Minutes 61-3 Meeting  
Phreatophyte Subcommittee  
Pacific Southwest Inter-Agency Committee  
August 16-17, 1961  Riverton, Wyoming

1. The Subcommittee Meeting was called to order at 9:00 a.m. by the Chairman, Len Kuiper, in the Hospitality Room of the First National Bank of Riverton, in Riverton, Wyoming. The following subcommittee members and/or alternates and guests were present:

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<tr>
<th>Name</th>
<th>Agency</th>
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<tr>
<td>L. R. Kuiper</td>
<td>State of Colorado</td>
<td>Denver, Colorado</td>
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<td>G. L. Christopulos</td>
<td>State of Wyoming</td>
<td>Cheyenne, Wyoming</td>
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<td>F. O. Case</td>
<td>Department of Agriculture</td>
<td>Salt Lake City, Utah</td>
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<tr>
<td>T. W. Robinson</td>
<td>U.S. Geological Survey</td>
<td>Menlo Park, California</td>
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<td>H. F. Blaney</td>
<td>Agricultural Research</td>
<td>Los Angeles, California</td>
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<td>E. A. Naphan</td>
<td>Soil Conservation Service</td>
<td>Reno, Nevada</td>
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<td>S. F. Cramer</td>
<td>Corps of Engineers</td>
<td>Los Angeles, California</td>
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<td>J. S. Horton</td>
<td>U.S. Forest Service</td>
<td>Tempe, Arizona</td>
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<td>J. W. Shannon</td>
<td>California Department of Water Resources</td>
<td>Sacramento, California</td>
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<tr>
<td>F. L. Timmons</td>
<td>Agricultural Research</td>
<td>Laramie, Wyoming</td>
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<td>L. F. Lawhon</td>
<td>Soil Conservation Service</td>
<td>Fort Worth, Texas</td>
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<td>D. C. Muckel</td>
<td>Agricultural Research</td>
<td>Reno, Nevada</td>
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<tr>
<td>Floyd Farrell</td>
<td>Bureau of Indian Affairs</td>
<td>Phoenix, Arizona</td>
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<tr>
<td>H. R. McDonald</td>
<td>Bureau of Reclamation</td>
<td>Denver, Colorado</td>
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**Guests**

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<tr>
<th>Name</th>
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<tr>
<td>Kirk M. Sandals</td>
<td>USDA-PSIAC</td>
<td>Berkeley, California</td>
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<tr>
<td>E. E. Hughes</td>
<td>Agricultural Research</td>
<td>Los Lunas, New Mexico</td>
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<tr>
<td>P. M. Turner</td>
<td>Bureau of Reclamation</td>
<td>Denver, Colorado</td>
</tr>
<tr>
<td>R. B. Balcom</td>
<td>Bureau of Reclamation</td>
<td>Washington, D.C.</td>
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<tr>
<td>H. W. Berndt</td>
<td>U.S. Forest Service</td>
<td>Laramie, Wyoming</td>
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<tr>
<td>R. C. Van Drew</td>
<td>Bureau of Reclamation</td>
<td>Riverton, Wyoming</td>
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<tr>
<td>J. F. Hendrickson</td>
<td>Chm. PSIAC</td>
<td>Salt Lake City, Utah</td>
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Those making the inspection trip on August 17 but who were not present at the meeting are listed below:

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<th>Name</th>
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<tr>
<td>K. W. Dunster</td>
<td>Amchem Products Inc.</td>
<td>Bozeman, Montana</td>
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<tr>
<td>J. M. Hodgson</td>
<td>Agricultural Research</td>
<td>Bozeman, Montana</td>
</tr>
<tr>
<td>A. D. Perkins</td>
<td>U.S. Bureau of Reclamation</td>
<td>Riverton, Wyoming</td>
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2. The minutes of the 61-2 meeting were approved with the following changes:

(a) Add the name of L. F. Lavhon to list of members present and revise Mr. Koogler's name to J. G. Koogler.

3. Mr. Van Drew described the field trip for August 17 and about 30 indicated they would attend.

4. Old Business:

(a) Reports by state representatives on the legal status of water salvaged by eradication and control of phreatophytes:

Colorado—The developer of salvaged water apparently has rights of prescription at any time. The developer must present evidence satisfactory to the State Engineer, and to the courts, if necessary, identifying amount and place of development. It was observed that some state laws are in need of recodification. Also in some areas water development has almost reached the limit and salvage and/or water conservation are all that remain.

California—Some attorneys object to the use of the term "salvage" but believe that water developed by eradication of phreatophytes would be subject to appropriation by the developer.

Nevada—The water right situation is apparently similar to that of Colorado. A question was raised regarding the ownership of water developed by the U.S. Government.

(b) Glossary of terms. Mr. Robinson, Chairman of the Task Force, furnished each member a draft of the proposed glossary for comments. It was pointed out that frequently definition of terms are important in the interpretation of water laws and interstate compacts. It is proposed to publish the glossary of terms when completed.
5. **New Business:**

(a) Mr. John Hendrickson, Chairman, PSIAC, discussed the 61-4 meeting to be held in Las Vegas, Nevada, the first full week in December. This meeting will be held immediately prior to the meeting of the Colorado River Water User's Association. The Subcommittee is responsible for providing a 2-hour program. A panel is proposed for discussion of various aspects of (1) the phreatophyte problem, (2) accomplishments toward solution of the problem, and (3) future needs. Plans for the program are to be submitted to the PSIAC prior to the 61-3 meeting to be held in Richfield, Utah, on September 6, 7, and 8, 1961.

6. **Agency Reports:**

Reports were presented by representatives and are included as attachments as indicated below:

- Attachment A—Agricultural Research Service, Crop Research Division
- Attachment B—Agricultural Research Service, Soil and Water Conservation Division
- Attachment C—Soil Conservation Service
- Attachment D—U.S. Forest Service
- Attachment E—U.S. Bureau of Reclamation

7. **Density Task Force:**

The manuscript has been reviewed by members of the task force and final draft is in the hands of the Chairman, J. S. Horton.


**Humboldt Research Project, Winnemucca, Nevada:** Three of the four small tanks 10 by 10 by 7 feet deep constructed in May were planted to wildrose the first week in July. On August 1, all of the plants appeared to be well established and many were showing new growth.

The fourth tank was completed to measure evaporation from bare soil. With the water level at about 4-1/2 feet, there is some evaporation loss.

Metering devices were installed on all tanks the last week in June. However, due to instrumental difficulties usable records were limited to the last week in July and first week in August. Preliminary data show that the average rate of use by the greasewood tank with the water level at 5 feet was about 0.01 foot per day, and the maximum rate about .016 foot a day. Average use by the
willow tanks with a 5-foot water level was about 0.02 foot a day or roughly twice that of the greasewood. The rate of use by greasewood during a 2-day rainy period was only 70 percent of that during a 4-day hot dry period. Neither the greasewood nor the willow growth in the tanks have attained the density and height of the surrounding undisturbed growth. This may require another growing season.

The vegetation mapping of the phreatophytes along the reach of the Humboldt River that is being studied was begun in June by the Soil Conservation Service with two mappers, and on August 1, was about 50 percent complete. The square-foot-density method is being used to evaluate the cover density. This method appears to be well suited for shrubs, low brush, and grasses, with heights of less than 5 feet. In this type of growth it is faster than the line transect and appears to be just as accurate. It is not usable in tall, dense growth, such as willows, saltcedar, cottonwood, and similar plants.

Buckeye Project: Revegetation of the project area has been completed but the growth must still attain height of the surrounding vegetation. Observations on rate of growth show that where water is readily available, as in the tanks, saltcedar shoots may grow as much as 2 cm per day, while from 18 feet a deep water table growth may only be 1 mm per week.

Request from the Bureau of Reclamation for consumptive use data: Mr. Rippon, Regional Director, Region 4, Salt Lake City, Utah, by letter dated June 30, desired to know if the Subcommittee could furnish information on the consumptive use of natural vegetation for the Colorado River Storage Project. Copies of the letter were circulated to members of the Subcommittee for such information as they might have on the subject.


Saltcedar Map: Virtually no progress since last meeting due to pressure of other projects.

61-4 Meeting: The 61-4 Subcommittee Meeting will be held in Las Vegas, Nevada, during the first week in December 1961, in connection with the meeting of the Pacific Southwest Interagency Committee.
10. Field Tour

The Subcommittee and guests left Riverton on the morning of August 17, 1961, to inspect phreatophyte research and control work in the Five Mile Creek area. The tour was arranged and conducted by Mr. F. L. Timmons of the Agricultural Research Service and Mr. Roy Van Drew, Project Manager, Bureau of Reclamation, Riverton Project. A 12-mile stretch of Fivemile Creek above Boysen Reservoir near Shoshoni, Wyoming, was inspected. Quadrants were established to study such factors as manner and rate of seedling establishments, rate and manner of growth of salt cedar of different ages from seedling to mature plants, growth under both intensive and light grazing, the effects of flooding on the survival and growth of salt cedar, the survival of seedlings and mature plants in stands of various densities, and effect of depth of water table and distance from Fivemile Creek on establishment and survival of salt cedar. The results of these studies as well as those of chemical treatments were described in Attachment C Part 2 of the Minutes of the 61-2 meeting.

Respectfully submitted,

Harris R. McDonald
Harris R. McDonald, Secretary
Phreatophyte Subcommittee PSIAC
Ecological and chemical control studies on salt cedar along Five-mile Creek near Shoshoni, Wyoming, have been continued along the lines discussed in our Second Quarter Report 1961. Current results will be seen during the tour August 17.

Observations of results and retreatments as scheduled have been made in the experiment on chemical control of salt cedar initiated in the spring of 1960 near Buckeye, Arizona.

A new research project on control of undesirable phreatophytes has been established at the New Mexico State University Middle Rio Grande Substation, Los Lunas, New Mexico. Mr. Eugene E. Hughes began his duties as our research scientist on that project. Mr. Hughes had his college training at Colorado State University and Texas A & M College and has had valuable training and experience in research on control of woody plants, including salt cedar.

Our Crops Research Division has received funds from Congress for a second research scientist who will be stationed at Los Lunas, New Mexico, with Mr. Hughes. The research program in New Mexico will be conducted in close cooperation with the New Mexico Agricultural Experiment Station and the Bureau of Reclamation Middle Rio Grande Project at Albuquerque and the Chief Engineer's office at Denver.
Evapotranspiration Study, Humboldt River, Nevada: Measurements of evapotranspiration by phreatophytes growing in plastic tanks 10 by 10 feet square and 8 feet deep were continued at Winnemucca station in cooperation with other agencies. The tanks are operated in triplicate, three with saltgrass, three with wild rye grass and three with a mixture of meadow grass (sedge, wire grass and wild rye). The vegetation planted in 1960 did not thrive on account of salt accumulation. The vegetation was replanted in 1961 and it is flourishing and evapotranspiration records are now being obtained.

Evapotranspiration by alfalfa in steel tanks, 9 feet deep, are being continued in cooperation with the University and State of Nevada at Reno. The water tables in the tanks are being maintained at 2, 4, and 8 feet and record is kept of yields.

During 1961, three standard Class A evaporation stations and transpiration wells equipped with water stage recorder were established near Winnemucca. A preliminary study was started on replacement vegetation in Paradise Valley.

The report on Research Needs on the Problem of Salt Cedar and Other Phreatophytes by the U.S. Department of Agriculture Working Group has been released since the last meeting. Funds are not yet available to carry out the suggestions of the group.

A provisional report entitled Determining Consumptive Use and Irrigation Water Requirements by Harry F. Blaney and Wayne D. Criddle has been completed and should be available in the near future.
The phreatophyte survey phase of Standard Soil Survey in the Winnemucca Project Area of the Humboldt River is approximately 50 percent complete. The flood plain area of the project is complete and mapping is now in progress on peripheral terraces and alluvial fans where the depth to ground water usually exceeds 20 feet. Vegetative types on these areas are complex and include greasewood, big sage, spring hopsage, and other plants. Mapping of these areas is to be completed to provide a basis for determining their role in the hydrology of the project area.

Phreatophyte surveys in the Humboldt River Basin are being conducted concurrently with soil surveys. This is advantageous for several reasons:

1. Wetness in soils is reflected in the morphology of soil taxonomic units. Consequently, vegetative type boundaries correspond closely with soil mapping unit boundaries. Also, since soil mapping units are individual taxonomic units of the soil classification system it is possible, when the soil-plant relationship is understood, to use soils data to extend the results of research and observations from area to area, and to make predictions relative to the affect of engineering works, vegetative manipulation and other practices upon ground water levels.

2. It is more economical to finance the operation of our field party to make both surveys.
The pumping tests at the Granite Reef experimental area continue. At present, by a series of 1/70th horsepower pumps, we can lower the water table and successfully follow a predetermined drawdown curve. We have also determined by the tests described below that removal of a small area of tamarisk and arrowweed vegetation will reduce the daily water use significantly. We are now fairly confident that we will be able to pump out and measure the water represented by this reduction.

In the clearing study, vegetation was removed in three stages from an area surrounding one recorder-equipped shallow ground water well. The objective was to determine not only if it is possible to decrease a diurnal fluctuation of the water table by clearing small areas of vegetation, but also to obtain information on effective size of cleared areas for later pumping studies. Comparisons of daily fluctuations of ground water levels at the study well before treatment and in a control well were not significantly different for a pre-treatment of one year.

In the first treatment on May 11, 1961, 2.2 square feet of basal area of tamarisk and arrowweed vegetation was cleared from a circular area of 491 square feet. Preliminary analysis of well records during the first treatment period show a highly significant reduction in daily water table fluctuation. In the second treatment on June 16, the circular cleared area was enlarged to 983 square feet, and 1.6 square feet of basal area of tamarisk and arrowweed was removed. The well recorders during the second period indicate an even greater reduction in daily water table fluctuations. In the third and last treatment on July 21, the cleared area was enlarged to 61 feet in diameter, giving a total of 2,922 square feet. Results of this treatment have not been analyzed. A total of 8.8 square feet of basal area of tamarisk and arrowweed was removed in the three clearings. Some of the tamarisk removed was 30 feet in height.

The summer's work with the evapotranspiration apparatus has given the following results:

1. Studies of instrumentation demonstrate that wet-dry bulb mercury thermometers give a crude but highly indicative, inexpensive, and rapid measurement of water loss. The relatively inexpensive Aminco electric hygrometer has great
2. Comparative tests of tamarisk and arrowweed show them to be about equal in water loss if about equal crown densities are compared. This is surprising because the arrowweed was growing in sites with greater water table depth.

3. A series of tests was run using tamarisk and arrowweed shrubs of varying crown volumes. Doubling the crown volume of either species increases evapotranspiration only by a third. The shrubs compared in this test were fairly dense but not up to 100 percent volume density.

The Forest Service has approved a project under PL-480 for negotiation with Israel to prepare a revision of the genus Tamarix. We are hoping that this will clear the confusion on taxonomy of tamarisk and also that this will be a source of seed for our reference collection being assembled at the Botanical Garden in Papago Park near Tempe.
Bureau of Reclamation Report of Phreatophyte Activities
Third Quarter 1961

by H. R. McDonald

The Division of Engineering Laboratories is continuing the study of carbohydrate reserves of salt cedar with the completion of the fourth year's study. A progress report will be released late in 1961. The herbicide spray chamber to be used in greenhouse studies has been completed. The herbicidal evaluation will use both outdoor plantings and greenhouse, container grown plants.

The Bureau, in cooperation with the Geological Survey, has completed installation of a series of evapotranspiration tanks in the Yuma area. Six of these tanks in the Imperial Dam vicinity are 32 feet square and 7 feet deep. The three other tanks in this area are 30 feet square but only 5 feet deep and will be used for studies of evaporation from bare soil. The six deep tanks have been planted to arrowweed and salt bush. The new plants in some tanks are thriving vigorously and regrowth in the area disturbed during construction is being encouraged by frequent watering. Water for this purpose is being pumped from a nearby open ditch. Final construction phases are now underway which include laying of a small-size plastic waterline into the area from Imperial Dam Camp and placement of a buried cable for transmission of power to the instruments which will be installed by Geological Survey. The six evapotranspiration tanks, each 10 feet square and 5-1/2 feet deep, to study use of water by Carrizo cane and cattail have also been completed. One of these tanks has been found inoperative and consideration is being given to its replacement. Vegetation replanted in the tanks is growing well.

There is nothing to report on the cooperative contracts with the University of Arizona, which are financed jointly by the Corps of Engineers and this Bureau, on the study of water quality and the investigation of replacement plants to use in floodways of the Southwest following phreatophyte clearing. The latter study was concluded and reported upon after one year's work because the technician from the University left school. This work is now being resumed with plans for a two-year study which will require a minor contract amendment which is in the process of being prepared. Field work on the phreatophyte study of Colorado River bottom lands has been completed from Davis Dam to the International Boundary. The field survey data are now being compiled.
Construction of lysimeters is underway in the Middle Rio Grande Valley near Bernardo, New Mexico. These studies are being closely coordinated with those of the Agricultural Research Service in that area.

Bids have been issued for helicopter spraying of 1,000 acres of phreatophytes in the flood plain of the Rio Grande in selected areas upstream from Bernardo. Herbicide formulation will be the same as that used last year. It is anticipated that costs will be slightly lower than the $13 per acre incurred last year.

Cooperation with the State of New Mexico will be continued on phreatophyte control measures in both the San Marcial and Caballo Reservoir areas. It is anticipated that both mechanical and chemical control measures will be used.