MINUTES 60-3 MEETING
PHREATOPHYTE SUBCOMMITTEE
PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE

August 17, 1960
Boulder, Colorado

1. The Subcommittee meeting was called to order by Chairman L. R. Kuiper at 10 a.m., August 17, 1960, in University Memorial Center on the campus of the University of Colorado, Boulder, Colorado. The following members and guests were present:

MEMBERS AND/OR ALTERNATES:

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
<th>Address</th>
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</thead>
<tbody>
<tr>
<td>George E. Barclay</td>
<td>Fish and Wildlife Service</td>
<td>Albuquerque, N. M.</td>
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<tr>
<td>Jack G. Koogler</td>
<td>State Engineer’s Office</td>
<td>Santa Fe, N. M.</td>
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<tr>
<td>F. L. Timmons</td>
<td>USDA - ARS</td>
<td>Laramie, Wyoming</td>
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<td>Fred O. Case</td>
<td>USDA - SCS</td>
<td>Salt Lake City, Ut.</td>
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<tr>
<td>J. S. Horton</td>
<td>Forest Service</td>
<td>Tempe, Arizona</td>
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<tr>
<td>S. F. Cramer</td>
<td>Corps of Engineers</td>
<td>Los Angeles, Calif.</td>
</tr>
<tr>
<td>Curtis W. Bowser</td>
<td>Bureau of Reclamation</td>
<td>Boulder City, Nev.</td>
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<tr>
<td>L. R. Kuiper</td>
<td>State of Colorado</td>
<td>Denver, Colo.</td>
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<tr>
<td>Wayne Criddle</td>
<td>State Engineer’s Office</td>
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<tr>
<td>Harry Blaney</td>
<td>USDA - ARS</td>
<td>Los Angeles, Calif.</td>
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GUESTS:

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<td>Farrel A. Branson</td>
<td>Geological Survey</td>
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<tr>
<td>Martin G. Weiss</td>
<td>USDA - ARS</td>
<td>Beltsville, Md.</td>
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<tr>
<td>W. B. Ennis, Jr.</td>
<td>USDA - ARS</td>
<td>Beltsville, Md.</td>
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<td>P. D. Akin</td>
<td>State Engineer’s Office</td>
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<td>Vincent H. Reid</td>
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<tr>
<td>Harris R. McDonald</td>
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<td>Ft. Collins, Colo.</td>
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<tr>
<td>W. L. Robinette</td>
<td>Fish and Wildlife Service</td>
<td>Denver, Colo.</td>
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2. The minutes of the 60-2 Subcommittee meeting were introduced and approved subject to the following correction: The report of the Coordinating Task Force submitted by Chairman T. W. Robinson should be amended in paragraph 2, page 3 of the minutes to read that mesquite was introduced into the "Islands in 1828 rather than 1928". Please make this change on your copy of the minutes.
3. OLD BUSINESS

a. Report upon activities of Density Survey Task Force

Chairman J. S. Horton stated that comments on the draft copy of the handbook have been received from members of the Task Force but all Phreatophyte Subcommittee members have not yet been afforded an opportunity to review the draft. He introduced a series of photographs taken with a "canopy camera" which is a technique of photographing upward from the ground to show extent of foliage overhang. There is the possibility that this technique will have a valuable place in recording density of foliage and should be included in the forthcoming publication. Field work in correlating the photographs with density of vegetation is planned for this fall. It was recommended that action be deferred on discussing the report until the 60-4 meeting with objective of planning completion of the handbook by the 61-1 meeting which would afford Mr. Horton sufficient time to evaluate the canopy camera. Provided plans have progressed sufficiently, it is planned to request permission of the Parent Committee at the 60-4 meeting to publish the density handbook.

b. List of publications in Phreatophyte Library

A list of publications reposing in the Library has been prepared and will be distributed by J. S. Horton. It was requested that anyone having additional publications, office memoranda, or documents pertaining to phreatophytes furnish copies to the Library to build up the collection.

c. Coordinating Task Force Report by Chairman T. W. Robinson

Humboldt Research Project, Winnemucca, Nevada. The greasewood plants transplanted to the evapotranspiration tanks April 14 are becoming well established. On July 26 a count of the living transplants showed 93 percent survival in Tank No. 1 and 83 percent in Tank No. 2.

During the first part of July a webbing insect, species unknown, but believed to be a moth, spun webs and laid eggs on about 90 percent of the greasewood plants along the Humboldt River in the Winnemucca area. The webbing was confined almost entirely to mature greasewood plants. Very little was observed on other plant species. A great deal of damage was done to the plants. Over 50 percent of the leaves present a dead appearance, are shriveled and brown in color, and contrast with occasional undamaged green growth. Damage is believed due to the larvae.

Some damage occurred to the plants in the tanks before they were sprayed with DDT on July 16. The DDT apparently was effective in killing the insects as no increase in damage was seen.
During the period June 19 to July 26 the water table in the tanks was raised from between 2 and 2.5 feet to 0.5 below the surface of the tank. This resulted in a noticeable deposition of a salt crust on the surface of the tanks. An analysis showed the salts to be largely sodium carbonate or black alkali.

No apparent harm was done to the greasewood plants by the near surface alkali concentration nor to some Suaeda seedlings that had taken root. However, all other annuals showed symptoms of distress and many have died.

A vegetation mapping program for the entire study section of the Humboldt River Research Project was agreed upon at a conference with State and Federal agencies on August 9. The principal woody phreatophytes are: greasewood, willows, rabbitbrush, and wildrose, with a small area of buffaloberry. Among the grasses are: saltgrass, giant wildrye, creeping wildrye, and sacaton. As guidelines, and in order to reduce field work, no phreatophyte mapping will be done where the density is less than 10 percent, and where the depth to water table is more than 25 feet. Indications are that water use under these conditions is very small and may be neglected in the overall study. It is planned to group the phreatophytes into the following densities: 10 to 25 percent, 25 to 50 percent, 50 to 75 percent, and 75 to 100 percent. As the mapping program proceeds these guidelines may be modified.

It is believed that a hitherto unknown phreatophyte has been discovered in the Humboldt River flood plain. Roots of the plant, *Iva axillaris*, or poverty weed, have been traced by Professor Joseph Robertson of the University of Nevada to the water table at a depth of 14 feet.

Buckeye Project, Arizona. Planting of the area with cuttings has been completed. Those planted in October and November 1959 were about 3 feet high in June. Instrumentation for the water budget as well as the mass transfer and energy budget is nearly complete. Many observations of water level inside the tanks showed a variation among the tanks. At first this was believed to be leakage but later it was found that in some tanks there was a considerable lag between the water level in the tank and in the supply pipe.

Saltcedar map. In accordance with suggestions made at the 60-2 meeting, copies of the photographic reduction of the compilation map, showing areas of saltcedar, were circulated to members of the Subcommittee and other interested parties in early July, with a request that areas of infestation not shown on the map be added, and any errors corrected. Only 2 maps showing additions have been received so far. A copy of the map showing saltcedar infestations reported as of June 1960 follows.
PRELIMINARY SALTCEDAR MAP OF WESTERN UNITED STATES
SHOWING AREAS OF INFESTATION

Compiled from information furnished by:

DEPARTMENT OF INTERIOR
Geological Survey
Bureau of Reclamation
Bureau of Indian Affairs
Bureau of Sport Fisheries and Wildlife
Bureau of Land Management

DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Forest Service
Soil Conservation Service

DEPARTMENT OF ARMY
Corps of Engineers

STATES
Colorado
New Mexico
Utah
Arizona
Salt River Valley Water Users’ Association

Legend
- 4, in thousands of acres, where known
1944-year area was determined

Scale
1 inch = 30 miles approximately

Compilation by: T. W. Robinson
Geological Survey
Menlo Park, California

As of June 1944
Bibliography of transpiration and evaporation. This bibliography which has been in preparation for nearly 3 years has been approved by the Director of the Geological Survey for publication as a Water Supply Paper. It should be available within the next 6 months. Coauthors are T. W. Robinson and A. I. Johnson of the Geological Survey

Senate Joint Resolution 153. No action by the Senate has been taken on this Joint Resolution. However, as a direct result of it the Agricultural and Farm Credit Administrations were directed to conduct a study relating to saltcedar and other phreatophytes and to determine the research needs of the Department of Agriculture concerning this problem. The sum of $25,000 was appropriated to cover the cost of this study.

The Mead Corporation. A letter of inquiry from this company requested information on the possible use of phreatophytes on land being used for spray disposal of waste effluents. The objective is to ascertain if these trees which use extremely large amounts of water would be useful in increasing the water usage in disposal areas, and consequently increase the amount of water that could be applied to the land. In reply the information requested was supplied, pointing out the various factors that control transpiration and giving some water use figures for different species. It was requested of the company that if it should go ahead with the venture that information on results be supplied.

Bitterbrush. On July 11-13 a field trip was made with Mr. Eamor Nord, U. S. Forest Service, to observe bitterbrush growth on the east slope of the Sierra in the vicinity of Doyle, California. The objective was to study the occurrence of this plant as a phreatophyte. Locally, in some situations, it appears that it is a phreatophyte. The large, luxuriant, and vigorous growth in these sites contrasts sharply with the smaller growth at other sites where it is growing as a xerophyte.

Reduction in the water needs of corn. A press release from the University of Illinois states that through the use of hexadecanol, water needs of growing corn have been reduced one third. Hexadecanol, in powder form, is mixed with the soil and apparently goes to the plant leaves where it forms a protective film in the stomata, where all transpiration occurs. No physiological effects on the plant are reported.

d. Collection of data on cost and effectiveness of chemical and mechanical means to control phreatophytes

It was reported by Mr. S. F. Cramer that distribution of forms which previously were reviewed by the Subcommittee had been completed. A number of negative replies have been received. It is anticipated that sufficient reports on the chemical and mechanical means of plant control will be available at the next meeting to permit discussion concerning form of tabulation and report to be issued.
4. NEW BUSINESS

a. Dr. Martin G. Weiss, Associate Director, Agricultural Research Service, Crops Research Division, U. S. Department of Agriculture, by letter of July 19, 1960, requested an opportunity to meet with the Phreatophyte Subcommittee regarding the mission of the Phreatophyte Study Group that was appointed by the Secretary of Agriculture. The Phreatophyte Study Group (of which 3 of the 5 are Phreatophyte Subcommittee members) convened with the Subcommittee for the purpose of soliciting information regarding the phreatophyte problem and research needs in this field. Dr. Weiss stated that the Senate Committee on Agricultural Appropriations for 1961 in considering the problem of saltcedars and other phreatophytes made the following request: "The Committee directs the Department to report to it on the research needs concerning this problem and recommends that additional funds be included in next year's budget based upon such needs".

In order to obtain information upon which to prepare its report to Congress the Department appointed a Working Group to study this problem. The Working Group consists of 5 members; 4 from the Agricultural Research Service, and 1 from the Forest Service. The members of this Committee are as follows:

- H. F. Blaney, Soil and Water Conservation Research Division, ARS
- W. B. Ennis, Jr., Crops Research Division, ARS
- J. S. Horton, Watershed Management Research Division, FS
- F. L. Timmons, Crops Research Division, ARS
- M. G. Weiss, Crops Research Division, ARS

The Working Group was asked to study the phreatophyte problem and to advise with the Administrator of the Agricultural Research Service and the Secretary's Office on the preparation of a report to the Senate Committee. Dr. Weiss was designated to serve as Chairman of this Working Group and Dr. Ennis as Secretary. The Working Group has been asked to develop a report of information and findings, including the total requirements for personnel and facilities, and submit it to the Department not later than December 1, 1960.

The Working Group has been requested to focus its attention on Department research needs in relation to the major problems created by the phreatophyte infestation in the Western United States. Attention is to be given to problems of National and Regional importance appropriate for attention by the Department of Agriculture and generally leave for the attention of the States those problems of State or Local significance. The group is meeting with other agencies and interested groups to invite
their suggestions and to obtain their evaluation of the kind and extent of problems associated with the phreatophyte infestations which need research.

The Working Group hopes to assess the adequacy of the current research program and facilities in each of the major problem areas associated with the phreatophyte infestation. In each of these areas consideration is to be given to the availability of existing personnel and facilities and the need for additional personnel and facilities, if any. The Working Group particularly wanted to meet with the Phreatophyte Subcommittee because this Subcommittee has been concerned with phreatophyte problems for many years and has been active in coordinating and promoting research to solve some of the critical problems in the Western States.

Dr. Weiss indicated that several agencies and interested groups were being contacted on a trip that the Working Group planned to make through the Southwest during August. He also indicated that various Governmental agencies would be contacted at the Washington level for information. He particularly solicited the suggestions and advice of the Phreatophyte Subcommittee on the nature and extent of phreatophyte problems in the Western States and research needs that should be fulfilled by the Department of Agriculture.

Subcommittee members offered comments to aid the Working Group in evaluating the phreatophyte problem and formulating its report. These discussions centered around the broad phase of the overall program requiring research, such as inventory of the problem, determining water losses, use of water by phreatophytes, conservation of water, botanical studies, control or elimination of undesirable plants, management of areas cleared of plants, plant-soil-water relationships, plant and environmental relationships to land use, etc.

b. Agency Reports

Agency reports were presented to the group and are included as attachments as indicated below:

Attachment A - Bureau of Indian Affairs Report, R. H. Rupkey
Attachment B - U. S. Army, Corps of Engineers Report, S. F. Cramer
Attachment C - State of Colorado Report, L. R. Kuiper
Attachment D - U. S. Forest Service Report, J. S. Horton and J. P. Decker
c. Miscellaneous discussions

It was recommended that the Chairman explore with the Parent Committee the possibility of including the Rio Grande Basin in the PSIAC. This area has an acute phreatophyte problem, there is interest in controlling these plants, and there are organizations which could profit by having firsthand knowledge of the activities of the Subcommittee.

Agricultural Engineer Dean C. Muckel, Soil and Water Conservation Research Division, Agricultural Research Service, Berkeley, California, reported to the group in Winnemucca that payment was being made in California to the farmer for removal of vegetation which is depleting the available water. Mr. Muckel furnished a copy of Specifications for Practice F-2, ACP, Tulare County, California. A copy of these specifications is included as Attachment I.

d. Future meeting

The 60-4 meeting will be held in Las Vegas, Nevada, in conjunction with the Parent Committee meeting. No field trip is contemplated by the Subcommittee although for those of you who have not been afforded an opportunity to see Hoover Dam this may be arranged. The agenda for the next meeting will include the report on collecting information on mechanical and chemical control and issuance of the Density Handbook. It is suggested that each conferee prepare a summary of 1960 activities for the agency reports.

e. Meeting was adjourned at 4 p.m.

5. FIELD TOUR

Many Subcommittee members participated in the tour of the Bureau of Standards Principal Central Radio Propagation Laboratory, Boulder, Colorado, on August 18, 1960. The field tour was arranged
by the Parent Committee. The Subcommittee had no separate field tour.

Respectfully submitted,

Curtis W. Bowser
Secretary, Phreatophyte Subcommittee
Bureau of Reclamation
Region 3
Boulder City, Nevada

Attachments A through I
A program for control of juniper at Fort Apache Reservation with a soil sterilant was reported upon in our 60-2 meeting. A similar program on the San Carlos Reservation was begun at Point of Pines Youth Camp with 678 acres of alligator juniper treated with 4,000 pounds of Fenuron (Dybar). Average application rate of Fenuron was 5.76 pounds per acre.

Also reported in the 60-2 meeting was the clearing of mesquite, whitethorn, and saltcedar with the Schallenberger root knife at San Carlos Reservation. An area of 218 acres of this growth was cleared and the area seeded by airplane with Lehman lovegrass, sand dropseed, and blue panic grasses. Knifing of saltcedar is still in progress in the San Carlos Reservoir in the vicinity of the old town of San Carlos.

At the Uintah Irrigation Project in Utah twenty-two 55-gallon barrels of 2,4-D and 2,4,5-T have been ordered this season to carry out the spray program through August along the irrigation distribution systems. This program is generally for the control of willows and brush along canal and lateral banks; however, other noxious weeds such as Russian knapweed, leafy spurge, and whitetop also are being sprayed. Two spray rigs were operated prior to August, and a third rig has been acquired and will be used also.

At the Colorado River Irrigation Project the Marden brush cutter was used on 71 miles of laterals and 7 miles of drains for the control of cattails and water weeds. During the year $25,700 was expended for the control of brush and weeds with chemicals along 274 miles of drainage canals. In addition, $21,000 was spent in control of 685 miles of canal and lateral banks by treating with chemicals and by burning with torch. Some of the above mileage consists of repeated trips over the same canal and lateral banks.
(THIS PARAGRAPH DELETED FROM MINUTES AT REQUEST OF AUTHORIZED PERSON. SEE MINUTES 60-4 MEETING.)

See p. 72
The Forest Service Phreatophyte Project has been concentrating upon field work for the last several months. A detailed study of the relation of site characteristics upon phreatophyte types is in progress at the Granite Reef experimental area. Soil texture and salinity and water table depth have been taken in several phreatophyte types to evaluate the effect of environmental factors in relation to the vegetation.

Development of methods for use of a reconnaissance survey of phreatophyte vegetation occurring along mountain streams has started. The canopy camera shows promise as a means of determining crown density of tree stands. This device works on the principle of a pinhole camera, but the addition of a lens extends the field of the photograph to a hemisphere. The pictures obtained, while not of top quality, can be used to determine cover if a suitably marked grid is placed over them.

Studies of seed germination and sprouting ability are continuing. Seedlings have been grown from seed obtained from Cordoba, Spain. Stem cuttings of tamarisk lose sprouting ability rapidly as they are dried.

Previous studies have shown the evapotranspiration apparatus (inflatable plastic tent with infrared gas analyzer) to be satisfactory for direct measurement of comparative evapotranspiration losses from undisturbed plots in the field. It is satisfactory also for following closely the daily time course of evapotranspiration. Recent efforts have been directed mainly at refining two aspects of the technique:

1. Evaluation of effect of enclosure. --Enclosure of a plot alters evapotranspiration rate. Although this does not hinder comparative measurements, precise evaluation of the effect will extend the usefulness of the technique. Replicated experiments showed that potted tamarisk plants enclosed in the tent with a large tamarisk bush lost water 78 percent as rapidly as they did in the open. Other experiments indicated that the enclosure effect resulted primarily from increased humidity and that transpiration was a linear function of vapor pressure deficit. More detailed studies under controlled conditions should yield data from which a system of simple corrections can be computed based on vapor pressure deficits.

2. Simplification of hygrometer. --Although the infrared gas analyzer is usable, it is expensive and is often unstable in the field. A prototype of a much simpler absolute-humidity meter has been constructed, but it is not yet reliable. It is based on the corona-discharge principle, and it will cost about 10 percent as much as the infrared analyzer.
In New Mexico both State and Federal agencies are actively engaged in a research program for the study of phreatophytes: their extent, the amount of water used by them, and the best methods for their eradication. In addition, they are also engaged in an action program to eradicate phreatophytes by mechanical and chemical means. Following is a summary of the programs now in progress:

1. The Bureau of Reclamation at Albuquerque, New Mexico, has been authorized to study the possibilities of water salvage by the eradication of phreatophytes in the Middle and Upper Rio Grande Valleys. They now plan to set up a study area, establish observation wells, and make volume-density surveys. They will study existing conditions for a period of time, then eradicate the phreatophytes by various means, and study conditions after eradication. The State of New Mexico is participating up to 10 percent of the cost of this program.

2. A comprehensive study of water use by phreatophytes in the Pecos River Valley between Acme and Artesia has been made by the Geological Survey under cooperative agreement with the New Mexico State Engineer Office. This study has been completed, and the report is being reviewed prior to release. A summary of this investigation was reported at the last phreatophyte meeting. Plans are in progress to develop an action program based on the recommendations of this report.

3. A detailed study is now being conducted in the delta of McMillan Reservoir on the Pecos River by the Geological Survey in cooperation with the Pecos River Commission. Weather recording instruments and 69 observation wells have been installed, and evapotranspiration studies are in progress.

4. A cooperative program between the Bureau of Reclamation and the State Engineer Office was initiated in 1957 for the clearing of some 5,000 acres of saltcedar in the delta of Caballo Reservoir. The clearing, mostly by mechanical means, was accomplished over a period of two years, and a continuing program of maintenance is now established. At the initiation of this study, some 63 observation wells were established. Two of these have automatic recorders. These wells are measured once a month. Saltcedar root samples are sent monthly to the Bureau laboratory in Denver for analysis of the carbohydrate content. An experimental area of sixteen 32-acre plots was established upon which various chemical formulas were sprayed. A tabulation of the results is attached.

5. A cooperative program of water salvage and saltcedar eradication between the Bureau of Reclamation at Albuquerque and the State Engineer Office was established in 1956 for the purpose of constructing
drains, eradicating saltcedar, and maintaining the channel at San Marcial. This work is continuing, and on September 1, 1960, the Bureau will spray by helicopter 1,000 acres of saltcedar not accessible to ground spray equipment in the Rio Grande from Bernardo to Albuquerque.
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<th>No. of Applications</th>
<th>Dates Sprayed</th>
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<td>32</td>
<td>2</td>
<td>7-9 &amp; 14-59; 9-25-60</td>
<td>5.46</td>
<td>11.23</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>1-1/4 gal. 2, 4, 5-T; 98-3/4 gal. water</td>
<td>2</td>
<td>40</td>
<td>32</td>
<td>2</td>
<td>7-9-59; 9-25-60</td>
<td>4.61</td>
<td>8.81</td>
<td>10</td>
</tr>
</tbody>
</table>

* From inspection on 7-6-60.
Measurements of evapotranspiration and evaporation and their correlation under different climatological conditions were continued in Southern Santa Barbara County, California, in cooperation with the Geological Survey, Bureau of Reclamation, Soil Conservation, and Santa Barbara County.

Work has been initiated at the Southwest Laboratory, Tempe, Arizona, to measure weekly and monthly rates of evapotranspiration by phreatophytes and replacement vegetation growing in lysimeters and in the field with depths to the water table ranging from 2 feet to 10 feet. These rates are to be correlated with observations of temperature, humidity, precipitation, evaporation, wind movement, and other data to provide basic principles involved in the consumptive use of water.

A report on "Estimated Evaporation and Evapotranspiration Losses Under Various Proposed Barrier Plans of the San Francisco Bay System, California", prepared by the Western Soil and Water Management Research Branch for the U. S. Army, San Francisco District Office, Corps of Engineers, has been mimeographed; however, this report is not for public release pending completion of a comprehensive Survey Report by the District Office. The report presents the results of measured pan evaporation and consumptive use of water by tules and the conversion of pan evaporation to lake evaporation and evapotranspiration by marshlands based on research studies.

The cooperative study on effects of depth to water table, soil texture, plant growth, and climatic conditions on use of water by phreatophytes was continued in Nevada.

There is a need for a coordinated research program for the phreatophyte problem. Some of its objectives would include the following:

1. Determine the consumptive use of major phreatophyte species in general locations in the Western States.

2. To study the life cycle of some of the important phreatophytes for the purpose of determining weaknesses that may be helpful in finding methods of control.

3. To study environment, types, and methods of substituting replacement vegetation which will use less water, provide more forage or other economic values and hold the soil in place after the phreatophytes have been eradicated.

Phreatophyte Subcommittee
Attachment F - p. 1
As a result of a request of a Senate Committee for a report on the problem of saltcedars and other phreatophytes, the Secretary of Agriculture has appointed a working group of five members to study and report on the research needs relative to this problem. The members of the group are as follows:

H. F. Blaney, Soil and Water Conservation Research Division, ARS
W. B. Ennis, Jr., Crops Research Division, ARS
J. S. Horton, Watershed Management Research Division, FS
F. L. Timmons, Crops Research Division, ARS
M. G. Weiss, Crops Research Division, ARS

This committee is starting immediately on a field trip to inspect the problem areas.
Observations made in July 1960 on our saltcedar ecological study plots near Shoshoni, Wyoming, showed an unusual amount of winterkill during the dry winter of 1959-1960. On some plots with saltcedar 3 or 4 years old, nearly all plants had been killed back to the crown. Older plants also showed considerable twig or shoot kill and some shoots 8 to 12 feet long were killed back to the crown.

Most of the saltcedar plants showing partial or complete top kill had produced vigorous new shoots from the crown, many of them having attained heights of 3 to 5 feet within 6 weeks. The number, size, and vigor of the new shoots appear to be greater for older plants which presumably have larger root systems.

Some winterkill of saltcedar topgrowth has been observed each year since the ecological study was initiated in the Spring of 1956. The indications are that the severity of climate in Wyoming greatly restricts the maximum size of topgrowth of saltcedar but does not prevent its rapid spread to new areas and increasing the density of existing infestations.
The two triparty contracts among the Corps of Engineers, Bureau of Reclamation, and the University of Arizona providing for investigation of mechanical means to control saltcedar and quality of water changes following removal of vegetation, and an investigation of replacement vegetation following removal of river-bottom vegetation have been signed. The University of Arizona assigned graduate student Bruce Powers to study the problem of revegetation of floodways following clearing and graduate student Frank Wilgus to study the groundwater conditions and report upon mechanical control of phreatophytes. The revegetation study is being conducted in a section of the Snyder Ranch Floodway, a tributary to the Gila River in the Wellton-Mohawk Irrigation and Drainage District. In this floodway a 550-acre section of this floodway has been leased to private interests with objective of determining if a higher land use can be developed for the floodway and yet retain the feature for the purpose it was constructed. The secondary purpose of the study is to determine if revegetation will keep down annual maintenance costs. The water-quality study and inventory of plant conditions is underway in that section of the Gila River downstream from Phoenix. The Corps of Engineers is planning a 2,000-foot-wide floodway through this section of river bottom and it is imperative that preclearing data be obtained to offer a basis for evaluation of the control work.

The Bureau has issued advertisements for bids for helicopter spraying of approximately 900 acres of phreatophytes in the Rio Grande Floodway between Albuquerque and U. S. Highway 60 near Bernardo. The contractor is to furnish all labor, materials, and equipment. Applications of 2, 4, 5-Trisethylamino Salt with emulsifier in water and oil are to be made. Results of this work will be apparent next spring.
SPECIFICATIONS FOR PRACTICE F-2
(copy)

This practice is applicable only to areas of foothill rangeland where a dense growth of vegetation in the immediate vicinity of streams or springs is depleting the available water. Cost-sharing will be based on the area of brush or trees destroyed, and 90% of this vegetation must be killed to qualify for payment. It is not required that the dead brush or trees be removed or burned.

Federal cost-sharing will be limited to the control of brush or non-commercial trees growing within 40 feet of the edge of stream channels or to such vegetation in the immediate vicinity of springs.

Bills showing the cost of labor and materials and dates of application must be presented as a basis for determining the cost share.

A sketch map of the area is required showing the distribution and density of the riparian vegetation and indicating the usual occurrence and duration of water flow.

Measures to prevent erosion such as establishing a protective cover in certain areas, or leaving vegetation that stabilizes a stream channel at vulnerable points such as sharp bends subject to swift currents will be specified when the practice is approved for the farm and these recommendations must be carried out before cost-shares will be paid.

The practice is eligible for cost sharing only when carried out in accordance with the applicable provisions of the following specifications:

Specifications for F-2 Practice

(1) 2,4-D amine, (minimum strength, 4 lbs. per gallon of liquid). Applied to trees by frilling the trunk with axe cuts through the bark and 1/2 inch into the wood; cuts spaced not more than 2 inches apart around the trunk and squirting solution into the cuts. Small shrubs must be cut off and the cut stumps doused with amine by means of a brush. Can be applied to all species of trees or shrubs at any season.

(2) 2,4-D low volatile ester, (minimum strength, 4 lbs. per gallon of liquid). Mix thoroughly 1 cup of the ester in 1 1/2 gallon of oil (diesel or orchard oil) or 1 gallon of ester in 24 gallons of oil in larger quantities. Does not need continued agitation. Trees with trunks more than 3 inches in diameter must be felled and the cut stump sprayed thoroughly with the solution. Shrubs up to 3 inches in diameter must be treated by spraying the lower 1 foot to 18 inches of the trunk or stems--wet very thoroughly so the material runs down on the ground around the base. Can be applied to all varieties at any season.
(3) Brush killer—(minimum strength 2 lbs. 2,4-D ester plus 2 lbs. 2,4,5-T per gallon of liquid). Three quarts of brush killer in 1 gallon of oil (diesel) with 100 gallons of water will treat about 1 acre of brush (solid). Apply as a spray (40 lbs. pressure or less) to cover the entire leaf surface. Plant must be in full leaf, have plenty of moisture, and be growing rapidly. Can be applied to all varieties, but treatment after June 15th will not qualify for payment.

Initial control of riparian vegetation along stream courses and in water bearing areas to conserve water

This practice is limited to the control of non-commercial brush and trees growing within 40 feet of the edge of stream channels or to such vegetation in the immediate vicinity of springs which is intercepting or depleting available water. This practice cannot be approved where erosion might result from the removal of the vegetative cover.

The Soil Conservation Service is responsible for the technical phases of this practice.

Performance of this practice shall be accomplished in accordance with specifications issued by the Tulare County ASC office and contained in the ACP Practice Specifications.

Maximum Federal Cost-Share

1. 70 percent of the cost not to exceed $14 per acre for control by means of "frilling" the trees with an axe and treating the cuts with 2,4-D amine.

2. 70 percent of the cost not to exceed $16 per acre for felling the trees and spraying the stumps with 2,4-D low volatile ester.

3. 70 percent of the cost not to exceed $10.50 per acre for control of low brush by spraying with brush killer.