
<td>Not scheduled</td>
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Aug 30-Sept 5
Field

(Travel time 7 days)

1. Bitterbrush Blacks Mountain 2
2. Vegetation techniques 3

Sept 6-30

Not scheduled

Oct 1-13
Field

(Travel time 13 days)

Vegetation techniques 10

Oct 14-Nov 15

Not scheduled

Nov 16-Mar 15

Range extension reports

Manuscripts

1. Effect protection bitterbrush
2. Effect trees bitterbrush
3. Effect trees grazing capacity
4. Others perhaps
Mr. A. L. Hormay  
Pacific Southwest For. & Range Expt. Sta.  
c/o Dean's Office  
1 Giannini Hall  
Campus

Dear Gus:

The list of species discussed in the browse paper is enclosed herewith. I'm glad that you're interested in a trial at keying them out.

Editorial work is coming along nicely, with Joe Fabry assigned to the task. He's good.

Best wishes,

Sammy

A. W. Sampson

AWS:pba
Enc.
KEY TO PLANT GROUPS

1. Trees
   Woody plants with a single main trunk with branches on the upper part; usually more than 8 feet tall.

2. Shrubs
   Woody plants with a number of main branches arising from near ground level; usually less than 8 feet tall.

3. Shrub-like Plants and Vines
   Erect or creeping plants with woody stems near ground level and somewhat herbaceous above or stems semi-woody throughout.

4. Spiny Plants
   Plants with prickles, thorns, or spines on the stems or branches.

5. Strong Scented Plants
   Plants with pleasant or unpleasant smelling herbage; often resinous, tarry or aromatic. Odor most noticeable in crushed foliage.
KEY TO SPECIES

Group I. Trees

A. Leaves small, 1/8 inch long or less, numerous covering the branchlets completely like scales on a fish, aromatic
   Plant bushy 2 to 15 feet high; flowers inconspicuous; fruit berry-like reddish brown. Lower altitudes. (Fig. 1)
   (1) Juniperus californica
   Plant usually of tree form, 10 to 65 feet high; flowers inconspicuous; fruit berry-like, blue black. Higher altitudes.
   (2) Juniperus occidentalis

B. Leaves large, 1 inch long and 1/4 inch wide or larger, not as in A
   1. Stems and larger branches crimson, terra-cotta or brownish red, polished, smooth
      Leaves 3 to 6 inches long; flowers white; fruit berry-like, orange colored to red (Fig. 2)
      Leaves 1 to 1 1/2 inches long (Fig. 3)
      (73) Arbutus menziesii
      (69) Arctostaphylos manzanita

   2. Stems and branches not red as above, usually greenish, white, gray or brown; if reddish, rough
      a. Branch ends thorny
         Leaves alternate, toothed; flowers white; fruit a red or yellowish plum (Fig. 4)
         Leaves opposite, not toothed, entire; flowers inconspicuous; fruit berry-like, red, 1/4 to 3/8 inches long
         (42) Prunus subcordata
         (64) Shepherdia argentea

      b. Branch ends not thorny, flexible
         (1) Leaves opposite
            (a) Leaves divided
               Leaves palmate, flowers pinkish white; fruit pear-shaped 1-1/2 to 2-1/2 inches long, with 2 large glossy brown seeds (53) Aesculus californica
               Leaves pinnate
               Leaflets 5 to 9, toothed
               Leaflets hairy; flowers cream-colored; fruit red (Fig. 5) (80) Sambucus racemosa var. callicarpa
               Leaflets glabrous; flowers white; fruit blue, covered with whitish bloom (Fig. 6)
               (79) Sambucus caerulea
               Leaflets 5 to 7, not toothed, entire
               Lateral leaflets on petioles 1/8 to 1/2 inches long; winged seed about 1 inch long. Desert areas.
               (75) Fraxinus velutina
               Lateral leaflets sessile; winged seed 1 to 2 inches long (Fig. 7) (74) Fraxinus oregona
(b) Leaves not divided; either lobed or entire
Leaves palmately lobed, the lobes pointed and toothed
Leaves 1/2 to 1-3/4 inches wide; lobes 3 to 5; flowers greenish yellow; winged seeds in pairs, diverging at an oblique angle; straw color or reddish; wings 1/2 to 1 inch long
(Fig. 8) (52) Acer glabrum
Leaves 2 to 4-1/2 inches wide; lobes 5 to 7 (11); flowers reddish-purple; winged seeds in pairs, spreading horizontally; wings 1/2 to 1 inches long, reddish when ripe
(Fig. 9) (51) Acer circinatum
Leaves entire; elliptical 3 to 5 inches long; "flowers" white, sometimes tinged with green or pink; fruit scarlet, 3/8 to 5/8 inches long in dense head-like clusters
(Fig. 10) (67) Cornus nutallii

(2) Leaves alternate
(a) Leaves entire, not toothed nor lobed
Leaves sessile or nearly so, lanceolate, margins revolute; flowers inconspicuous; seed with a long twisted silky plume-like tail
(33) Cercocarpus ledifolius
Leaves petioled, margins not revolute
Leaves willow-like, elongate
Leaves 1 to 1-1/2 (4) inches long; broadest above the middle; flowers showy, yellow in catkins 1/2 to 1 inch long
(5) Salix scouleriana
Leaves 2-1/2 to 4-1/2 inches long, broadest at the middle, pungently aromatic. Flowers yellow green; fruit 3/4 to 1 inch long, greenish becoming dark purple when ripe
(Fig. 11) (26) Umbellularia californica
Leaves not willow-like; broad
Leaves roundish, heart shaped at base; flower red-purple; fruit like a pea pod 1-1/2 to 3-1/2 inches long, dull red when ripe
(Fig. 12) (45) Cercis occidentalis
Leaves ovate, strongly 3 veined from the base; flowers blue varying to white; capsules glandular and black when ripe 1/8 to 3/16 inch broad
(59) Ceanothus thyrsiflorus

(b) Leaves lobed or toothed or both
Lobes or teeth on upper part of blade
Leaves 1/4 to 1/2 inch long, sessile, 3 to 5 lobed, margins revolute; flowers yellow; seed with a long plume-like tail
(37) Cowania mexicana
Leaves 1/2 to 1 inch long, petioled margins not revolute; flowers inconspicuous; seed with a long plumule-like tail

Fig. 13) (32) Cercocarpus betuloides
Lobes or teeth on both upper and lower portions of the blade
Leaves lobed, lobes toothed or entire
Lobes toothed; the teeth bristle tipped; flowers inconspicuous; fruit an acorn 1 to 1-1/8 inches long

Fig. 14) (16) Quercus kelloggii
Lobes entire; flowers yellow or orange colored; capsule 3/4 to 1 inch long, densely bristly hairy.

Fig. 15) (63) Fremontia californica
Leaves toothed, not lobed or only obscurely so
Leaves double toothed
Leaves roundish; bark smooth; flowers bright red, fruit a smooth nut, 1/2 to 5/8 inches long enclosed in a leafy sac

Fig. 16) (12) Corylus rostrata
Var. californica

Leaves elliptic-ovate; bark scaly; flowers inconspicuous; seeds born in small cones
Leaves rusty, hairy beneath, margins revolute. Marshy bottoms near the sea, Santa Inez Mtns. to Del Norte County

(9) Alnus oregona
Leaves green beneath, margins not revolute. Sierra Nevada and Coast Ranges except strip occupied by A. oregona.

(8) Alnus rhombifolia

Leaves not double toothed, in one series
Teeth spine tipped; flowers inconspicuous; fruit an acorn 1 to 1-1/2 inches long

Fig. 17) (13) Quercus wislizenii
Teeth not spine tipped
Teeth large and coarse
Teeth 3 to 7 or more blunt, short; flowers inconspicuous; fruit an acorn 3/4 to 1-1/4 inches long

Fig. 18) (15) Quercus douglasii
Teeth, several on both edges of the blade but not at the tip or base; hooked upward; flowers inconspicuous; seeds cottony hairy

Fig. 19) (7) Populus fremontii
Teeth small, few to numerous
Leaves roundish, about as broad as long; bark gray white, not fissured except on older stems, flowers inconspicuous; seeds coryne hairy (Fig. 20) (6) Populus tremuloides

Leaves ovate, longer than broad
Leaves strongly 3 veined from the base, branchlets green strongly angled; flowers purple grading to white; capsule glandular and black when ripe, 1/8 to 3/6 inch broad (59) Ceanothus thyrsiflorus

Leaves not 3 veined from the base
Leaves 3/4 to 2 inches long
Petioles 1/8 to 1/4 inch long; flowers white; fruit a red to purple-black cherry (Fig. 21) (40) Prunus emarginata
Petioles 1/4 to 1/2 inch long; flowers inconspicuous; seeds winged 1/8 inch long, borne in erect catkins (10) Betula fontanaalis

Leaves 1-1/2 to 3 or 4 inches long
Leaves unequal sided and heart shaped at base; flowers inconspicuous; fruit about 1/4 inch wide, dark brown or orange when mature. Desert areas. (17) Celtis douglasii

Leaves not unequal sided at base
Petioles about 1/2 inch long; flowers white; fruit a red or purple cherry (Fig. 22) (41) Prunus virginiana var. demissa
Petioles 3/8 to 3/4 inch long; flowers inconspicuous; seeds borne in small cones (8) Alnus rhombifolia
KEY TO SPECIES

Group II. Shrubs

A. Stem and larger branches crimson, terra-cotta or brownish red, polished smooth
   Leaves 1 to 1-1/2 inches long
   Leaves ovate, pale green. Foothills.
   (59) Arctostaphylos manzanita
   Leaves roundish, bright green. Mountains, timber zone.
   (68) Arctostaphylos patula

B. Stems and branches not red as above, usually green, white, gray or brown; if reddish, rough or fissured
1. Leaves pinnately divided
   Leaves opposite
   Leaflets 5 to 9, toothed
   Leaflets 2-1/2 to 6 inches long, glabrous
   (79) Sambucus coerulea
   Leaflets 3 to 6 (8) inches long, hairy
   (80) Sambucus racemosa

   Leaves alternate
   Leaflets 3, variously lobed or toothed, 3/4 to 2-3/4 inches long
   (50) Rhus diversiloba
   Leaflets 3, 4, or 5, not lobed or toothed, entire, 1/4 to 1/2 inch long
   (46) Lotus scoparius

2. Leaves not divided; either lobed, toothed, or entire
   a. Leaves lobed or toothed
      (1) Lobes or teeth on upper half of blade
          (a) Leaves narrowly or broadly cuneate, sessile, 3 to 5 toothed
              Leaves fascicled, 1/4 to 3/4 inches long
              (30) Purshia tridentata
              Leaves not fascicled, 1/8 to 1/2 inches long
              (85) Artemisia arbuscula

          (b) Leaves roundish-oval, petioled
              Teeth at apex of blade (34) Amelanchier alnifolia
              Teeth on upper half of blade (32) Cercocarpus betuloides

      (2) Lobes or teeth on lower as well as upper half of the blade
          (a) Leaves opposite, palmately lobed
              Leaves 1-1/4 to 2 inches wide. Coast, Del Norte-Humboldt Co.
              (52) Acer glabrum
              Leaves 2 to 4-3/4 inches wide. Interior
              (51) Acer circinatum
(b) Leaves alternate

Leaves lobed; lobes 3 to 5, shallow, rounded
Lobes, toothed, crenate  (28) Ribes viscossimimum
Lobes, not toothed  (63) Fremontia californica

Leaves not lobed; toothed
Leaves sessile, teeth coarse, few; branchlets angular  (80) Baccharis pilularis var. consanguinea

Leaves petaled
Teeth spine tipped  (14) Quercus dumosa
Teeth not spine tipped
Leaf margins double serrate  (12) Corylus rostrata var. californica
Leaf margins not double serrate; teeth fine or coarse, few or many
Petioles 1/4 inch long or less
Leaves up to 5/8 inch long; branchlets not warty, glandular but often spinescent, leaves often clustered  (61) Rhamnus crocea

Leaves up to 1 inch long, branchlets warty, glandular  (11) Betula glandulosa

Leaves 1 to 1-1/2 inches long
Leaves strongly 3 veined from the base; bark grayish-white  (56) Ceanothus leucodermis

Leaves not 3 veined; bark dull red  (40) Prunus emarginata

Leaves 1-1/2 to 4 inches long. Coastal redwood region.
Desert canyons  (17) Celtis douglasii

Petioles up to about 1/2 inch long
Leaves strongly 3 veined from the base, branchlets green, angled  (59) Ceanothus thyrsiflorus

Leaves not 3 veined; branchlets not green, nor angled
Leaves oblong-ovate
1-1/2 to 2-1/2 inches long  (60) Rhamnus californica
1-1/2 to 3-1/2 inches long  (41) Prunus virginiana var. demissa
Leaves round-ovate, 1 to 2 inches long  (10) Betula fontinalis

Petioles 1/2 to 3/4 inch long; leaves 2 to 4 inches long  (44) Heteromeles arbutifolia
b. Leaves not lobed or toothed; entire
   (1) Leaves opposite
       (a) Petiole 1/3 inch or less long
           Leaves 1 inch or less long
           Erect bush with stiff divergent branches and gray bark
           (55) Ceanothus cuneatus
           Straggling bush
           (82) Symphoricarpus rotundifolius
           Leaves 1 to 1-1/2 inches long
           Round oval, Sierra Nevada and coast ranges
           (81) Symphoricarpus albus
           Oblong ovate, arid hills southern California
           (49) Simmondsia californica
           Leaves 1-1/2 to 3 (5) inches long
           (83) Lonicera involucrata
       (b) Petiole 1/4 to 1/2 inch long
           Twigs bright red to purplish red, leaf blades 1-1/2 to 3-1/2 inches long
           (66) Cornus stolonifera
           Twigs not red
           Leaves 1/2 inch long
           (77) Salvia crenata
           Leaves 1 to 3 inches long, shiny green above
           (65) Garrya fremontii

(2) Leaves alternate
   (a) Leaves fascicled, clustered or grouped, narrow, 1-1/4 inches long or less
       Leaves green, smooth needle-like, plants heather-like
       (36) Adenostoma fasciculatum
       Leaves grayish, white, woolly or hairy, linear
       Leaf margins strongly revolute
       Leaves woolly hairy on both surfaces
       (22) Eriogonum lanatum
       Leaves white woolly below but green and glabrate above
       (18) Eriogonum fasciculatum
       Leaf margins not revolute
       (90) Tetradymia canescens
   (b) Leaves not fascicled
       Leaves with petioles 1/4 inch long or longer
       Leaves round, heart-shaped at base
       (45) Cercis occidentalis
       Leaves ovate or oblong
       Stems deep green, most 5 angled, petioles 1/4 inch long
       (78) Solanum umbelliferum
       Stems yellow green, not 5 angled leaves 3 nerved
       from the base, petioles 1/2 inch long
       (54) Ceanothus integerrimus
Leaves willow-like, 1 to 1-1/2 (4) inches long, broadest above the middle  (5) Salix scouleriana

Leaves sessile, or with petioles 1/8 inch or less long  (89) Baccharis viminalis

Leaves and stems willow-like

Leaf margins strongly revolute  (33) Cercocarpus ledifolius

Leaf margins not revolute, plane

Leaves narrow, linear or needle-like

Leaves linear

Leaves scurfy hairy  (19) Atriplex canescens

Leaves not scurfy

Leaves glabrate, 3 veined  (87) Chrysothamnus vicidiflorus

Leaves glabrate to densely hairy, not 3 veined  (86) Chrysothamnus nauseosus

Leaves needlelike, green glabrous; plants heather-like  (35) Adenostoma sparsiflorum

Leaves broad, not needle-like or linear

Leaves 1 to 3-1/2 inches long, sometimes minutely toothed

Petioles twisted bringing blade vertical, leaves yellowish pale green 1 to 3-1/2 inches long  (27) Dendromecon rigida

Petioles not twisted, leaves 1 to 1-1/2 to 2 inches long. Humboldt and Siskiyou Counties.  (70) Vaccinium membranaceum

Leaves 1/4 to 1-1/4 inches long

Plants of desert areas; somewhat spiny and scurfy

Leaves ovate-elliptic, abruptly cuneate at base  1/4 to 3/4 inches long  (20) Atriplex confortifolia

Leaves linear, oblanceolate or obovate, fleshy  1/4 to 1-1/4 inches long  (23) Grayia spinosa

Plants of the Sierra Nevada-Cascade ranges

Leaves elliptical or broadly ovate. Foothills.  (58) Ceanothus lemmonii

Leaves oblance-obovate. High mountain swamps.  (71) Vaccinium occidentale
KEY TO SPECIES

Group III. Shrub-like plants and vines

A. Stems round, jointed, rod-like; leaves inconspicuous, bract-like about 1/4 inch long, opposite
   Branches erect, brome-like
   Branches divergent
   (3) Ephedra viridis
   (4) Ephedra nevadensis

B. Stems not jointed as above; leaves evident, not bract-like
   1. Plants vine or vine-like, climbing or spreading
      Tendrils present
      (62) Vitis californica
      Tendrils absent; adventitious roots sometimes present in Rhus diversiloba
      Leaves pinnately 3 foliate
      (50) Rhus diversiloba
      Leaves palmately 5 to 7 pointed
      (51) Acer circinatum
      Leaves entire, elliptical, 2 to 4 inches long
      (66) Cornus stolonifera

   2. Plants upright or spreading but not vine-like, not strongly woody
      a. Leaves pinnately divided
         Leaflets 3 (4 or 5)
         (46) Lotus scoparius
         Leaflets subdivided many times, leaves fern-like, heavily resinous scented
         (39) Chamaebatia foliolosa

      b. Leaves simple, at most toothed
         (1) Resinous, glutinous, shiny above; aromatic 2 to 6 inches long
         (76) Eriogonum californicum

         (2) Not resinous or glutinous
             Leaves narrow, sessile
             Fascicled, margins revolute
             (18) Eriogonum fasciculatum
            Not fascicled, terete, fleshy
             (25) Kochia americana

             Leaves broad, petiolated
             1 to 2 inches long; stems deep green, angled
             (78) Solanum unbelliferum
            2 to 4 inches long; stems not green, not angled
             (72) Gaultheria shallon
KEY TO SPECIES

Group IV. **Spiny plants**

A. Plants with prickles on the stems and branches; the ends of the branches not sharp-pointed or thorny

(43) **Rosa californica**

B. Plants without prickles; the ends of the branches sharp-pointed or thorny

1. Leaves palmately divided, sessile, leaflets 1 to 3

(47) **Pickeringia montana**

2. Leaves not divided; either lobed-toothed or entire

a. Leaves opposite

(1) Leaves 5-toothed at apex, fascicled

(38) **Coleogyne ramosissima**

(2) Leaves entire

(a) Silvery scurfy underneath, 1 to 1-1/2 inches long

(64) **Shepherdia argentea**

(b) Not scurfy 1/4 to 3/4 inches long

(55) **Ceanothus cuneatus**

b. Leaves alternate

(1) Leaves fascicled or bunched

(a) Leaves linear, sessile, entire

Leaves revolute, *woolly* hairy

(22) **Eurotia lanata**

Leaves not revolute, gray scurfy but not *woolly* hairy

(21) **Atriplex polycarpa**

(b) Leaves broad, petioled, toothed, shiny green

(61) **Rhamnus crocea**

(2) Leaves not fascicled

(a) Leaves linear, sessile, fleshy, glabrous

(24) **Sarcobatus vermiculatus**

(b) Leaves broad

Leaves scurfy, entire

Leaves sessile or nearly so; oblanceolate

(23) **Grayia spinosa**

Leaves petioled; ovate-elliptic

(20) **Atriplex confertifolia**

Leaves not scurfy

Leaves entire strongly 3 veined from the base; branchlets *whitish*

Leaves 1/4 to 3/4 (1) inch long

(57) **Ceanothus cordulatus**

Leaves 1/2 to 1-1/4 inches long

(56) **Ceanothus leucodermis**

Leaves finely toothed, not 3 veined, branchlets brownish, thorny

(42) **Prunus subcordata**
KEY TO SPECIES

Group V. Strong scented plants

A. Leaves small, 1/8 inch long or less, numerous, covering the branchlets completely like scales on a fish, aromatic
   Plant bushy 2 to 15 feet high; flowers inconspicuous; fruit berry-like reddish brown, lower altitudes.
   (Fig. 1) (1) Juniperus californica
   Plant usually of tree form, 10 to 65 feet high; flowers inconspicuous; fruit berry-like, blue black. Higher altitudes.
   (2) Juniperus occidentalis

B. Leaves large, 1 inch long and 1/4 inch wide or larger, not as in A
   1. Leaves pinnately divided
      a. Leaflets subdivided into numerous segments; leaves fern-like.
         Sierra Nevada. (39) Chamaebatia foliolosa
      b. Leaflets 2 entire. Desert.
         (48) Larrea tridentata var. glutinosa

   2. Leaves not divided; either lobed, toothed or entire
      a. Leaves lobed or toothed
         (1) Leaves palmately 3 to 5 lobed, peltioled
            (a) Leaves 3/4 to 1 inch wide (29) Ribes cereum
            (b) Leaves 1-1/2 to 2-1/2 inches wide
                (28) Ribes viscosissimum
         (2) Leaves lobed or toothed on the upper part of the blade, cuneate sessile.
            (a) Leaves fascicled or in clusters, glandular; margins often revolute
               Leaves pinnately 3 to 7 lobed
               (37) Cowania mexicana
               Leaves shallowly or deeply 3 to 5 lobed or toothed at the apex
               (30) Purshia tridentata
               (31) Purshia glandulosa
            (b) Leaves not fascicled, not glandular, margins not revolute
               Leaves 1/4 to 1/2 inch long
               (85) Artemisia arbuscula
               Leaves 3/4 to 1-3/4 inches long
               (84) Artemisia tridentata

      b. Leaves entire (or serrate in Eriddictyon)
         (1) Leaves narrow, less than 1/4 inch wide
            (a) Leaves needle or heather-like, green, glabrous
               Leaves fascicled (36) Adenostoma fasciculatum
               Leaves not fascicled, single
               (35) Adenostoma sparsiflorum
            (b) Leaves not needle-like, linear, gray hairy
               (86) Chrysothamnus nauseosus
(2) Leaves broad, more than 1/2 inch wide, and 3 to 6 inches long

(a) Leaves glutinous, as if varnished

(76) Eriodictyon californicum

(b) Leaves not glutinous or only slightly

Stems and leaves both willow-like. Not strongly aromatic. Flood beds. (89) Baccharis viminalis

Stems not willow-like, plant pungently aromatic. Hills and canyons (25) Umbellularia californica
1. Acer circinatum
2. Fraxinus americana L.
3. Quercus douglasii H. & A.
4. Prunus emarginata
5. Umbellularia californica Nutt.
6. Sambucus pubens Nutt.; a, nectaries
7. Sambucus racemosa var. californica
8. Cercis occidentalis
9. Prunus demissa Dietr.; a, f. branches
10. Quercus wislizenii A. & D.
11. Freycinetia californica Turr.; f. branchlet x 1
12. Corylus rostrata var. californica
13. Populus; a, P. fremontii Wats. x 1; b, P.
Reference is made to Mr. Bacon's memo of March 9 with outline of proposed training course attached. We have not had time for full staff review of the proposed training plan, but our first reaction is that it is satisfactory. We will offer detailed comments at a later date.

We would like to agree that an I&R brochure could wait until Service personnel are exposed to the training course; but we believe there is an immediate need to have available hand-out material explaining restoration and other recognized deferred use grazing systems for use in outlining our program to stockmen groups and wildlife groups as well as Congressional inquiries. As you know many forests are moving rather fast in setting up new plans for grazing management and this subject is getting quite a bit of publicity right now. We believe Nerman should devote considerable thought to this, and attempt to secure some illustrative photographs this coming summer, with the goal of getting out a publication for FY 63.

Regarding the financing, we will increase the travel budget for FY 63 as requested. At this time we cannot promise any supplement for FY 62, but will attempt to secure the additional funds requested and will notify you definitely by May 1.