I. Introduction. The 66-4 meeting was called to order at Hotel Riviera, Las Vegas, Nevada, at 8:00 a.m. on November 29, 1966, by Chairman Jerome S. Horton.

The following members (or alternates) and guests were present:

Members or Alternates:

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. W. Bailey</td>
<td>Bureau of Reclamation</td>
<td>Sacramento, Calif.</td>
</tr>
<tr>
<td>F. O. Case</td>
<td>Soil Conservation Service</td>
<td>Denver, Colorado</td>
</tr>
<tr>
<td>Floyd Farrell</td>
<td>Bureau of Indian Affairs</td>
<td>Phoenix, Arizona</td>
</tr>
<tr>
<td>E. H. Haycock</td>
<td>Utah Water &amp; Power Board</td>
<td>Salt Lake City, Utah</td>
</tr>
<tr>
<td>J. S. Horton</td>
<td>USDA, Forest Service</td>
<td>Tempe, Ariz.</td>
</tr>
<tr>
<td>E. E. Hughes</td>
<td>Agricultural Research Service</td>
<td>Los Lunas, New Mexico</td>
</tr>
<tr>
<td>J. C. Koogler</td>
<td>State Engineer's Office</td>
<td>Santa Fe, New Mexico</td>
</tr>
<tr>
<td>A. C. Mace, Jr.</td>
<td>University of Arizona</td>
<td>Tucson, Arizona</td>
</tr>
<tr>
<td>L. D. Morrill</td>
<td>Colorado Water Conservation Board</td>
<td>Denver, Colo.</td>
</tr>
<tr>
<td>M. E. Noble</td>
<td>Bureau of Land Management</td>
<td>Denver, Colo.</td>
</tr>
<tr>
<td>A. V. Potter</td>
<td>Corps of Engineers</td>
<td>Los Angeles, Calif.</td>
</tr>
<tr>
<td>M. G. Sheldon</td>
<td>Bur. of Sport Fisheries &amp; Wildlife</td>
<td>Albuquerque, New Mexico</td>
</tr>
<tr>
<td>J. Van De Erve</td>
<td>U. S. Weather Bureau</td>
<td>Salt Lake City, Utah</td>
</tr>
</tbody>
</table>

Guests

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. C. Bergeson</td>
<td>Bureau of Indian Affairs</td>
<td>Window Rock, Ariz.</td>
</tr>
<tr>
<td>Curtis Bowser</td>
<td>Bureau of Reclamation</td>
<td>Boulder City, Nevada</td>
</tr>
<tr>
<td>S. F. Cramer</td>
<td>Corps of Engineers</td>
<td>Los Angeles, Calif.</td>
</tr>
<tr>
<td>W. T. Davoren</td>
<td>Department of Interior</td>
<td>San Francisco, Calif.</td>
</tr>
<tr>
<td>A. S. Dylla</td>
<td>ARS - Soil &amp; Water Conservation</td>
<td>Reno, Nevada</td>
</tr>
<tr>
<td>Norman Hall</td>
<td>Dept. Conservation &amp; Natural Resources</td>
<td>Carson City, Nevada</td>
</tr>
<tr>
<td>R. G. Pollan</td>
<td>Bureau of Reclamation</td>
<td>Sacramento, Calif.</td>
</tr>
<tr>
<td>R. H. Rupkey</td>
<td>Bureau of Indian Affairs</td>
<td>Phoenix, Ariz.</td>
</tr>
</tbody>
</table>

II. Task Force Reports

A. Research and Coordination - T. W. Robinson

Interest in vegetative cover appears to be on the increase in Russia. Two publications on geobotanical mapping have been reviewed in the last two years. The most recent titled "Geobotanical Mapping" is a series of papers dealing with various facets of the subject. Considerable emphasis is given to the cartographic expression of the different plant types, by color and
by cross hatching. One paper discussed field mapping on aerial photographs from airplanes. For this they recommend two observers, one on either side of the plane; altitude 100-200 meters and air speed as low as 100 km (62 miles) per hour. Grouping of species with the various vegetation are given. Tamarix is mapped as a single species. Mapping the areas of fires that have occurred in the past, is the subject of one paper.

One comment is worthy of note. On page 10 the author in discussing future development in mapping from aerial photos speaks of the "electronic identification of vegetation on aerial photographs," and processing the information thus obtained by the mechanographic method.

B. Plant succession - No report.

C. Library - J. S. Horton

Mr. Horton reported on the style and format to be followed in the reproduction of the Phreatophyte Subcommittee minutes by the Bureau of Reclamation. The final report will be consolidated to eliminate all partial pages and bound with uniform cover pages as used in other Phreatophyte reports. This is in accordance with the wishes of the parent committee. Mr. Arnett Mace gave a short report on the index system for the report. The committee was well satisfied with his report and unanimously accepted the proposal for indexing the minutes.

III. Agency Reports.

A. Federal.

1. Department of Agriculture.
   a. Agricultural Research Service - Eugene E. Hughes
      (See Attachment A)
   b. Soil Conservation Service - Fred O. Case
      (See Attachment B)
   c. Research Agricultural Engineer, ARS, SWC - A. S. Dylla
      (See Attachment C)

2. Department of Interior.
   a. Geological Survey - T. W. Robinson
      (See Attachment D)
   b. Bureau of Indian Affairs - Floyd Farrell
      (See Attachment E)
   c. Bureau of Sport Fisheries & Wildlife - M. G. Sheldon
      (See Attachment F)
   d. Bureau of Reclamation - J. W. Bailey
      (See Attachment G)
   a. Corps of Engineers - Arthur V. Potter
      (See Attachment H)

   B. State Reports.
      1. Department of Watershed Management, University of Arizona -
         Arnett C. Mace, Jr. (See Attachment I)

IV. Old Business

   A. A booklet containing papers presented at the Phreatophyte Symposium
      held in Albuquerque, New Mexico, on August 30, 1966, was distributed to all
      Phreatophyte Subcommittee members and guests at the 66-4 meeting in Las Vegas.
      Members not present and others interested in a copy of the report may make
      their requests known by writing J. S. Horton, USDA, Forest Service, Tempe,
      Arizona.

   B. Mr. Horton announced that Mr. Arthur V. Potter, Corps of Engineers,
      would replace S. F. Cramer as a member of the Phreatophyte Subcommittee.
      Mr. Horton also reported that Arnett C. Mace, Jr., Department of Watershed
      Management, University of Arizona, has been appointed to the committee to
      represent the State of Arizona.

      We regret the loss to another committee of our good friend "Skip"
      as his contributions have been many and his friendship great.

V. New Business

   A. Arnett Mace reported on a grass, native to Australia, which he hopes
      will prove successful for replacing phreatophytic vegetation on extremely high
      saline soils. Once the grass is established it tolerates salts up to 30,000 ppm
      and is reported as very palatable. A small quantity of seed will be obtained
      by the University of Arizona and test conducted to determine its suitability
      for a replacement vegetation.

      A short technical bulletin from Australia, entitled "Reclaiming Salted Land",
      is attached. The article was made available by Mr. Mace and states that the
      salt tolerant perennial Puccinellia out-produced all other salt land plants
      on summer dry areas often waterlogged during winter.

   B. An inquiry from Dr. F. Dixey, Editor, Journal of Hydrology, Sussex,
      England, regarding research of "Water Losses Due to Phreatophytes" has been
      referred to the Committee by John W. Shannon, Staff Specialist, Department
      of Water Resources, Sacramento, California. T. W. Robinson's publication
      entitled "Phreatophyte Research in the Western States March 1959 to July 1964"
      was forwarded to Dr. Dixey. Additional publications relative to water losses
      by Phreatophytes will be sent by the Phreatophyte Subcommittee.
C. It was suggested that the 67-1 meeting be held on March 7, 1967, at Tempe, Arizona. This date was suggested in hopes a field trip to the San Carlos Phreatophyte Project on the Gila River could be arranged for Monday, March 6, 1967, the day before the Subcommittee meeting. Those present having interests in the project assured the committee that arrangements could be made for members and guests to visit the project.

D. The meeting adjourned approximately 12:00 noon, immediately following the installation of new officers for 1967.

Floyd Farrell
Secretary
Phreatophyte Subcommittee, PSIAC
Reclaiming Salted Land

You can reclaim salted areas by introducing salt tolerant plants. In addition, reclamation prevents further spread and the loss of valuable land.

Where to Start

- **Drainage.** Remove as much surface water as possible. For contouring, check with the Soil Conservation Service of the Department of Agriculture.

- **Fence off the area.** You must fence off the salted areas to prevent livestock grazing. This allows establishment of native and introduced annual and perennial plants. You can't expect much cover for a couple of years.

- **Break the soil surface** and leave in a roughened condition. Salt then leaches to lower levels after rainfall. It may be necessary to cultivate severely salted land for several seasons if establishment of plants is slow. But avoid fine working and long fallow.

- **Seed bare patches** before opening rains but delay seeding where annual grasses need cultivation to control them. You can seed up to July on these areas.

- **In badly salted areas** strip furrows every ten yards in checkerboard design and allow windblown seed to establish on furrow edges. This makes it easier for salt tolerant perennials to grow and avoids continual cultivation and reseeding.

- **Fertilise.** Salt tolerant plants will respond to super dressings except on extremely salted areas. Use about fifteen pounds per acre to assist establishment of Puccinellia and grasses in summer moist areas.

Plants to Use

Suitable plants to sow depend on the type and degree of salting. Cultivation before germination of salt resistant annuals, barley grass and curly ryegrass, prevents their being lost.

- **Puccinellia.** Department of Agriculture trials show that the salt tolerant perennial Puccinellia out produced all other salt tolerant plants on summer dry areas often watered just during winter. Sow one pound per acre. Don't graze Puccinellia in the spring, but it stands grazing in autumn and winter months once established.

- **Wimmera Ryegrass** can be used for saltly salted land, using Merredin strain in drier areas and oats or barley as a cover crop.

- **Creeping saltbush**, a native shrubland perennial plant, is very salt tolerant and in medium to dry parts of the wheat belt can be introduced to highly salted soils. Often self-seeding is insufficient to maintain creeping saltbush stands. You may have to replough strips in bare patches and introduce more seed.

- **Bluebush,** another native perennial, grows two to three feet high and is a very useful plant on well-drained salted land. It's high in protein too. Sow saltbush and bluebush just covered with soil from April to July at a few ounces to two pounds per acre. Regeneration of other grasses will follow establishment of the longer lived perennials.

- **Paspalum vaginatum** is highly tolerant to salt in summer moist patches. Plan seeds because seed won't grow.

- **Samphire.** You should encourage Samphire to spread over low lying salt areas in the wheatbelt by avoiding grazing.

- **Trees.** Some trees stand very wet and salted soil conditions—evergreen tamarisk, deciduous tamarisk, salt she-oak and salt river gum.

Seepage patches above salted land will often grow perennial plants— lucerne, strawberry clover, couch, kikuyu, paspalum, perennial veldt grass and tree lucerne.

Grazing

Once established, salt tolerant plants can be grazed continuously, but avoid over-topping and depletion of surface plant cover. Best time to graze is in autumn months. Restewith is better following grazing and prevents woody unpalatable plant growth.

For further information contact Wesfarmers Technical Service Agronomists.
Preliminary evaluation of the 1966 field research shows that the combination of mowing and spraying, again, was the best method for control of saltcedar. A study on retreatment, using both mowing in March and unmowed, then spraying in May and again in August, indicated that mowing greatly increased the effectiveness of the initial and respray treatments with silvex ester. Previous retreatment studies had involved spraying unmowed plants only.

Another promising saltcedar control treatment, involving mowing and spraying, was concerned with stage of growth. In 1965, three plots were mowed each month in June, July, August, and September; three others were mowed in July, August, and September; three were mowed in August and September; and three were mowed only in September. This allowed approximately 4, 3, 2, or 1 month for the saltcedar to regrow before frost. As a check, three plots were mowed the following March. All plots were uniformly sprayed in May, 1966, with 4 lb/A of the propylene glycol butyl ether ester of silvex. Preliminary results indicate a high percentage of control in plots mowed in August and September then sprayed the following May.

Field research with silvex does not show any benefits from using various additives. An interesting long term study, which involves spraying the same plots every year to see how long it would take to kill 100% of the saltcedar plants yielded the following results at the end of the second year:

<table>
<thead>
<tr>
<th>Silvex OSA Rate</th>
<th>Percent of the plants killed</th>
<th>1965</th>
<th>1966</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>26</td>
</tr>
</tbody>
</table>

The large scale aerial application of granular dicamba, (Banvel D) near Arestia, New Mexico, was inundated by 1-3 feet of floodwater on August 8, 1966. This will provide an excellent opportunity to study the effect of inundation at various depths on control with dicamba.

Greenhouse research was hampered by an infestation of fungus which produced deformed shoots on saltcedar. Control measures appear to be effective with normal growth evident.
SOIL CONSERVATION SERVICE

By

Fred O. Case

The USDA River Basin Field Party of Colorado including the Soil Conservation Service has completed a report of the Water and Related Land Resources for the White River Basin in Colorado. This report contains a survey of the Phreatophyte (non-beneficial) within the Basin. A section including a table of acreages begins on page 40. Copies of this report may be obtained by writing USDA Field Party, River Basin Surveys, 12417 Federal Building, Denver, Colorado 80202.
AGRICULTURAL RESEARCH SERVICE
Soil and Water Conservation Research Division

REPORT TO PSIAC PHREATOPHYTE SUBCOMMITTEE 66-4 MEETING

By
A. S. Dylla, Research Agricultural Engineer
USDA, ARS, SWC
Reno, Nevada

Work has progressed on rehabilitating the meadow grass evapotranspiration study at the Humboldt Research Site near Winnemucca, Nevada, in cooperation with the Nevada State Department of Conservation and Natural Resources. The State has just extended the leasing arrangement on the study site through 1972.

In the fall of 1965, twelve new steel tanks were installed for measuring evapotranspiration of grasses. Three of the twelve tanks are double tanks, one encased inside the other. The tanks are of 12 gauge steel, 5 feet diameter by 6-1/2 feet deep. The soil filled inner tank is supported on liquid filled butyl tubing. Weight changes in the tank are measured by detecting changes in the fluid pressure in the butyl tubing with a manometer mounted on a post. One millimeter change in the manometer reading is equivalent to about a three pound weight change in the tank. A "dummy" manometer filled with liquid is used to correct for the effect of temperature on the density of the fluid. The first twelve tanks have been sodded in 1965 and will be ready for water use measurements in 1966.

Twelve additional hydraulic weighing tanks have been installed during the fall of 1966. These newer tanks all have fluid pressure sensing lines routed to a centrally located instrument pit. A mercury-piston manometer arrangement in the pit will be used to periodically measure weight changes in the tanks. The newer arrangement is designed to eliminate the need for the temperature correction manometer and minimize errors due to fluid density changes, since all fluid sensing lines are at least 3 feet below ground level. These later tanks are to be vegetated in 1967 with water use measurements to begin in 1968.
On September 12, 1966, starting at 2:00 p.m., a torrential rain in the Buckeye area caused Waterman Wash to overflow, and covered the experimental tank site with water and mud. Mr. Van Hylckama estimated that the peak flow in the Wash was about 12,000 cubic feet per second and the velocity of the water 3 - 3.5 feet per second. The storm was the tail end of hurricane Helga, and dumped 5 inches of rain in 4 hours at the experimental site.

About 2 feet of mud was deposited at the trailer that serves as the field office. Tanks 3 and 5 with almost 2 feet of mud on the surface probably will be abandoned and tank 6 is in poor condition. Smaller tanks in the open area were undamaged, but were flooded. The silt and mud deposit in the saltcedar growth on the tanks resulted from reduction in the velocity of the sediment laden waters, causing them to drop their load.

The Honeywell 16 channel recorder, some 2.5 feet above the land surface was under water and put out of order. One anemometer installed 6 inches above the tank surface was damaged beyond repair. Many small tools and material stored under the trailer were washed away and have not been found. Records of rainfall indicate the tank site was in the center of the heaviest rainfall. Considerable damage was done to irrigation ditches in the general area.

Most of the evapotranspiration tanks at Winnemucca, Nevada, were closed down on October 20. Six were closed on October 17 as the result of below freezing temperatures at night that burst pipes, and glass-water gages. The 1966 growing season was the coolest and driest since starting the studies in Nevada.

The work of revising the 1956 estimate of phreatophyte areas in the 17 Western States is moving ahead slowly. The map showing areas in Nevada is about 80 percent complete. Total area to date is 2,800,600 acres, the amount estimated for the State in 1956. Information of areas, species, and locations in any of the Western States will be very helpful in speeding the work.

On the return trip from the 66-3 meeting at Albuquerque, a stop was made in Grand Junction, Colorado, for a visit to the Badger Work Area. All of the detention reservoirs in the upper part of the area had a growth of saltcedar. No saltcedars were found in the lower part of the area. Photos were taken of most of the reservoirs in the upper part of the area.

A reconnaissance was made of the occurrence of saltcedar on the Humboldt River above Rye Patch Dam on October 20, 1966. Saltcedar plants were observed or reported as far upstream as Battle Mountain; however, none were found in the river in the vicinity of the test site. A report on the findings was prepared for the USBR and State of Nevada.
Attachment E

BUREAU OF INDIAN AFFAIRS

Report to Phreatophyte Subcommittee
PSIAC - 66-4 Meeting

By
Floyd Farrell

My report this morning will cover progress thus far of the San Carlos Phreatophyte Project on the Gila River. In the interest of time, we will not get into details of the program. Most of you are familiar with the project as it has been reported upon to this committee by more than one Agency. Briefly the project consists of a coordinated effort between the Bureau of Indian Affairs, U.S.G.S., the University of Arizona, the Bureau of Reclamation, and the San Carlos Tribe, to study water losses by phreatophytes, remove present vegetation, and replace with a more desirable plant.

All equipment needed to begin the project has been obtained with the exception of two large crawler tractors and root knives for each of the two tractors. We expect this equipment to be delivered within the next 30 days and to be in the field very shortly thereafter.

We have had problems in hiring employees as a result of personnel ceiling limitations. We think, however, that this problem has been eliminated and as soon as we receive delivery on the tractors all forces needed will be exerted toward the task at hand. In spite of our many problems in organizing personnel and obtaining the necessary equipment to undertake such a project, we are moving forward faster than we had hoped. To date, 400 acres of salt cedars have been knifed. Most of this was accomplished above Bylas Bridge and above the water study area. We are at this time, however, knifing in the study area at the request of Mr. Richard Culler. We expect to clear the 4,500 acres as scheduled for the first fiscal year. Progress on the project will be reported to this committee.

In view of the importance of this project to the committee, we take this opportunity to extend an invitation to its members and other interested parties to visit the area and view progress of the program.
The Bureau of Sport Fisheries and Wildlife is primarily a management organization; we do however have a Research Division which is primarily interested in the effects of phreatophyte and hydrophyte treatments on wildlife population and habitat. The role of research, then, is to assess the effects of vegetative manipulation, by other agencies, and its impact upon wildlife.

Basically, the Bureau of Sport Fisheries and Wildlife's vegetative control programs are designed primarily to upgrade existing vegetation to more desirable wildlife habitat. This, in some cases, is the treating of phreatophytes and hydrophytes for possible water salvage and to improve wildlife utilization. Methods used, on relatively small areas, range from mechanical removal, chemical controls, to blasting or digging of potholes in dense marsh vegetation. Desired results reduce evapotranspiration, increase "edge", maintain ditches and canals, and stabilize riparian vegetation to control bank erosion, provide stream shade, or aesthetic purposes.

This Bureau is, however, involved in some phreatophytic investigations (most of which are adjacent to the PSIAC boundary) which include dove and upland game bird production and utilization prior to and following salt cedar manipulation on the Pecos River in New Mexico, and the effects upon waterfowl production habitat through the manipulation and control of water in a greasewood-rabbit brush type in the San Luis Valley of Colorado. Another investigation is the study of the effects of channelization and vegetative control in the lower Rio Grande Valley of Texas.

Although the upgrading of vegetation is primarily for wildlife and recreation purposes, improved water utilization and some water salvage are desirable side benefits.
During 1966 the Bureau of Reclamation carried out phreatophyte control and studies relating thereto in the river basins of the Arkansas, Rio Grande, Pecos, Colorado rivers, and in the Lahontan and Humboldt basin of Nevada. This work, which was carried out by the Office of the Chief Engineer in Denver, and Regions 7, 5, 3, and 2, is summarized as follows:

Office of Chief Engineer, Denver

Herbicide evaluation was carried out in greenhouse and nursery studies and at 11 field plots along the Arkansas River near La Junta, Colorado. Studies were made on the effects on saltcedar of various herbicides such as silvex, tordon, 2,4,5-T, various combinations of herbicides, and various herbicides with the use of surfactants.

Region 7

A phreatophyte survey along the Arkansas River was carried out by a contract with Colorado State University from Pueblo to the Kansas line, and a contract with the Kansas State College at Fort Hayes for the area within the State of Kansas.

Region 5

The following work was carried on in Region 5 in the Rio Grande, Little Rio Grande, and Pecos River basins:

**Rio Grande Project - Caballo Reservoir**

During 1966, phreatophyte control was continued on the Caballo Reservoir area. Various phreatophyte-infested areas were treated with formulation of herbicides. The most effective and economical chemical used in these areas has been (2)2,4,5-TP (Silvex) at the rate of 3 pounds per acre repeated annually. During the latter part of the growing season, a new machine was purchased for use in the control of phreatophytes. This machine (a rotary mower with a spray rig mounted on top the mower) has been tried on 20-acre plots monthly. The results from the use of this combination equipment will not be available until next year. The following work has been accomplished this calendar year:

<table>
<thead>
<tr>
<th>Regrowth Control:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Root plow</td>
<td>1,152 acres</td>
</tr>
<tr>
<td>Rotary mowers</td>
<td>1,083 acres</td>
</tr>
<tr>
<td>Herbicides (ground spray)</td>
<td>120 acres</td>
</tr>
<tr>
<td>Mowing and Herbicides</td>
<td>123 acres</td>
</tr>
</tbody>
</table>
Middle Rio Grande Project - (Bernardo and Chemizal)

The following work was accomplished during the year on this project:

- Root plowing: 2,501 acres
- Chopping (brushchopper): 0 acres
- Mowing: 3,587 acres
- Herbicides (ground spray): 1,200 acres
- Herbicides (helicopter): 2,492 acres

Pecos River Basin Water Salvage

In cooperation with the Bureau, the State of New Mexico has initiated activity to obtain right-of-way on private land for this project. No funds are available at this time to initiate the program to remove phreatophytes from the area.

Region 3

The field work on the phreatophyte survey of the Colorado River floodplain was completed in 1965, and the office tabulation of density and acreage by plant species for each reach of the river has now been completed. The groundwater observation well network has been read in the spring and fall of each year since 1961. The report is scheduled for issuance for F.Y. 1968.

The cooperative investigations on phreatophyte control, replacement vegetation, and water use by plants with the University of Arizona, is scheduled for termination at the end of this fiscal year. Funds have not been provided for continuance of this work with the University, and only limited funds are available for a wrap-up of the cooperative investigations with the Geological Survey. One of the items programmed for F.Y. 1968 is to excavate one or more of the evapotranspiration tanks at the Buckeye Site to determine root penetration of the plastic liners.

Region 2

In the Lahontan Reservoir area 865 acres of saltcedar were mowed in April and May 1966 at a total cost of $2,914. In the Sheckler Reservoir area 425 acres of saltcedar were sprayed using 4 lbs. acid equivalent of silvex with water and surfactants at a total cost of $5,000. This work was carried on cooperatively with the Truckee-Carson Irrigation District, with the government, and the district sharing half the cost.

In the Humboldt Sink an investigation covering the period from 1959-1966 on the control of saltcedar was completed by Dr. Howard P. Cords of the University of Nevada, and a terminal report received as of June 30, 1966, has been furnished to the Phreatophyte Subcommittee library. This report included
herbicide trials at various rates and timing of applications, the use of various surfactants and formulations, the effect of various periods of water immersion and water temperatures, and the susceptibility of salt-cedar as related to carbohydrate storage. A new contract was started in July of 1966 by Dr. Cords to study the effect of systemic herbicides upon salt-cedar utilizing both growth chamber and field conditions.

CORPS OF ENGINEERS
Arthur V. Potter

Gila River - Camelsback Damsite to Salt River
Authorized clearing project upstream of San Carlos Indian Reservation.

Rights of way acquired by local sponsor are being reviewed for adequacy. Subject to availability of funds new aerials will be flown preparatory to delineating clearing limits on contract plans. Downstream of San Carlos Reservoir rights of way have not yet been obtained by local sponsor.

Gila and Salt River - McDowell to Gillespie Dam
Authorized clearing project.

Local sponsor has requested reactivation of project. Reactivation will depend on local sponsor providing unequivocal assurances of required local cooperation.
Work on this project during the past year has been concentrated in three areas of study which are as follows:

1. Laboratory investigations of the effect of salinity on transpiration and possible reasons for these effects.
2. Evaluation of the evapotranspiration tent on leaf temperature of enclosed plants.

Laboratory investigations indicate that salinity has a significant effect on transpiration rates of tamarisk plants. Tests conducted at 0, 4, 8, and 12 atmospheres of osmotic pressure or 0, 5140, 10,650 and 16,670 ppm of Na Cl indicate a significant reduction at the 5% level in transpiration beginning at the end of the fourth day for the plants grown in a nutrient solution of 16,670 ppm of Na Cl. Transpiration rates were lower on all days from plants in the 16,670 ppm solution but were not significantly different. Plants whose foliage weighed approximately 3 grams (F.W.) and were grown in the 16,670 ppm solution transpired approximately 1 ml/hour less than the control plants.

Tests were conducted on the root permeability of the tamarisk plants used in the transpiration versus salinity study. A significant reduction at the 5% level in root permeability was found for the plants grown in a media containing 16,670 ppm of Na Cl. Root permeability rates for plants grown at the above concentration of NaCl were approximately one-half of the control plants.

Identical results have been found with bean plants at the University of Arizona except the significant reduction takes place at 4 atmospheres of osmotic pressure rather than at 12 atmospheres.

These results indicate that salt concentration is one factor that should be considered in predicting evapotranspiration losses from phreatophyte zones and that the reduction in root permeability is one mechanism which causes reduced transpiration rates from tamarisk plants growing in saline soils.

Tests were conducted during the past summer on the effects of the evapotranspiration tent on leaf temperatures of enclosed plants. The data from these tests are presently being analyzed and will be reported upon at a later date.

* Sponsored by the U. S. Bureau of Reclamation.
At the present time I am in the process of analyzing E-T data for the past three summers. Development of a prediction equation for E-T using readily obtainable inventory data has not been completed.

Using climatic data collected at the study area, E-T losses have been computed by the Penman equation and compared to E-T losses determined by the E-T tent. The following results were obtained:

<table>
<thead>
<tr>
<th>Area</th>
<th>Water Table Depth (feet)</th>
<th>N</th>
<th>E-T (Penman x 0.9) (in/hr.)</th>
<th>E-T (Tent) (in/hr.)</th>
<th>r^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>20-24</td>
<td>156</td>
<td>1.98x10^{-2}</td>
<td>3.04x10^{-2}</td>
<td>0.798</td>
</tr>
<tr>
<td>Middle</td>
<td>15-18</td>
<td>121</td>
<td>1.80x10^{-2}</td>
<td>2.27x10^{-2}</td>
<td>0.714</td>
</tr>
<tr>
<td>Lower</td>
<td>0-5</td>
<td>17</td>
<td>1.57x10^{-2}</td>
<td>4.09x10^{-2}</td>
<td>0.928</td>
</tr>
</tbody>
</table>

E-T losses obtained by this comparison are very close with the exception of the lower area, where the sample size is insufficient for a valid comparison. As data is converted to suitable form for increasing the sample size on the lower area it is expected that the values will become closer together.

The correlation of determination is very high for all areas. The best correlation is obtained for the lower area which is expected since the Penman equation was derived for areas where water is non-limiting. The lower correlation for the middle area as compared to the upper area is a reverse of the expected, but in this case probably shows the influence of higher salt concentrations in the middle area on transpiration rates.