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(Palo Verde Nuclear	)	
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I hereby certify that copies of "An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Station" and "Data Summary Volume" have been served upon the following listed persons by deposit in the United States mail, properly addressed, and with postage prepaid, this 14th day of August, 1984.

Docketing and Service Section
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Chairman, Maricopa County Board of Supervisors
111 South Third Avenue
Phoenix, Arizona 85004

Lee Scott Dewey, Esq. (2 copies)
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, DC 20555

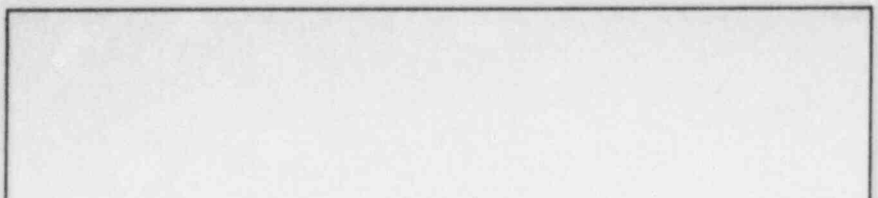
Kenneth Berlin, Esq. (2 copies)
Suite 550
2550 M Street, N.W.
Washington, DC 20037

DS03

E. A. Licitra
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Arthur C. Gehr

An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Station



University of Arizona • College of Agriculture • August 1984

AN ASSESSMENT OF SALT DRIFT ON THE PRODUCTIVITY OF AGRICULTURAL CROPS IN THE VICINITY OF THE PALO VERDE NUCLEAR GENERATING STATION

by

Kennith E. Foster, Paul G. Bartels,
Wallace C. Hofmann, and Martin M. Karpiscak
College of Agriculture

in cooperation with

University Analytical Center
Department of Nuclear and Energy Engineering
University of Arizona
Tucson, Arizona

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TABLE OF CONTENTS

Page

Page

Page

LIST OF TABLES

Page

LIST OF FIGURES

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Dr. Leon Bernstein
Consultant
Riverside, California

Dr. Charles R. Curtis, Panel Chairman
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Department of Plant Pathology
The Ohio State University
Columbus, Ohio

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Plant Physiologist
Boyce Thompson Institute for Plant Research at Cornell University
Ithaca, New York

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Dr. Robert O. Kuehl
Statistical Support Unit
Agricultural Experiment Station
College of Agriculture
University of Arizona

Dr. Robert S. Young
Office of Arid Lands Studies
College of Agriculture
University of Arizona

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Makonnen Alemayehu
Department of Plant Sciences
College of Agriculture
University of Arizona

Denis E. Boswell
Office of Arid Lands Studies
College of Agriculture
University of Arizona

Cyra J. Cain
Department of Plant Sciences
College of Agriculture
University of Arizona

Dr. Bartley P. Cardon, Dean
College of Agriculture
University of Arizona

Oscar E. Day
Agricultural Communications
College of Agriculture
University of Arizona

Dr. Leonard W. Dewhirst
Associate Dean
College of Agriculture
University of Arizona

Dr. Albert K. Dobrenz
Department of Plant Sciences
College of Agriculture
University of Arizona

Leland Evans
Office of Arid Lands Studies
College of Agriculture
University of Arizona

Dr. William R. Feldman
Department of Plant Sciences
College of Agriculture
University of Arizona

Dr. Morton I. Goldman
Senior Vice President
NUS Corporation
Gaithersburg, Maryland

Dr. LeMoyne Hogan
Department of Plant Sciences
College of Agriculture
University of Arizona

Susan B. Hopf
University Analytical Center
Department of Chemistry
University of Arizona

Wally Householder, Manager
BKW Farms, Inc.
Marana, Arizona

Terry Lauver
Boyce Thompson Institute for Plant Research
Ithaca, New York

Ted McCreary
Soils, Water and Plant Testing Laboratory
Department of Soils, Water and Engineering
College of Agriculture
University of Arizona

Dale E. McDonald
Department of Plant Sciences
College of Agriculture
University of Arizona

Cathey Moody, Manager
Avra Valley Airport
Marana, Arizona

Dr. Leon Moore
Department of Entomology
College of Agriculture
University of Arizona

Dr. George W. Nelson
Department of Nuclear and Energy Engineering
College of Engineering
University of Arizona

Dr. David A. Palzkill
Department of Plant Sciences
College of Agriculture
University of Arizona

Phillip A. Rademacher
Department of Plant Sciences
College of Agriculture
University of Arizona

Dr. Robert T. Ramage
Department of Plant Sciences
College of Agriculture
University of Arizona

Harold E. Reyher, Farm Manager
Marana Agriculture Center
College of Agriculture
University of Arizona

Dr. Robert L. Seale, Head
Department of Nuclear and Energy Engineering
College of Engineering
University of Arizona

Stephen H. Shepherd
Bechtel Power Corporation
Norwalk, California

Dr. Brooks B. Taylor, Acting Head
Department of Plant Sciences
College of Agriculture
University of Arizona

Dr. Thomas C. Tucker
Department of Soils, Water and Engineering
College of Agriculture
University of Arizona

Dr. Theo Franklin Watson
Department of Entomology
College of Agriculture
University of Arizona

Ralph Wong, President
BKW Farms, Inc.
Marana, Arizona

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Janet R. Hogan
Rebecca L. Jackson
Billie Jo Lobley
Geneva M. Mariano
Colleen M. Moosbrugger
Dr. Margaret A. Norem
James M. Parker
William H. Rademacher
R. Leslie Rawles
Teresa C. Reen
Joseph J.P. Rongo
Susan Rutman
Peggy J. Specht
Ramadjita Tabo
James A. Tanguay
Peter M. Wernsdorfer
Emily Whitehead

1. EXECUTIVE SUMMARY

1.1. INTRODUCTION

During the operation of the Palo Verde Nuclear Generating Station cooling towers, saline water in the form of droplets (drift) will be emitted in the cooling tower air stream(plume) and transported downwind. The water in the drift is expected to evaporate quickly in the arid Arizona climate resulting in the deposition of dry particles (the solids dissolved in the water droplets prior to evaporation) on plants in surrounding areas. The salinity of the drift can be characterized generally as one-third that of sea water and the particles deposited are predominantly composed of Na^+ and Cl^-, approximately 31.7% and 30.7 % respectively. The quantity of drift that will be emitted and the distribution of the depositions in the area surrounding Palo Verde are not within the scope of this study.

The effects of sea spray and cooling tower saline drift on plants in coastal areas have been the subject of research in recent years. These studies have shown that sensitivity of vegetation to saline drift is a function of plant species, the levels of Cl^- and Na^+ in the droplets, duration of exposure, and the ambient relative humidity. In contrast, little research has focused on this problem in noncoastal arid environments.

The primary objective of this research was to evaluate the effects of foliar salt drift deposition on the productivity of selected crop species. Correlative to this primary objective, the program included observations of phenological and physiological responses, the occurence of foliar injury, and tissue analyses to determine the accumulation of salts.

A simulated saline drift similar in composition to the drift predicted to be emitted from the cooling towers at the Palo Verde Nuclear Generating Station was applied to crops grown under field or greenhouse conditions. These crops were: cotton (greenhouse and field); alfalfa (greenhouse and field); barley (greenhouse only); and cantaloupe (field only). The simulated saline drift was applied to the crops at nominal rates*: control with no spray treatment (field only); 0 (control sprayed with distilled water); 10 lbs/a·yr; 100 lbs/a·yr; 500 lbs/a·yr; and 1,000 lbs/a·yr (not applied in the field to cotton or cantaloupe). The effective deposition rates (based on the total disolved solids in anhydrous form) were approximately 74% of the nominal rates, or 7.4 lbs., 74 lbs., 370 lbs. and 740 lbs/a·yr, respectively.

* For conversion to equivalent metric units, 1 lb/a·yr = 1.12 kg/ha·yr

1.2. RESULTS

Although the same rates of simulated saline drift deposition were used in the greenhouse and field, as noted above, it should be emphasized that because of the differences between the two environments direct comparisons of data cannot be made.

In alfalfa, barley, and cantaloupe, there was no evidence of any impact on yield from foliar deposition of the simulated drift applied at effective rates of 370 lbs/a·yr or less. With respect to field-grown alfalfa there was some evidence (not conclusive) that measurable effects on yield were obtained at a deposition rate of 740 lbs/a·yr.

In the case of cotton, the yield results were more complex. Comparisons among treatments in the greenhouse showed that yields (lint and seed) from cotton plants treated at rates of 7.4, 74, 370 lbs/a·yr, respectively, were all greater than yields from control plants treated with distilled water. At final greenhouse harvest, the controls had about five times more green bolls on a weight basis than the 370 lbs/a·yr treated plants.

With respect to field-grown machine-harvested cotton, the 7.4 lbs/a·yr treatment yield was greater when compared to the no treatment (unsprayed) control yield, but less than the distilled water (sprayed) control treated plants; however, the differential in yields was not statistically significant (Table 1). Among the machine-harvested plants a nonsignificant increase in yield from the 7.4 lbs/a·yr treated plants was observed when compared to both no treatment control plants and the 74 lbs/a·yr treated plants (Table 1). Yields from the no treatment plants and the 74 lbs/a·yr treated plants were basically the same. There was a nonsignificant decrease in yield in the 7.4 lbs/a·yr treated plants as compared to the sprayed control. There were no statistical yield differences in the machine-harvested plots, although there was a trend in the sprayed plots toward reduced yields with increasing treatment levels (Table 1).

In the field, some cotton plants were also harvested by hand as the bolls matured. As in the machine-harvested plots the highest yields were obtained from the control plants treated with distilled water (Table 1). The hand-harvested yields from the 7.4 lbs/a·yr treatment were not statistically different from the sprayed and unsprayed controls. The 74 lbs/a·yr treatment had statistically lower yield than the sprayed control but not the unsprayed or the 7.4 lbs/a·yr treatment. Yield from the 370 lbs/a·yr treatment was significantly lower than the 7.4 lbs/a·yr treatment and the sprayed and unsprayed controls (Table 1).

Table 1.
Effects of Simulated Saline Drift on Yields of Cotton
in Field and Greenhouse

Effective Treatment Levels lbs/a-yr	Yields of Seed Cotton[1] Field		Greenhouse
	Hand-Harvested lbs/a	Machine-Harvested lbs/a	Hand Harvested g/plant
No Treatment	2527.2[ab]	2269.6	N/A
0	2734.3[a]	2594.4	63.9[a]
7.4	2356.5[ab]	2316.2	83.3[b]
74	2237.4[bc]	2238.8	81.6[b]
370	1905.2[c]	2124.4	88.9[b]
LSD (.05)	381.6	NS	11.7
Standard Error ($S_{\bar{x}}$)	30.4	133.3	3.7

[1]Means followed by the same letters within a column are not significantly different at the 5% level when using the least significant difference (LSD) test.

In both greenhouse and field, no conclusive changes in cotton fiber quality were measured.

In general, there were no salt induced physiological changes observed in the four crops. However, greenhouse cotton plant heights were reduced in both the 370 and 740 lbs/a·yr treatments. Foliar injury was observed in the greenhouse cotton and barley treated with 370 and 740 lbs/a·yr simulated saline drift only during the latter part of the growing season and in the field grown alfalfa treated with 740 lbs/a·yr simulated saline drift. The form, incidence, and severity of salt-induced foliar injury was conditioned by four factors: species; level of treatment; duration of the exposure period; and conditions of culture and exposure. Tissue analysis indicated that more Na^+ and Cl^- were absorbed by the simulated saline drift treated plants than the control plants.

1.3. CONCLUSIONS

Given the limitations of any one-year study, it appears that a simulated saline drift treatment level of 7.4 lbs/a·yr did not adversely affect the productivity of alfalfa, barley and cantaloupe. In the greenhouse, cotton plants treated with 7.4 lbs/a·yr simulated saline drift yielded significantly more seed cotton. Machine-harvested field-grown cotton productivity was not statistically affected at a simulated saline drift treatment level of 7.4 lbs/a·yr. Although the treatment level of 7.4 lbs/a·yr did not statistically reduce productivity of hand-harvested, field-grown cotton ($p = .05$), the data indicate that this treatment may be near the level where statistically significant reduction could be detected (Table 1).

2. INTRODUCTION

2.1. BACKGROUND

2.1.1. The Palo Verde Nuclear Generating Station

Palo Verde Nuclear Generating Station Units 1, 2, and 3 are located in Maricopa County in southwestern Arizona. The general descriptions of the generating station, the site, and surrounding area, are from the following three documents:

- Final Environmental Statement Related to the Operation of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, Docket Nos. STN 50-528, 529, and 530, Arizona Public Service Company, et al., U.S. Nuclear Regulatory Commission, February 1982. (FES-OL)

- Environmental Report, Operating Licensing Stage, Palo Verde Nuclear Generating Station, Arizona Public Service Company, Supplement 4, December 21, 1981. (ER-OL)

- Final Environmental Statement Related to Construction of Palo Verde Nuclear Generating Station, Units 1, 2, and 3, Docket Nos. STN 50-528, 529, and 530, Arizona Public Service Company, U.S. Nuclear Regulatory Commission, September 1975. (FES-CP)

The FES-OL was used as the primary information source and was supplemented by additional information from the ER-OL and FES-CP.

The general description of Palo Verde Nuclear Generating Station is:

> The facility will employ three pressurized-water reactors (PWRs) producing 3817 megawatts thermal (MWt) each. Steam turbine-generators will use this heat to provide a nominal net electrical output of 1270 megawatts (MWe) per unit. The maximum design thermal output of each unit is 4100 MWt. The exhaust steam will be condensed by cooled water from three circular mechanical-draft cooling towers per

unit. Secondarily treated sewage effluent from a pipeline in the vicinity of the City of Phoenix, Arizona, 91st Avenue sewage treatment plant will be the sole source of cooling water. (FES-OL, pg. iii).

2.1.2. Description of Site and Surrounding Area

The FES-OL identifies several changes in the Palo Verde Nuclear Generating Station area since the FES-CP but does not summarize current land use. These changes are the addition of an interstate highway interchange, extension of Interstate Highway 10, and additional residential development in the region. Accordingly, excerpts from the FES-CP are still valid, and excerpts from the ER-OL generally provide accurate information on the site and the surrounding natural features and land use.

> The site of the Palo Verde Generating Station (PVNGS) is in Maricopa County, Arizona, roughly 15 miles west of Buckeye, and about 50 miles west of downtown Phoenix. An approximately rectangular area, four miles (N-S) by two miles (E-W) in its maximum dimensions, comprises the site property. Its northern edge is just south of the Buckeye-Salome Road and about 1-1/2 miles south of Wintersburg. (FES-CP, pg. 2-1).

The total area of the site is "1640 ha (4050 acres). Of this, 1250 ha (3100 acres) will be occupied by station facilities" (FES-OL, pg. 4-2, 3). This includes an approximately 80-acre makeup water reservoir and "250 acres of evaporation ponds" that could be expanded to no more than "a total of 670 acres" (ER-OL, pg. 3.6-13).

> The terrain in the site area is relatively flat desert with elevations ranging from about 900 to 1000 feet above mean sea level (MSL). Scattered about the vicinity are small hills and buttes.... Northwest of the site are the Palo Verde Hills, rising fairly abruptly to nearly 2200 feet MSL about six miles west-northwest of the reactor locations. Centennial Wash is an intermittent stream about six miles south of the reactor sites, beyond which the land rises gradually, but includes isolated, steeply sloped hills. Buckeye Valley, through which the Gila River flows, is east and southeast of the site. The desert is flat north and northeast of the site and is traversed by many intermittent streams. (FES-CP, pg. 2-1).

"Most of the land within ten miles of the site is open desert. About 10% of it is currently irrigated for agricultural purposes" (FES-CP, pg. 2-5). A 1983 map showing agricultural land and crops is presented in Figure 1 (foldout in pocket).

2.1.3. Cooling Tower System Description

As indicated in the FES-OL, "The design of the cooling towers has been changed to three circular mechanical-draft cooling towers per unit" instead of the rectangular mechanical draft towers originally proposed. "Each of the round towers will be 92 m (300 ft) in diameter at the base and 20 m (64 ft) high, with 16 fans...." (FES-OL, pg. 4-3).

> The total annual makeup water requirement per unit is now estimated...to be 2.6 x 10 m^3/year (21,350 acre-ft/year) per unit. (ER-OL, pg. 3.3-1).

> The primary plant water source is waste water effluent from the City of Phoenix 91st Avenue Sewage Treatment Plant and from the City of Tolleson's Sewage Treatment Plant. The processed effluent from these two sources is delivered to the onsite water reclamation plant via pipeline which starts at the 91st Avenue Sewage Treatment Plant. It is further treated and then stored in the 2300 acre-foot onsite reservoir. (ER-OL, pg. 3.3-1).

> Each unit's circulating water system removes waste heat resulting from normal operation of the unit and rejects it to the atmosphere via the three cooling towers in each system. Heat rejection is accomplished by the evaporation of a portion of the circulating water flow. To maintain the chemical concentration of circulating water at or below 15 times that of makeup water (15 cycles of concentration), a quantity of water, called blowdown, must be discharged from the system. In addition to evaporation and blowdown losses, a small amount of water in the form of entrained droplets (drift) is carried away in the cooling tower air stream. Makeup water to replace these losses in each unit is drawn from the reservoir. (ER-OL, pg. 3.3-2).

After approximately 15 cycles of concentration, the salt content of the circulating water will be approximately one-third of the salt content of sea water. The salt (species) will be primarily sodium (and) chloride with substantial amounts of magnesium and calcium ... and sulfates. Less than 0.1 percent by weight of the solids will be heavy metals or biocides. Drift from cooling towers is designed to be controlled to 0.0044 percent loss of the circulating water flow" (ER-OL, pg. 5.3-3). This value "is a manufacturer's guarantee and is typical of drift losses from circular mechanical draft cooling towers. (FES-OL, pg. 4-3).

This drift is emitted from the cooling tower stacks and is transported downwind with the plume. As the plume loses buoyancy, the droplets fall out and drift downward by gravity. Because of the arid desert climate, the water in these droplets is expected to evaporate quickly. The resulting solid salt particles will deposit over a wide area on the surrounding soil and plants. The amount of salt drift and the Palo Verde Nuclear Generating Station deposition pattern was predicted in the ER-OL and was reviewed by the Nuclear Regulatory Commission in the FES-OL. Additional studies on drift loss, transport modeling, and monitoring have been commissioned by Arizona Public Service Company. These topics are beyond the scope of this report.

2.1.4. Environmental Impact Statements

As indicated in Section 2.1.1., the Nuclear Regulatory Commission has issued two environmental impact assessments of Palo Verde Nuclear Generating Station, the FES-OL in February 1982 and the FES-CP in September 1975.

The FES-OL concluded that "Station cooling towers will produce no appreciable impacts from fogging and drift deposition; the impacts that do occur will be less than predicted in the FES-CP (Sections 5.4 and 5.5)" (FES-OL, pg. iv). With respect to drift, it was further stated "The maximum offsite deposition rate is now estimated to be 13.4 kg/ha (12 lb/acre) of solids per year, primarily concentrated salts ... Even if all solids from offsite drift deposition accumulated in desert soils over the lifetime of PVNGS, soil salinity would not be altered sufficiently to impact biota (NUREG-0522)" (FES-OL, pg. 5-10).

A more comprehensive discussion of potential salt drift impacts was presented by the NRC in the FES-CP:

> Salt from cooling tower drift could modify floral and faunal species composition on some acreage close to the site boundaries depending upon drift design specification selected for the cooling towers; however, this is not expected to generally affect the population structure and stability of areas further away (Sec. 5.5.2). (FES-CP, pg. i).
>
> Very little information is available in the literature on the effects of aerosol salt applied to soils associated with vegetation, or on the vegetation itself, particularly for the arid southwest. Salts applied directly to the soil may adversely affect vegetation in at least three diverse ways: (1) increase the osmotic potential, thereby making it more difficult for roots to withdraw water from the soil, (2) specific ions contained therein may inhibit plant nutrition, and (3) some specific ions may produce toxic effects. Airborne salts, when directly applied to plant seeds or the foliage, also may have adverse effects. These effects are known to be different for various species and at different life stages within species and are briefly discussed below.
>
> Foliar accumulation of airborne salt on leaf surfaces can cause leaf damage (e.g., necrotic lesions). The staff is unaware of any studies which assess the impact of foliar salt application on desert scrub vegetation. The unique leaf morphology of many desert plants (i.e., thick leaves, heavy cuticle, stomatal distribution, etc.) coupled with the low humidity and sparse rainfall characteristic of the PVNGS region invalidates the use of coastal salt water cooling tower studies for comparison purposes. That (sic) the applicant will monitor for offsite damage to vegetation due to salt deposition and evaluate and transmit such information to the staff. (FES-CP, pg. 5-17, 18).

2.2. LITERATURE REVIEW

2.2.1. Cooling Towers

The natural draft tower and the mechanical draft tower are the two designs most commonly chosen for closed-cycle cooling of the steam condensers in a power plant. The most extensive studies of the effects of saline drift have been conducted for the natural draft cooling towers at the Chalk Point Station in Maryland, which uses brackish water for makeup (Curtis, 1977; Curtis, Lauver and Francis, 1976; Curtis, Lauver and Francis, 1977; Curtis et al., 1977; Curtis, Francis and Lauver, 1978; Lauver et al., 1978; Mulchi, Armbruster and Wolf, 1982). The effects of drift emissions from mechanical draft towers have been investigated at the Palisades Plant in Southwestern Michigan (Rochow, 1978), the P.H. Robinson Generating Station in Galveston County, Texas (Wiedenfeld, Hossner and McWilliams, 1978), and Turkey Point Station in Florida (Hindawi, Raniere and Rea, 1976).

Design features of the cooling tower such as type of tower, drift eliminator design, and release height, determine the amount of drift and the affected dispersal pattern. The concentration of salts in the drift is determined by the salt content of the makeup water and the number of cycles of concentration, which is an operational parameter. In general, aerosol drift from the taller natural draft towers is dispersed over a greater area (with lower salt deposition per unit area) than the drift dispersed from mechanical draft towers (Chen, 1977). Droplet size, which is dependent on drift eliminator design, also has been identified as a very important factor in determining drift deposition pattern (Webb, Wheeler and Morre, 1978; Policastro, Dunn, and Breig, 1978; Dunn, Boughton and Policastro, 1978; Slinn, 1974).

In addition to cooling tower design and operational parameters, dispersal of the aerosol drift is dependent upon ambient meteorological conditions such as wind velocity, relative humidity, and evaporation rate, which is related to humidity and temperature (Davis, 1979; Israel and Overcamp, 1974). Evaporation is considered of greater importance in neutral atmospheres (Environmental Systems Corporation, 1974), and modellers must alter predictive methods to account for the resultant changes in droplet size and salt concentration (Laskowski, 1975; Hanna, 1974; Roffman and Grimble, 1975). Relative humidity influences what fraction of the droplets size spectrum will become dry prior to deposition. Wind speed has been identified as influential when the plume reaches its full height and begins to turn horizontal (Argonne National Laboratory, 1981).

Studies of the effects of saline drift emissions from cooling towers generally have been limited in scope and location. As shown by the studies cited above, most studies of drift from cooling towers located at power plants have been conducted in humid coastal climates with moderate rainfall. Because the characteristics of the makeup water at these plants is generally brackish (i.e., seawater diluted with freshwater), the studies of the effects of saline drift at these plants have focused on Na^+ and Cl^- uptake by vegetation.

2.2.2. Salt Dispersion, Deposition, and Accumulation

The concentration of salts in the saline drift from a cooling tower is dependent on salinity of the cooling water, and tower concentration rate (Davis, 1979; Israel and Overcamp, 1974). Dispersal of the aerosol drift is dependent upon wind velocity and relative humidity as well as tower design (Davis, 1979; Israel and Overcamp, 1974). Drift from cooling towers is deposited upon vegetation through sedimentation and impaction of wet and dry particles (Talbot, 1979). Leaves on the windward side suffer significantly more damage than leaves on the leeward side (Hindawi, Raniere and Rea, 1976).

Deposition and accumulation of salts on crop foliage are dependent upon: 1) airborne salt emission rate; 2) wind velocity; 3) surface roughness factors of plant canopy and leaves (Williams and Moser, 1975); 4) settling velocity of the particles; and 5) the distance from the cooling tower (Moser, 1975; Roffman and Roffman, 1973). Heaviest deposits occur downwind from the tower and the amount of salts deposited per unit area decreases as the distance from the tower increases (Israel and Overcamp, 1974). Roffman and Roffman (1973) report that rates of deposition decrease almost exponentially with increasing distance from the source, i.e., the estimated deposition rate decreases at least an order of magnitude with a three-fold increase in radius from the tower. A comprehensive review of and comparisons among the various cooling tower studies was published by Talbot (1979).

2.2.3. Factors Determining Salt Injury

Studies show that foliar injury from saline aerosols is dependent upon the following factors: 1) relative humidity (McCune et al., 1977; Moser, 1975); 2) temperature (Smith and Robinson, 1971); 3) photoperiod (Simini and Leone, 1982); 4) salt particle size and composition (McCune et al., 1977); 5) rainfall after exposure (Silberman and McCune, 1978); and 6) plant species (McCune et al., 1977).

McCune et al. (1977) reports that at equivalent exposures, saline mist with 45% of the particles larger than 150 μm in diameter caused more injury to foliage than a mist in which 95% of the particles were 50 μm to 150 μm in diameter.

Relative humidity is a highly significant factor in foliar injury. Saline aerosols deliquesce when the relative humidity exceeds 75% suggesting that the salts on the surface are absorbed into the leaf only when they are hydrated (Cassidy, 1971). The penetration of the salt from the droplets across the epidermis is proportional to the area of contact between droplet and epidermis and the concentration of salts within the droplet (Logan, 1975). Kannan (1980) reports that substances with high molecular weight penetrate more slowly; ionic radius and degree of hydration also influence the rate of penetration, favoring a lyotropic series (Haile Mariam, 1965). McCune et al. (1977) and Moser (1975) showed that when plants were exposed and maintained at 75% or greater relative humidity for 12 hours per day, the toxicity of saline particles was increased, i.e., it was doubled, as compared to plants exposed to 50% relative humidity. Grattan, Maas and Ogata (1981) demonstrated that foliar accumulation of Na^+ and Cl^- were linear functions of salt deposition levels in pepper (Capsium annum L.), corn (Zea mays L.), soybean (Glycine max L.) and tomato (Lycopersicon lycopersicum L.).

Simini and Leone (1982) studied Cl^- uptake in 11 woody and nonwoody plant species under different conditions of temperature, relative humidity, and photoperiod. In general, most species studied absorbed more Cl^- when exposed to shorter photoperiods, lower temperatures, and higher relative humidities. The authors suggest that increased light and temperature may cause structural changes in the cuticle, leading to decreased permeability. Sargent and Blackman (1970) have shown in young bean (Phaseolus vulgaris L.) leaves that the penetration rate of chloride in the presence of light decreases as pH increases; in the dark, the rate of absorption remains constant throughout the pH range.

Crop salt tolerance is generally expressed as a function of soil salinity. However, Bernstein (1975) and Maas, Grattan and Ogata (1982) demonstrated that the relative tolerance of crop species to saline aerosols and sprinkler irrigation water is not the same as the tolerance of these same crops to soil salinity. Species that do not appear to be specifically sensitive to Cl^- and Na^+ when surfaced irrigated, may be injured by spraying saline irrigation water on the leaf surfaces. Conversely, the response of plants to saline sprays does not necessarily parallel known responses to soil salinity. Busch and Turner (1967) have reported that sprinkling cotton with saline irrigation water caused leaf burn and yield reduction not apparent with surface irrigation. Citrus trees will loose their leaves when sprinkled with saline irrigation water but will not lose their leaves when surface irrigated with the same water (Ehlig and Bernstein, 1959). Because of these differences, soil salinity studies have not proven to be a reliable guide for predicting how saline drift may affect plants.

In general, field tests have shown foliar damage to be dependent on plant species and stage of development. Woody plants tend to be more sensitive to aerosol drift than nonwoody plants (McCune et al., 1977), probably because of continued salt absorption over the longer time period. McCune et al. (1977) studied 11 woody species treated with saline mists and found that the younger leaves of deciduous species were more sensitive than older ones. A greater than 100-fold difference in median effective doses existed among the 11 species examined. Increasing the relative humidity from 50% to 80% doubled the injurious effect as did increasing the particle size of the mist ($> 150\ \mu m$). Francis and Curtis (1979) conducted a 2-year field study using six tree species. Replicated field plots were sprayed with simulated saline cooling tower drift at concentrations ranging from 8685 to 13888 ppm at various spray rates. Injury was noted on tulip poplar stipules (Liriodendron tulipifera L.), slight injury was noted on some white ash leaves (Fraxinus americana L.) and significant injury was noted on flowering dogwood (Cornus florida L.). Francis and Curtis (1979) suggest that dogwood may be a useful bioindicator of saline drift because the intensity of tip and marginal necrosis was related to Na^+ and Cl^- accumulation in leaves.

2.2.4. Plant Injury: Detrimental Concentrations of Airborne and Foliar Salts

Symptoms of plant damage from foliar absorption of saline aerosol drift are characterized as acute and chronic. Acute symptoms include marginal foliar necrosis, lesions, shoot-tip dieback, leaf curl, interveinal necrosis, and molding, a condition of stunted growth on the pollutant source side of the foliage (McCune et al., 1977; Talbot, 1979). Chronic effects, which are less obvious, are characterized by a chlorotic condition in the interveinal regions, lighter leaves, slower growth, and a change in structure and diversity in the plant community over time (McCune et al., 1977). According to Hosker and Lindberg (1982), chronic exposure also may increase susceptibility to disease and insect damage.

Numerous researchers have treated nonwoody plants with a simulated aerosol salt drift. Mulchi and Armbruster (1975) investigated the effects of saline aerosol on soybeans and corn. Severity of injury was directly proportional to the quantity of salt and duration of exposure. In addition, yields of the treated plants were reduced relative to control plants. In a subsequent study, Mulchi and Armbruster (1981) found that application rates of 6.88 and 13.76 kg NaCl/ha·wk* induced foliar injury in soybean seedlings within 1 week. Rates of 13.76 kg NaCl/ha·wk and 6.88 kg NaCl/ha·wk resulted in foliar injury to corn in 3 and 5 weeks, respectively. After 8 weeks, soybean recovered and no injury was observed in the upper canopy; however, corn foliar injury became more pronounced with time. Mulchi and Armbruster (1983) also have studied tobacco (Nicotiana tabacum L.) plants using either NaCl or brackish water at rates of 0.97 to 22.24 kg/ha·wk for 8 weeks. No foliar injury was induced by treatment; however, an application rate of 4.0 kg/ha·wk resulted in a yield increase.

Grattan, Maas and Ogata (1981) treated peppers, tomatoes, and soybeans with saline aerosols in an environmental chamber that simulated morning dew. A total deposition treatment level of 0.4 mg Cl^-/cm^2 resulted in foliar necrosis within 3 to 8 days. No injury symptoms were apparent, however, on any species when relative humidity was maintained at 70% in the absence of the simulated morning dew. McCune et al. (1977) has reported that sensitive plant species (corn, Canadian hemlock [Tsuga canadensis (L.) Carr.], dogwood) show adverse effects from saline aerosols at Cl^- deposition levels ranging from 3 μg to 67 μg Cl^-/cm^2. Susceptible

* For conversion to equivalent english units, 1 kg/ha·wk = 0.891 lb/a·wk

species displayed extensive leaf burn, tip and marginal necrosis, and defoliation following foliar application of saline aerosols.

Hassan (1981) observed that NaCl sprayed on bean plants stimulated vegetative growth but reduced flower, pod, and seed growth. Bernstein and Francois (1975) reported lower yields from bell peppers sprinkled with water containing 1450 mg/l of salts. Bernstein and Francois (1975) also found more leaf burn and lower yields of plants sprinkled at 2.3 day intervals (seasonal average) compared to 3.5 and 4.75 day intervals and attribute the yield reduction primarily to foliar salt absorption. Eisikowitch (1979/1980) reported that an ecotype of the horned poppy (Glaucium flavum, Crantz) has difficulty setting seed in locations exposed to winds carrying sea spray.

In a study of the effect of salt drift from a nuclear generating station at Turkey Point, Florida, Hindawi, Raniere and Rea (1976) found no effects on indigenous vegetation; however, sweet corn and bush bean introduced 215 m from the cooling tower exhibited leaf injury after 3 weeks of exposure. The authors then treated 1-, 3-, and 5-week-old bush beans with a saline aerosol with concentrations of 5, 25, and 75 μg sea salt/m^3. The incipient injury threshold was found to be 5 $\mu g/m^3$ after 100 hours cumulative exposure to saline aerosols over a 4-week period. The leaves from treated plants exhibited random chlorotic and necrotic areas on the adaxial (upper) surfaces.

In controlled environment studies, plant salt tolerance and absorption rates affected the amount of injury from saline spray. Barley (Hordeum vulgare L., 'Gus') treated with saline spray at rates of 15 and 30 meq/l daily (5 days/wk) for seven weeks induced only minor injury even though Na^+ and Cl^- were readily absorbed. Alfalfa (Medicago sativa L.) sprayed at the same rates absorbed less salt but exhibited more foliar damage. Cotton (Gossypium hirsutum L., 'Deltapine 90') sprayed at with 30 meq/l and 60 meq/l absorbed salt very slowly and exhibited little foliar injury (Maas, Grattan and Ogata, 1982).

Rochow (1978) studied the effects of calcium and sulfate deposition on leaves in the vicinity of the Palisades Nuclear Plant in southwestern Michigan. Severe foliar damage was observed on all deciduous and evergreen tree species within 92 m of the cooling towers and was attributed to the extremely high sulfate deposition rate. Injury was similar to that caused by sulfur oxides.

Some studies show that foliar injury from saline aerosols is dependent not only upon the size and composition of the salt particles deposited on the leaf tissue, but also upon: 1) the nature of the leaf surface; 2) climatic parameters, particularly humidity; 3) plant species and age; and 4) cuticular thickness and composition (Robertson and Kirkwood, 1969; Bukovac, Flore and Baker, 1979; Hull, 1970; Leece, 1976). Most of the research on saline drift effects has focused on climatic conditions similar or equivalent to a coastal climate with high humidity and moderate to high rainfall. A literature search conducted in December 1983 by the University of Arizona's College of Agriculture did not identify any published studies assessing the impact of salt accumulation on native and cultivated plants in noncoastal arid areas. A study of saline drift effects with low humidity and sparse rainfall should provide a better basis for assessment of the physiological and biochemical mechanisms of foliar injury in an arid environment.

3. GENERAL STUDY APPROACH

3.1. SCOPE

This project investigated the effects of foliar deposition of simulated saline drift on crop growth in noncoastal arid environments. Four levels of simulated saline drift were applied to cotton, alfalfa, and barley cultivated in greenhouses, and to cotton, alfalfa, and cantaloupe cultivated in a field near Marana, Arizona. At both sites, evaluations were made of drift deposition, accumulation of foliar salts, foliar injury, and productivity.

The period of cultivation extended from April 1983 to November 1983. Barley is a winter crop and was studied only at the greenhouse site where temperature could be moderated. In contrast, cantaloupe was studied only at the field site because cultivation of a vine crop in a greenhouse presents operational constraints. To conform as closely as possible to agronomic conditions near the Palo Verde Nuclear Generating Station all cultivation practices in the field followed those commonly employed by Arizona growers.

3.2. RATIONALE

Cotton, barley, and alfalfa are three representative crops cultivated near the Palo Verde Nuclear Generating Station (Figure 1 foldout in pocket, Data Summary Volume Section B). Although not extensively grown in that area, cantaloupe is a representative melon crop under consideration for cultivation in the region. The area near Marana, Arizona, was chosen as the agronomic field site because of the proximity to the University of Arizona.

The chemical composition of the simulated saline drift was similar to that expected to be emitted from the cooling towers at the Palo Verde Nuclear Generating Station. Droplet mean diameter was approximately 100 μ. Different rates of application were used to provide a more comprehensive evaluation than could be obtained by using a single application rate. Greenhouses were employed to control variations caused by rain, temperature, wind, humidity, cultivation, soil, irrigation, diseases, etc. The greenhouse study permitted more detailed evaluations and measurements of individual plants. Three species of crops were evaluated: cotton (Gossypium hirsutum L., 'Deltapine 90'), alfalfa (Medicago sativa L.), and barley (Hordeum vulgare L., 'Gus'). A special greenhouse chamber was designed for the application of measured quantities of simulated saline drift to the plants.

Field studies were conducted on 6 acres of a commercially managed farm near Marana, Arizona. Cotton (Gossypium hirsutum L., 'Deltapine 90'), alfalfa (Medicago sativa L.), and cantaloupe (Cucumis melo L., 'Top Mark') were cultivated. A special tractor mounted sprayer was designed for applying measured quantities of simulated saline drift to the crops.

3.3. OBJECTIVE

The objective of this study was to evaluate the effects of foliar salt drift deposition on the vegetative and reproductive development, and productivity of selected crop species.

4. MATERIALS AND METHODS

4.1. GREENHOUSE - PROJECT DESIGN

4.1.1. Description of the Greenhouses

The study was conducted in two greenhouses designated north and south and located on the University of Arizona Campus Agricultural Center. The north greenhouse was 27 ft-by-72 ft (Figure 2); the south greenhouse was 22 ft-by-72 ft. Drip irrigation systems were used. Plants were grown under sunlight filtered through the clear plastic greenhouse covering. Air temperature was moderated by evaporative coolers and average maximum temperature was approximately 30 C. Relative humidity was increased to 75% or more three times per week by applying water to the greenhouse floor. Temperature and relative humidity were monitored by Omnidata Datapod Digital Recorders located at each end of the north greenhouse (Project Study Plan [PSP] Procedure CA-29).

4.1.2. Experimental Design

Each crop in the north greenhouse was grown in a randomized complete block design with four replications. Each experimental unit consisted of four samples grown in separate pots and separate benches were used for each crop (Figure 3). The experiment was designed to statistically block the variability caused by the temperature gradient from one end of the greenhouse to the other.

Randomized complete block designs were also used in the south greenhouse (Figure 4). All three crops were grown on separate parts of the same bench. The cotton and alfalfa each had three replications and the barley had two replications. Each alfalfa experimental unit had five transplant pots and five seedling pots/unit.

4.1.3. Plant Culture

Cotton (Gossypium hirsutum L. 'Deltapine 90'), alfalfa seedlings and transplants (Medicago sativa L. 'Lew'), and barley (Hordeum vulgare L. 'Gus') were cultivated. Plants were grown in plastic pots filled with Terra-lite potting mix. Cotton was planted in 6-gallon pots; one plant per pot. Barley was planted in

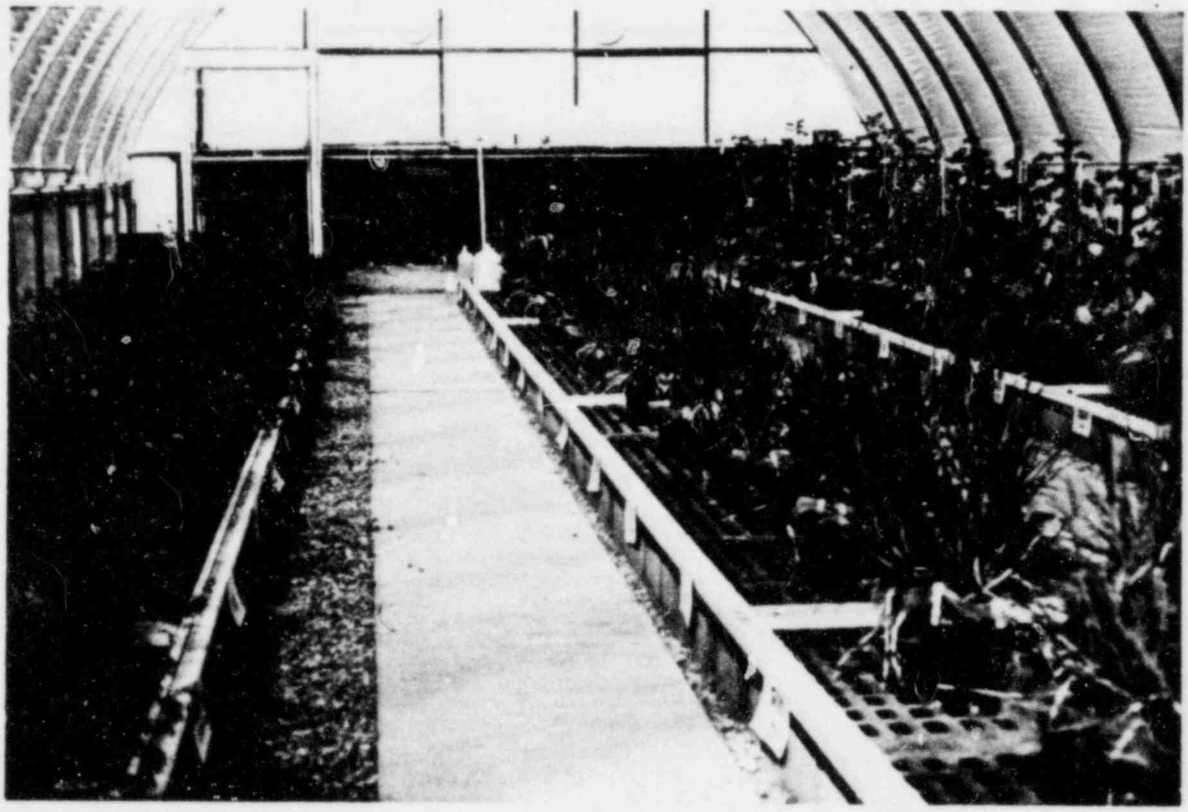


Figure 2. North greenhouse at the University of Arizona Campus Agricultural Center. The crops from left to right are alfalfa, barley and cotton

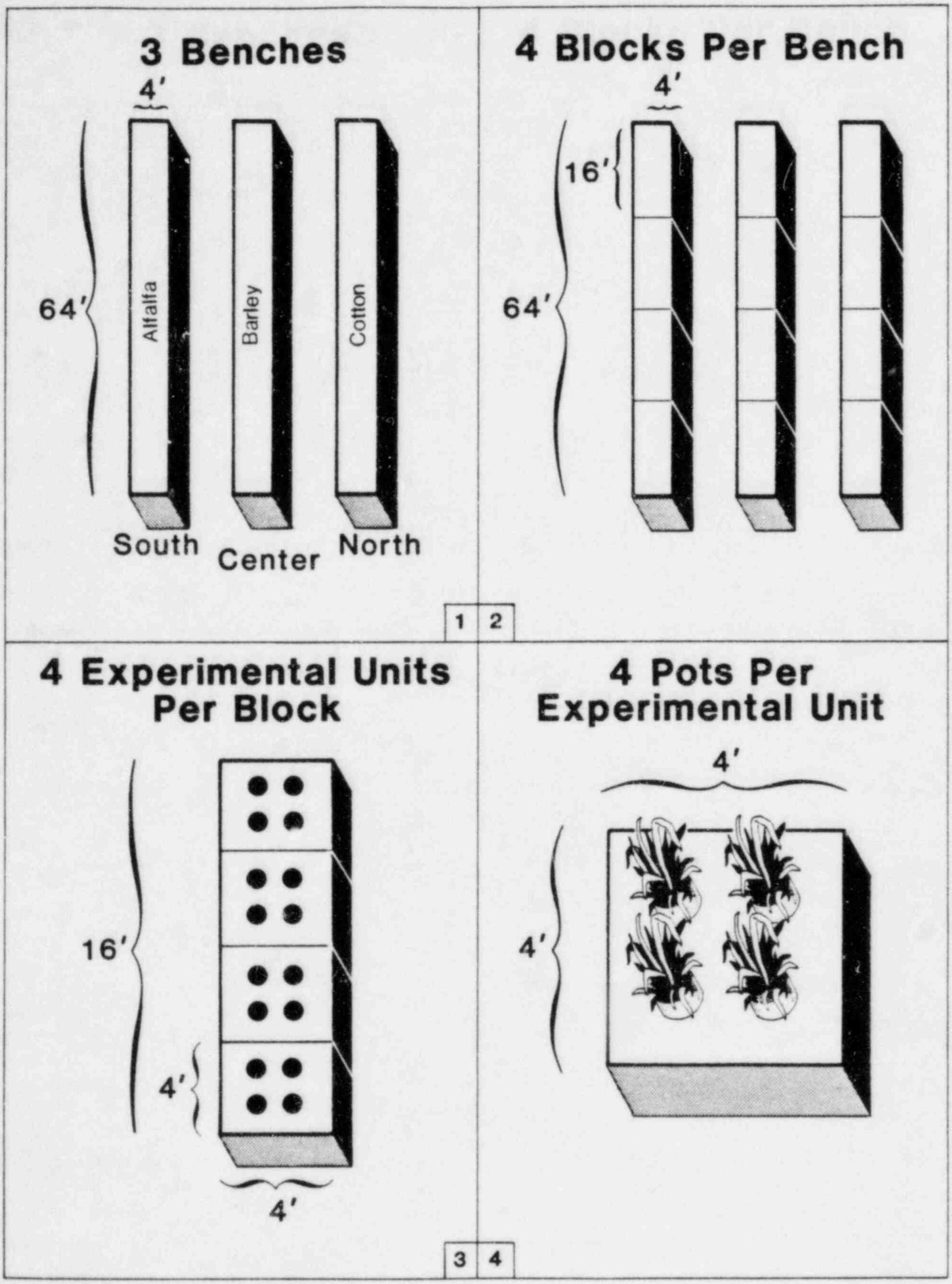


Figure 3. Experimental plan for the north greenhouse

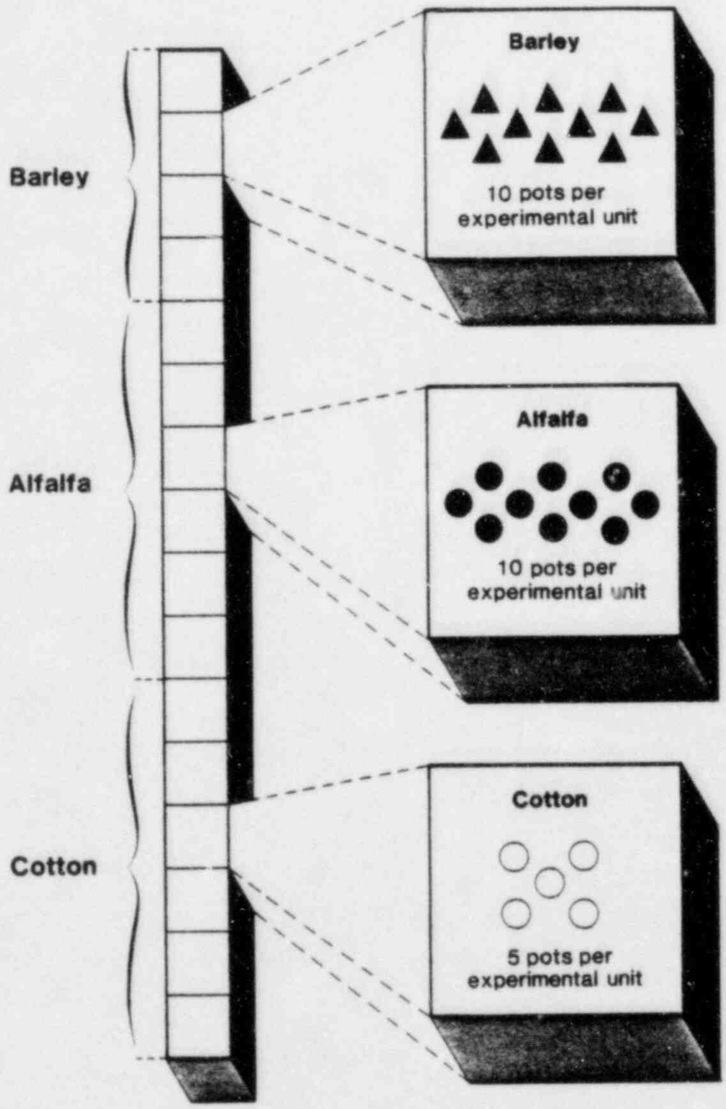


Figure 4. Experimental plan for the south greenhouse

2-gallon pots and was thinned to two plants per pot. Alfalfa seeds were planted in 2-gallon pots and thinned to approximately 10 plants/pot (seedlings). Alfalfa transplants from the United States Department of Agriculture's Plant Materials Center were planted in 2-gallon pots. Clear plastic sheeting with holes cut for the plants to grow through was placed over the pots. To help prevent overheating of the soil the plastic covering was elevated on stakes 5 cm above the rim of the pot.

When required, irrigation was applied to the plants through the 1 gallon/hour drip emitters. Irrigation duration ranged from 20 to 30 minutes, or until the water began to leak from the bottom of the pot (PSP Procedures CA-36, and CA-39).

Fertilizer was added weekly to the irrigation water (fertigation). A Smith Measure Mix Liquid Fertilizer Injector, Model R-3, ensured a uniform and constant rate of application to each pot. Peter's Professional Water Soluble Fertilizer (20-20-20 plus micronutrients) was initially used as the sole nutritional source. The fertilizer injector mixed the weighed quantity of nutrients with irrigation water to deliver a solution with a concentration of 100 ppm nitrogen. The total weekly fertilizer amendment for each pot was 0.5 gallon of water and 100 ppm nitrogen. When required to maintain proper nutrient levels, Hoagland's solution and urea were applied directly to the pots (PSP Procedures CA-35, CA-36, and CA-39).

Lannate, Malathion 50, Thuricide, Fulex DDVP, and Clean Drop Dimethoate 267 EC Systemic Insecticide were used as needed for insect control in both greenhouses (PSP Procedure CA-32).

4.1.4. Treatment

In the north greenhouse crop species were treated with four nominal rates of deposition (0 [distilled water], 10, 100, and 500 lbs/a·yr). Whereas, in the south greenhouse crop species were treated with 0 (distilled water) and a nominal 1000 lbs/a·yr treatment. To apply these levels of treatment, a known volume and composition of simulated saline drift was applied at regular intervals.

4.1.4.1. Preparation of Simulated Saline Drift Treatment Solutions

Three simulated saline drift solution formulations were provided by the Bechtel Power Corporation over the duration of this study (Table 2). Stock solutions of each compound were prepared. Treatment solutions were prepared by combining aliquots of the stock solutions with distilled water. The amount of stock solutions used to prepare the final treatment solutions was based on the hydrated chemical weights (Table 2a).

Salt solutions were applied to the plants in the greenhouses by means of a chain driven spray boom mounted in a specially designed portable plexiglass chamber measuring 4 ft-by-4 ft at the base with a height of 7 ft (Figures 5 and 6). Each spray rig was adjustable and was raised or lowered to approximately 0.5 m above the crop canopy during spraying. A vinyl curtain was attached at the top of the spray chamber on a spring loaded roller to contain the spray within the experimental unit. Velcro was used to ensure a tight curtain seal at the chamber sides. Gutters at each endpoint of boom travel collected excess solution that dripped from the nozzles.

The volume of solution applied to the experimental units was dependent upon nozzle delivery rates and spray boom speed. The speed of the boom was adjusted so that the correct amount of solution could be dispersed over the area of each experimental unit in two passes of the boom. The area of each experimental unit was 1.48 m^2 (16 ft^2). As an example, the concentration of the treatment solution to be applied to the experimental units in the nominal 500 lbs/a·yr treatment group during a 5-day week, were calculated as follows:

treatment solution concentration [TSC] (g/l) =

$$\frac{\text{salt treatment (g/experimental unit area[EUA]·wk)}}{\text{spray volume (l/EUA)}}$$

salt treatment:

$$500 \text{ lbs/a·yr} = 226800\text{g/a·yr} \div 43560 \text{ ft}^2\text{/a} \div 52 \text{ wk/yr} \times 16 \text{ ft}^2\text{/EUA}$$

$$= 1.60 \text{ g/EUA·wk}$$

Table 2.

Simulated Saline Drift Formula
(Provided by Bechtel Power Corporation)

Chemical	Revision 2 7/20 - 12/2	Revision 1[a] —	Revision 0 5/24 - 7/19
	Quantity lbs/1000 gal		
Distilled H_2O	995 (gal)	995 (gal)	995 (gal)
$Na_2SO_4 \cdot 10H_2O$	68.0	68.0	68.0
NaCl	54.0	54.0	54.0
$NaNO_3$	26.6	26.6	26.6
$CaCl_2 \cdot 2H_2O$	10.0	10.0	10.0
$Na_2Si \cdot O_3 \cdot 9H_2O$	3.1	3.1	3.1
KOH	2.5	2.5	--
$MgSO_4 \cdot 7H_2O$	2.0	2.0	2.0
$NaHCO_3$	0.6	0.6	0.6
NALCO 1370[b]	0.21	0.21	0.25 (NALCO 345)[c]
$Na_3PO_4 \cdot 12H_2O$	0.2	0.2	0.2
NH_4Cl	0.05	0.05	0.05
$BeSO_4 \cdot 4H_2O$	0.05	0.05	0.05
$FeCl_3 \cdot 6H_2O$	0.04	0.04	0.04
NaF	0.03	0.03	0.03
H_3BO_3	0.03	0.03	0.03
$MnCl_2 \cdot 4H_2O$	0.022	0.022	0.014 ($MnCl_2$)
$ZnCl_2$	0.02	0.02	0.02
$SrI_2 \cdot 3H_2O$	0.02	0.002 ($SrI_2 \cdot 6H_2O$)	--
$CuCl_2$	0.005	0.005	0.005
Phenol	0.0012	0.0012	--
$AgNO_3$	0.0007	0.0007	0.0007
$Pb(NO_3)_2$	0.0004	0.0004	0.0004
As_2O_3	0.0003	0.0003	0.0003
$Ba(NO_3)_2$	0.0002	0.0002	0.0002
$CdCl_2$	0.0002	0.0002	0.0002
SeO_2	0.0002	0.0002	0.0002
CrO_3	0.0001	0.0001	0.0001
$HgCl_2$	0.00002	0.00002	0.00002

[a] Not applied to plants.
[b] Proprietary water treatment chemical.
[c] NALCO 1370 used to prepare treatment solutions.

Table 2a.

Simulated Saline Drift Anhydrous Formula
(Provided by Bechtel Power Corporation)

Chemical	Quantity lbs/1000 gal	Anhydrous lbs/1000 gal
Distilled H_2O	995 (gal)	
$Na_2SO_4 \cdot 10H_2O$	68.0	29.979
NaCl	54.0	54.0
$NaNO_3$	26.6	26.6
$CaCl_2 \cdot 2H_2O$	10.0	7.550
$Na_2Si \cdot O_3 \cdot 9H_2O$	3.1	1.331
KOH	2.5	2.5
$MgSO_4 \cdot 7H_2O$	2.0	0.977
$NaHCO_3$	0.6	0.6
NALCO 1370[a]	0.21	0.21
$Na_3PO_4 \cdot 12H_2O$	0.2	0.0863
NH_4Cl	0.05	0.05
$BeSO_4 \cdot 4H_2O$	0.05	0.03
$FeCl_3 \cdot 6H_2O$	0.04	0.0235
NaF	0.03	0.03
H_3BO_3	0.03	0.03
$MnCl_2 \cdot 4H_2O$	0.022	0.0137
$ZnCl_2$	0.02	0.02
$SrI_2 \cdot 3H_2O$	0.02	0.0173
$CuCl_2$	0.005	0.005
Phenol	0.0012	0.0012
$AgNO_3$	0.0007	0.0007
$Pb(NO_3)_2$	0.0004	0.0004
As_2O_3	0.0003	0.0003
$Ba(NO_3)_2$	0.0002	0.0002
$CdCl_2$	0.0002	0.0002
SeO_2	0.0002	0.0002
CrO_3	0.0001	0.0001
$HgCl_2$	0.00002	0.00002
TOTAL	167.48032	124.05612

[a] Proprietary water treatment chemical.

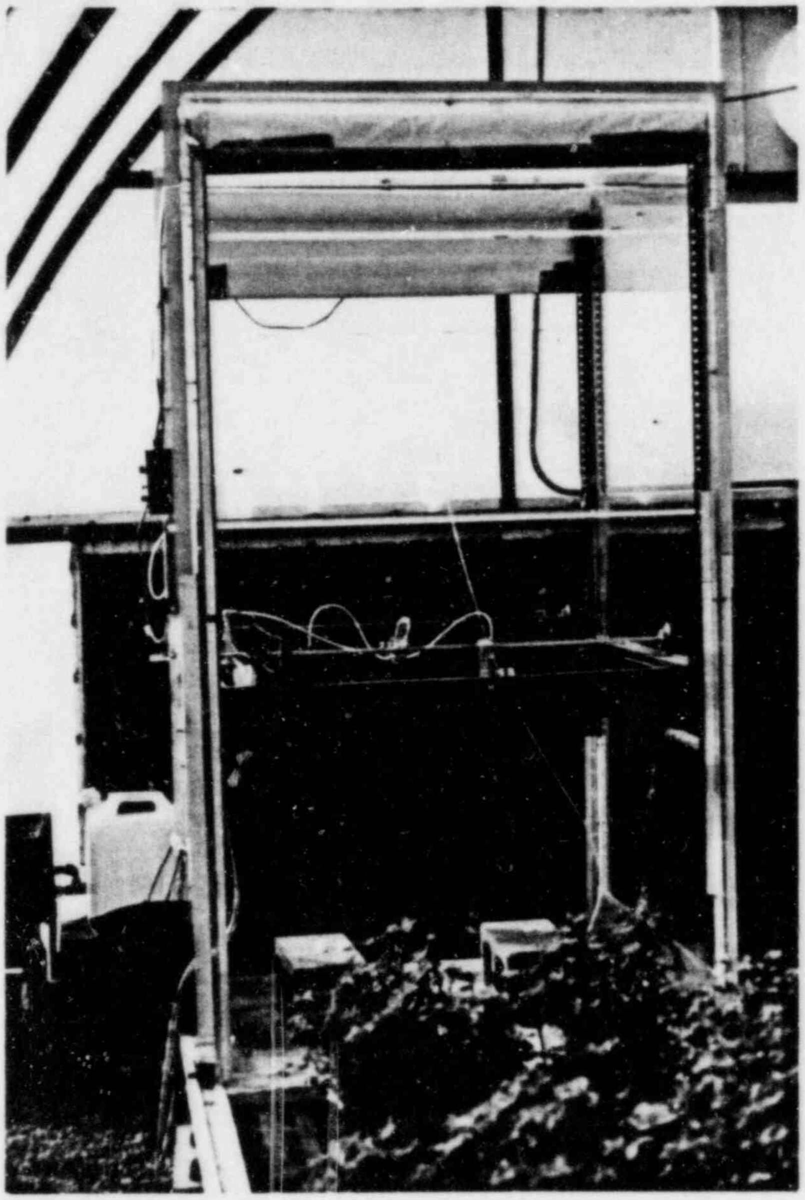
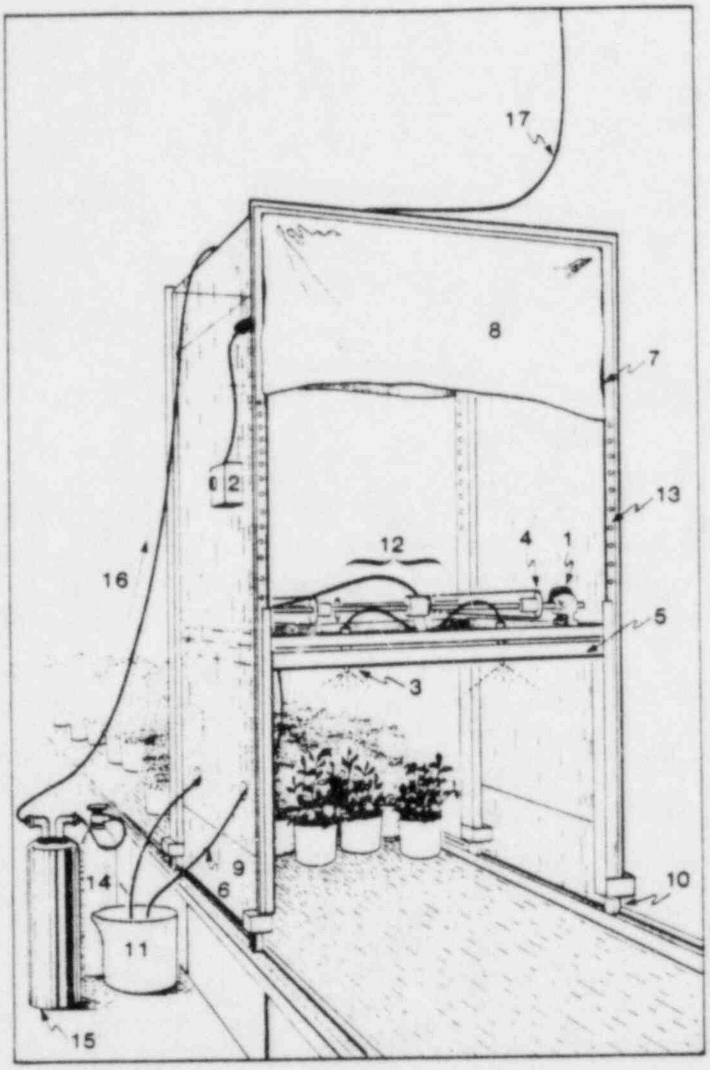


Figure 5. Spray boom rig used to apply simulated saline drift to greenhouse plants



1 drive motor
2 control box
3 spray nozzle
4 chain drive
5 gutter
6 gutter hoses
7 Velcro strips on edges of curtains
8 vinyl curtains
9 skirts on bottom of chamber
10 wheels
11 drain bucket
12 spray boom rig
13 height adjustment angle iron
14 compressed nitrogen tank
15 salt solution tank
16 salt solution under pressure
17 power supply line

Figure 6. Plexiglass chamber and spray boom rig

spray volume:

2 nozzles = 0.017 l/EUA·day

TSC = 1.60g/EUA·wk ÷ (0.017 l/EUA·day x 5 day/wk)

= 1.60g/EUA·wk ÷ 0.085 l/EUA·wk

= 18.82g/l

Application rates and solution concentrations are shown in Table 3. The nominal 100 lbs/a·yr treatment solution was prepared by diluting an aliquot of the nominal 500 lbs/a·yr treatment solution. The nominal 10 lbs/a·yr treatment solution was prepared by diluting an aliquot of the nominal 100 lbs/a·yr treatment solution. The pH of each of the final solutions was adjusted to 6.8-7.0 using sulfuric acid (H_2SO_4). The calculations for the nominal 1000 lbs/a·yr solution differed somewhat from the nominal 500 lbs/a·yr solution because the spray boom delivered only 15 ml with two passes of the boom, requiring a treatment solution concentration of 42.67 g/l (PSP Procedures CA-25 and CA-33).

4.1.4.2. Application of Simulated Saline Drift Treatment Solutions

Treatment was accomplished as follows: a stainless steel tank was pressurized to 80 pounds per square inch (psi) $\pm$ 5 psi using nitrogen gas and connected to the Spraying Systems Model SF-2 (hollow cone) spray nozzles located on the bottom of the spray boom. The volume of solution delivered was monitored each spraying day in both greenhouses by holding a Nalgene graduated cylinder beneath a moving nozzle, thus measuring the amount of liquid sprayed by each nozzle during two passess of the boom. Delivery rates were adjusted to the 15 ml or 17 ml standard by adjusting the boom velocity. Boom travel was then timed with a stopwatch in order to check and adjust boom speed as the day progressed (PSP Procedure CA-22).

Spraying was done in increasing order of concentration, beginning with the distilled water controls. After each spraying, the vinyl curtains were raised and the outside of the gutters were wiped off to prevent excess solution from dripping on the plants. The chamber then was moved to the next experimental unit to be sprayed.

Table 3.

Greenhouse Treatment Rates and Solution Concentrations

Treatment Number	Nominal Treatment Rates (lbs/a·yr)	Treatment Solution Concentration (mg/l)	Treatment Solution Volume (ml)
1	0[a]	0	17 or 15[b]
2	10	376.3	17
3	100	3763	17
4	500	18815	17
5	1000	42667	15

[a] Distilled water.

[b] The treatment solution volumes in the north and south greenhouses were 17 and 15 ml, respectively.

After the final spraying at each concentration level, 500 ml samples of each treatment solution were collected from the nozzles. Analyses of the concentrations were run on weekly (5 day/wk) composites of these 500 ml samples. The University Analytical Center, Department of Chemistry, University of Arizona, analyzed samples of the distilled water and simulated saline drift solutions collected from the spray nozzles during spraying at the greenhouse. Total dissolved salts (TDS), pH, and ionic concentrations of major species (sodium, chloride, sulfates, calcium, magnesium, potassium, and nitrates) and minor species were determined according to standard procedures (Methods for APS Salt Drift Project).

Following completion of spraying, the chamber was placed on a cart for cleanup. The nozzles were flushed with distilled water for 6 minutes, were removed from the spray rig, and were dried with compressed air. The nozzles were not replaced in the spray rig until the next application day to ensure that they remained dry and unclogged. The inside of the chamber was thoroughly cleaned and dried after completion of the spraying (PSP Procedure CA-22).

The salt delivery of the spray boom was evaluated using parafilm covered petri dishes (McCune et al., 1977). Two petri dishes covered with parafilm were placed at the plant canopy height. The two-nozzle spray boom rig was operated in the same manner as in the treatments. After exposure to the spray, the petri dishes were covered, marked, and returned to the laboratory for conductivity measurements.

In the laboratory, the parafilm was removed from the petri dishes, and the salt exposed side of parafilm was placed face down for 5 minutes in 6 ml of distilled water to dissolve the salts on the parafilm surface. Electrical conductivity measurements then were taken of the 6 ml solution with a Model 4503 Selectro Mark Analyzer. The quantity of salts deposited was estimated from a standard curve (PSP Procedures CA-13 and CA-14).

Droplet size measurements were taken once a week using a photographic paper technique (Farlow, 1954; Stainer and Stow, 1976). A piece of predeveloped paper (Iford-Ilfobrom 4.24K semi-mat, double weight, developed in Kodak Dektol developer, air dried in darkness) was placed under a nozzle at the same height as the plant canopy. The spray boom was passed over the paper once, covering it with droplets. The paper was exposed to bright light to intensify the droplet marks, then placed in Kodak Fixer General Purpose (10 minutes), rinsed in water (10 minutes), and air dried. The droplets were measured using an ocular micrometer (20 mm diameter disc with 5 mm length line divided into 50 units) installed in a Bausch and Lomb Compound Microscope (PSP Procedure CA-9).

A Sierra Instruments Model 244 Dichotomous Virtual Impactor was used in the north greenhouse to monitor for background salts (PSP Procedure CA-43).

Table 4 presents a schedule for planting, harvesting, and treatment for the greenhouse experiments.

4.1.5. Evaluation of Plant Response

4.1.5.1. Selection of Plants for Evaluation

One plant from each experimental unit was used for repeated measurements using the porometer and psychrometer throughout the growing season and was not included in the final harvest. Visual evaluations were performed on the remaining plants of each experimental unit.

4.1.5.2. Visual Observations

Plants in the controls and the nominal 500 lbs/a·yr or nominal 1000 lbs/a·yr treatments were evaluated weekly. Observations were recorded and photographs were taken of the plants. Plants were evaluated for insect and fungal damage, necrosis, chlorosis, leaf deformity, plant height, turgidity, epinasty, and the number of flowers and/or fruit estimated. Cotton flowers were tagged as they appeared and the number of flowers were recorded (PSP Procedures CA-24, CA-31, and CA-40).

Table 4.

Planting, Harvesting and Treatment Schedule for the Greenhouse, 1983

Crop	Planting Date	Start of Treatment	End of Treatment	Spray Days Potential[a]	Spray Days Applied	Date of Harvest
North Greenhouse						
Cotton	5-27	6-3	10-12	94	92	10-13 to 10-17[b]
Alfalfa transplants	5-12	6-3	12-2 11-2[c]	101[cd]	99[cd]	6-24, 7-11, 8-1, 8-24 9-12, 9-28, 10-25
seedlings	6-28	7-14	12-2 11-2[c]	75[cd]	74[cd]	8-12, 9-12, 9-30, 10-25
Barley	7-18	8-8	10-19	53	51	10-20
South Greenhouse						
Cotton	6-29	7-13	11-11	88	86	11-14[b]
Alfalfa transplants	6-23	7-13	12-2 11-2[e] 11-23[f]	77[de]	76[de]	8-10, 9-6, 9-27, 10-24
seedlings	6-29	7-13	12-2 11-2[e] 11-23[f]	77[de]	76[de]	8-10, 9-6, 9-27, 10-24
Barley	6-29	7-13	10-06	62	61	10-7

[a] Potential spray days are 5 days/wk Monday through Friday.
[b] Dates of biomass harvest, seed cotton harvested as it matured.
[c] Last day of any data collection, plants not sprayed on 2 November 1983.
[d] Plants not sprayed on date of harvest.
[e] Last day of any data collection 2 November 1983, plants sprayed.
[f] Plants moved to north greenhouse.

4.1.5.3. Resident Surface Salts on Plants

The quantity of resident surface salts was estimated by measuring the area of the leaves and washing the leaves to remove the accumulated salts from the surface of the leaves.

After biomass harvesting, all crop species were washed to remove the resident salts from the surface of the plants. The plastic bags in which the plants were stored were rinsed with distilled water and the rinse water was combined with the plant wash solution. Each plant was dipped once in a beaker containing 2000 ml distilled water for 15 seconds and then was dipped in a second beaker containing 2000 ml distilled water for another 15 seconds. The water in the two beakers was then combined and a sample was reserved in a 2-oz plastic bottle. Electrical conductivity readings were made on the reserved sample. The concentration of the salt was determined from a standard curve. Plastic gloves were worn at all times to prevent contamination (PSP Procedures CA-3, CA-13, CA-27, and CA-28).

4.1.5.4. Steady-State Porometer Measurements

Transpiration, diffusive resistance, relative humidity, leaf temperature, and cuvette temperature measurements were taken weekly from each plot on the abaxial surface of the youngest fully expanded cotton leaf, the abaxial surface of a barley leaf blade, and the fourth leaf down from an apex of an alfalfa plant. All measurements were taken with a LI-COR LI-1600 Steady-State Porometer. Measurements were taken from a 2.0 cm^2 leaf area for cotton and 0.6 cm^2 leaf area for barley and alfalfa (Beardsell, Jarvis and Davidson, 1972) (PSP Procedure CA-42).

4.1.5.5. Leaf Area Measurements

Leaf area measurements were taken with the LI-COR LI-3000 Portable Area Meter in the greenhouse and the LI-COR 3100 in the laboratory. One plant was selected from each experimental unit for measurement at the time of harvest. Approximately 20% to 25% of each representative alfalfa and barley plant was removed from the plastic bag. All leaves were removed from this sample and were run through the leaf area meter, and then dried. After drying, the leaf area of the whole plant was estimated by comparing the dry weight of the sample to the dry weight of the entire plant. Cotton leaves were separated into several pieces in order to fit into the transparent sheath (PSP Procedures CA-1, and CA-2).

4.1.5.6. Leaf Water Potential Measurements

Leaf water potential measurements were taken with a Wescor HP-115 Water Potential data system according to the method of Walker, Oosterhuis and Savage (1983). Attached leaves were washed by dipping them in 500 ml of distilled water for 30 seconds and allowing them to dry at room temperature. Two 6-mm diameter leaf disks were taken from the fully expanded leaves of cotton and barley. The two leaf disks were placed in a sample chamber, abaxial side up, approximately 2 mm below the psychrometer (PSP Procedure CA-26).

4.1.5.7. General Harvest and Yield Procedures

4.1.5.7.1. Alfalfa

Alfalfa plants were harvested when approximately 50% of the plants in all experimental units were at 10% bloom (approximately one inflorescence/plant). The plants were cut approximately 2.5 cm above the soil medium, immediately placed into labelled plastic bags, and stored in an ice cooler until transfer to the main campus of the University of Arizona for storage in a refrigerator. Fresh weights of alfalfa were taken as soon as the plants were brought to the laboratory. In the north greenhouse, the transplants were harvested seven times, and the seedlings were harvested four times. In the south greenhouse, the transplants and seedlings were harvested four times (Table 4) (PSP Procedure CA-3).

Leaf area measurements were made at harvest on one representative alfalfa plant from each experimental unit. A LI-COR LI-3000 leaf area meter was used as previously described (cf. 4.1.5.5).

The harvested alfalfa tissue was placed in paper bags and was dried in a General Signal "Stabil-Therm" forced draft oven at 80 C for at least 36 hours. Dry weights of each plant were then taken. The plants were then ground in a UDY Cyclone Sample Mill (Model MS), and the ground samples were stored in labelled envelopes. These samples were sent to the University of Arizona's Soils, Water, and Plant Testing Laboratory for analysis of 13 essential elements (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, boron, copper, chlorine, iron, manganese, molybdenum, zinc) and sodium. Twelve plants from the control and the nominal 500 lbs/a·yr simulated saline drift treatment were analyzed from six harvests (PSP Procedures CA-3, and CA-23).

4.1.5.7.2. Cotton

Seed cotton and bracts were harvested from each plant and weighed as the bolls matured. The bracts were dried at 80 C for at least 36 hours in a General Signal "Stabil-Therm" constant temperature oven and dry weights were obtained. Lint samples were sent to the United States Department of Agriculture Marketing Service Cotton Laboratory at Memphis, Tennessee, for quality analysis (PSP Procedures CA-28, and CA-41).

Cotton leaves with attached petioles, green bolls, squares, and flowers (including entire pedicels), stems, and all axillary branches were placed in plastic bags. Fresh weights were obtained using a Mettler balance and the samples were stored in a refrigerator. Plastic gloves were worn at all times while harvesting the plant material.

The detached plant parts were rinsed in distilled water and electrical conductivity readings were taken of the salt solution as previously described (cf. 4.1.5.3.). Leaf area measurements were taken from 25% to 35% of the leaves of one plant randomly selected from each plot. Dry weights of the leaf samples were obtained and total leaf areas were estimated by comparing the dry weight of each measured leaf area portion with the dry weight of the entire plant. The plants were dried and ground as described above. Twelve control plants and an equal number of plants treated with nominal 500 lbs/a·yr simulated saline drift were analyzed for 13 essential elements and Na^+ (PSP Procedures CA-28, and CA-13).

4.1.5.7.3. Barley

The heads of each barley plant were removed and placed in a labelled plastic bag. The remaining above ground portion of each plant (stems, leaf blades) was placed in another labelled plastic bag. Fresh weights were taken using a Mettler balance and the plants stored in a refrigerator (PSP Procedure CA-27).

Salts residing on the plant surfaces were washed off the plant with distilled water as described above and electrical conductivity readings were taken of the salt solutions (PSP Procedures CA-27, and CA-13).

The plants were dried as described above in Section 4.1.5.7.1. The dry barley heads and florets were counted for each plant. The heads were threshed to dislodge the seeds and winnowed to remove the chaff. Seeds were counted and weighed and the percentage seed set for each plant was determined. Dried plant material was ground using a UDY Cyclone Sample Mill (Model MS) as described in section 4.1.5.7.1. Vegetative tissue from twelve plants from the control and nominal 500 lbs/a·yr simulated saline drift treatment were analyzed for 13 essential elements and Na^+ (PSP Procedures CA-27, and CA-23).

4.2. FIELD PROJECT DESIGN

4.2.1. Experimental Design

The experimental plan for each crop in the field study consisted of a randomized complete block design with eight replications of each treatment. Cotton (Gossypium hirsutum L. 'Deltapine 90'), alfalfa (Medicago sativa), and Cantaloupe (Cucumes melo L. 'Top Mark') were cultivated.

4.2.1.1. Cotton

The cotton was grown in eight blocks arranged in two 985 ft-by-38 ft strips. Each strip contained 20 plots. Each plot consisted of 12 rows 35 ft in length with 38 in. row spacing. Fifteen ft alleys were established between plots. The 40 plots were numbered in sequence from 41 to 80. Two rows on each side (east and west) of a plot served as border rows; the plants in these rows were not analyzed. The two rows (rows 3 and 4) adjacent to the two border rows on the eastern side (rows 1 and 2) were machine harvested at the end of the season (Figure 7). Flower tagging and hand harvesting was conducted in the third row from the western edge of each plot (row 10). Visual observations were taken from the fourth row from the western edge of each plot (row 9). Random selection of plants was accomplished by tossing a stick. Additional measurements such as porometer and water potential readings were taken in rows 9 and 10 (Figure 7). Data were not collected from the center four rows (rows 5-8). Field roads measuring 13 ft wide were established on each side of the two blocks to permit spraying with the tractor spray boom rig. Four additional border rows were planted on the west and east side of the experiment to act as buffers.

4.2.1.2. Alfalfa

Alfalfa was cultivated in four borders running north and south in an established field of 3-year-old alfalfa. Each of the four borders consisted of 12 plots, numbered in sequence from 81 to 128. Each plot measured 35 ft-by-18 ft and was separated from adjoining plots by 15 ft alleys (Figure 8). Plants in the alfalfa plots used for observations and measurements were randomly selected.

4.2.1.3. Cantaloupe

The cantaloupe was grown in eight experimental blocks grouped into two strips measuring 985 ft-by-20 ft. The two strips were separated by a 10-ft alley. Forty plots were used, each measuring 35 ft by 20 ft and separated from adjoining plots by 15-ft alleys. The plots were numbered in sequence from 1 to 40. Each plot contained three rows (north and south) spaced 80 in. apart. The center row of each plot was used for plant and fruit evaluation (Figure 9). Random selection of plants for visual evaluation was accomplished by tossing a 55 cm-by-25 cm frame into the middle row (PSP Procedure CA-18).

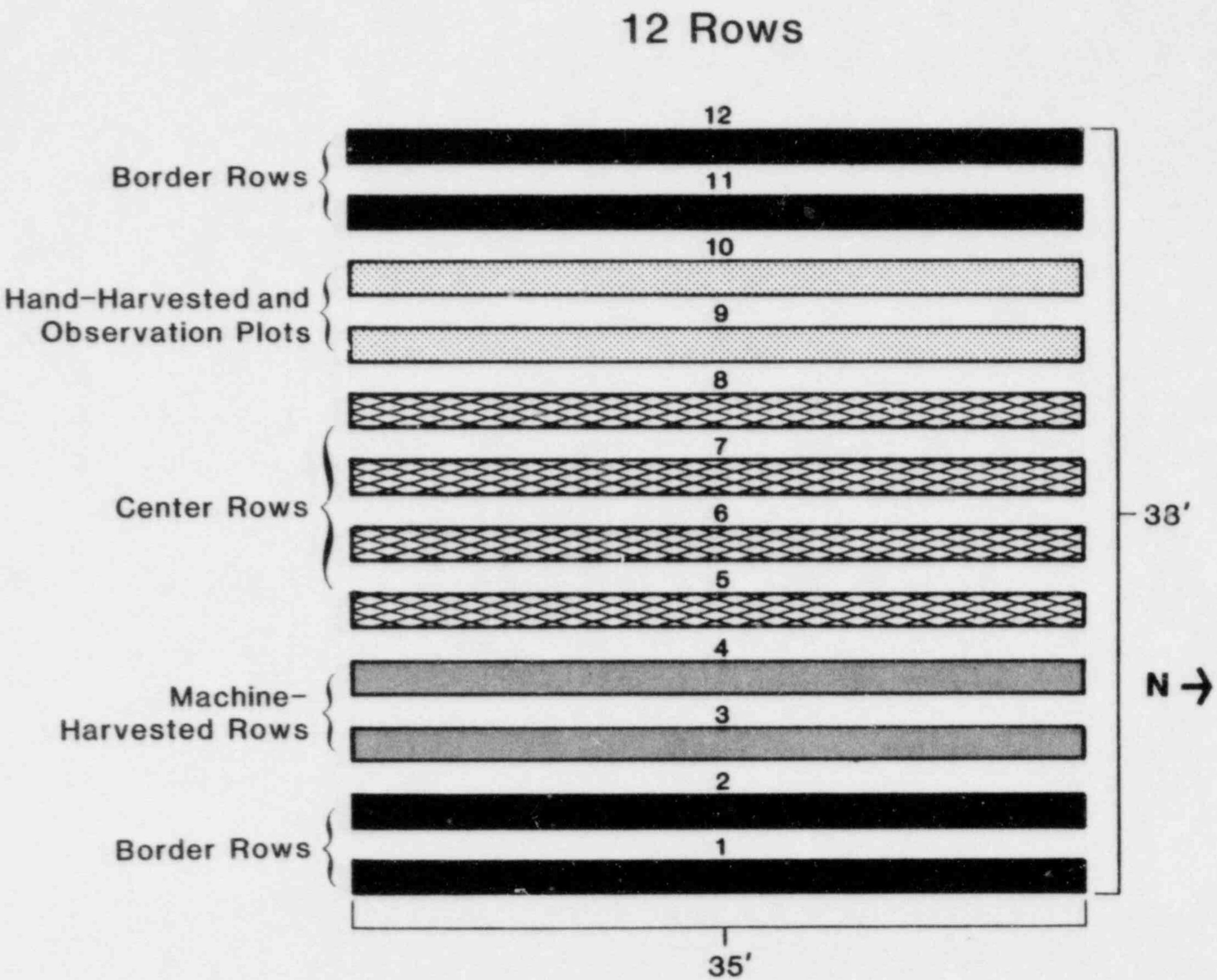


Figure 7. Cotton plots at the Marana field site

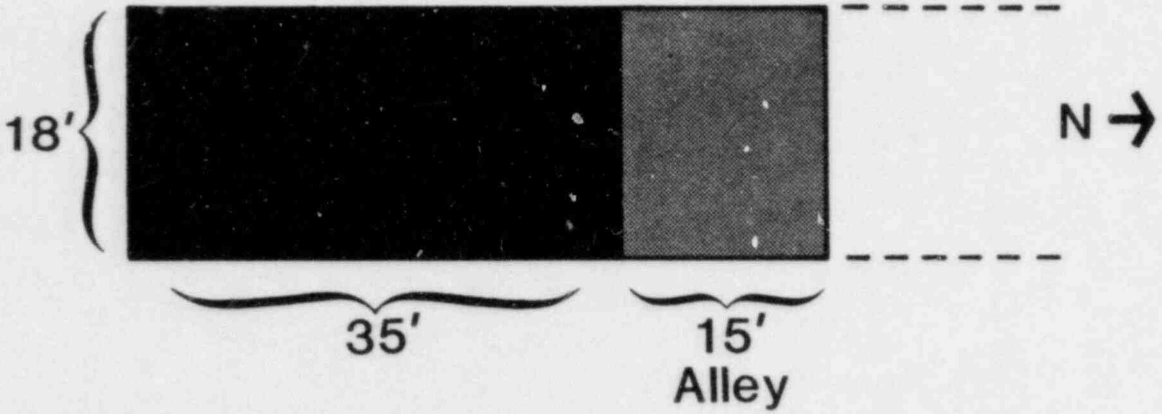


Figure 8. Alfalfa plots at the Marana field site showing alley between plots

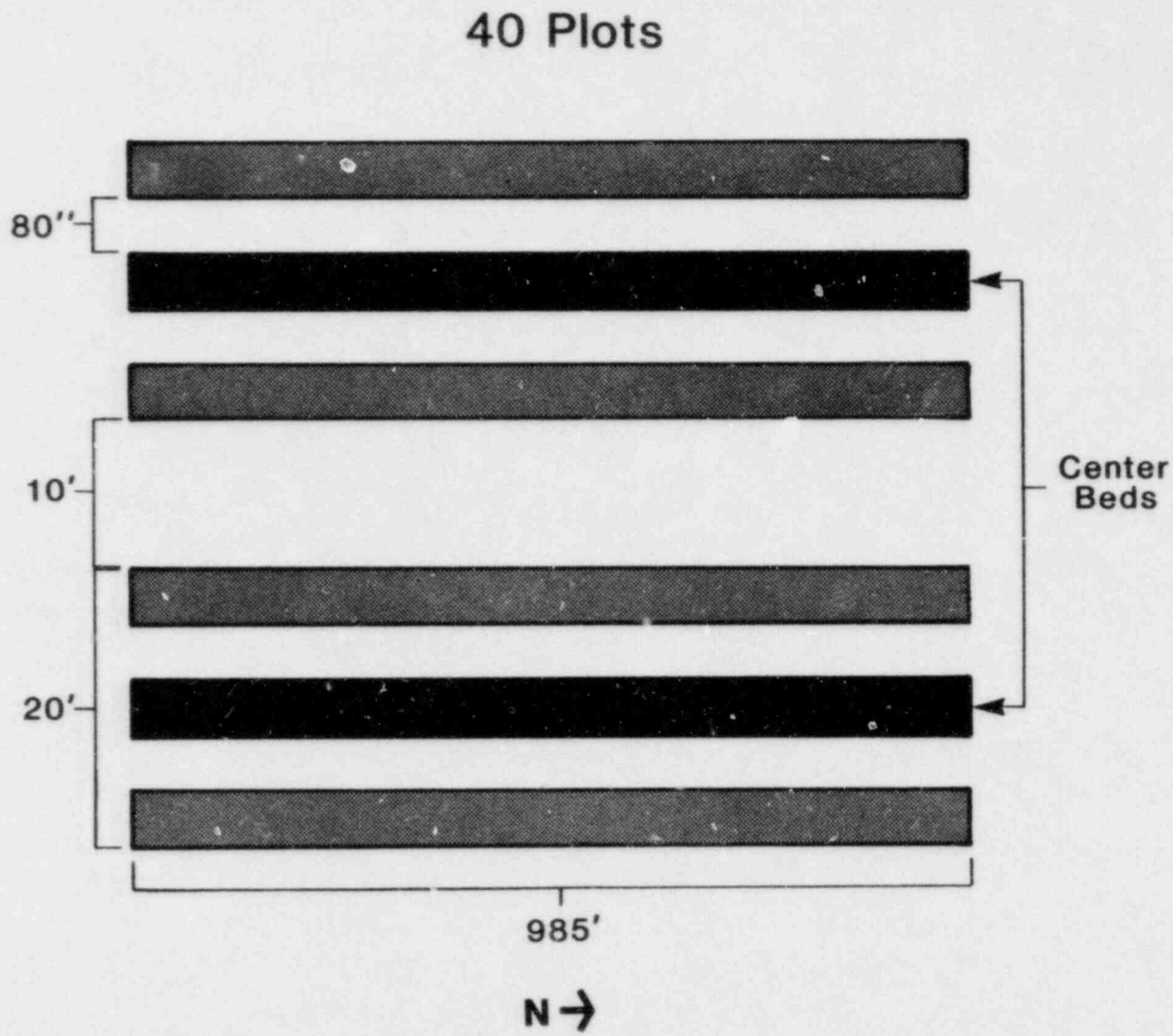


Figure 9. Cantaloupe strips at the Marana field site

4.2.2. Plant Culture

The alfalfa plots were established in a 3-year-old stand of alfalfa. The cotton and cantaloupe were planted for this study. Cultural practices including the amount and timing of irrigation for these crops were conducted by the farm operator, using practices in general use for proper farm management, except for the application of Benlate 50WP fungicide on the cantaloupe to control powdery mildew. Alfalfa was commercially harvested with a swather and was baled before the first treatment and following each sample harvest (PSP Procedures CA-17, and CA-19).

4.2.3. Treatment

Four nominal rates of deposition (0 [distilled water], 10, 100, and 500 lbs/a·yr) and an unsprayed control were selected to evaluate the effects of foliar deposition and accumulation on the selected species. In addition, a nominal 1000 lbs/a·yr treatment was included for alfalfa.

4.2.3.1. Preparation of Simulated Saline Drift Treatment Solutions

The composition of the simulated saline drift solution (Table 2) was provided by the Bechtel Power Corporation and was the same as that used in the greenhouse studies (cf. 4.1.4.1). The treatment solutions were prepared from stock solutions (PSP Procedures CA-25, and CA-33).

The salt solution was applied to the plots by a modified tobacco sprayer boom mounted on a Ford 1500 tractor. The sprayer had a 21 ft long spray boom on one side that was vertically adjustable from 2 ft to 8 ft above the ground. The boom was shrouded in a polyethylene curtain measuring 30 in. across the top and 15 in. on the sides (Figures 10, 11, and 11a). The boom carried four independent spray lines, each with 13 nozzles placed 19 in. apart, and had an effective spray width of 20.58 ft. Four tanks were mounted on the tractor. Each tank was connected to its own corrosion resistent roller pump, pressure regulator, and spray line, thus avoiding the possibility of contamination from other solutions (PSP Procedures CA-6, CA-16, and CA-21).

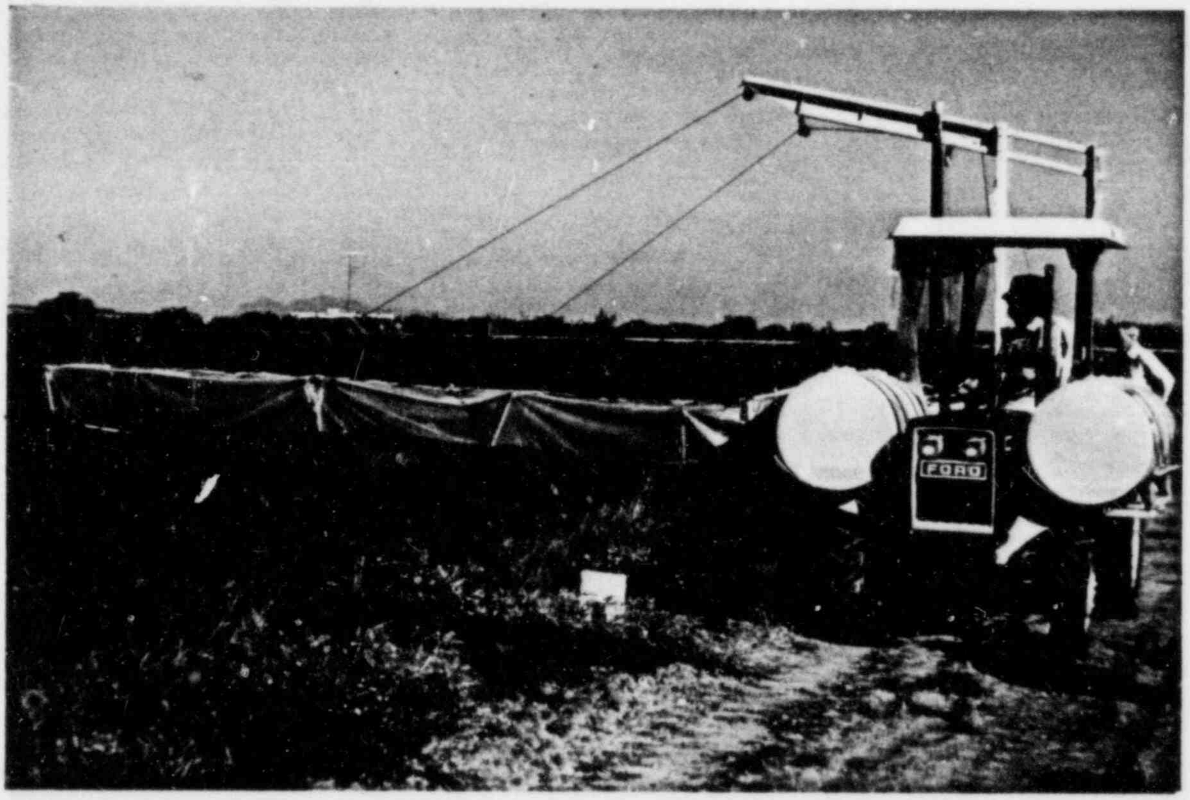
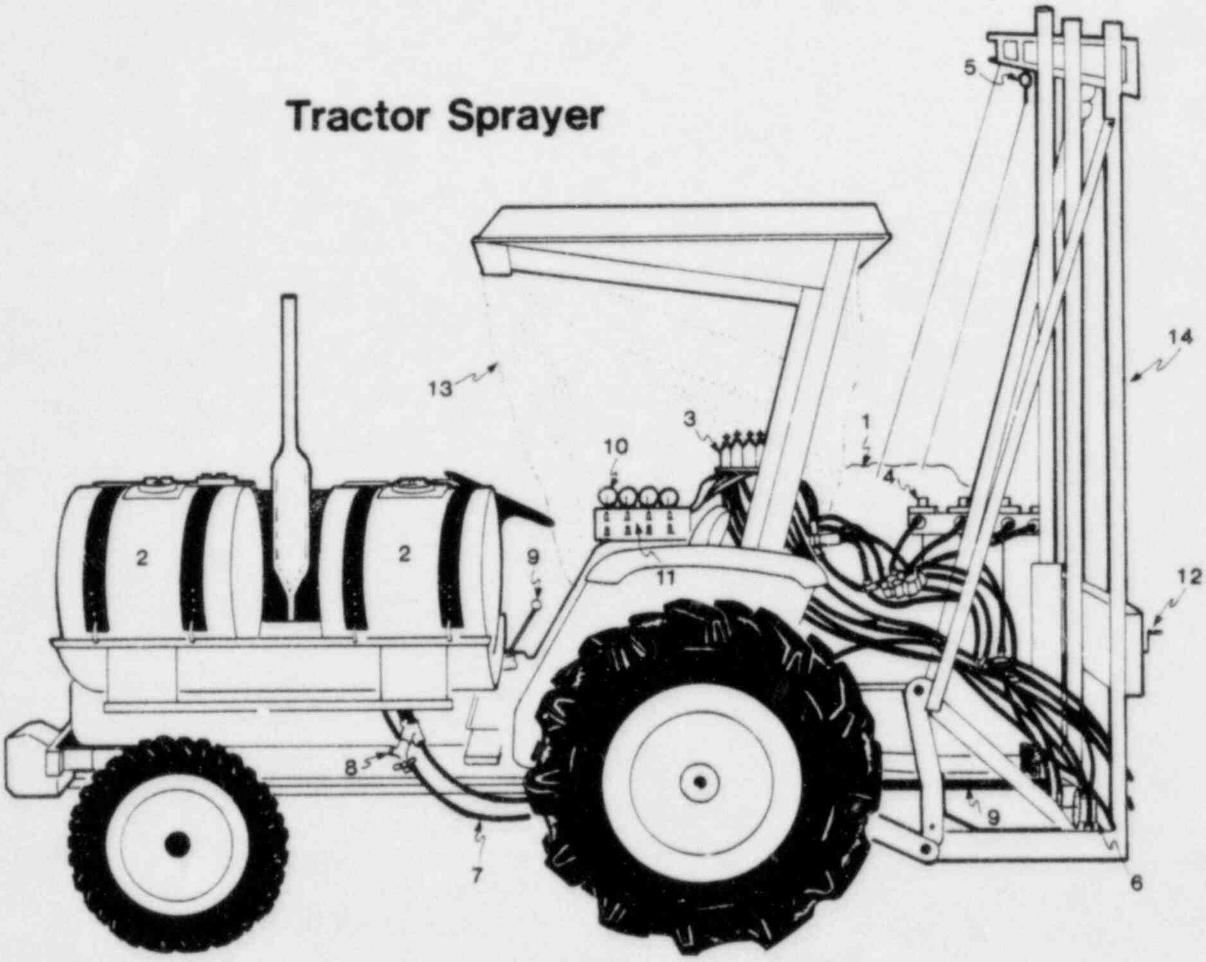
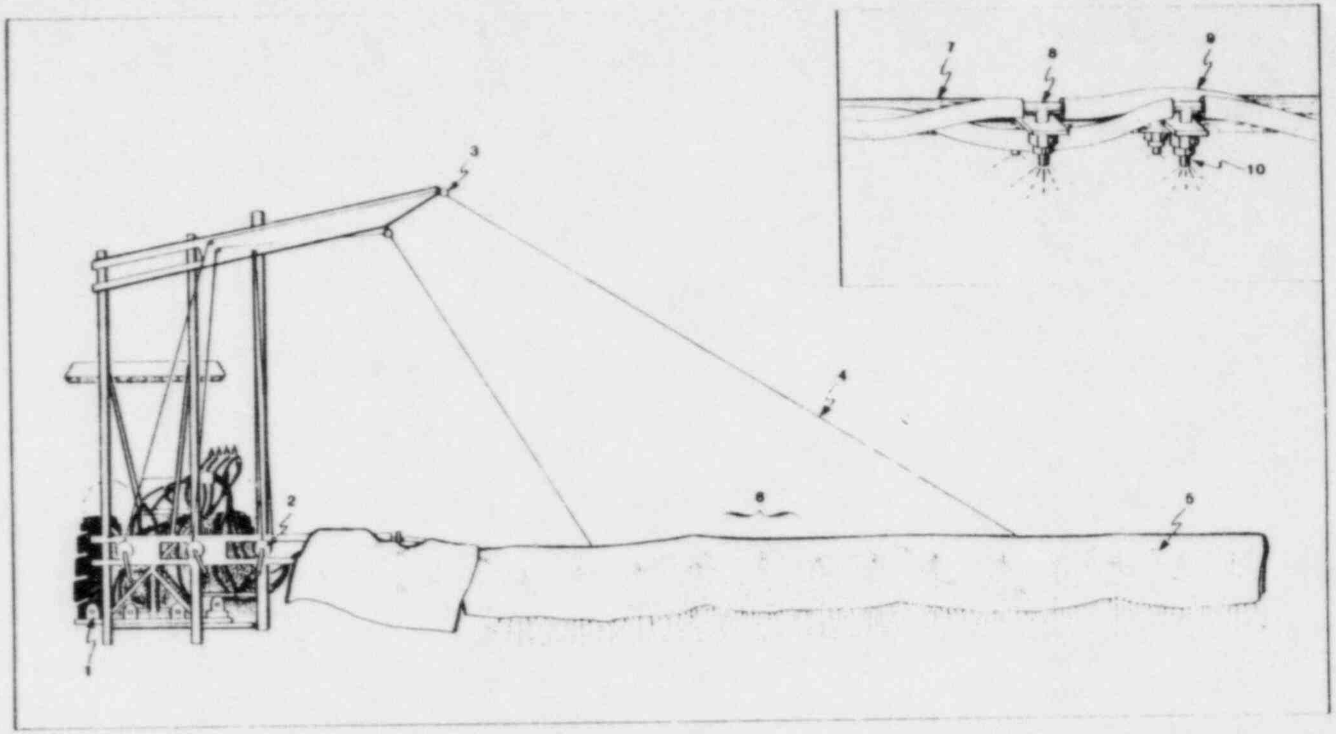


Figure 10. Tractor sprayer applying simulated saline drift to alfalfa at the Marana field site



1 spray boom
2 tanks
3 pressure regulators
4 solenoid valves
5 pulleys for adjusting height
6 pumps
7 hoses from tank to boom
8 drain spigot on tanks
9 PTO shaft
10 pressure gauges
11 switches (boom switches and regulator bypass switches)
12 boom adjustment winches
13 tractor curtain
14 boom stabilizer

Figure 11. Detailed diagram of the tractor sprayer



1 pump
2 boom adjustment winches
3 pulley
4 lift cable
5 curtain
6 boom
7 metal boom arm
8 fitting
9 spray line
10 spray nozzle

Figure 11a. Rear view diagram of tractor boom and spray distribution

The concentration of the treatment solutions applied to the crops was determined by nozzle delivery rates and tractor speed. The tractor speed was established with the engine running at 1650 RPM $\pm$ 50 RPM using a tachometer. At 1650 rpm, the tractor was run in ninth gear to apply the 0, nominal 10, and 100 lbs/a·yr treatments, and in third gear to apply the nominal 500 and 1000 lbs/a·yr treatments. Using a pressure of 90 psi the nozzle delivery rate of each nozzle was approximately 98.4 ml/min with a mass mean droplet diameter of 100 μ.

The plots for the three crops measured 35 ft in length. For calculations of treatment solution concentrations, plot width was established at 20.58 ft which is the total effective width of the spray boom. The transit time of the tractor in third gear along the length of a plot was 33.5 seconds, and in ninth gear, the transit time was 6.8 seconds. The concentration of treatment solution applied to the plots in the nominal 100 lbs/a·yr treatment group was calculated as follows:

treatment solution concentration [TSC] (g/l) =

$$\frac{\text{salt treatment (g/experimental unit area [EUA]} \cdot \text{wk)}}{\text{spray volume (l/EUA)}}$$

where EUA = plot

salt treatment:

100 lbs/a·yr = 45360g/a·yr ÷ 52 wk/yr x 0.0165 a/EUA

= 14.393g/EUA·wk

spray volume:

13 nozzles = 0.1451 l/EUA·day

TSC = 14.393g/EUA·wk ÷ (0.1451 l/EUA·day x 5 day/wk)

= 14.393 g/EUA·wk ÷ 0.726 l/EUA·wk

= 19.84g/l

4.2.3.2. Application of Simulated Saline Drift Treatment Solutions

Each individual experimental plot was sprayed with one of the following nominal treatments: no spray; 0 lbs/a·yr (distilled water); 10 lbs/a·yr; 100 lbs/a·yr; and 500 lbs/a·yr (Table 5). Each alfalfa block also included a plot sprayed with a nominal 1000 lbs/a·yr treatment. In addition to the plot number, each plot was also labelled with a treatment number (Figure 12).

Treatments 5 and 6 were sprayed using the nominal 100 lbs/a·yr solution as follows: for treatment 5, the tractor was slowed to one-fifth the speed at which treatment 4 was sprayed, thus delivering 725 ml (5 x 145 ml) of the nominal 100 lbs/a·yr solution to the treatment 5 plots. Treatment 6 was sprayed in two passes of the tractor boom at the same speed as in treatment 5. Thus 1450 ml (2 passes x 5 x 145 ml) of the nominal 100 lbs/a·yr solution was applied to the treatment 6 plots.

The cotton plots were less than twice the width of the spray boom, and the salt solutions were applied from each side of the plots. The center four rows received more simulated saline drift, and were not used for data collection.

Aliquots of solutions were collected from the spray boom nozzles and were composited weekly; they then were analyzed at the University Analytical Center to confirm treatment solution concentrations (cf. 4.1.4.2.).

In addition, deposition of salts was measured weekly (or as conditions permitted) by placing three parafilm-covered petri dishes at the top of the plant canopy (McCune et al., 1977). One dish was placed in each of three plots at distances of approximately 5, 10, and 15 ft from the edge of the plot. The tractor spray boom then was driven across each of the three plots under the same operating conditions used for the treatments. After spraying, the dishes were covered and labelled. The dishes then were returned to the laboratory and electrical conductivity measurements were taken as described above in Section 4.1.4.2. (PSP Procedure CA-14).

Table 5.

Field Treatment Rates and Solution Concentrations

Treatment Number	Nominal Treatment Rates (lbs/a·yr)	Treatment Solution Concentration (mg/l)	Treatment Solution Volume (ml)
1	no treatment	0	0
2	0[a]	0	145
3	10	1.98	145
4	100	19.839	145
5	500	19.839	725
6	1000	19.839	1450

[a] Distilled water.

Figure 12. Alfalfa plot number 114 exposed to simulated saline drift treatment 6 (nominal 1000 lbs/a·yr)

Droplet sizes were measured weekly as conditions permitted using the procedure described above in Section 4.1.4.2. (PSP Procedure CA-9).

Table 6 presents a schedule for planting, harvesting, and treatment for the field study.

4.2.4. Evaluation of Plant Response

4.2.4.1. Visual Observations

Visual observations followed the procedure described in Section 4.1.5.2. (PSP Procedure CA-18).

4.2.4.2. Various Measurements

Suface salt deposition, steady-state porometer, leaf area, and leaf water potential measurements were made as described above in Section 4.1.5. (PSP Procedures CA-8, CA-11, CA-12, CA-4, CA-29, CA-1, CA-2, and CA-26).

4.2.4.3. General Harvest and Yield Procedures

4.2.4.3.1. Cotton

Cotton was harvested by a two-row cotton picker from the third and fourth rows (Figure 7). These rows were not used for any observations, measurements, or other procedures. Cotton from each plot was kept separate and the seed cotton yields weighed. The harvested cotton was ginned at the University of Arizona Cotton Research Center. Lint samples were sent to the United States Department of Agriculture Agricultural Marketing Service Cotton Division Laboratory at Memphis, Tennessee, to determine fiber quality (PSP Procedure CA-12).

Hand-harvested cotton was picked as it matured from a 7-ft section of the tenth row of each plot as shown in Figure 7 (PSP Procedure CA-12 and CA-15).

Table 6.

Planting, Harvesting and Treatment Schedule for the Marana Field Site, 1983

Crop	Planting Date	Start of Treatment	End of Treatment	Spray Days: Potential	Spray Days: Applied	Date of Harvest
Cotton	5-2	5-24	12-1	137	137	11-1 machine 12-1 machine
Alfalfa	Established plants	7-19	7-25	4[a]	3	7-25
		7-25	9-1	28	31	9-1
		9-1	11-3	45	43	11-3
Cantaloupe	5-24	6-6	9-28	83	83	8-19
						8-29
						9-9
						10-11

[a] Spray application on harvest dates not counted. Treatment ended on day prior to harvest.

Cotton leaves were dried and ground as described in Section 4.1.5.7.2. Samples from each sprayed control plot and the nominal 500 lbs/a·yr simulated saline drift treatment were analyzed by the University of Arizona's Soils, Water, and Plant Testing Laboratory, for 13 essential elements and Na^+ (PSP Procedure CA-23)

4.2.4.3.2. Alfalfa

Alfalfa plants were harvested when at least 50% of the plants in all plots were at 10% bloom (approximately one infloresecence/plant). A 20 ft-by-30 in. strip of alfalfa beginning approximately 5 ft to 6 ft into the plot was cut at a height of about 1 in. with a Jari "Chief" Model "K" Sickle Bar Mower. The cut alfalfa was raked and placed on a tarpaulin attached to a Pelouze Spring Balance. A sample of the freshly cut alfalfa was retained for additional analysis, e.g. leaf areas and moisture determinations. The field alfalfa was sampled on 25 July, 1 September and 3 November (Table 6).

Surface salt deposition, leaf areas, drying and grinding of alfalfa were conducted according to procedures described in section 4.1.5.7.1. Samples from the untreated control plots and the nominal 1000 lbs/a·yr plots were analyzed by the University of Arizona's Soils, Water, and Plant Testing Laboratory for 13 essential elements and Na^+ (PSP Procedures CA-11, CA-14, CA-1, CA-2, and CA-23).

4.2.4.3.3. Cantaloupe

A 30-ft section in the center bed of each plot was staked to designate the area to be harvested and weighed (Figure 9). Cantaloupe were considered ripe when the color of the melon was light tan. Harvested cantaloupe were weighed and counted and the average weight/plot was recorded. (PSP Procedure CA-8)

Harvested cantaloupe were surface washed with tap water. The cantaloupe fruit exclusive of the seed and rind was cut into 2.5-cm cubes, and stored in a freezer. The fruit samples from the unsprayed control and the nominal 500 lbs/a·yr treatment were later freeze dried and stored until chemical analysis by the University of Arizona's Soils, Water, and Plant Testing Laboratory. Samples were analyzed for 13 essential elements and Na^+, arsenic, barium, cadmium, chromium, lead, mercury, strontium, and selenium. (PSP Procedure CA-38).

4.3. CLIMATIC CONDITIONS

Omnidata Datapod Digital Recorders were installed in the cotton field at Marana approximately 7 m south of the experimental plots and in a cotton field approximately 2 km northwest of the Palo Verde Nuclear Generating Station. Rainfall, temperature, and relative humidity, were monitored and recorded throughout the growing season (May through November). Omnidata Datapod Digital Recorders were set up at a desert site approximately 100 m north of the northwest corner of the Marana field site. Rainfall, temperature, and relative humidity were recorded throughout the growing season (May through November). Two Omnidata Datapod Digital Recorders were installed in the north greenhouse to measure relative humidity and temperature throughout the growing season (May through November) (PSP Procedure CA-29).

4.4. STATISTICAL ANALYSIS METHODOLOGY

The north and south greenhouses were separate experiments; therefore, no statistical comparisons were made.

In the observations that were recorded as a "1" for condition present or "0" for condition absent, a chi-square test was used to determine if the fraction of population affected was different between treatments.

4.4.1. One-time Measurements

Since all field and greenhouse experiments were conducted in randomized complete blocks designs, each of the variables that were measured only once during the experiment were subjected to an analysis of variance for the randomized complete blocks design (Steel and Torrie, 1980). An overall test of treatment differences was conducted with the F ratio, F = mean square treatments/mean square error. If the F ratio test was declared significant (at the 5% level), then the Least Significant Difference test was used to make comparisons among the treatment means. When appropriate, a linear regression was computed with salt treatment level as the independent variable and the measurement of interest as the dependent variable (Procedure CA-34).

4.4.2. Repeated Measurements

Those variables that were measured repeatedly over time on each of the experimental units also were subjected to an analysis of variance. However, measures repeated over time on the same experimental units are multivariate observations, and often the repeated measures are intercorrelated. A standard procedure for repeated measures data is to test initially for the existence of the correlation structure among orthogonal contrasts (a method of separating variability due to treatment effects into component parts) of the repeated measures (Bock, 1975). In these analyses, the chosen contrasts represent terms of a polynomial that expresses the trend over time (i.e., linear, quadratic, etc.). If the contrasts have independent errors (i.e., if they are uncorrelated and have equal variances) and the error variances are not different statistically, then the data may be analyzed with a split plot analysis of variance using treatments as the main plot unit factor and time (occasions of measurement) as the subplot unit factor. If the contrasts are different (statistically different), and differences existed among the variances of the contrasts, then a separate analysis of variance was conducted on each contrast. In this latter case, the analysis was that for a randomized complete blocks analysis of variance, and the F ratio test for treatments was a test for differences among treatments in the trend over time and in treatment averages over time.

If the contrasts had intercorrelated errors (the error terms are not independent), a multivariate analysis of variance was used to analyze the variability among the treatments. Again the analysis of variance was a randomized blocks analysis of variance, but it was for the multivariate observation of contrasts.

Any trends over time in the characteristics were estimated for each of the treatments. If the characteristics changed over time, then the differences in those trends among the treatments were tested for statistical significance. The 5% level was used to determine significance unless otherwise stated (Procedure CA-34).

Standard errors reported in this study were calculated by taking the square root of the quotient resulting from the division of the mean square error by the number of observations.

4.5. PROJECT STUDY PLANS, QUALITY ASSURANCE PROTOCOLS, AND GREENHOUSE, FIELD, AND LABORATORY METHODS AND PROCEDURES

The following documents provide detailed descriptions of the materials and methods used during this study:

An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Plant: 17 November 1983. The Project Study Plan includes 42 procedures describing the laboratory and field methods and related procedures used by personnel directly engaged in this study. Refer to Table 7 for a complete listing of all field, greenhouse, and laboratory procedures and methods.

Project for an Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Station: 24 June 1983. The Quality Assurance Plan and protocol for this study.

Methods for APS Salt Drift Project: 15 November 1983. The laboratory procedures used by personnel at the University Analytical Center for analysis of stock solutions, and composited treatment solutions.

Quality Assurance Plan for the Analysis of Salt Drift Deposition on Soil and Vegetation Adjacent to the Palo Verde Nuclear Generating Station: 5 October 1983. The Quality Assurance Plan and laboratory procedures used by personnel at the Soils, Water, and Plant Testing Laboraty for the analysis of plant tissue.

Table 7.

List of Greenhouse, Field and Laboratory Methods and Procedures Used and Contained in Project Study Plan

Procedure	Title
CA-1	Procedure for Measurement of Leaf Area with LI-COR LI-3000 Portable Area Meter
CA-2	Procedure for Measurement of Leaf Area with LI-COR LI-3100 Area Meter
CA-3	Procedure for Greenhouse Alfalfa Harvest
CA-4	Procedure for Use of the LI-COR LI-1600 Porometer at the APS Project Field Site
CA-5	Procedure for Collecting Soil Samples
CA-6	Procedure for Calibration of the Tractor-Sprayer Spray Nozzles
CA-7	Procedure for Use of Datamyte 1001 Data Recorder
CA-8	Procedure for Harvesting Cantaloupe at the APS Project Field Site
CA-9	Procedure for Droplet Size Measurements
CA-10	Procedure for Calibration of Mettler Balance AC 100
CA-11	Procedure for Harvesting Alfalfa at the APS Project Marana Field Site
CA-12	Procedure for Harvesting Cotton at the APS Project Marana Field Site
CA-13	Procedure for Electrical Conductivity Measurements of Salt Solutions
CA-14	Procedure for Salt Deposition Measurement in Spray Chamber and Field Plots
CA-15	Procedure for Tagging Cotton Blooms at the APS Project Field Site
CA-16	Procedure for Spraying Salt Solution on Field Study Plots
CA-17	Procedure for Applying Benlate 50WP Fungicide to the Cantaloupe at the APS Field Site
CA-18	Procedure for Making Field Site Plant Observations (Field Evaluation Form V-3)
CA-19	Procedure for Field Cultural Practices
CA-20	Procedure for Calibration of Mettler Balance PC 2200

Table 7 (cont.)

CA-21	Procedure for the Pre-Treatment and Post-Treatment Checks of the Tractor-Sprayer
CA-22	Procedure for Use of Greenhouse Spray Chamber
CA-23	Procedure for Grinding Plant Tissue Samples with the UDY Cyclone Sample Mill (Model MS)
CA-24	Procedure for Performing Greenhouse Site Plant Observations
CA-25	Procedure for Preparation of Synthetic Blowdown Solutions for Field and Greenhouse Application
CA-26	Procedure for Use and Calibration of the Wescor HP-115 Psychrometer
CA-27	Procedure for Greenhouse Barley Harvest
CA-28	Procedure for Greenhouse Cotton Biomass Harvest
CA-29	Procedure for Use of Environmental Data Recorders
CA-30	Procedure for Maintaining Laboratory Notebooks
CA-31	Procedure for Photographic Documentation
CA-32	Procedure for Application of Pesticides in the Greenhouse During the APS Study
CA-33	Procedure for Use of the Cole-Parmer Model 5994 pH Meter
CA-34	Procedure for Data Reduction
CA-35	Procedure for Use of the Smith Fertilizer Injector
CA-36	Procedure for Fertilizing and Watering Plants in the Greenhouse
CA-37	Procedure for Chain-of-Custody and Document Control
CA-38	Procedure for Preparation of Cantaloupe for Chemical Analysis
CA-39	Procedure for Indoor Drip Irrigation
CA-40	Procedure for Tagging Blooms in the Greenhouse for the APS Project
CA-41	Procedure for Greenhouse Cotton Boll Harvest
CA-42	Procedure for Use of the LI-COR LI-1600 Porometer in the Greenhouse During the APS Study
CA-43	Procedure for Use of the Sierra Series 244 Dichotomous Sampler (Virtual Impactor)

5. RESULTS

5.1. MONITORING THE DELIVERY OF THE SIMULATED SALINE DRIFT

Concentrations of the salts in the simulated saline drift were monitored to verify the levels of salts applied to the plots. Two different methods were used to monitor these treatment levels. Daily samples of simulated saline drift treatment solutions were collected directly from the spray nozzles, were composited weekly, and were analyzed by the University Analytical Center; and electrical conductivity measurements of salts deposited on parafilm covered petri dishes were taken as described in Section 4.1.4.2.

The amounts of salts applied to the greenhouse and field experimental plots were based on the total chemical weights (Table 8). To adjust for the weight of water in the hydrated salts, it was concluded that TDS better represented the anhydrous salts in the solution (Table 2). Based on TDS the effective solution levels were 74.1% of the nominal concentrations (Table 8).

5.1.1. Analytical Laboratory Analyses of Treatment Solutions

Analyses by the University Analytical Center of weekly composited treatment solutions collected from the spray nozzles in the greenhouse indicated that TDS concentrations ranged from 102% to 133% of the calculated effective treatment solutions concentrations (Table 9). Treatment solutions were within 10% of calculated rates except for the nominal 10 lbs/a·yr treatment level which was 133%.

Weekly treatment solutions composites collected from the tractor sprayer ranged from 101% to 107% of the calculated effective TDS concentrations (Table 10). These percentages are greater than the targeted amounts and may be partially attributed to: 1) slight variations in the concentrations of stock solutions used to prepare treatment solutions; 2) slight variations in the aliquots of stock solution used to prepare treatment solutions; 3) experimental error during analytical determinations of the concentrations of stock solutions; and 4) analytical error in the determinations of TDS concentrations of the treatment solutions.

Table 8.

Nominal and Effective Treatment Rates
(NTR and ETR)

Nominal TDS Treatment Rate[a]		Effective TDS Treatment Rate[b]	
lbs/a·yr	$mg/m^2 \cdot day$[c]	lbs/a·yr	$mg/m^2 \cdot day$[c]
0	0	0	0
10	4.3	7.4	3.2
100	43.0	74.1	31.9
500	215.1	371	159.4
1000	430.2	741	318.8

[a] Treatment assuming hydrated (formula weight) composition from Table 2.
[b] Treatment assuming anhydrous (ionic) composition from Table 2.
[c] Daily treatment rate based on 5 applications per week.

Table 9.

Comparison of Calculated and Measured TDS in Simulated Saline Drift Solutions (Greenhouse)[a]

Nominal Treatment Levels (lbs/a-yr)	Effective Treatment Levels (lbs/a-yr)	Calculated Effective TDS of Treatment Solutions (mg/l)	Average TDS of Sampled Treatment Solutions (mg/l)	Percent of Effective TDS Treatment Rate
North House				
0	0	0	20.8	--
10	7.4	279	371	133
100	74.1	2790	2840	102
500	371.0	13900	14570	105
South House				
0	0	0	54.4	--
1000	741	31600	34740	110

[a] Based on analyses of solutions used from 25 July to 28 November 1983 Data Summary Volume Section C.

Table 10.

Comparison of Calculated and Measured TDS in Simulated Saline Drift Solutions (Field)[a]

Nominal Treatment Levels (lbs/a-yr)	Effective Treatment Levels (lbs/a-yr)	Calculated Effective TDS of Treatment Solutions (mg/l)	Average TDS of Sampled Treatment Solutions (mg/l)	Percent of Effective TDS Treatment Rate
0	0	0	34.3	--
10	7.4	1469	1483	101
100	74.1	14690	15770	107

[a] Based on analyses of solutions used from 25 July to 28 November 1983, Data Summary Volume Section C.

The ionic composition of these weekly composited samples of the simulated saline drift solutions collected at the greenhouse and the field are in Tables 11 and 12. Trace amounts of salts also were found in the distilled water used at both the greenhouse and the field sites (Data Summary Volume Section C).

5.1.2. Nozzle Delivery Rates

The delivery rate of all nozzles used in the field study was checked weekly (approximately every five spraying days). A delivery rate of 49.2 ml/30 sec per nozzle was used as the standard for calculating the concentration of salt solutions to be sprayed in the field studies (cf. 4.1.4.). The results of these measurements are graphed in Figure 13 and recorded in the Data Summary Volume Table F-I. The individual nozzles were consistent in their delivery rate.

Prior to the 13 September installation of new nozzles with stainless steel cores there was a very gradual increase in the delivery rates. The greatest increase (3.4%) occurred in the distilled water treatment line. The line used to apply the nominal 100 lbs/a·yr and the nominal 500 lbs/a·yr treatment solution increased 1.4%. The line used for the nominal 10 lbs/a·yr fluctuated only slightly, delivering 3.4% less. Following the replacement of the nozzles the delivery rate increased by 6.7%. During the field study, the measured delivery rates for the different lines based on the standard of 49.2 ml/30 sec were 5.4% greater, 0.9% less, and 4.8% greater for the 0, nominal 10 and nominal 100 lbs/a·yr treatment solutions, respectively (Figure 13). The delivery of the spray nozzles positioned directly over the mechanically and hand-harvested cotton rows were within 3% of the measured delivery rates.

5.1.3. Petri Dish Measurements of Salt Deposition

The deposition of simulated saline drift in the greenhouses as measured by the petri dish method exceeded the calculated effective treatment rate for all treatment levels. The averages for all greenhouse treatments and crops are summarized from the Data Summary Volume Section D in Table 13.

Table 11.

Comparison of the Ionic Concentrations of the Simulated Saline Drift Treatment Solutions Used in the Greenhouse Study. (Data Based on Results from the University Analytical Center Analyses from 25 July 1983 to 14 November 1983.)[a]

Ion	Nominal 10 lbs/a·yr Treatment			Nominal 100 lbs/a·yr Treatment			Nominal 500 lbs/a·yr Treatment			Nominal 1000 lbs/a·yr Treatment		
	Calculated (mg/l)	Analytical Center Analyses, Aver. (mg/l)	Std. Dev.[b]	Calculated (mg/l)	Analytical Center Analyses, Aver. (mg/l)	Std. Dev.[b]	Calculated (mg/l)	Analytical Center Analyses, Aver. (mg/l)	Std. Dev.[b]	Calculated (mg/l)	Analytical Center Analyses, Aver. (mg/l)	Std. Dev.[b]
Ca	6.106	7.59	± 0.96	61.06	72.0	± 9.2	305.3	364.5	± 41.6	692.3	870.5	± 71.2
Mg	0.442	0.44	± 0.02	4.42	4.1	± 0.3	22.1	19.8	± 1.5	50.3	47.3	± 2.8
Na	87.07	114.2	± 25.1	870.7	836.1	± 69	4353.8	3923.0	± 465.5	9872.6	9339.0	± 1118.2
K	3.912	4.12	± 0.31	39.12	38.4	± 3.7	195.6	186.3	± 6.7	443.3	428.5	± 12.1
Cl	84.30	119.3	± 21.2	843.0	877.1	± 97.9	4215.1	4492.0	± 295.2	9553.9	10406.0	± 683.8
SO_4	47.27	65.5	± 59.6	472.7	586.4	± 59.2	2363.3	2772.0	± 220.5	5356.8	6289.0	± 545.9
NO_3	43.48	65.1	± 7.2	434.8	484.2	± 44	2173.9	2351.0	± 419.6	4927.6	5581.0	± 782.6
NH_4	0.038	0.079		0.377	0.2		1.886	2.10		4.275	5.52	
Be	0.0057	0.0		0.057	0.0		0.286	0.0		0.646	0.064	
Fe	0.002	0.0		0.020	0.0		0.101	0.10		2.095	0.50	
F	0.030	0.0		0.304	0.37		1.521	1.45		3.446	2.65	
BO_3	0.064	0.096		0.638	1.53		3.188	6.99		7.225	13.49	
Mn	0.014	0.0		0.136	0.12		0.678	0.55		1.550	1.262	
Zn	0.022	0.058		0.216	0.22		1.078	0.86		2.442	1.41	
Sr	0.010	0.0		0.099	0.09		0.496	0.5		1.124	0.998	
Cu	0.005	0.0		0.053	0.04		0.265	0.15		0.599	0.32	
Ag	0.001	0.0		0.010	0.0		0.050	0.027		0.113	0.075	
Pb	0.0006	0.0		0.0056	0.0		0.028	0.0		0.064	0.312	
As	0.0005	0.0		0.005	0.003		0.025	0.015		0.058	0.043	
I	0.029	0.0		0.287	0.0		1.4364	0.0		3.255	0.0	
Si	0.685	0.0		6.849	7.2		34.244	35.18		77.619	81.7	
Ba	0.0002	0.0		0.0024	0.0		0.012	0.07		0.027	0.824	
Cd	0.0003	0.0		0.0028	0.0		0.014	0.042		0.031	0.094	
Se	0.0003	0.0		0.0032	0.002		0.016	0.014		0.036	0.034	
Cr	0.0001	0.0		0.0012	0.0		0.006	0.0		0.013	0.049	
Hg	0.00004	0.0		0.0004	0.0		0.002	0.0		0.004	0.0	
HCO_3	0.976	0.0		9.764	1.73		48.818	26.86		110.653	63.75	
PO_4	0.112	0.018		1.120	0.69		5.602	3.13		12.698	6.45	
IONIC SUM	274.6	376.6	± 82.0	2746	2909	± 223	13729	14188	± 1264	31125	33141	± 2369

[a] Individual ions may not be detectable in treatment solutions.

[b] Standard deviations were calculated only for Ca, Mg, Na, K, Cl, SO_4, NO_3 and ionic sums of individual samples of treatment solutions.

Table 12.

Comparison of the Ionic Concentrations of the Simulated Saline Drift Treatment Solutions Used in the Field Study. (Data Based on Results from the University Analytical Center Analysis from 25 July 1983 to 28 November 1983.)[a]

	Nominal 10 lbs/a-yr Treatment			Nominal 100 lbs/a-yr Treatment		
Ion	Calculated (mg/l)	Analytic Center Analyses, Aver. (mg/l)	Std. Dev.[b]	Calculated (mg/l)	Analytic Center Analyses, Aver. (mg/l)	Std. Dev.[b]
Ca	32.3	40.7	± 6.1	322.9	418.4	± 43.2
Mg	2.3	2.2	± 0.2	23.4	21.7	± 1
Na	460.4	431.1	± 59.6	4603.5	4353.3	± 341.9
K	20.7	19.1	± 0.9	206.8	192.3	± 15.4
Cl	455.7	481.1	± 107.4	4556.8	4823.3	± 576.5
SO_4	249.9	280.1	± 20.2	2498.6	2890.0	± 368.6
NO_3	229.8	213.6	± 42	2298.4	2272.7	± 470.1
NH_4	0.2	0.18		1.994	2.39	
Be	0.03	0.0		0.301	0.04	
Fe	0.098	0.0		0.977	0.33	
F	0.161	0.2		1.608	1.84	
BO_3	0.337	0.95		3.37	7.01	
Mn	0.072	0.032		0.723	0.79	
Zn	0.114	0.14		1.139	0.82	
Sr	0.052	0.017		0.524	0.52	
Cu	0.028	0.0		0.280	0.16	
Ag	0.005	0.0		0.053	0.044	
Pb	0.003	0.0		0.030	0.0	
As	0.0027	0.0003		0.027	0.015	
I	0.152	0.0		1.519	0.0	
Si	3.620	0.0		36.204	41.31	
Ba	0.0012	0.0		0.012	0.0	
Cd	0.0015	0.0		0.015	0.047	
Se	0.0017	0.0		0.017	0.018	
Cr	0.0006	0.0		0.006	0.0	
Hg	0.0002	0.0		0.002	0.0	
HCO_3	5.161	1.97		51.613	25.87	
PO_4	0.592	0.052		5.923	3.02	
IONIC SUM	1462	1471	± 195	14617	15060	± 1307

[a] Individual ions may not be detectable in treatment solution.

[b] Standard deviations were calculated only for Ca, Mg, Na, K, Cl, SO_4, NO_3 and ionic sums of individual samples of treatment solutions.

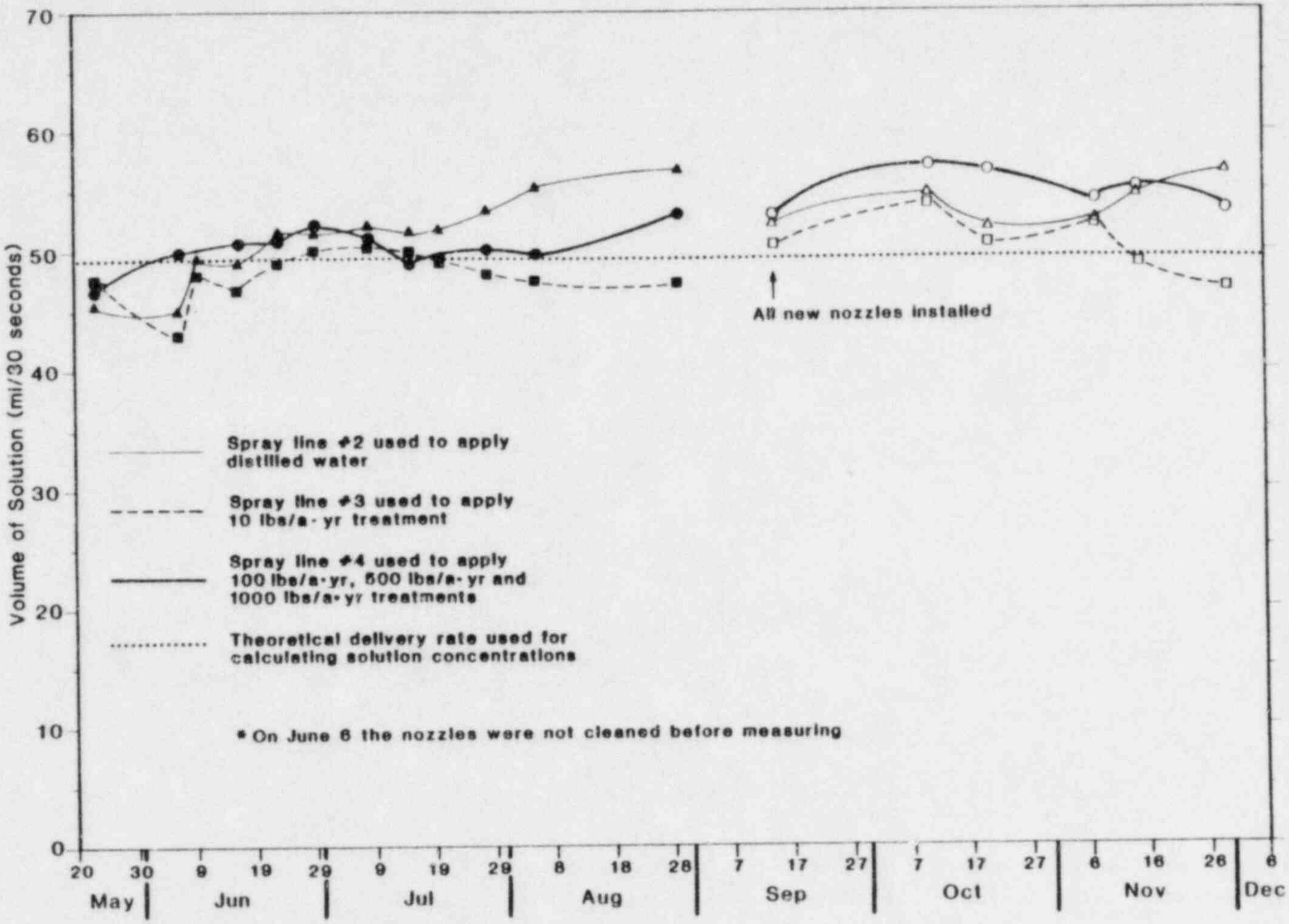


Figure 13. Nozzle delivery rates (field)

Table 13.

Petri Dish Determinations of
Simulated Saline Drift Deposition (Greenhouse)

Effective Treatment Level[a] (lbs/a·yr)	TDS Deposition Petri Dish Measurements[b] (lbs/a·yr)	Effective Treatment Levels[c]
0	6.1	-
7.4	17.3	2.34
74.0	112.0	1.51
371.0	518.0	1.40
741.0	909.0	1.23

[a] Based on actual treatment solution analyses.

[b] Calculations based on multiplying average daily deposition rate x 260 application days.

[c] Ratio of TDS data to effective treatment level.

The average amount of TDS found on the petri dishes sampled in the field ranged from 80% to 200% of the calculated effective treatment levels. The averages for each field treatment level are summarized from Data Summary Volume Section E in Table 14.

5.1.4. Calculated and Measured Delivery of Simulated Saline Drift

5.1.4.1. Greenhouse

Calculated effective treatment levels are compared with measured delivery rates for greenhouse cotton, as an example, in Figures 14 to 16. Detailed tabular data and similar comparisons for greenhouse barley and alfalfa are presented in Data Summary Volume Section D.

5.1.4.2. Field

A comparison of calculated and measured delivery rates are presented as an example, for the field alfalfa plots in Figures 17 to 20. Additional data and similar comparisons for the other field crops are presented in Data Summary Volume Section E.

Petri dish deposition measurements of the simulated saline drift solutions applied to the plots showed variability (Data Summary Volume Section E). Variation in measurements may be attributed to sampling, analytical and experimental error, and fluctuations in environmental conditions.

5.1.5. Droplet Size

5.1.5.1. Greenhouse

The mass mean diameter of simulated saline drift droplets is shown in Table 15. The overall mean was 105 μ, 5 μ greater than the expected 100 μ size. The size of the droplets in the simulated saline drift during June declined to about 80 μ, at which time the old nozzles were replaced (Data Summary Volume Tables G-1 and G-2).

Table 14.

Petri Dish Determinations of
Simulated Saline Drift Deposition (Field)

Effective Treatment Level[a] (lbs/a·yr)	TDS Deposition Petri Dish Measurements[b] (lbs/a·yr)	Effective Treatment Levels[c]
0	6.7	
7.4	14.7	1.99
74	69.5	0.94
371	296.6	0.80
741	852.1	1.15

[a] Based on actual treatment solution analyses.

[b] Calculations based on multiplying average daily deposition rate x 260 application days.

[c] Ratio of TDS data to effective treatment level.

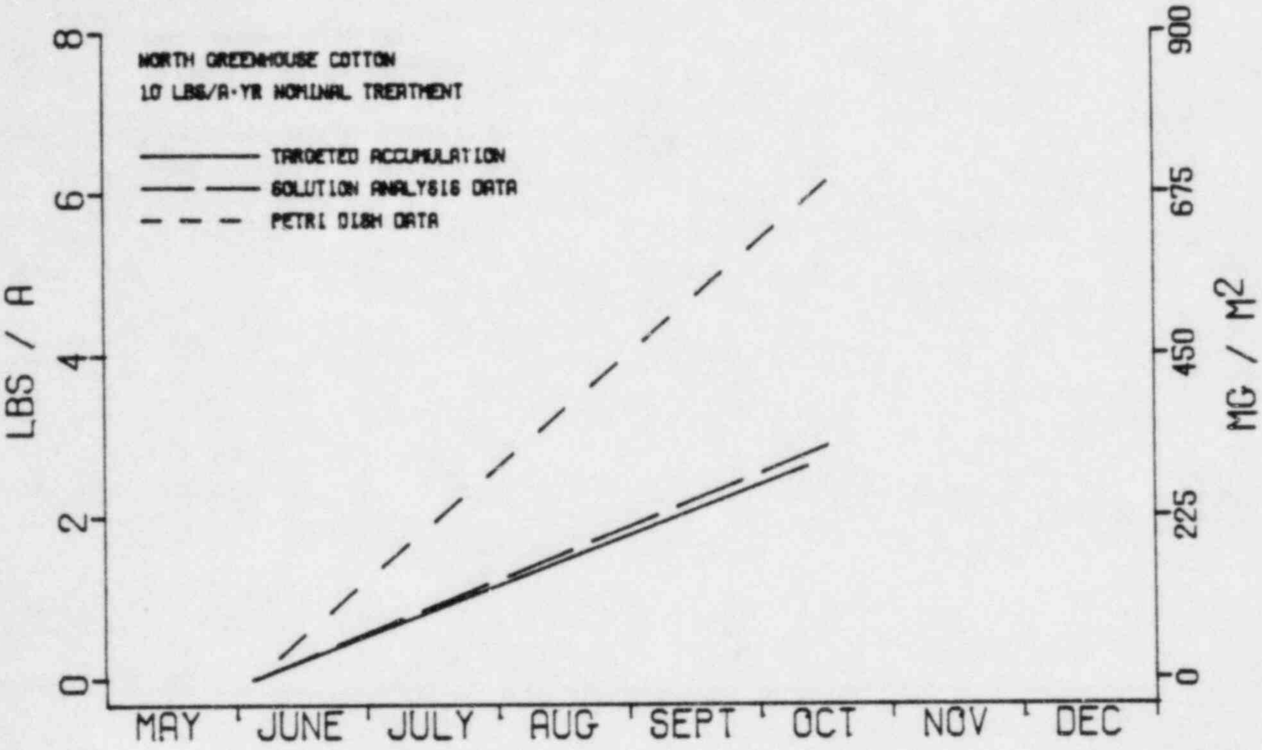


Figure 14. Simulated saline drift deposition levels for the nominal 10 lbs/a • yr treated greenhouse cotton. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

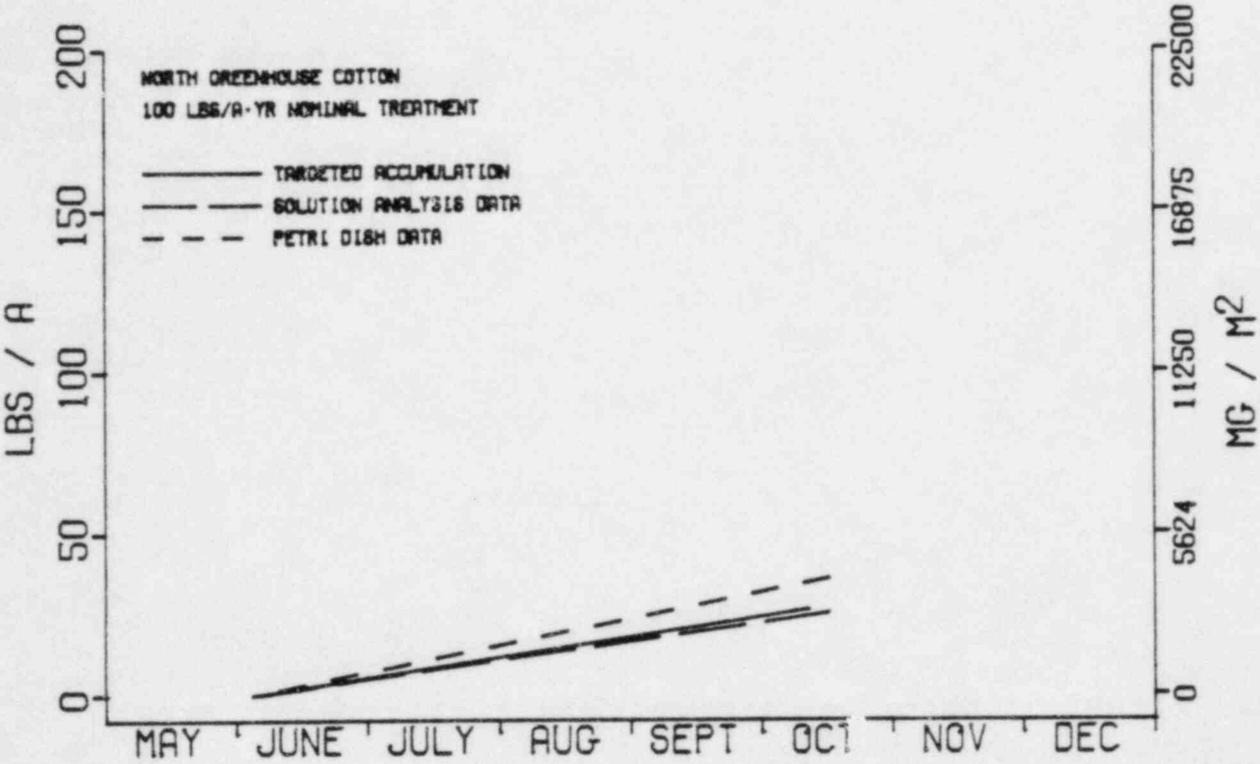


Figure 15. Simulated saline drift deposition levels for the nominal 100 lbs/a • yr treated greenhouse cotton. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

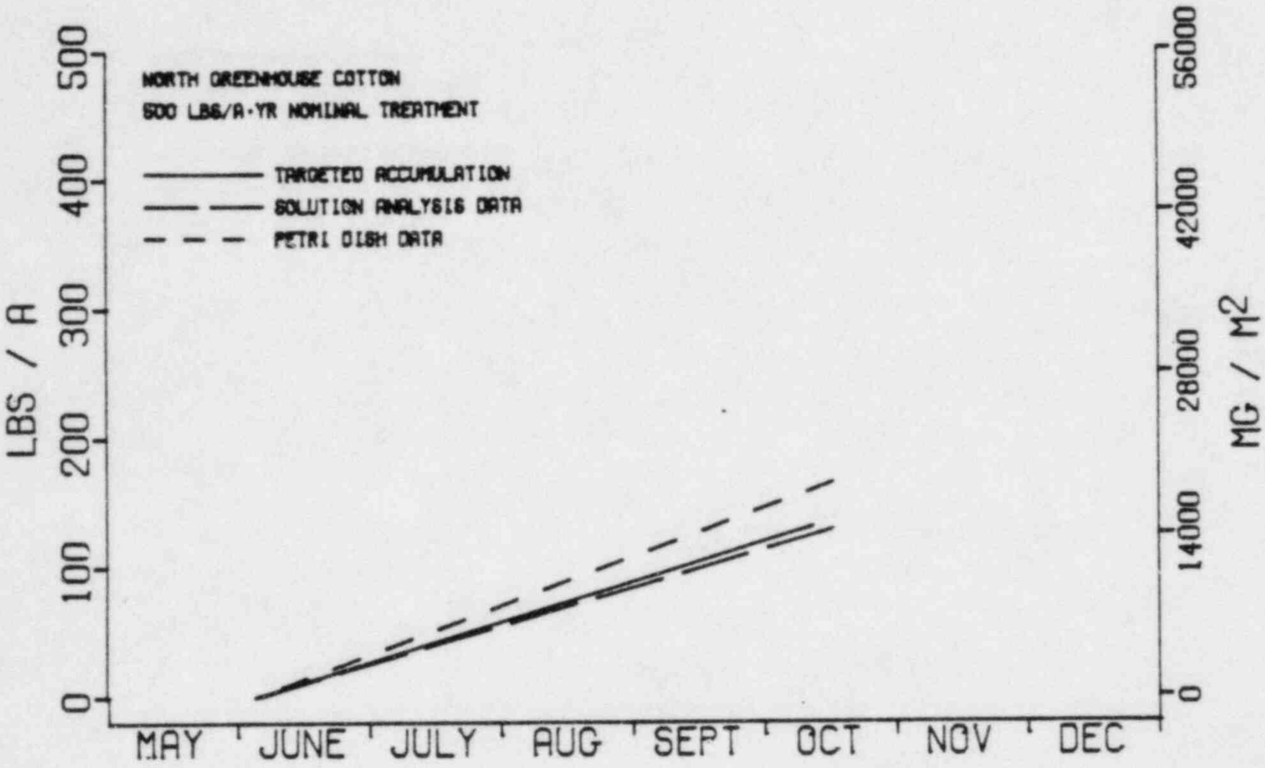


Figure 16. Simulated saline drift deposition levels for the nominal 500 lbs/a • yr treated greenhouse cotton. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

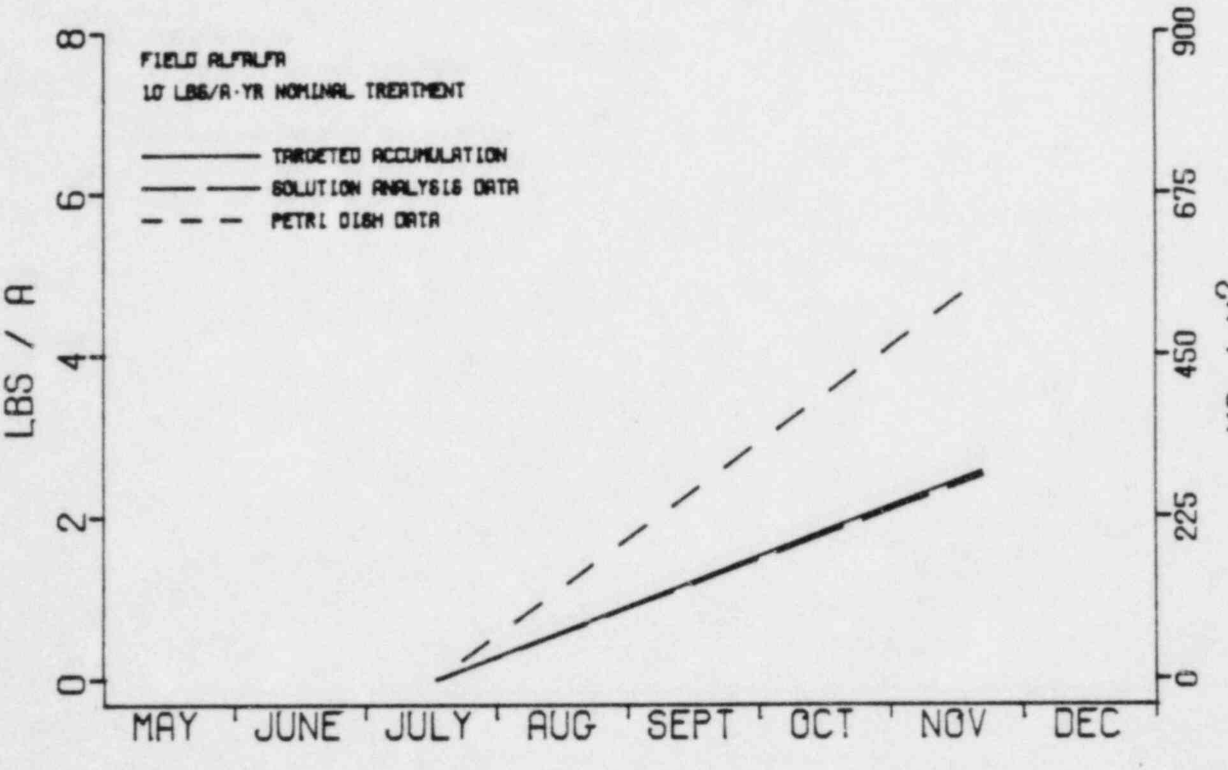


Figure 17. Simulated saline drift deposition levels for the nominal 10 lbs/a • yr treated field alfalfa. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

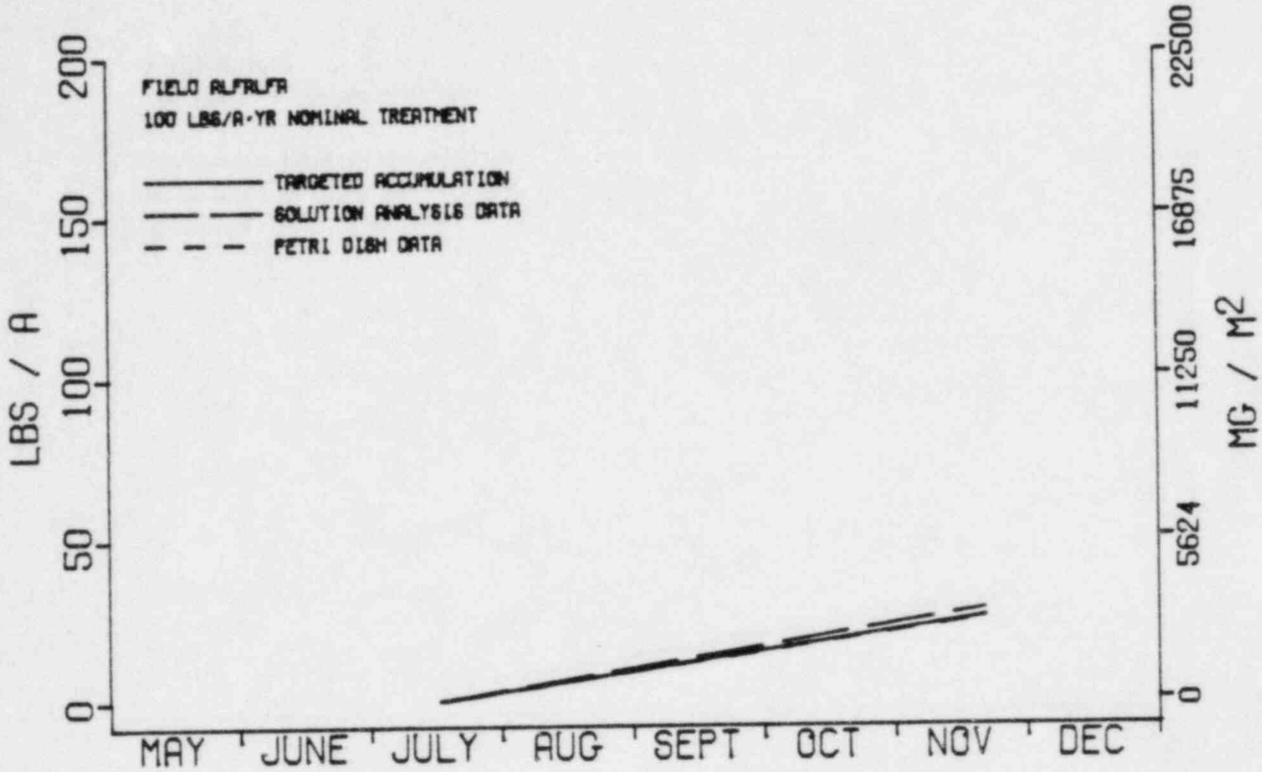


Figure 18. Simulated saline drift deposition levels for the nominal 100 lbs/a • yr treated field alfalfa. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

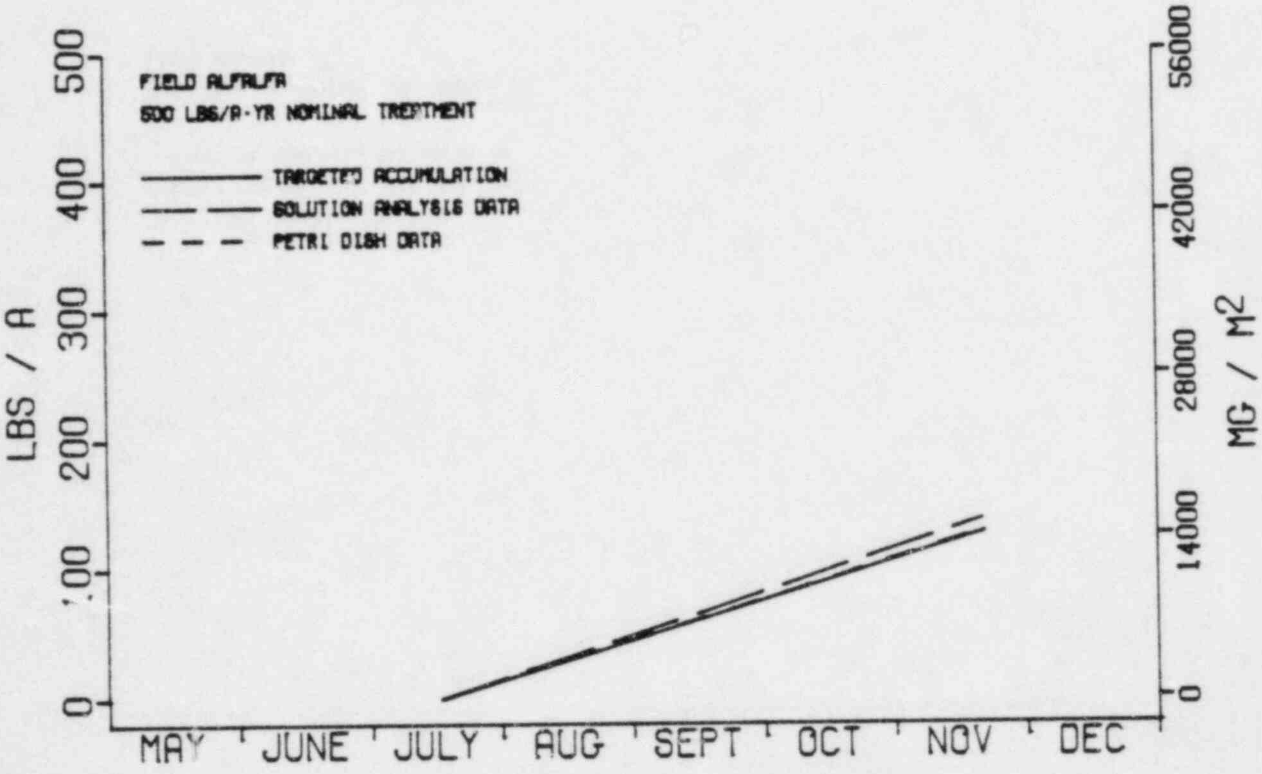


Figure 19. Simulated saline drift deposition levels for the nominal 500 lbs/a • yr treated field alfalfa. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

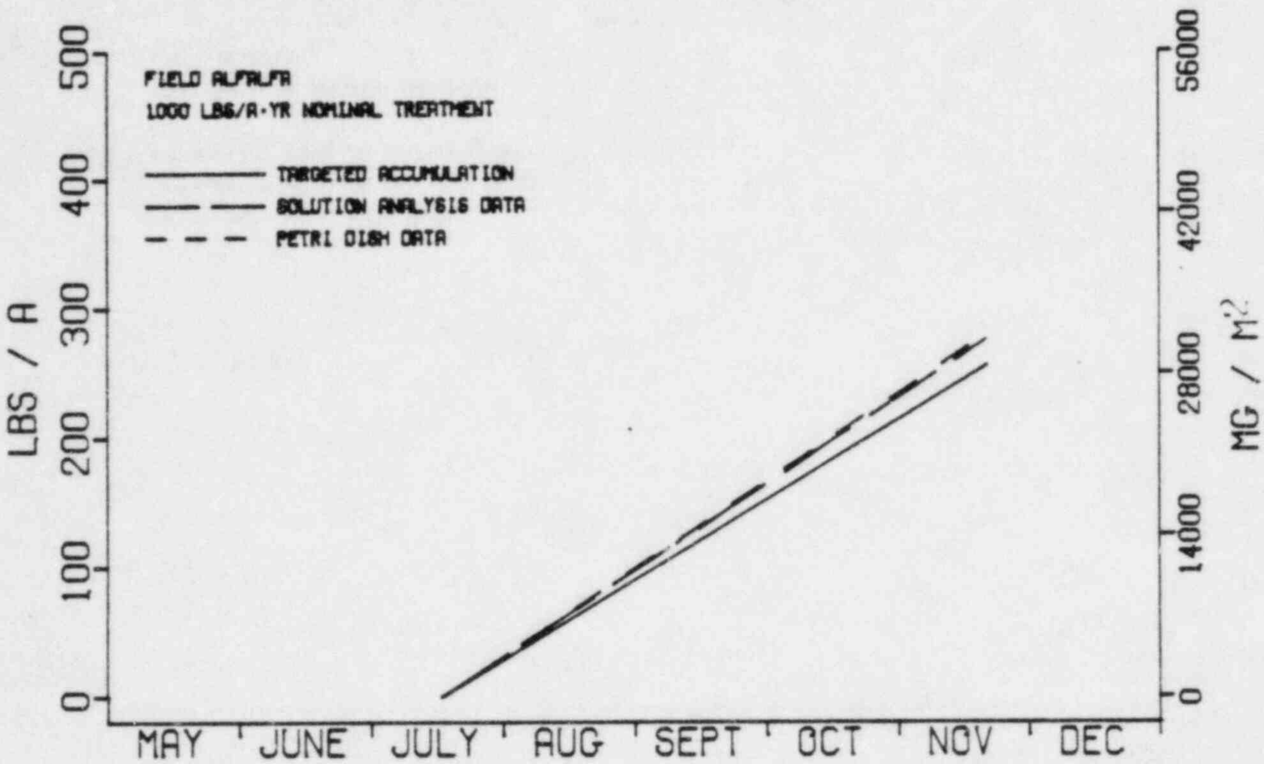


Figure 20. Simulated saline drift deposition levels for the nominal 1000 lbs/a • yr treated field alfalfa. The calculated effective treatment level (targeted accumulation) is compared with measured delivery (solution analysis data [volume concentration data] and petri dish data).

Table 15.

Greenhouse Droplet Size Measurements[a]

Nominal Treatment Levels (lbs/a·yr)	Seasonal Mass Mean Diameter (μ)	Pooled Standard Deviations[b]
0	106.2	40.8
10	103.1	39.4
100	106.9	40.7
500	104.7	39.7

[a] Data abstracted from Data Summary Volume Section G.

[b] Square root of the mean of individual variances.

5.1.5.2. Field

The mass mean diameter of the droplets sprayed in the field study is shown in Table 16 (Data Summary Volume Table G-3).

5.2. CLIMATIC COMPARISONS

5.2.1. The Palo Verde Nuclear Generating Station Field Site and Marana

The maximum temperature in a cotton field near the Palo Verde Nuclear Generating Station was consistently higher than that at Marana field site except for the weeks of 15 July and 11 November (Table 17; Figures 21a, 21b, 21c). The difference in the weekly mean maximum temperatures between the two sites was very small in June but increased gradually in July and August, reaching a peak difference of 7.2 C during the first week of September. The difference in weekly mean maximum temperatures between the two sites decreased gradually to less than 1 C difference in November (Table 17). The weather instruments at the Marana field site and the Palo Verde field site were located in cotton fields. The temperatures may have been affected by irrigation practices and microclimates within the plant canopy. The weekly mean maximum temperatures for both field sites were consistently lower than the weekly mean maximum temperatures for the Marana desert site. This difference persisted until October when irrigation was discontinued.

The weekly mean minimum temperatures at the two field sites were similar. The mean minimum temperature at the Palo Verde field site was within 2.5 C of the mean minimum temperatures at the Marana field site. The seasonal mean minimum temperature was less than 0.1 C higher at the Palo Verde field site than at the Marana field site.

The weekly means for maximum and minimum relative humidity were consistently higher at the Marana field site than at the Palo Verde field site (Table 17). The maximum seasonal mean relative humidity was 5.4% higher and the minimum seasonal mean relative humidity 17.8% higher at the Marana field site (Table 17: Figure 22a, 22b). The maximum and minimum means at both the Palo Verde field site and the Marana field site were greater than those recorded at the

Table 16.

Field Droplet Size Measurements[a]

Nominal Treatment Levels (lbs/a·yr)	Seasonal Mass Mean Diameter (μ)	Pooled Standard Deviations[c]
0	97.0	36.2
10	97.7	35.6
100	96.0	35.4[b]
500	96.0	35.4[b]

[a] Data abstracted from Data Summary Volume Section G.

[b] Same spray line used for these treatments.

[c] Square root of the mean of individual variances.

Table 17.

Weekly Temperature and Relative Humidity Means for the Field Study[a]

	Temperature (C) - Weekly Average						Relative Humidity (%) - Weekly Average					
	Maximum			Minimum			Maximum			Minimum		
	Desert site	Marana site	Palo Verde site	Desert site	Marana site	Palo Verde site	Desert site	Marana site	Palo Verde site	Desert site	Marana site	Palo Verde site
June 3	-	37.1[b]	-	-	14.0[b]	-	-	30.0[b]	-	-	-	-
10	-	37.6	38.1	-	15.1	16.3	-	39.4	44.9	-	7.8	-
17	-	39.4	40.2	-	16.6	16.5	-	33.0	36.1	-	-	-
24	-	37.6	37.9	-	15.4	14.9	-	39.4	49.7	-	-	-
July 1	-	38.8	39.1	-	18.4	19.6	-	55.6	50.4	-	12.7	16.0
8	-	37.7	40.1	-	22.7	23.4		75.4	61.3	-	33.1	23.9
15	39.1	37.4	36.1	22.3	20.7	20.6	53.4	68.3	69.3	-	27.7	28.1
22	-	34.1	36.6	-	22.5	22.5	-	84.4	82.6	-	52.3	42.7
29	-	34.5	38.1	-	22.9	23.9	-	85.9	82.9	-	53.3	43.0
Aug 5	-	32.6	36.8	-	21.5	23.8	-	90.3	83.9	-	58.4	49.9
12	-	30.9	35.1	-	20.8	22.5	-	91.7	87.9	-	76.7	57.1
19	-	29.9[b]	34.2	-	18.6[b]	18.3	-	89.3[b]	89.4	-	66.0[b]	44.6
26	39.7	31.5	38.4	22.5	21.1	21.8	75.9	90.1	84.0	21.6	74.7	39.9
Sept 2	39.8	30.4	37.6	22.4	20.5	21.6	77.1	90.0	87.0	21.6	76.0	38.0
9	38.9	29.9	35.6	23.4	21.2	22.7	70.9	87.7	84.3	24.0	72.3	42.7
16	36.0	28.6	33.3	21.4	20.3	20.9	86.3	90.9	87.4	33.0	78.3	55.1
23	31.9	26.3	29.9	18.6	17.9	17.6	89.3	92.7	90.7	40.6	79.0	52.9
30	25.1	23.1	27.4	16.0	16.4	15.1	91.6	93.6	91.9	67.0	85.6	62.7
Oct 7	29.8	27.7	33.3	14.6	14.3	12.6	86.7	91.7	83.1	32.0	63.1	27.7
14	27.4	30.2	31.6	12.8	11.6	11.3	83.9	91.9	8[illegible].9	37.0	44.0	25.7
21	28.1	30.4	32.1	13.9	12.8	11.1	82.9	86.1	71.9	33.9	37.7	22.7
28	27.9	30.6	31.1	12.8	12.0	10.4	88.6	90.4	78.0	36.9	38.6	27.1
Nov 4	25.1	27.8	28.5	10.2	9.4	7.8	90.1	92.4	69.9	41.1	42.9	20.7
11	25.0	28.8	27.8	7.7	6.8	5.6	85.6	89.4	67.9	29.3	29.0	17.9
18	17.1	19.7	20.1	2.1	1.0	2.1	84.9	89.1	81.1	31.4	33.9	19.1
25	13.3[b]	16.0[b]	17.4	-0.8[b]	-0.9[b]	-1.1	92.6[b]	94.2[b]	82.3	41.4[b]	42.0[b]	29.0
Seasonal $\bar{x}$[c]		30.86	33.46		15.98	16.07		80.92	75.43		53.51	35.75

[a] The maximum or minimum temperatures or relative humidities recorded each day were averaged, every 7 days, to determine the weekly mean maximums or minimums.

[b] Mean based on less than 7 days because of missing data.

[c] Only for dates with paired data.

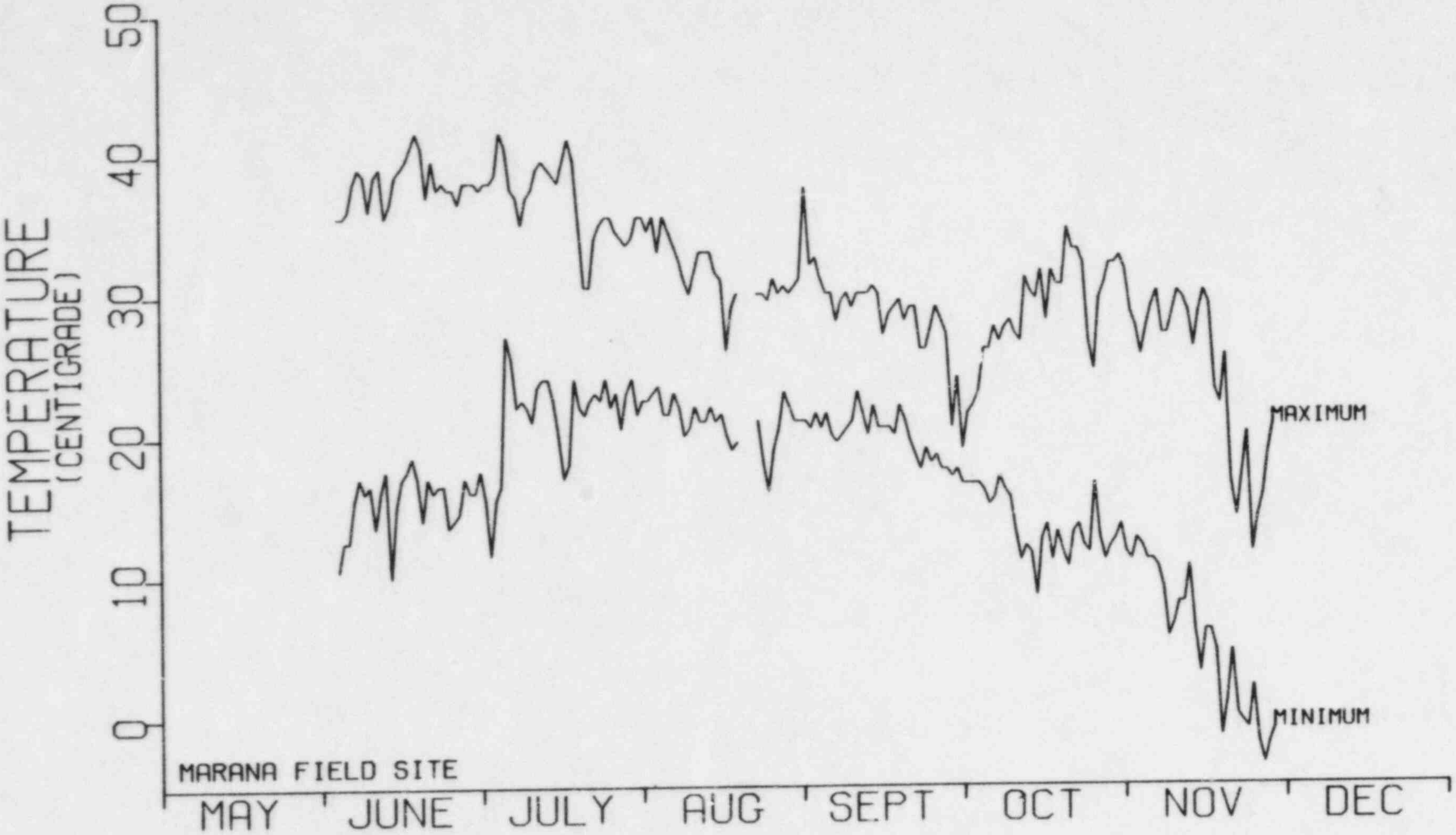


Figure 21a. Maximum and minimum temperatures recorded during the growing season at the Marana field site

Gaps indicate missing data.

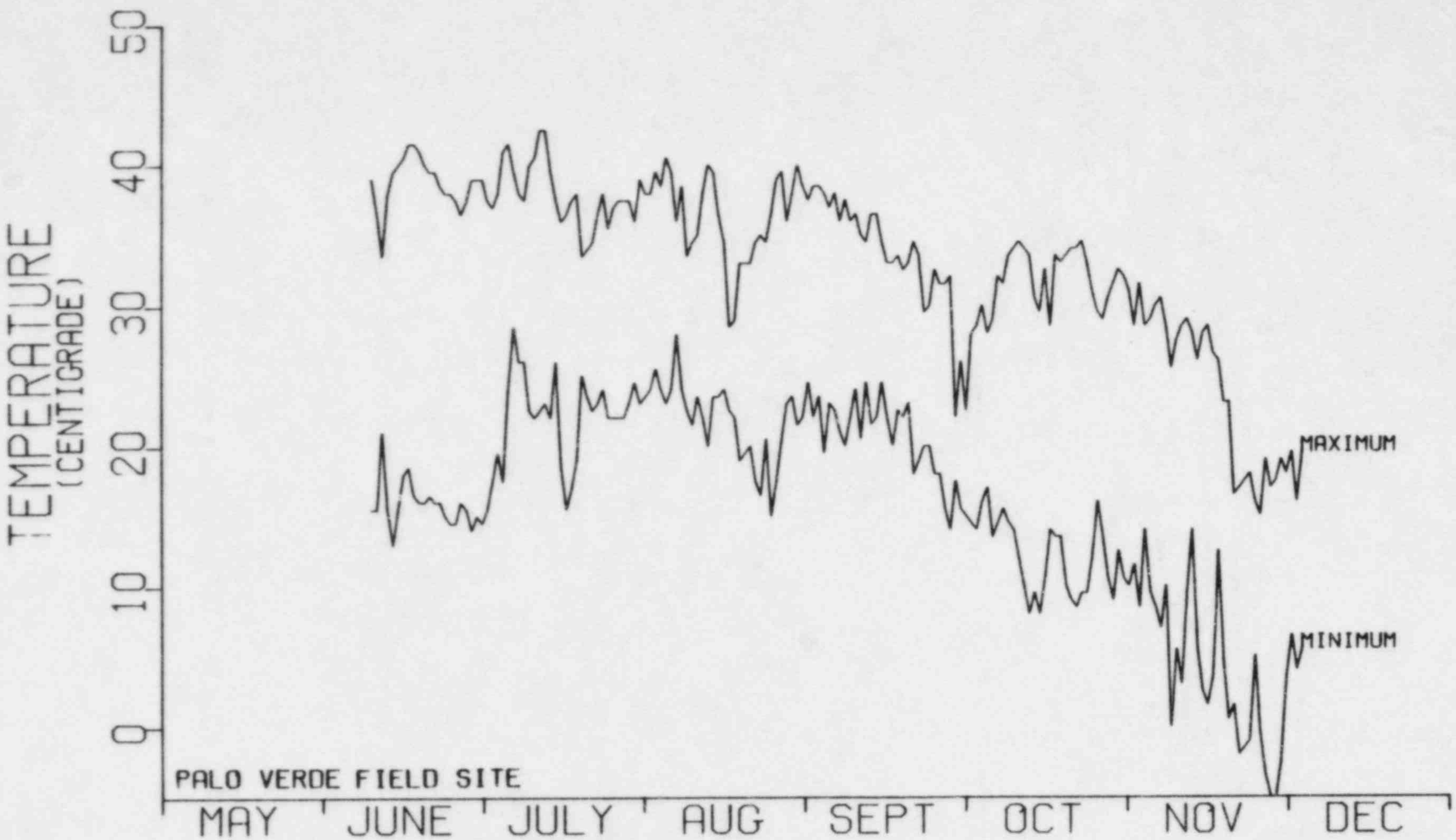


Figure 21b. Maximum and minimum temperatures recorded during the growing season at the Palo Verde field site

Gaps indicate missing data.

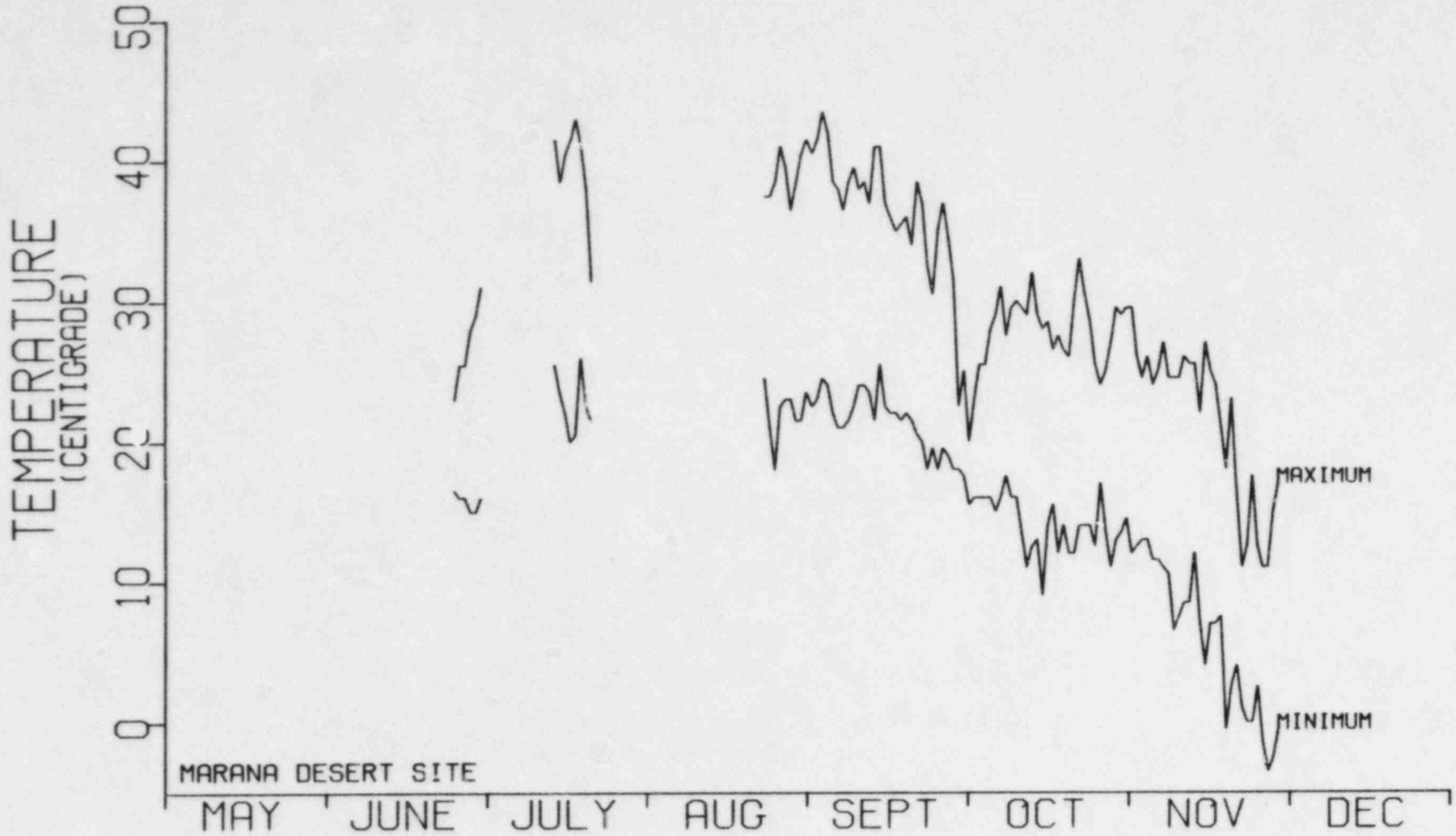


Figure 21c. Maximum and minimum temperatures recorded during the growing season at the Marana desert site

Gaps indicate missing data.

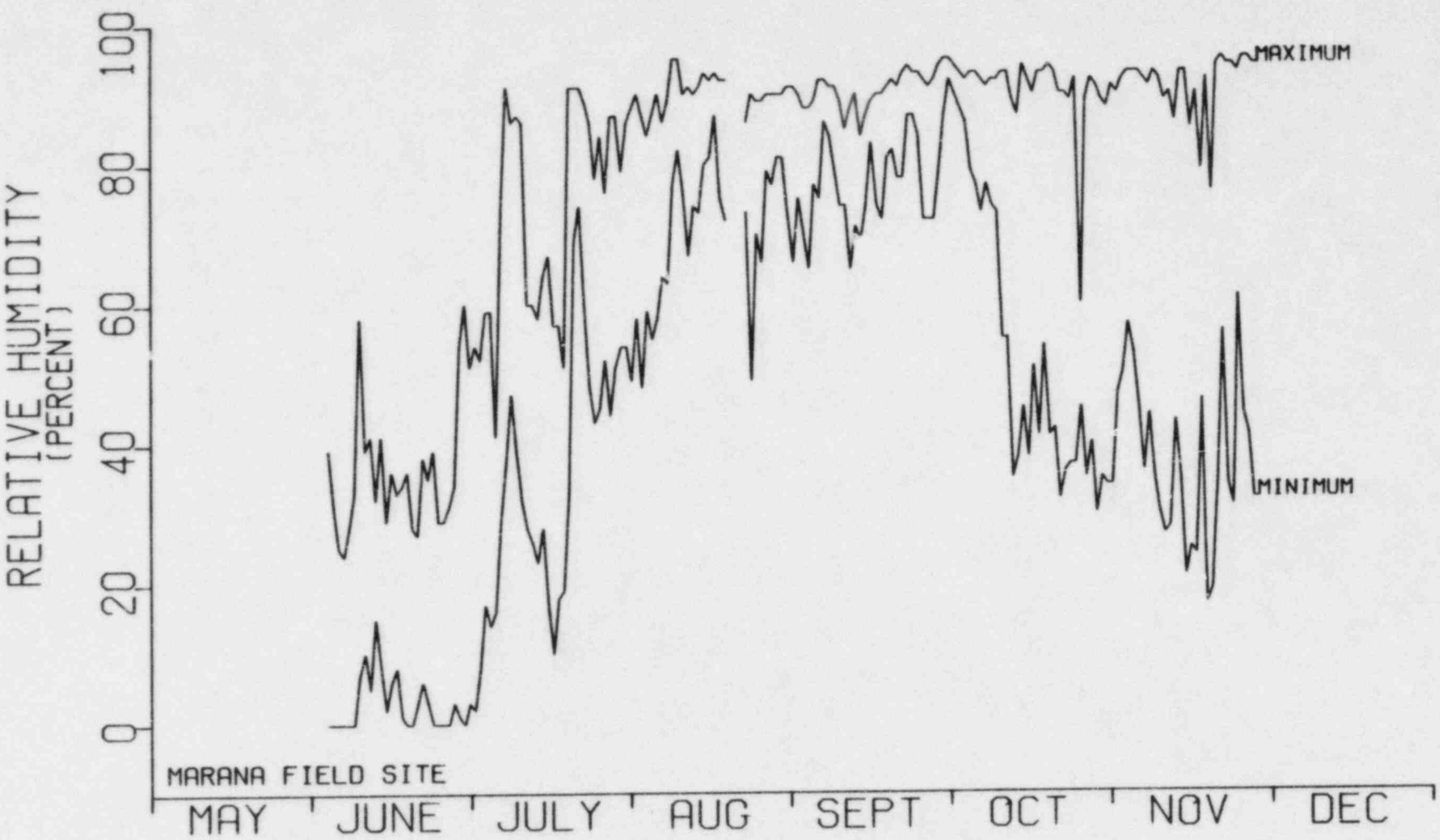


Figure 22a. Maximum and minimum relative humidities recorded during the growing season at the Marana field site

Gaps indicate missing data.

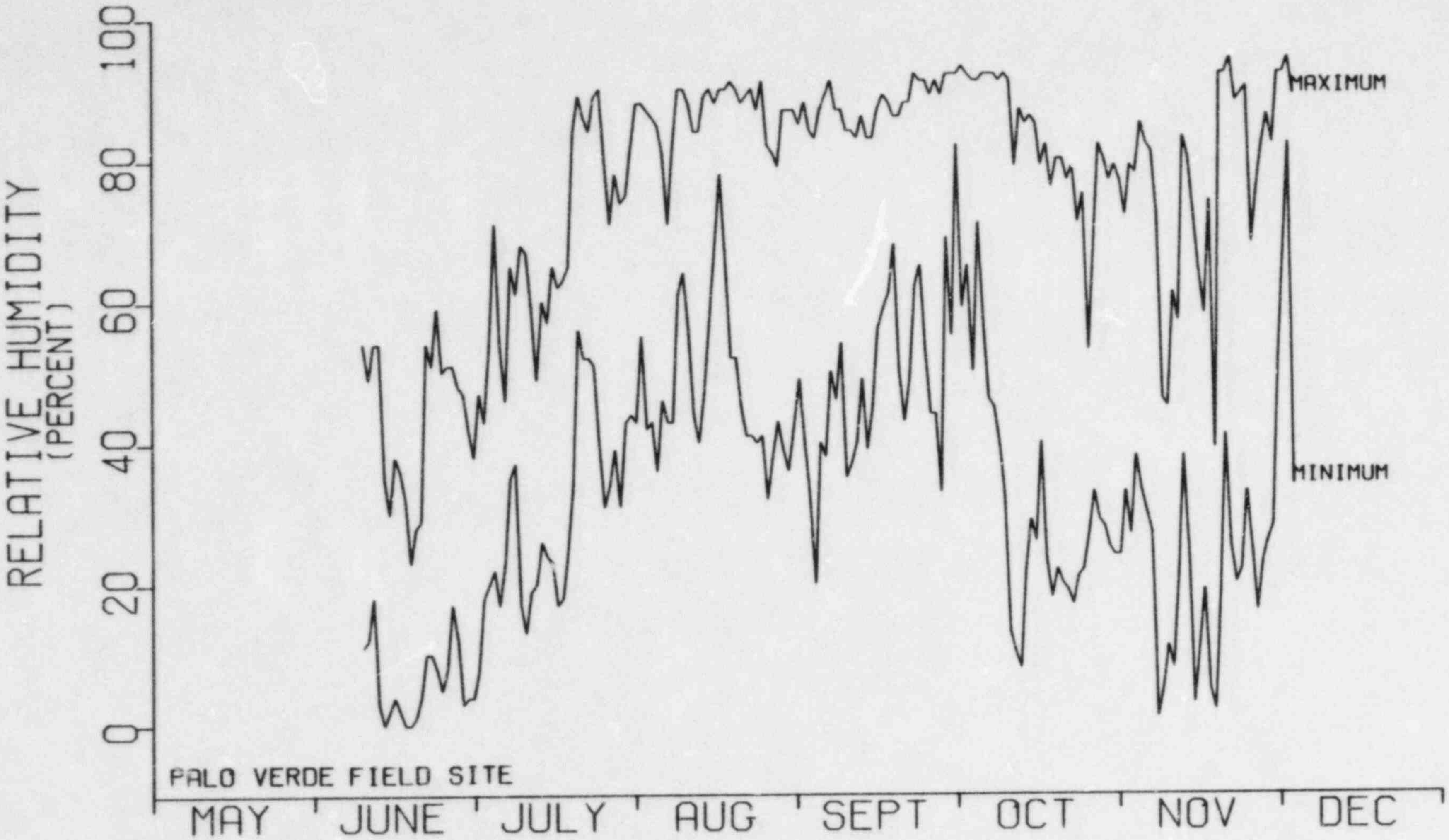


Figure 22b. Maximum and minimum relative humidities recorded during the growing season at the Palo Verde field site

Gaps indicate missing data.

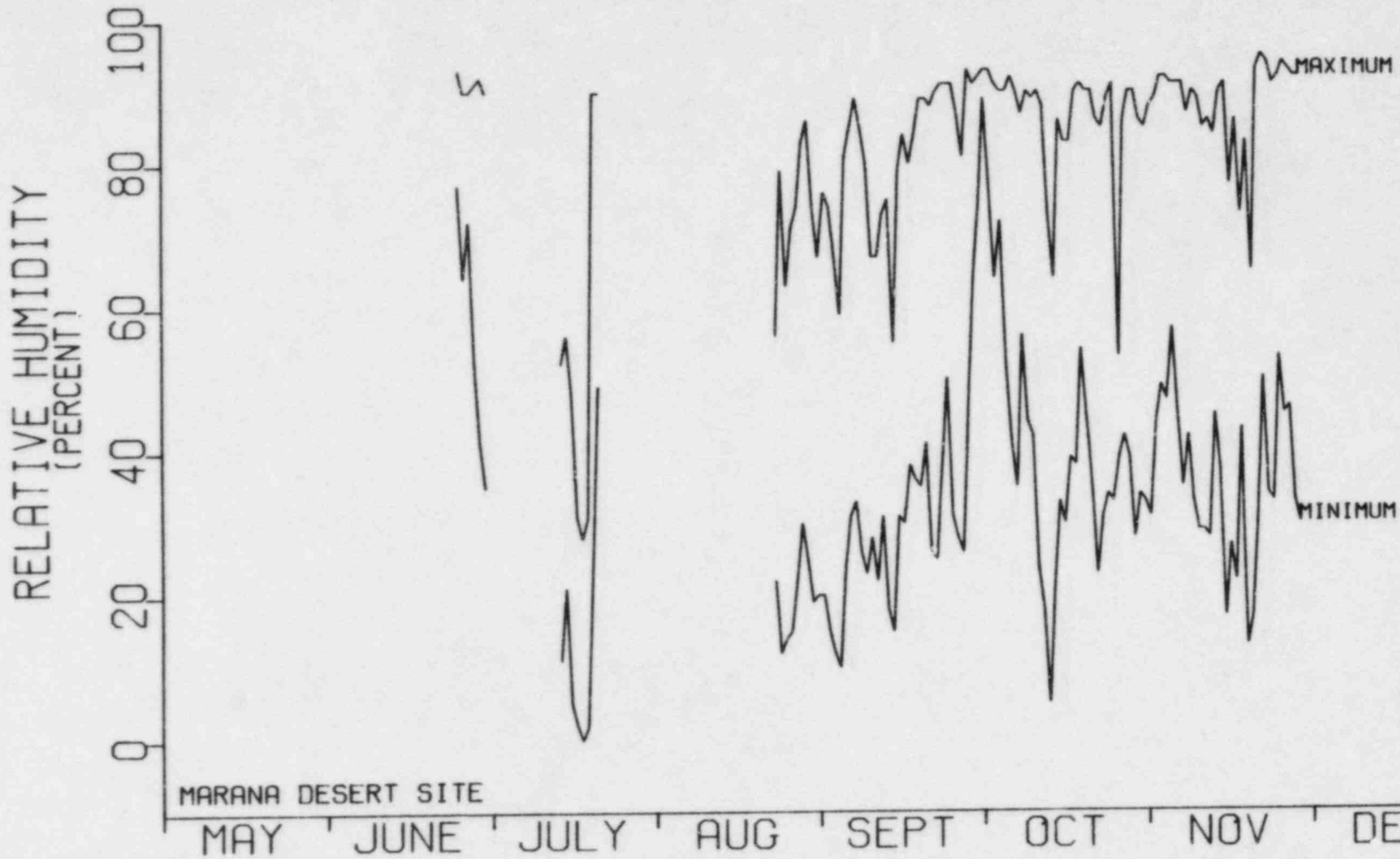


Figure 22c. Maximum and minimum relative humidities recorded during the growing season at the Marana desert site

Gaps indicate missing data.

desert site until October (Figure 22c). In October and November, however, higher means were recorded at the desert site than at the Palo Verde field site, in part due to the excessive precipitation received in the Marana region from an unusually large storm in late September and early October.

The amounts of precipitation received at Marana and the Palo Verde field site were nearly equal until 18 August. Marana received 2 in. of rain during this period, and the Palo Verde field site received 2.03 in. During late August and early September, Marana received more than 1.25 in. more precipitation than the Palo Verde field site. An unusually large storm in late September and early October left 5.5 in. of rain at Marana site. The Palo Verde field site received less than 0.75 in. of rain from this storm (Figure 23). Total rainfall was 10.58 in. at Marana and 4.16 in. at the Palo Verde field site, for the duration of this study.

5.2.2. Greenhouse

The daily maximum temperatures in the north greenhouse ranged from 25 C to 45 C. Maximum temperatures were higher at the east end of the greenhouse, except in November. These variations in temperature can be attributed to the evaporative coolers located at the west end and the exhaust fans located at the east end of the greenhouse. Minimum temperatures at both ends of the greenhouse did not vary by more than 2 C (Figures 24a, 24b).

Recording of the relative humidity in the greenhouse during May 1983 to October 1983 shows that the relative humidity reached 75% or greater each day for approximately 6 hr, 12 hr, 17 hr, 20 hr, and 12 hr, during the months of June, July, August, September, and October, respectively (Figure 25a, 25b, Data Summary Volume Tables H-1, H-2).

Analysis of the air quality in the north greenhouse showed that there were no significant difference in ionic species concentration between days on which spraying with the simulated saline drift took place and nonspraying days (Data Summary Volume Section C).

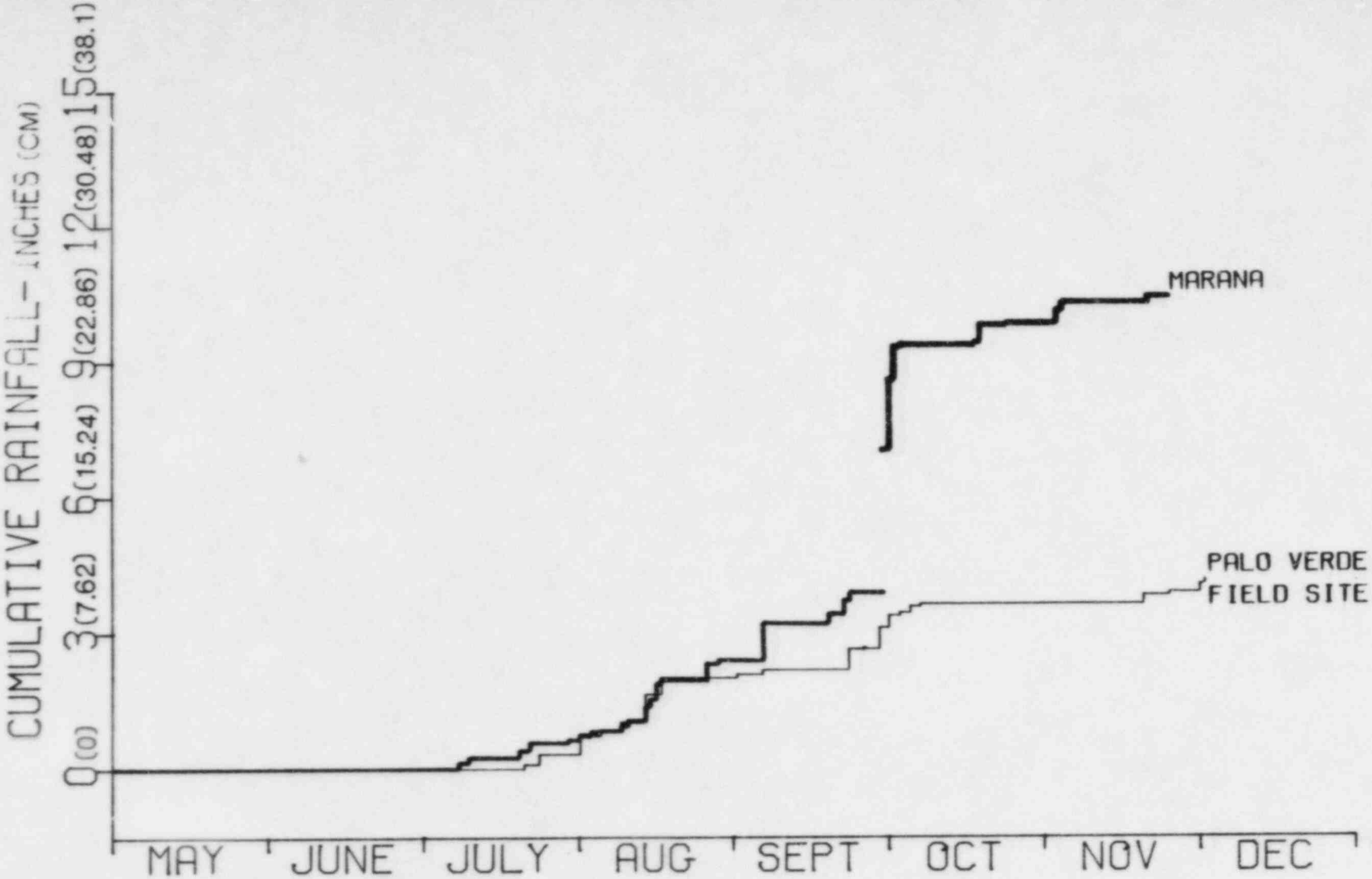


Figure 23. Rainfall comparison: Marana and the Palo Verde field site

Gaps indicate missing data.

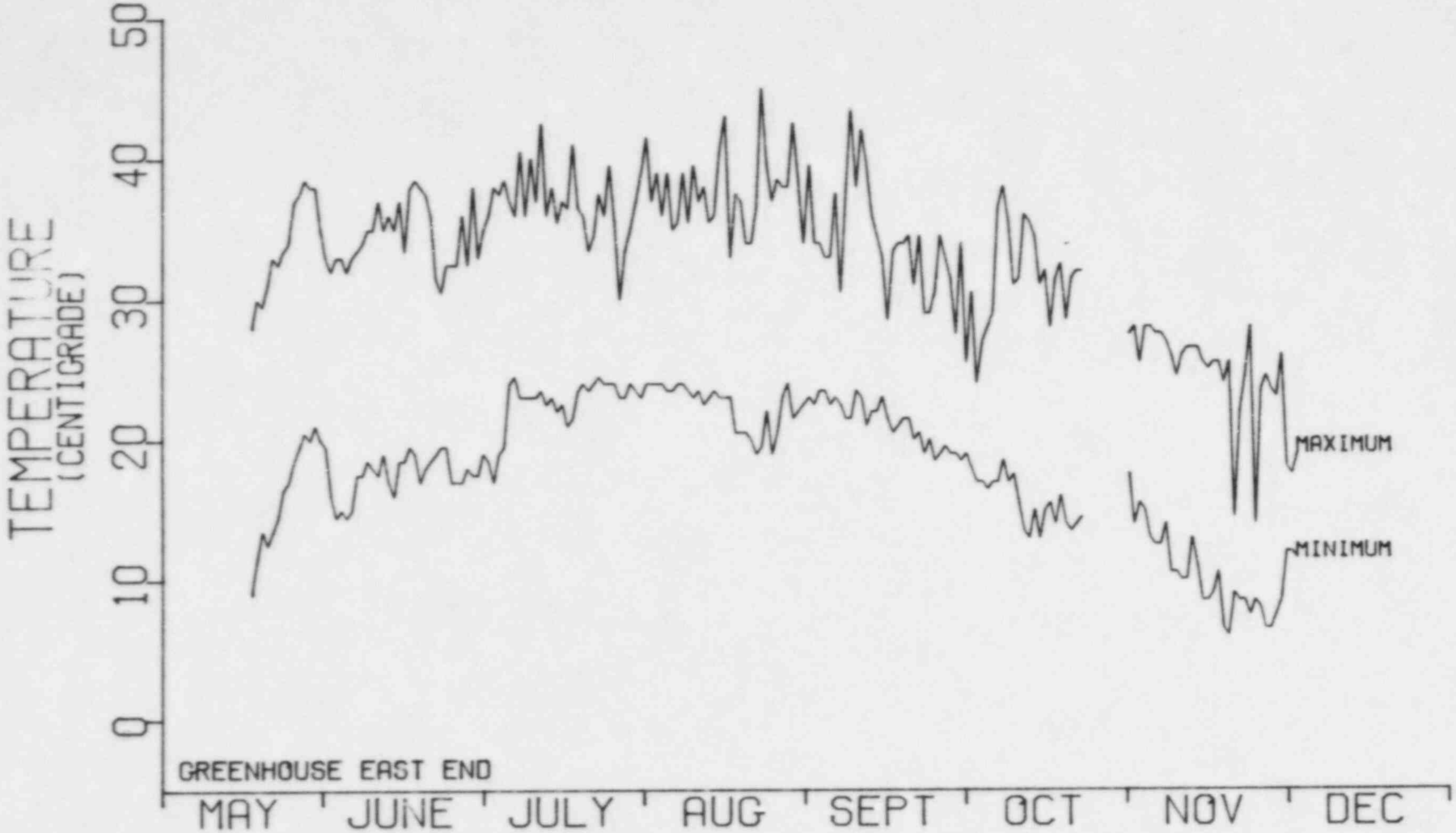


Figure 24a. Maximum and minimum temperatures recorded during the growing season at the east end of the north greenhouse

Gaps indicate missing data.

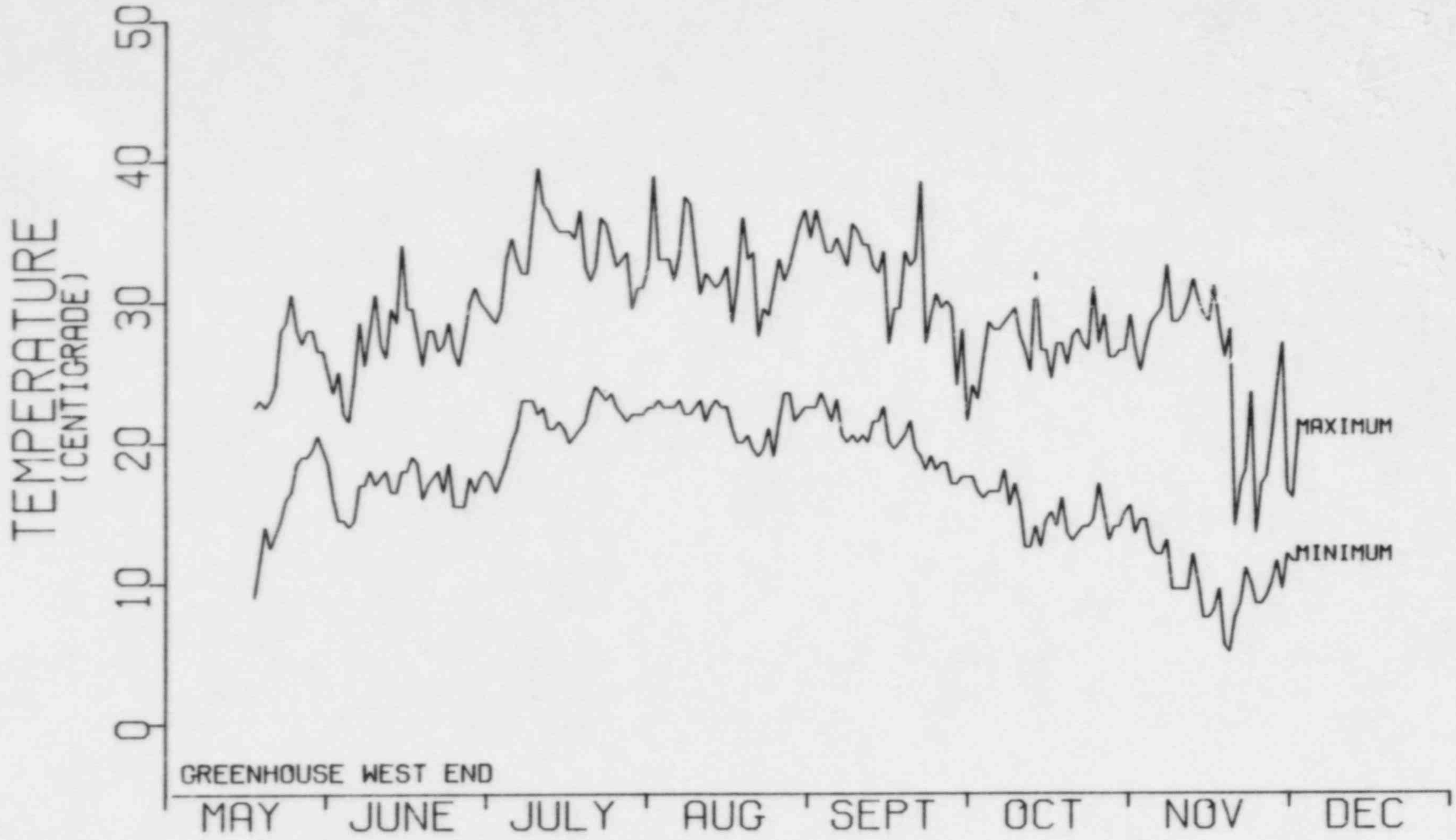


Figure 24b. Maximum and minimum temperatures recorded during the growing season at the west end of the north greenhouse

Gaps Indicate missing data.

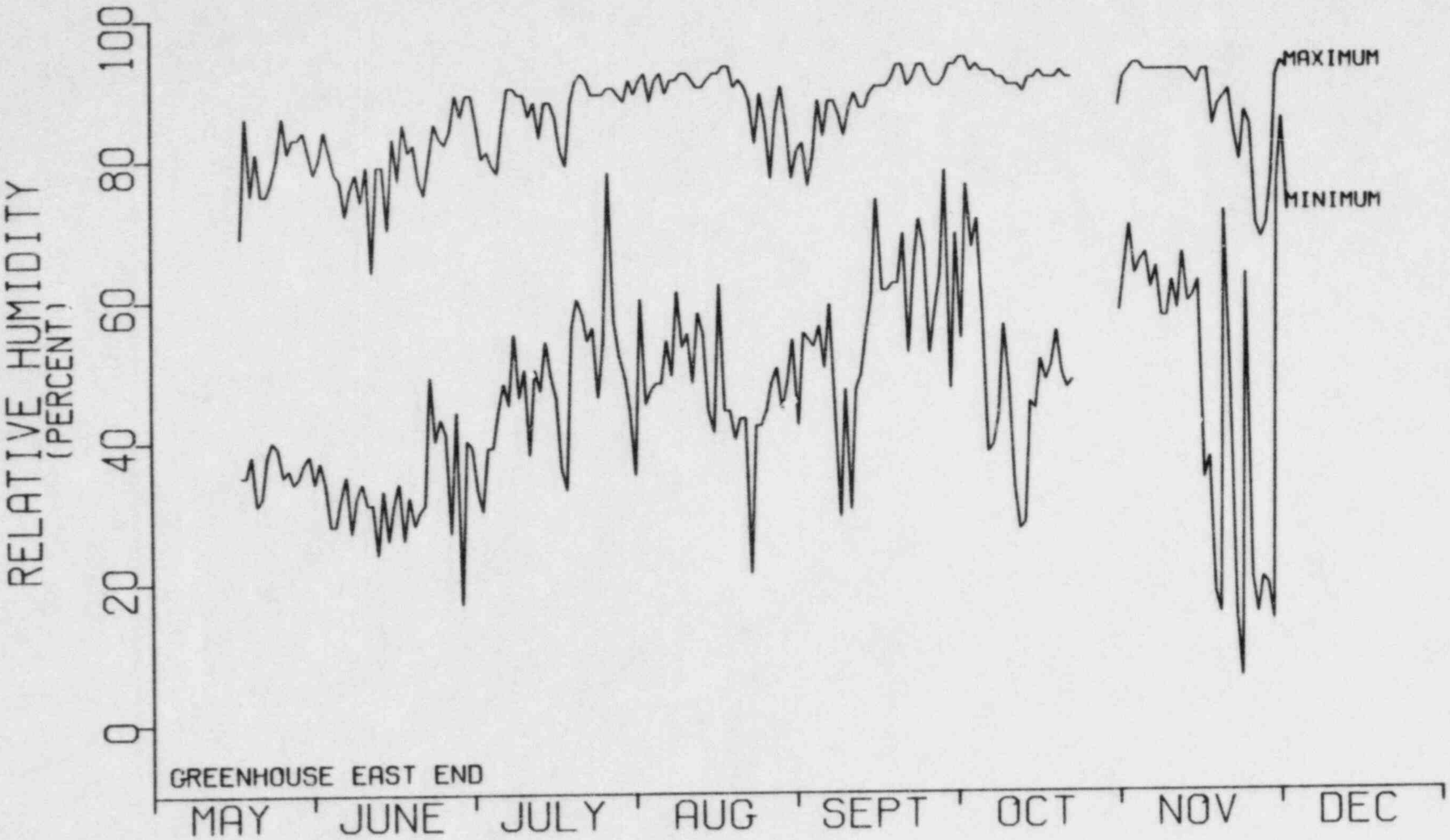


Figure 25a. Maximum and minimum relative humidities recorded during the growing season at the east end of the north greenhouse

Gaps indicate missing data.

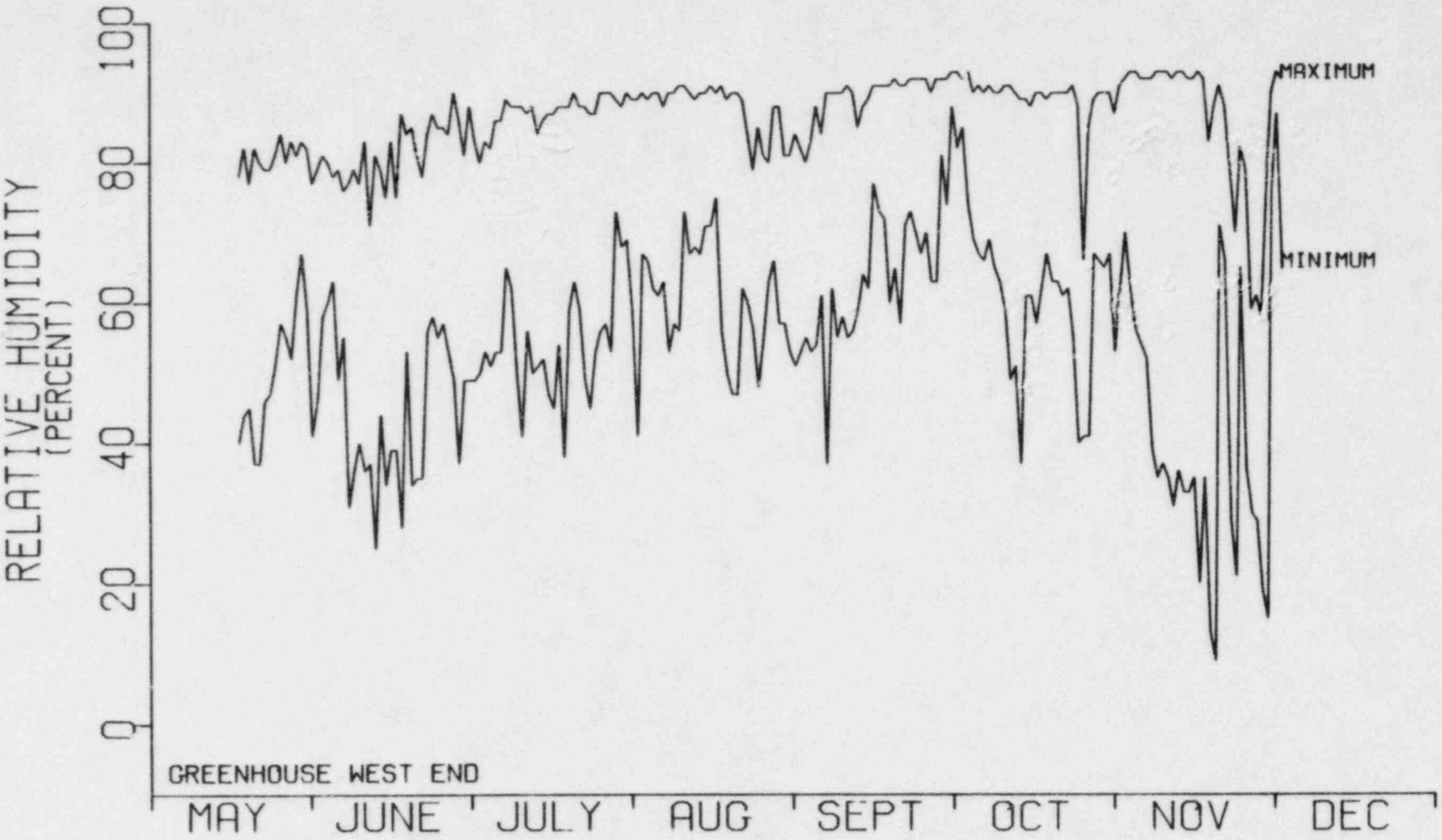


Figure 25b. Maximum and minimum relative humidities recorded over the growing season at the west end of the north greenhouse

Gaps indicate missing data.

5.3. GREENHOUSE EXPERIMENTAL RESULTS

5.3.1. Cotton

5.3.1.1. Resident Salts on Cotton Leaf Surfaces

There were no significant differences among the treatments in the north greenhouse for resident surface salts. The mean concentrations of resident surface salts were 0.045, 0.059, 0.048, 0.047 mg/cm^2 of leaf area and 10.2, 9.4, 10.6, and 9.2 mg/g leaf dry weight for the 0, 10, 100, and 500 lbs/a·yr nominal treatments, respectively (Data Summary Volume Table I-7).

In the south greenhouse, cotton plants treated with nominal 1000 lbs/a·yr simulated saline drift accumulated approximately 23 percent more surface salts/g dry weight of leaves than the controls (Table 18, Data Summary Volume Table I-7). These values were statistically different. The mean concentrations of resident surface salts were 22.3 and 29.2 mg/g leaf dry weight for the 0 and nominal 1000 lbs/a·yr treatment, respectively. On a leaf area basis, the resident salts on the control and treated plants are both 0.13 mg/cm^2.

5.3.1.2. Cotton Leaf Tissue Analysis

Tissue analysis showed that salts accumulated within cotton leaf tissue (Data Summary Volume Tables M-1 to M-4). At harvest, the average Na^+ concentration in the leaves of the nominal 500 lbs/a·yr treated cotton plants (4187 ppm) was approximately six times that of the control plants (662 ppm). The average Cl^- concentration in the treated plants (9901 ppm) was approximately twice that in the controls (5301 ppm). Only the Na^+ and Cl^- concentrations were statistically different (Table 18).

5.3.1.3. Phenological Responses

The plants in the nominal 1000 lbs/a·yr treatment group in the south greenhouse on the average were 19 cm shorter than the controls. This 15% reduction was consistent from 9 September to biomass harvest and was

Table 18.

Significant Differences

Visual Evaluations

Crop	Variable[a]	Harvest	Nominal Treatment Level (lbs/a·yr) 0	500	1000	Standard Error
Cotton North Greenhouse	Height/Plant (cm)					Trend difference
	No. Nodes/Plant					Trend difference
	No. Bolls/Plant 7/27, 8/4, 8/9, 8/15, 8/23, 8/30, 9/8, 9/13, 9/29, 10/5		10.27	12.22	*	0.78
	Tip Necrosis (% leaves/plant) 8/30, 9/8, 9/13, 9/29, 10/5		4.08	7.33	*	0.89
	Margin Necrosis (% area/leaf) 7/6, 7/11, 7/18, 7/27, 8/4, 8/9, 8/15, 8/23, 8/30, 9/8, 9/13, 9/29, 10/5		0.7	3.23	*	0.16
	General Chlorosis (% leaves/plant) 8/30, 9/8, 9/13, 9/29, 10/5		37.50	45.80	*	0.86
	Leafshed/plant[b] 7/27, 8/4, 8/9, 8/15, 8/23, 8/30, 9/8, 9/13, 9/29, 10/5		3.42	3.93	*	0.09
	Deformity - Margin Curl[c] 8/9, 8/15, 8/23, 8/30, 9/8, 9/13, 9/29, 10/5		0.69	0.80	*	0.10

Table 18 (cont.)

Crop	Variable	Harvest	Nominal Treatment Level (lbs/a·yr) 0	500	1000	Standard Error
Cotton North Greenhouse	Square shed/plant[b] 8/9, 8/15, 8/23, 8/30, 9/8		0.53	1.27	*	0.13
Cotton South Greenhouse	Height/Plant (cm)					Trend difference
	No. Flowers/Plant		0.36		0.23	0.04
	Tip Necrosis[c] 8/1, 9/9, 9/28, 10/10, 10/19, 10/26, 11/1		0.45	*	0.9	0.02
	Tip Necrosis (% leaves/plant) 8/1, 9/9, 9/28, 10/10, 10/19, 10/26, 11/1		5.85	*	27.86	1.69
	Margin Necrosis (% leaves/plant) 8/1, 9/9, 9/28, 10/10, 10/19, 10/26, 11/1		5.42	*	27.75	3.01
	Spot Necrosis (% leaves/plant) 8/1, 9/9, 9/28, 10/10, 10/19, 10/26, 11/1		0.77	*	6.37	0.87
	Surface Chlorosis (% leaves/plant) 7/8, 8/1, 9/9, 9/28, 10/10, 10/19, 10/26, 11/1		29.12	*	23.39	0.90
Barley - North Greenhouse	Spot Chlorosis (% leaves/plant) 8/17, 8/24, 9/1, 9/8, 9/14		4.17	10.25	*	2.9

Table 18 (cont.)

Crop	Variable	Harvest	Nominal Treatment Level (lbs/a·yr) 0	500	1000	Standard Error
Barley - North Greenhouse	General Chlorosis (% leaves/plant) 8/17, 8/24, 9/1, 9/8, 9/14, 9/29, 10/7, 10/12		29.9	34.3	*	2.75
Barley - South Greenhouse	Tip Necrosis[c] 7/19, 8/8, 9/14, 9/23		0.33	*	0.36	0.0001
	Margin Necrosis (% leaves/plant) 7/19, 8/8, 9/14, 9/23		1.39	*	2.96	0.14
Cotton - Field	Chlorosis (% leaves/plant) 7/5, 7/13, 7/26, 8/3, 8/25, 9/2, 9/12, 9/15, 9/27, 10/13		15.4	12.1	*	0.58
	Chlorosis (% area/leaf) 7/5, 7/13, 7/26, 8/3, 8/25, 9/2, 9/12, 9/15, 9/27, 10/13		24.3	19.2	*	1.16
	Chlorosis - Surface Yellow[c] 8/25, 9/2, 9/12, 9/15, 9/27, 10/13		0.38	0.29	*	0.03
Alfalfa - Field	Chlorosis (% leaves)		6.94	*	9.5	0.62
	Margin Necrosis[c]		0.08	*	0.28	0.04
North Greenhouse Alfalfa Transplants	Height (cm)/Plant	Seventh	32.6	30.87		0.40
	Diameter (NS) (cm)	Second	16.25	18.00		0.56
	(NS) (cm)	Fourth	20.30	24.15		0.06
	(EW) (cm)	Fourth	19.25	22.75		0.72

Table 18 (cont.)

Crop	Variable	Harvest	Nominal Treatment Level (lbs/a·yr) 0	500	1000	Standard Error
	No. of Stems/Plant	Third[d]	11.04	13.00		0.05
	Percent Bloom/Plant	Second	3.00	0.83		0.20
		Third[d]	3.54	4.79		0.76
	Chlorosis - Surface Yellow in Population[c]	First	0.46	0.04		0.01
North Greenhouse Alfalfa Seedlings	Height (cm)/Plant	Second	49.97	47.20		0.36
	No. of Stems/Plant	Fifth	30.83	33.75		0.07
	Abscission in Population[e]	Fourth	0.94	1.06		0.02
	Spot Chlorosis (% area/leaf)	Fifth	19.58	7.92		2.26
South Greenhouse Alfalfa Transplants	Abscission in Population[e]	Third	0.58		1.00	0.06
	Surface Chlorosis (% leaves/plant)	Fifth	55.00		30.83	3.11
South Greenhouse Alfalfa Seedlings	Abscission in Population[e]	Fourth	0.50		0.84	0.03

[a] Dates are listed for individual variables which were significant only for the dates listed, all dates listed were analyzed collectively.

[b] Each value represents the mean number of leaves, squares, or bolls shed for 12 plants.

[c] In each observation, condition was noted as "1," present or "0," absent. The resultant mean represents the fraction of the population affected with the condition.

[d] Linear response difference between treatment.

[e] In each observation, condition was noted as "0," no leaves abscised, "1," few leaves abscised, or "2," many leaves abscised. The resultant mean represents an index of the severity of the condition throughout the population.

Table 18 (cont.)

Harvest Data

Crop	Variable	Nominal Treatment Level (lbs/a-yr) No Tmt.	0	10	100	500	1000	Standard Error	b	S_b
Cotton - North Greenhouse	Fresh Weight Bracts/Plant (g)	*	21.58	29.76	28.73	31.36	*	1.39	--	--
	Dry Weight Bracts/Plant (g)	*	18.91	25.92	25.62	34.89	*	2.28	--	--
	Seed Cotton Weight/Plant (g)	*	63.90	83.31	81.56	88.94	*	3.67	--	--
	Lint Weight/Plant (g)	*	24.92	32.49	30.81	34.69	*	1.43	--	--
Alfalfa - Field	Leaf Surface Salt/ Leaf Area									
	mmhos/cm^2	0.0077	0.0066	0.0082	0.0139	0.0159	0.0274	0.0025	0.1839	0.0293
	mg/cm^2	0.0014	0.0015	0.0027	0.0087	0.0103	0.0248			
	Leaf Surface Salt/ Plant Dry Weight									
	mmhos/g	0.8997	0.7225	0.8983	1.5455	1.9025	3.2763	0.2721	0.0023	0.0002
	mg/g	0.1779	0.1575	0.2858	0.8990	1.2127	2.8552			
Cotton - Field Hand Harvested	No. Bolls	147.0	152.0	138.4	135.1	116.9	*	7.02	-0.0561	0.0172
	Seed Cotton (g/plot)	583.3	631.0	543.9	516.4	439.7	*	30.41	-0.2876	0.0744
Alfalfa Seedlings North Greenhouse	Leaf Surface Salt/ Leaf Area									
	mmhos/cm^2	*	0.0034	0.0036	0.0036	0.0091	*	0.00048	--	--
	mg/cm^2	*	0.0084	0.0090	0.0093	0.0266	*			
	Leaf Surface Salt/ Plant Dry Weight									

Table 18 (cont.)

Crop	Variable	Nominal Treatment Level (lbs/a·yr) No Tmt.	0	10	100	500	1000	Standard Error	b	S_b
	mmhos/g	*	0.4766	0.5730	0.6005	1.1443	*	0.02400	0.00127	0.00006
	mg/g	*	0.7643	0.9287	1.2242	2.7100	*			
Alfalfa Seedlings South Greenhouse	Fresh Weight (g)	*	84.64	*	*	*	96.15	1.54	--	--
	Leaf Surface Salt/ Leaf Area									
	mmhos/cm^2	*	0.0025	*	*	*	0.0115	0.0004	--	--
	mg/cm^2	*	0.0061	*	*	*	0.0346	0.0015		
	Leaf Surface Salt/ Plant Dry Weight									
	mmhos/g	*	0.4086	*	*	*	1.5552	0.0330		
	mg/g	*	1.0483	*	*	*	4.7179	0.218		
Alfalfa Transplants North Greenhouse	Leaf Surface Salt/ Leaf Area									
	mmhos/cm^2	*	0.0033	0.0032	0.0040	0.0079	*	0.00065	0.09430	0.00860
	mg/cm^2	*	0.0070	0.0070	0.0098	0.0224	*			
	Leaf Surface Salt/ Plant Dry Weight									
	mmhos/g	*	0.3668	0.4169	0.5074	0.9638	*	0.026	0.00116	0.00006
	mg/g	*	0.7643	0.9287	1.2242	2.7100	*			
Alfalfa Transplants South Greenhouse	Leaf Surface Salt/ Leaf Area									
	mmhos/cm^2	*	0.0033	*	*	*	0.0121	0.0007	--	--
	mg/cm^2	*	0.0084	*	*	*	0.0365	0.0021		

Table 18 (cont.)

Crop	Variable	Nominal Treatment Level (lbs/a·yr) No Tmt.	0	10	100	500	1000	Standard Error	b	S_b
	Leaf Surface Salt/ Plant Dry Weight									
	mmhos/g	*	0.3644	*	*	*	1.3805	0.0044	--	--
	mg/g	*	0.9273	*	*	*	4.1347	0.021		
Barley North Greenhouse	No. Seeds/Plant	*	263.00	198.67	203.08	296.67	*	18.01	--	--
	Leaf Surface Salt/ Plant Dry Weight (mg/g)	*	3.82	3.76	3.98	6.22		0.53		
Barley South Greenhouse	Leaf Surface Salt/ Plant Dry Weight (mg/g)		5.31				11.66	0.862		
Cotton South Greenhouse	Total Fresh Weight/	*	459.26	*	*	*	416.02	6.50	--	--
South Greenhouse	Plant (g)									
	Total Dry Weight/ Plant (g)	*	128.53	*	*	*	115.29	0.93	--	--
	Leaf Surface Salt/ Dry Weight of Leaves (mg/g)	*	22.28	*	*	*	29.18	0.92	--	--

Table 18 (cont.)

Porometer Data

Crop	Variable	Nominal Treatment Level (lbs/a-yr) No Tmt.	0	10	100	500	Standard Error	b	S_b
Cotton - Field	Leaf Temperature (C)	33.47	33.24	33.67	33.46	33.05	0.14	-0.00121	0.00035
	Temperature Differential (C)	2.4327	2.5765	2.3332	2.4230	2.6246	0.0586	0.00057	0.00015
Barley North Greenhouse, P.M.	Leaf Temperature (C)	*	26.83	26.98	27.28	27.78	0.19	0.0017065	0.000456
	Temperature Differential (C)	*	1.63	1.46	1.30	1.16	0.08	-0.000729	0.000191

Table 18 (cont.)

Tissue Analyses

Crop	Variable	Nominal Treatment Level (lbs/a·yr) Control[a]	500	1000	Standard Error
North Greenhouse					
Cotton	Na	662.43	4186.92	—	419.37
	Cl	5301.00	9900.92	—	302.80
Alfalfa (Transplants)	Na	344.75	833.32	—	48.28
	Cl	6335.86	7508.19	—	112.89
Barley	Na	1882.67	2872.67	—	82.39
	Mn	72.80	59.18	—	1.98
Field					
Cantaloupe	N	15419.38	13473.50	—	469.98
Cotton	Na	1005.94	4651.86	—	121.68
	Ca	35314.00	31329.00	—	828.85
	Mg	4275.14	3320.29	—	111.00
	B	48.36	40.64	—	1.78
	Cl	18046.29	22500.29	—	515.02
Alfalfa	Na	911.00	—	3653.00	152.26
	Cl	9801.25	—	14848.63	764.92

[a] The sprayed control was analyzed in the greenhouse study, and unsprayed controls in the field study.

statistically significant (Figure 26, Data Summary Volume Table J-5). There was no significant difference in the number of nodes/plant between the treated plants and the controls. The number of flowers per plant per observation (seasonal average)* was significantly lower for the nominal 1000 lbs/a·yr treatment (0.23 flowers/plant) than in the control (0.36 flowers/plant) (Table 18, Data Summary Volume Table J-5). There was no significant difference in the number of bolls in the treated plants and the controls. No other statistically significant visual phenological differences were observed.

In the north greenhouse, statistical analysis showed that turgidity, epinasty, and number of stems/plant were not affected by the simulated saline treatment.

A comparison of plant heights (only between control and the nominal 500 lbs/a·yr treatment) showed that: 1) control plants and treated plants were not different from 14 June to 11 July; 2) the treated plants were significantly taller than control plants from 11 July to 15 August; and 3) control plants were significantly taller than treated plants from 15 August to 5 October (Figure 27, Data Summary Volume Table J-4).

In the earlier part of the growing season, the number of nodes on the nominal 500 lbs/a·yr treated plants during the middle and latter part of the growing season is significant, and that the simulated saline drift treatments appear to have reduced the height of the treated plants from 15 August to 5 October (Figure 27, Data Summary Volume Table J-4).

No significant differences were observed in the number of squares and the number of flowers between control plants and the nominal 500 lbs/a·yr treatment; however, the number of bolls/plant (seasonal average) and flowers/plant (seasonal average) was significantly greater for the nominal 500 lbs/a·yr treatment (12.2 bolls/plant) than for the controls (10.3 bolls/plant) (Data Summary Volume Table J-4). In addition, the seasonal average of the number of plants per observation in which squares and leaves were shed is statistically greater in the treated plants (nominal 500 lbs/a·yr) than in the control plants (Table 18, Data Summary Volume Table J-4)

*The average value for all individual measurements taken during the entire growing season.

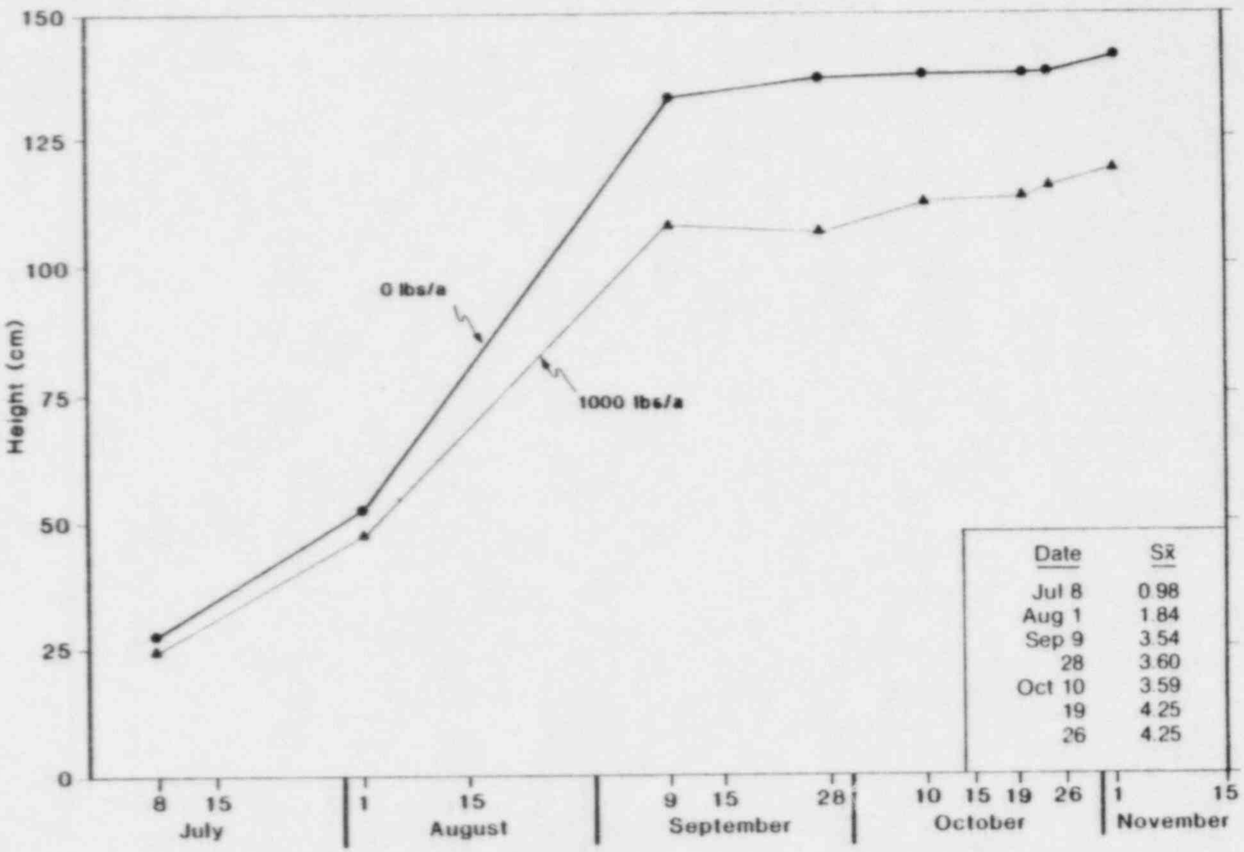


Figure 26. Mean plant heights of cotton treated with nominal 1000 lbs/a·yr simulated saline drift

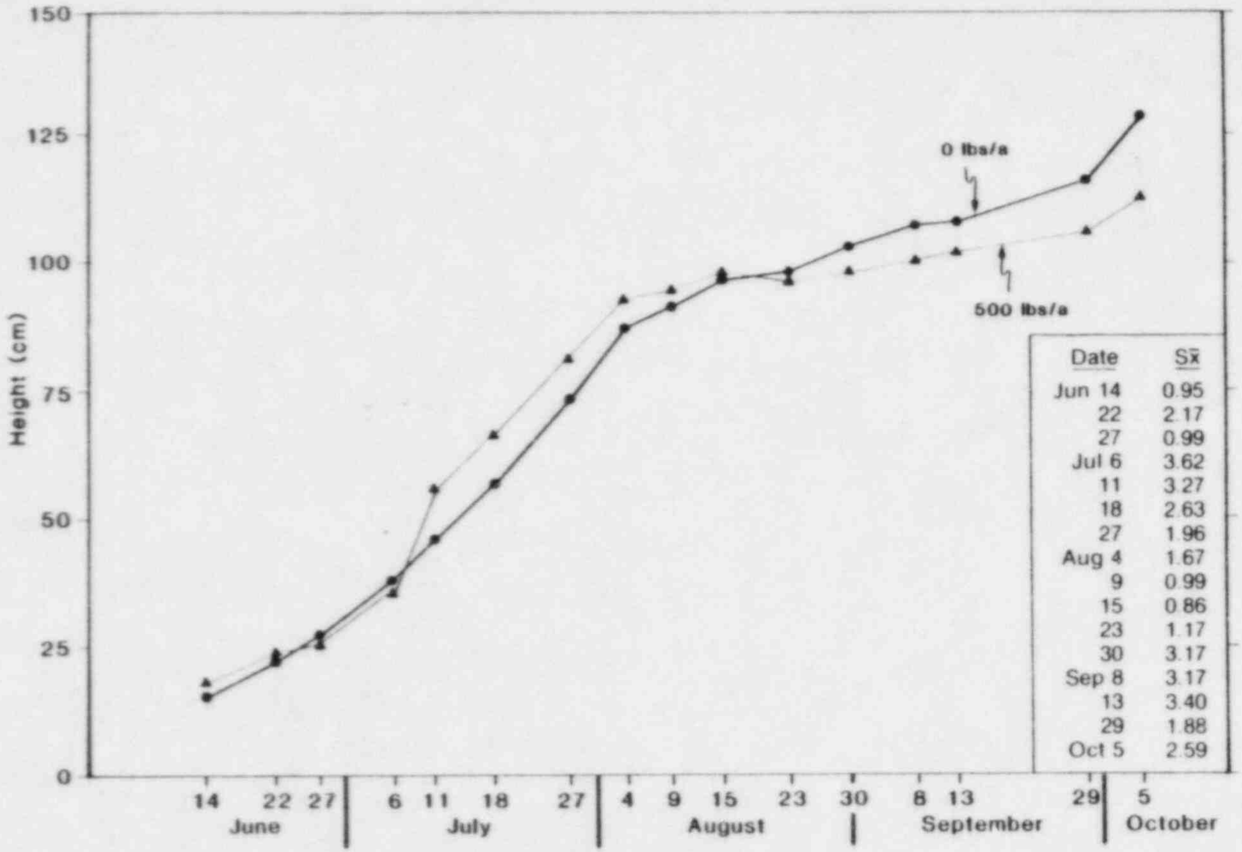


Figure 27. Mean plant heights of cotton treated with nominal 500 lbs/a·yr simulated saline drift

5.3.1.4. Foliar Injury

Tip and marginal necrosis were observed on the leaves in both the control and the nominal 1000 lbs/a·yr treated plants; however, the percentage of leaves/plant showing tip and/or marginal necrosis over time was significantly greater in the saline treated plants (Table 19, Data Summary Volume Table J-5). Based on seasonal averages, the nominal 1000 lbs/a·yr treatment exhibited approximately five times more leaf tip and margin necrosis/plant than the controls (Table 19). This necrosis was observed throughout the growing season. The percent area of the affected leaves showing tip and margin necrosis in the nominal 1000 lbs/a·yr ranged from 0.42% to 23.33% (Data Summary Volume Table J-5).

The seasonal averages of the percent leaves/plant showing spot necrosis was significantly higher in the treated plants (0.77%) than in the controls (6.37%), but this higher percentage was observed only during the earlier observation dates (Table 18, Data Summary Volume Table J-5). These results may have been influenced by the use of insecticides and nutritional deficiencies.

Tip, margin, and spot chlorosis were not observed on the cotton plants (nominal 1000 lbs/a·yr or 0 lbs/a·yr) during most of the observation periods. However, these plants did exhibit pale green general chlorosis throughout the growing season. The nominal 1000 lbs/a·yr treated plants showed significantly less general chlorotic leaves/plant than the controls over the growing season (Data Summary Volume Table J-5).

Plants in the north greenhouse treated with the nominal 500 lbs/a·yr treatment did not exhibit increases in marginal, or spot necrosis (% leaves/plant) when compared to the controls. However, the number of leaves exhibiting tip necrosis was significantly greater in the treated plants (7.3%) than in the controls (4.1%) from 30 August to 5 October. Analysis of the data in Data Summary Volume Table J-4 shows that from 6 July to 27 July, the necrotic injury probably was caused by leafburn from an insecticide. The seasonal average of percent leaf area having marginal necrosis was significantly higher in the nominal 500 lbs/a·yr treatment (3.23%) than in the controls (0.7%) (Table 18, Data Summary Volume Table J-4).

Table 19.

Visual Evaluations for Necrosis in Cotton
Treated with Nominal 1000 lbs/a-yr Simulated Saline Drift

Variable	Nominal Treatment Levels (lbs/a-yr)	Date								Seasonal Average	
		7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1	%	$S_{\bar{x}}$
Tip Necrosis	0	0	0	0	0	0	1.7	17.5	8.8	5.9	1.69
% Leaves/Plant	1000	0	1.7	19.6	35.4	30.0	36.7	37.5	34.2	27.9	
Margin Necrosis	0	0	0	0	0.8	0.4	17.5	11.3	8.0	5.4	3.01
% Leaves/Plant	1000	0	0.4	0	0	19.2	36.7	37.5	34.2	27.8	

From 30 August to 15 October, the simulated saline drift treatment produced significantly more leaf marginal curling deformity in the treated plants than in the controls (Table 18).

5.3.1.5. Harvest Yields

Average lint yields of 35.3 g/plant and 32.7 g/plant were obtained from the control and the nominal 1000 lbs/a·yr treatment, respectively. Seed cotton weights averaged 90.6 g/plant and 84.0 g/plant for the controls and treatment groups, respectively. This reduction in lint and seed cotton yields in the nominal 1000 lbs/a·yr treated plants was not statistically significant (Data Summary Volume Table I-7). The dates of first appearance of flowers, bolls, and seed cotton were the same for both treatments (Data Summary Volume Table J-4).

The simulated saline drift treatment did not appear to have changed the quality of the cotton lint. Minor differences were noted among some of the fiber analysis variables, but no consistent trends were observed for micronaire (fiber fineness), length, uniformity, strength, grade, trash, or color (Data Summary Volume Table I-6). For example, cotton fiber fineness was of better quality in the nominal 1000 lbs/a·yr treatment than in the control, but the uniformity of the cotton was of better quality in the control than in the nominal 1000 lbs/a·yr treatment.

The biomass harvest was significantly reduced by approximately 10% by the nominal 1000 lbs/a·yr treatment compared to the control on a fresh and dry weight basis (Table 20). These data correspond with the reduced heights of cotton plants in the nominal 1000 lbs/a·yr treatment (Figure 26).

In the north greenhouse, the simulated saline drift did not cause a reduction in fresh weight of leaves, fresh weight of stems, total fresh weight, dry weight of leaves, total dry weight of the plant, seed cotton weight, and lint weight in the nominal 500 lbs/a·yr treatment group as compared to the control.

Table 20.

Cotton Plant Biomass

Variable	Nominal Treatment Levels (lbs/a·yr)	Average Weight (g/plant)	$S_{\bar{x}}$
Total Fresh Weight	0	459.3	7.51
	1000	416.0	
Total Dry Weight	0	128.5	2.28
	1000	115.3	

A comparison of the mean weights of the seed cotton and the lint yields obtained for all treatments in the north greenhouse shows that there was a significant increase in the lint and seed cotton weights in all levels of the saline drift treated plants over controls (Data Summary Volume Table I-7). Seed cotton weight of 63.9, 83.3, 81.6, and 88.9 g/plant were obtained from the control and the nominal 10, 100, and 500 lbs/ac·yr treated plants, respectively. Total lint yields of 24.9, 32.5, 30.8, and 34.7 g/plant were obtained from the control and the nominal 10, 100, and 500 lbs/ac·yr treated plants, respectively. The nominal 500 lbs/a·yr treatment also significantly increased fresh and dry weight of the bracts as compared to the control (Data Summary Volume Table I-7).

5.3.1.6. Physiological Measurements

Porometer measurements of the cotton taken from the same leaf in the morning and afternoon showed no significant effects from the treatments for transpiration, diffusive resistance, leaf temperature, and temperature differential (Data Summary Volume Tables K-4 to K-11). Neither the seasonal mean response nor trend over time were found to be different. No differences were observed in the leaf water potential measurements in the 0 and the nominal 500 lbs/a·yr treated plants (Data Summary Volume Table L-1).

5.3.2. Alfalfa

5.3.2.1. Resident Salts on Alfalfa Plant Surfaces

Electroconductivity measurements of alfalfa seedlings and transplants washes from the four harvests in the south greenhouse reveal significant differences in the salts accumulation on the treated plants when compared to the controls (Data Summary Volume Tables I-11, I-12). A comparison of the seasonal averages of the salts on the surfaces of the controls and the nominal 1000 lbs/a·yr treated plants from the four harvests shows that there was a statistically significant increase in the resident salts per unit leaf area (mg salts/cm^2) and on a dry weight basis (mg salts/g) for the nominal 1000 lbs/a·yr treatment as compared to the controls. The concentration of salts on the plant surfaces of the nominal 1000 lbs/a·yr treatments of both seedling and transplant alfalfa for all harvests was approximately three to four times higher than in the controls (Table 21).

Alfalfa transplants and seedlings in the north greenhouse also showed increased resident surface salts when treated with increasing levels of saline drift solutions (Data Summary Volume Tables I-9, I-10). Analysis of the seasonal means of the transplants shows that there was a significant difference among the treatments with an increase in resident salts on a dry weight basis (mg/g) and leaf area basis (mg/cm^2) with increasing treatment levels (Data Summary Volume Table I-10). The level of resident surface salt on the nominal 500 lbs/a·yr treated plants was approximately three to four times that of the distilled water controls (Table 18, Data Summary Volume Tables I-9, I-10).

5.3.2.2. Alfalfa Tissue Analysis

The Cl^- and Na^+ content was significantly greater in the nominal 500 lbs/a·yr treated plants than in the controls at each harvest. The Na^+ content of the treated plants (833 ppm seasonal average) was twice that of the controls (344 ppm seasonal average), whereas the Cl^- content of the treated plants varied from 10 to 33 percent greater than that in the controls (Data Summary Volume Table M-6). The Cl^- content of the treated (7508 ppm seasonal average) and control plants (6355 seasonal average) was always greater than the Na^+ content of these plants (Table 18).

5.3.2.3. Phenological Responses

None of the treatments of alfalfa transplants and seedlings in the south greenhouse affected plant heights, turgidity, diameters, epinasty, stem numbers, and percent bloom (Data Summary Volume Table J-10).

In the north greenhouse, the growth and development of alfalfa transplants treated with nominal 500 lbs/a·yr simulated saline drift were not reduced and in some instances were increased. In the second harvest, the percent bloom was significantly lower in the nominal 500 lbs/a·yr (0.83%) treatment than in the control (3%). In the third harvest the percent bloom

Table 21.

Surface Salts on South Greenhouse Alfalfa

Nominal Treatment Levels (lbs/a·yr)	Seasonal Average Transplants (mg/cm² leaf area)	Seasonal Average Seedlings (mg/cm² leaf area)	Seasonal Average Transplants (mg/g dry weight)	Seasonal Average Seedlings (mg/g dry weight)
0	0.0084	0.0061	0.9273	1.0483
1000	0.0365	0.0346	4.1347	4.7179
$S_{\bar{x}}$	0.0021	0.0015	0.021	0.218

averages were statistically greater for the nominal 500 lbs/a·yr treated plants than in the control plants. In the seventh harvest mean height was significantly lower for the nominal 500 lbs/a·yr treatment (30.9 cm) compared to the control (32.6 cm). The number of stems/plant in the third harvest was statistically higher in the nominal 500 lbs/a·yr treatment (13) than in the control (11). Plant diameters also were statistically higher for the nominal 500 lbs/a·yr treatment than in the control in the second (18 cm vs 16.3 cm), and fourth (24.2 cm vs 20.3 cm) harvests.

Growth and development of the alfalfa seedlings treated with nominal 500 lbs/a·yr simulated saline drift were not different from the control plants except during the second harvest. In the second harvest, the heights were significantly reduced by the nominal 500 lbs/a·yr treatment (47 cm) as compared to the control (50 cm). During the fifth harvest, the number of stems/plant was significantly higher in the nominal 500 lbs/a·yr treated plants (33.8) than in the control plants (30.8). During the fourth harvest period, there was significantly greater leaflet abscission in the nominal 500 lbs/a·yr treatment as compared to the control (Table 18, Data Summary Volume Table J-8).

5.3.2.4. Foliar Injury

No significant differences for any necrotic symptoms were found between the control plants and the nominal 1000 lbs/a·yr treated plants. (Data Summary Volume Table J-10).

The most common chlorotic symptom observed on the 0 and nominal 1000 lbs/a·yr treated alfalfa was general chlorosis. Spot and margin chlorosis were less prominent. No significant differences were observed for chlorosis except in the fifth transplant harvest, when the control plants had significantly more leaflets exhibiting general chlorosis/plant (55.0%) than the nominal 1000 lbs/a·yr treated plants (30.8%) (Table 18, Data Summary Volume J-10).

There were no statistically significant differences between treatments for leaf deformities. All alfalfa plants abscised a few leaflets throughout the study. The abscission of the nominal 1000 lbs/a·yr treated plants was significantly greater than the controls during the third harvest period for the transplants and the fourth harvest period for the seedlings (Table 18, Data Summary Volume Table J-10).

For both transplants and seedlings, no statistically significant differences were observed between the control and the nominal 500 lbs/a·yr treatment for tip or margin necrosis. The treated and untreated alfalfa transplants in the north greenhouse showed essentially no tip or margin necrosis during the first four harvest periods. Only in the latter harvest periods were any necrotic symptoms observed in the transplants, but these differences were not significant. (Data Summary Volume Tables J-8, J-9). No tip or margin necrosis was observed in the seedlings in the first three harvests. Throughout the study, neither the transplants nor seedlings had tip and/or margin necrosis exceeding 12% for the control and treated plants (Data Summary Volume Tables J-8, J-9). In general, approximately 5% of the area of each affected leaflet in the seedlings and transplants had tip and/or margin necrosis.

No significant difference in spot necrosis was observed between the control and the nominal 500 lbs/a·yr treatment. Spot necrosis was detected during several of the harvest periods in both seedling and transplanted alfalfa, but both the number of leaves/plant showing necrotic spots and the area of those affected leaves was 5% or less.

The most common form of chlorosis noted in the alfalfa was pale green and yellow general. In general, there were no significant difference for chlorosis between the nominal 500 lbs/a·yr treatment and the control. In the first harvest period, the control transplants exhibited significantly greater general yellow chlorosis than the nominal 500 lbs/a·yr treatment. Seedlings in the fifth harvest exhibited a greater percentage of spot chlorosis per affected leaf (Table 18, Data Summary Volume Table J-8).

5.3.2.5. Harvest Yields

The alfalfa harvest showed that the simulated saline drift treatments did not cause a reduction in fresh weight, dry weight, or leaf area/alfalfa plant as compared to control plants (Data Summary Volume Tables I-9, I-10, I-11, I-12). No significant differences were noted among the treatments and the control except in the fresh weight of the alfalfa seedlings in the nominal 1000 lbs/a·yr treatment (Tables 18, 22). The differences in dry weights between treatments were not significant.

5.3.2.6. Physiological Measurements

There were no significant differences in transpiration, diffusive resistance, leaf temperature, and temperature differential in the mean or trend over time responses (Data Summary Volume Section K).

5.3.3. Barley

5.3.3.1. Resident Salts on Barley Plant Surfaces

At harvest, the 500 lbs/a·yr treated barley plants had significantly more resident salts on their surfaces than the control plants, the nominal 10 lbs/a·yr, and nominal 100 lbs/a·yr treatments (Table 23, Data Summary Volume Table I-8). Salt accumulation on surfaces of the nominal 10 and 100 lbs/a·yr treated plants was not statistically different from the controls.

There was a significant increase in resident salts for the nominal 500 lbs/a·yr treatment (6.2 mg/g dry weight) compared to the control (3.8 mg/g dry weight) (Table 23). There was also a significant increase in resident salts for the nominal 1000 lbs/a·yr treatment (11.7 mg/g dry weight) compared to the control (5.3 mg/g dry weight) (Table 23).

5.3.3.2. Barley Tissue Analysis

Barley plants treated with the nominal 500 lbs/a·yr simulated saline drift solution contained significantly more Na^+ than the control plants. The Na^+

Table 22.

Harvest Data for Greenhouse Alfalfa

Place and Plant	Nominal Treatment Levels (lbs/a·yr)	Seasonal Average: Fresh Weight (g/plant)	$S_{\bar{x}}$	Dry Weight (g/plant)	$S_{\bar{x}}$	Leaf Area (cm^2/plant)	$S_{\bar{x}}$
South House							
Seedlings	0	84.6		13.9		2040.7	
	1000	96.2		15.8		1964.1	
			1.5		0.4		95.0
Transplants	0	76.4		13.8		1747.8	
	1000	77.6		13.4		1661.4	
			4.9		0.8		26.3
North House							
Seedlings	0	68.1		11.7		1622.1	
	10	72.9		12.3		1591.6	
	100	71.3		13.0		1736.3	
	500	71.8		12.9		1725.9	
			4.6		0.8		49.1
Transplants	0	46.6		8.5		1024.8	
	10	47.6		8.4		1055.0	
	100	46.4		8.4		1116.8	
	500	51.5		9.3		1237.8	
			1.5		0.2		35.4

Table 23.

Deposition of Simulated Saline Solutions on Barley Plant Surfaces

Variable	Nominal Treatment Levels (lbs/a·yr)	North Greenhouse (mg/g dry weight)	$S_{\bar{x}}$	South Greenhouse (mg/g dry weight)	$S_{\bar{x}}$
Leaf surface salt per plant	0	3.82		5.31	
	10	3.76			
	100	3.98			
	500	6.22			
	1000			11.66	
			0.53		0.86

content was 1883 ppm and 2872 ppm for the controls and the nominal 500 lbs/a·yr treated plants, respectively (Table 18). Chloride content of the treated plants was slightly higher than the controls, but the means were not statistically different. Manganese content was significantly lower in the treated group (59.2 ppm) as compared to the control (72.8 ppm). Concentrations of other ions did not appear to be affected by the saline treatments.

5.3.3.3. Phenological Responses

The saline drift treatments did not appear to alter the development of the vegetative or reproductive structures. None of the plants showed epinasty or the lack of turgidity (Data Summary Volume Table J-6, J-7).

5.3.3.4 Foliar Injury

Barley plants grown in both greenhouses exhibited some tip, spot, and/or margin necrosis during the growing season but no significant differences were observed until the latter part of the growing season (Data Summary Volume Table J-6, J-7). From 19 July to 14 September, there was significantly more marginal necrosis on a percent leaves/plant basis for the nominal 1000 lbs/a·yr treatment (3% seasonal average) than in the controls (1.4% seasonal average). The percentage of leaves/plant exhibiting spot necrosis was similar in all the treatments in both greenhouses. No significant differences were observed among the treatments in the percent area of each leaf showing necrotic symptoms. Tip, margin and/or spot necrosis were similar in the nominal 500 lbs/a·yr treated plants and the control plants.

All barley plants showed chlorosis. About 13% of the leaf blades/plant in both the controls and treated plants showed marginal or tip chlorosis. There was a significant increase in the percentage of leaf blades/plant exhibiting spot and general chlorosis in the nominal 500 lbs/a·yr treated plants as compared to the control plants (Data Summary Volume Table J-7). The seasonal means for spot chlorosis were 4.17% and 10.3% in the control and nominal 500 lbs/a·yr treatment, respectively. The seasonal means for general chlorosis were 29.9% for controls and 34.3% for the nominal 500 lbs/a·yr treatment (Data Summary Volume Table J-6).

5.3.3.5. Harvest Yields

The above ground biomass of the barley plants was not significantly affected by any of the saline treatments (Data Summary Volume Table I-8). A comparison of the number of spikes, spikelets, seeds, and seed weights of the nominal 500 lbs/a·yr and nominal 1000 lbs/a·yr treatments and their respective controls showed that salt deposition did not appear to have reduced yield. However, the number of seeds/plant for the nominal 500 lbs/a·yr treatment was significantly higher than in the controls (Data Summary Volume Table I-8). The seed set was 29% for the controls and 35% for the nominal 500 lbs/a·yr treatment in the north greenhouse. There was no significant difference between control and the nominal 1000 lbs/a·yr treatment in number of seeds/plant (Data Summary Volume Table I-8).

5.3.3.6. Physiological Measurements

In general, no biologically significant differences were observed between the various treatments for transpiration (Data Summary Volume Tables K-10, K-11), diffusive resistance (Data Summary Volume Tables K-4, K-5), leaf temperature (Data Summary Volume Tables K-6, K-7), and temperature differential (Data Summary Volume Tables K-8, K-9). However, in the north greenhouse the afternoon leaf temperature was significantly higher in the nominal 500 lbs/a·yr treated plants (27.8 C) than in the controls (26.8 C).

There were no significant differences between treatments for leaf water potential (Data Summary Volume Section L).

5.4. FIELD EXPERIMENTAL RESULTS

5.4.1. Cotton

5.4.1.1. Resident Salts on Cotton Leaf Surfaces

Based on the leaf wash data, resident salts on the leaf surfaces increased with increasing treatment levels (Tables 24, 25). The differences were not statistically significant, however, there were over four times more salts on the

Table 24.

Cotton Leaf Wash (Field)
Data on a Leaf Area Basis
(mg/cm^2 leaf area)

Nominal Treatment Levels (lbs/a·yr)	Date					Average
	6/17	6/23	8/4	9/8	9/16	
No TMT	0.0024	0.0059	0.0045	0.0065	0.0049	0.0048
0	0.0035	0.0058	0.0057	0.0044	0.0055	0.0050
10	0.0056	0.0058	0.0057	0.0041	0.0060	0.0054
100	0.0126	0.0136	0.0059	0.0041	0.0079	0.0088
500	0.0356	0.0443	0.0095	0.0089	0.0157	0.0228
$S_{\bar{x}}$	0.0016	0.0025	0.0010	0.0011	0.0006	0.0007

Table 25.

Cotton Leaf Wash (Field)
Data on a Dry Weight Basis
(mg/g dry weight)

Nominal Treatment Levels (lbs/a·yr)	Date					Average
	6/17	6/23	8/4	9/8	9/16	
No TMT	0.39	1.10	0.94	1.62	1.28	1.07
0	0.62	1.08	1.31	1.02	1.36	1.06
10	0.90	0.98	1.32	1.05	1.61	1.18
100	1.98	2.47	1.39	0.98	2.09	1.78
500	6.15	8.00	2.18	2.30	4.42	4.61
$S_{\bar{x}}$	0.25	0.39	0.19	0.33	0.17	0.13

nominal 500 lbs/a·yr treatment (Figure 28) as compared to the unsprayed control, on both a dry weight and leaf area basis.

5.4.1.2. Cotton Leaf Tissue Analysis

Sodium ion and Cl^- concentrations were significantly higher at the 1% level of significance in the nominal 500 lbs/a·yr treatment when compared to the control. Sodium increased from 1006 ppm to 4652 ppm in the control and nominal 500 lbs/a·yr treated plants, respectively. Chloride in the tissue increased from 18046 in the control to 22500 ppm in the nominal 500 lbs/a·yr treatment (Table 18, Data Summary Volume M-2).

In the nominal 500 lbs/a·yr treatment leaf tissue, boron, calcium, and magnesium were significantly lower when compared to the control. Levels of boron dropped (significant at the 5% level) from 48.4 ppm in the controls to 40.6 ppm in the nominal 500 lbs/a·yr treatment. Calcium levels declined (significant at the 2% level) from 35300 ppm in the controls to 31300 ppm in the nominal 500 lbs/a·yr treatment. Magnesium levels declined (significant at the 1% level) from 4275 ppm in the controls to 3320 ppm in the nominal 500 lbs/a·yr treatment (Table 18).

No other statistically significant differences in ion concentrations were detected.

5.4.1.3. Phenological Responses

The morphological development of the nominal 500 lbs/a·yr treated plants was not different from the unsprayed controls (Data Summary Volume Table J-2). The nominal 500 lbs/a·yr treatment mean plant heights were slightly greater than those in the unsprayed control; however, neither the seasonal mean nor the response over time were found to be significantly different. The unsprayed control and nominal 500 lbs/a·yr plants remained fully turgid, and no evidence of epinasty was found.

The only visually evident, statistically significant, change to the plants was the degree of chlorosis. Beginning 25 August, the unsprayed control plants

Figure 28. Cotton plants at the Marana field site on 6 November 1983

showed more general chlorosis (38%) compared to the plants in the nominal 500 lbs/a·yr treatment (29%) (Table 18, Data Summary Volume Table J-2). Chlorosis on the control plants also was observed on a greater number of leaves/plant (15.4% and 12.1% for the unsprayed control and nominal 500 lbs/a·yr treatment, respectively) (Table 18, Data Summary Volume Table J-2).

While not statistically significant, a slight reduction in necrosis was observed in the nominal 500 lbs/a·yr treatment when compared to the controls.

5.4.1.4. Harvest Yields

The machine-harvested plots showed no statistical differences in yield (Table 26).

The hand-harvested yields from the nominal 10 lbs/a·yr treatment were not statistically different from the sprayed and unsprayed controls. The nominal 100 lbs/a·yr treatment had statistically lower yield than the sprayed control but it was not statistically different from the unsprayed control or the nominal 10 lbs/a·yr treatment. Yield from the nominal 500 lbs/a·yr treatment was significantly lower than the nominal 10 lbs/a·yr treatment and the sprayed and unsprayed controls (Table 26, Figure 29).

The machine- and hand-harvested plots showed an increase in yield for the sprayed controls. The hand-harvested plots showed a trend toward reduced yields when the unsprayed (no treatment) control is compared to the nominal 10, 100, and 500 lbs/a·yr treatments.

The machine-harvested plots showed a nonsignificant increase in yield when the nominal 10 lbs/a·yr treatment is compared to the no treatment control, and the nominal 100 lbs/a·yr and 500 lbs/a·yr treatments had nonsignificant decreases in yield when compared to the no treatment control.

Boll production throughout the season was consistently higher in the sprayed control when compared to the nominal 10, 100, and 500 lbs/a·yr treatments (Figure 30); however, only the sprayed control and the nominal 500 lbs/a·yr treatments were statistically different. The total number of bolls produced by the end of the season in the sprayed control plots was statistically

Table 26.

Field Cotton Harvest Data
(Results from hand- and machine-harvested plots which represent two independent estimates of yield)

Nominal Treatment Levels (lbs/a·yr)	Hand-Harvested Plots[1] Seed Cotton (lbs/a)[4]	(n)	Machine-Harvested Plots: Seed Cotton[2] (lbs/a)	(n)	Lint[3] First Pick (bales/a)[5]	(n)	Lint[3] Second Pick (bales/a)[5]	(n)	Lint[3] Total (bales/a)[5]	(n)
No TMT	2527.2^{ab}	8	2269.6	7	1.35	8	0.39	7	1.62[6]	7
0	2734.3^{a}	8	2594.4	8	1.44	8	0.42	8	1.86	8
10	2356.5^{ab}	8	2316.2	8	1.28	8	0.38	8	1.66	8
100	2237.4^{bc}	8	2238.8	7	1.20	7	0.37	8	1.60[6]	7
500	1905.2^{c}	8	2124.4	8	1.17	8	0.35	8	1.52	8
LSD (0.05)	381.6		NS		NS		NS		NS	
$S_{\bar{x}}$	30.4		133.3		0.08		0.03		0.10	

[1]Total seed and lint weight hand harvested over the season as bolls opened.

[2]Total seed and lint weight from the first (1 November) and second (1 December) machine-harvested picks.

[3]Lint weight after ginning.

[4]Means followed by the same letters within a column are not significantly different when using the LSD test at the 5% level.

[5]One bale equals 480 lbs of lint.

[6]Total yield differs from the sum of the first and second picks because of 1 missing replication in either the first or second pick. This necessitated omitting the corresponding pick from the other harvest for statistical analysis.

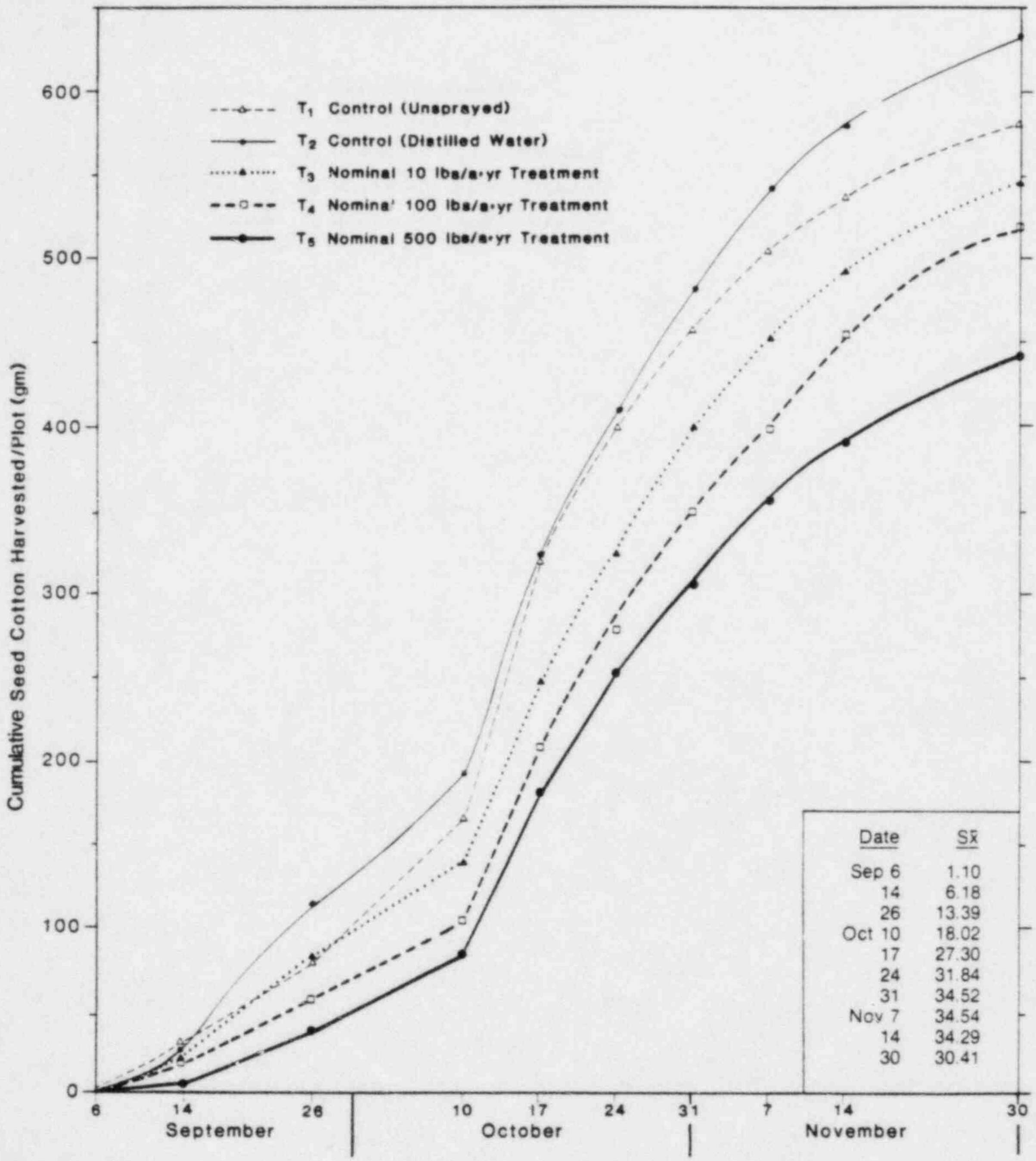


Figure 29. Cumulative hand harvested seed cotton (field)

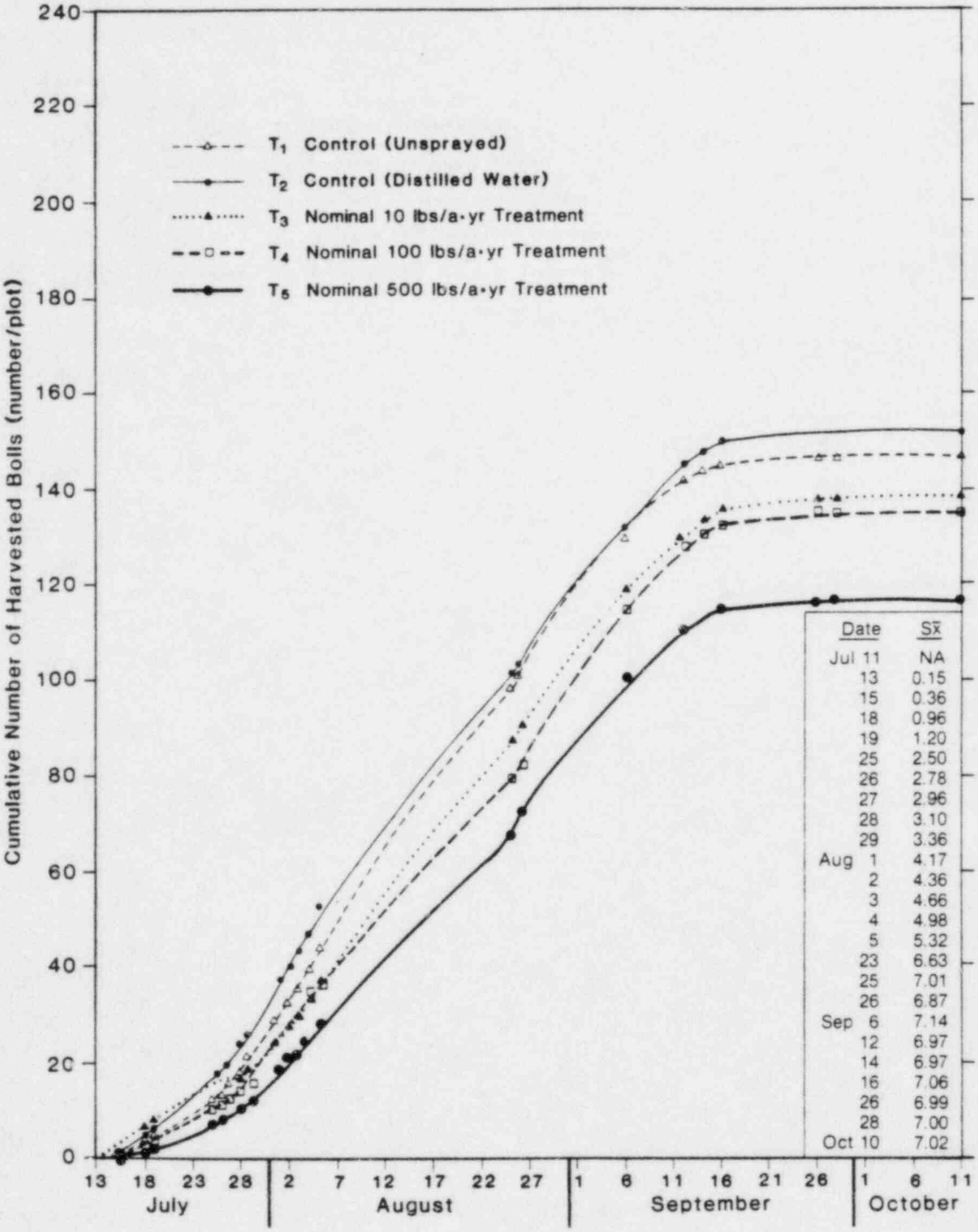


Figure 30. Cumulative cotton bolls harvested (field)

greater than the total number produced in either the nominal 100 or 500 lbs/a·yr plots (Table 27). No statistical differences were observed in the number of flowers or in the number of rotten bolls produced in the hand-harvested plots.

The fiber quality of samples from the machine-harvested plots showed no meaningful differences between treatments. Micronaire showed a slight, non-significant increase ranging from 37.50 to 40.25 for the nominal 500 lbs/a·yr treatment and the controls, respectively (Data Summary Volume Table I-2). A similar nonsignificant trend was observed for fiber strength, with the nominal 500 lbs/a·yr treatment having slightly weaker fibers. Based on the mean responses (Data Summary Volume Table I-2), the relationship between simulated saline drift treatment and fiber length is not resolved. There were no differences in either the grade or the amount of trash across the treatments.

5.4.1.5. Physiological Measurements

The measurements taken with a steady state porometer showed no meaningful significant differences in either transpiration or diffusive resistance. The nominal 10 lbs/a·yr treatment was found to have higher leaf temperatures than both the unsprayed control and the nominal 500 lbs/a·yr treatments (Table 28). The untreated control leaves were significantly warmer than those in the nominal 500 lbs/a·yr treatment. There was a significant trend towards cooler leaf temperatures from the nominal 10 to nominal 500 lbs/a·yr treatments ($b = 0.0012$, $S_b = 0.00035$) at the 1% level of significance.

Corresponding differences were observed for the temperature differential measurements during the season (Table 28). There was a significant difference between the unsprayed control (0 lbs/a·yr) and the nominal 10 lbs/a·yr treated leaves, with the nominal 10 lbs/a·yr treated leaves having the lower temperature differential. There was a significant linear increase in the temperature differential from nominal 10 lbs/a·yr to nominal 500 lbs/a·yr ($b = 0.000567$, $S_b = 0.000152$) at the 0.01 level of significance (Table 18).

Table 27.

Field Cotton Flowering and Boll Data

Nominal Treatment Levels (lbs/a·yr)	Flowers/7 ft of Row	Bolls/7 ft of Row[1]	Rotten Bolls/7 ft of Row
NO TMT	410.0	147.0[a]	43.3
0	418.8	152.0[a]	49.4
10	387.1	138.4[a]	46.4
100	391.8	135.1[ab]	49.5
500	389.5	116.9[b]	47.4
LSD (0.05)	NS	20.3	NS
$S_{\bar{x}}$	13.4	7.0	5.2

[1] Means followed by the same letter within a column are not significantly different using the LSD test at the 5% level.

Table 28.

Field Cotton Leaf Temperatures as Measured by LiCor Porometer
(Seasonal Average)

Nominal Treatment Levels (lbs/a·yr)	Leaf Temp (C)	$S_{\bar{x}}$	Temperature Differential (Cuvette - Leaf Temp, C)	$S_{\bar{x}}$
No TMT	33.47		2.43	
0	33.24		2.58	
10	33.67		2.33	
100	33.46		2.42	
500	33.05	0.14	2.62	0.06

No differences were observed in the leaf water potential between the 0 lbs/a·yr and the nominal 500 lbs/a·yr treatments which were the only treatments measured (Data Summary Volume Table L-1).

5.4.2. Alfalfa

5.4.2.1. Resident Salts on Alfalfa Plant Surfaces

Salt deposition on the leaf surfaces was monitored before the second and third harvests. On both sampling dates, there were significantly more salts in residence on the plants on a leaf area basis (mg/cm^2) and on a dry weight basis (mg/g D.W.) (Data Summary Volume Table I-5). Based on seasonal averages, there was a consistent increase in resident salts from 0.16 mg/g in the sprayed controls to 0.29, 0.90, 1.21, and 2.86 mg/g for the nominal 10, 100, 500, and 1000 lbs/a·yr treatments, respectively (Table 18, Data Summary Volume Table I-5).

5.4.2.2. Alfalfa Tissue Analysis

The Na^+ levels were increased significantly at the 1% level from 911 ppm in the unsprayed controls to 3653 ppm in the nominal 1000 lbs/a·yr treatment. Chloride content was also significantly increased at the 1% level from 9801 ppm in the unsprayed controls to 14849 ppm in the nominal 1000 lb/a·yr treatment (Table 18).

Copper levels were reduced in the nominal 1000 lb/a·yr treatment (significant at the 0.068 level) from 18.4 ppm to 10.6 ppm in the controls and nominal 1000 lbs/a·yr treatments, respectively. Calcium levels declined (significant at the 0.064 level) from 16200 ppm in the controls to 15000 ppm in the nominal 1000 lbs/a·yr treatment. No other significant differences were detected; however, there were trends toward reduced levels of potassium, iron, manganese and magnesium in the nominal 1000 lbs/a·yr treatment (Data Summary Volume Table M-3). Results of the boron analysis were invalid due to the accidental contamination of the water used in the analysis.

5.4.2.3. Phenological Responses

Visual evaluations on the unsprayed control and nominal 1000 lbs/a·yr alfalfa plots revealed only a few treatment effects (Data Summary Volume Table J-3). The heights of the plants were unaffected and at no time was there any epinastic response or any indication of lack of turgidity.

The nominal 1000 lbs/a·yr treatment induced significantly more leaflet necrosis than the unsprayed control (0 lbs/a·yr). The seasonal mean incidence of marginal necrosis showed that 28% of the leaflets were affected with marginal necrosis in the nominal 1000 lbs/a·yr treatments as compared to only 8% in the 0 treatment plots (Data Summary Volume Table A-3). In the last two sets of visual evaluations before the second and third harvests there was significantly more tip necrosis in the nominal 1000 lbs/a·yr treatment than in the control. These symptoms occurred after 6 to 7 weeks of repeated treatment application.

The incidence of leaflet chlorosis (% leaves/plant) was significantly lower in the sprayed controls compared to the nominal 1000 lbs/a·yr treatment, 6.9% and 9.5%, respectively. A significantly higher incidence of white marginal chlorosis was observed in the nominal 1000 lbs/a·yr treatment on 24 October (Figure 31). No chlorosis was observed in the control plots. A similar significant difference was seen on 3 November when 42% and 17% of the leaflets were affected in the nominal 1000 lbs/a·yr treatment and the control plots, respectively (Table 18, Data Summary Volume Table J-3).

5.4.2.4. Harvest Yields

The simulated saline drift treatments did not have any statistically significant effect on the yields of the three harvests, or on the total yield produced during the season (Data Summary Volume Table I-5).

5.4.2.5. Physiological Measurements

The simulated saline drift treatments had no measurable effect on any of the characteristics evaluated with the porometer. There were no statistically

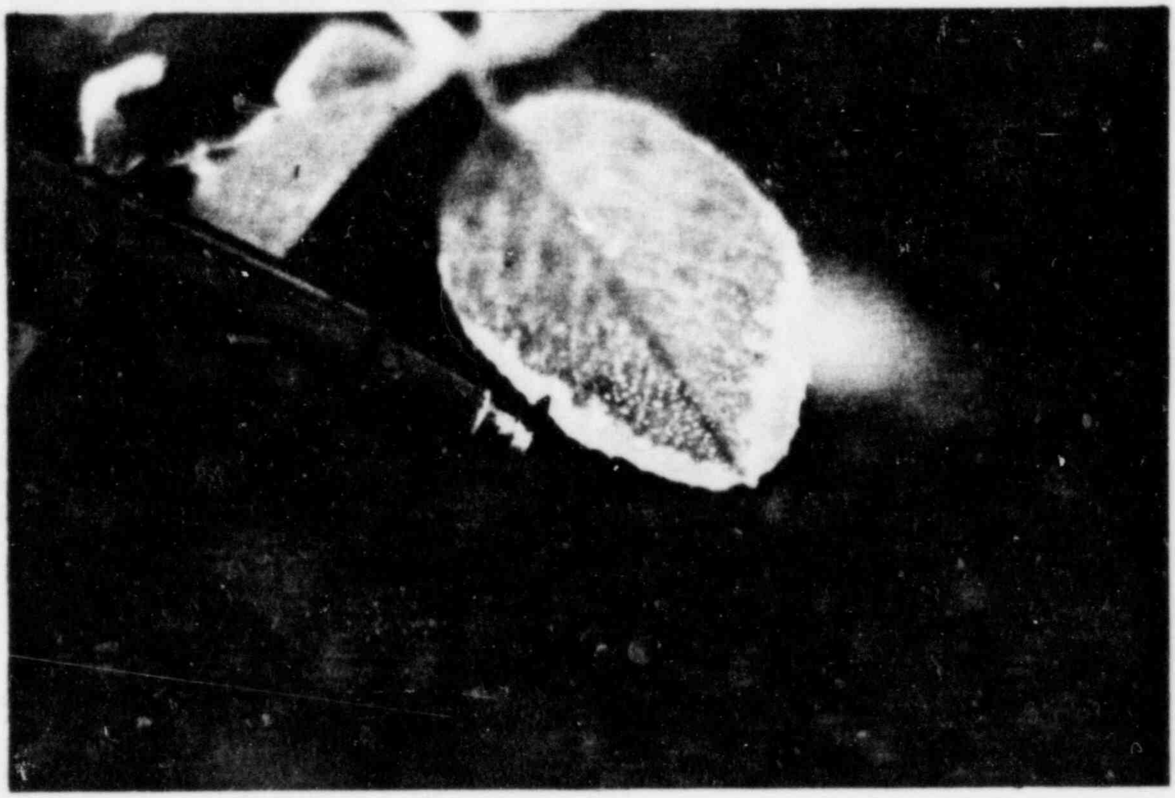


Figure 31. White marginal chlorosis on an alfalfa leaflet at the Marana field site

significant differences in transpiration or diffusive resistance. Leaf temperatures and the temperature differential measurements showed no differences in the seasonal mean response or the trend over time response (Data Summary Volume Tables K-3).

5.4.3. Cantaloupe

5.4.3.1. Resident Salts on Cantaloupe Plant Surfaces

The amount of salts resident on the cantaloupe leaves in the control, and the nominal 10, nominal 100, and nominal 500 lbs/a·yr treatments were not significantly different. The amount of salts resident on the plants in the nominal 500 lbs/a·yr treatment was 58% greater on a leaf area basis (mg/cm^2) and a dry weight basis (mg/g) than on the unsprayed controls (Data Summary Volume Table I-1).

5.4.3.2. Cantaloupe Tissue Analysis

Nitrogen levels were lower (at the 5% significance level) in the nominal 500 lbs/a·yr treatment with values of 15419.4 and 13473.5 ppm respectively for the unsprayed controls and the nominal 500 lbs/a·yr plots (Table 18, Data Summary Volume Table M-1). Lead levels were higher (at the 6.9% level of significance) in the nominal 500 lbs/a·yr treatment (0.75 ppm) compared to the unsprayed controls (1.06 ppm). No other significant differences were found

5.4.3.3. Phenological Responses

There were no statistically significant differences in the visual evaluations made on the cantaloupe plants (Data Summary Volume Table J-1). Numbers of flowers and fruit/plant were unaffected by the salt treatments. Similar amounts of chlorosis and necrosis were observed between the 0 lbs/a·yr and nominal 500 lbs/a·yr treated plants throughout the season.

5.4.3.4. Harvest Yields

No differences were observed at any of the four harvest dates for fresh weight, or total number of melons/harvest, or the total yield for the entire season (Data Summary Volume Table I-1).

5.4.3.5. Physiological Measurements

Measurements made with the porometer revealed no significant differences in transpiration, diffusive resistance, leaf temperature, and temperature differential (Data Summary Volume Table K-1).

6. DISCUSSION

6.1. SIMULATED SALINE DRIFT COMPOSITION AND DELIVERY

The composition of the simulated saline solution used in this study consisted of 28 different compounds in specified concentrations. The ionic composition was similar to that predicted by Bechtel Power Corporation for the blowdown water and drift of the cooling towers at the Palo Verde Nuclear Generating Station. The various treatment levels were chosen to approximate or exceed the predicted deposition levels in the off-site agricultural areas. The petri dish data and the delivered volume concentration data defined the actual quantities of salts delivered to the plots. Monitoring of the simulated saline drift treatment solutions by the University Analytical Center indicated that the treatment solutions used in this study contained about 75% of the TDS of the selected treatment levels.

It was not possible to apply the simulated saline drift in a dry crystalline state. However, water in the fine droplets of the simulated saline drift evaporated quickly, and the plants in both greenhouses and the field were dry within seconds of treatment applications.

The droplet sizes of the simulated saline drift were found to be within 1% and 5% of the targeted 100 μ for the field and greenhouse, respectively. This droplet size was selected based on previous work (Mulchi and Armbruster, 1981; McCune et al., 1977).

6.2. CLIMATIC COMPARISONS

According to McCune et al. (1977), foliar injury from saline particles is greater at a relative humidity of 85% compared to the effects at a relative humidity of 50%. The climatic conditions at both the greenhouse and field study sites (Figures 25 and 22, respectively) indicated that relative humidities exceeded 75% were recorded throughout the growing season (Table 17). The weekly mean maximum and minimum relative humidities were consistently higher at the Marana Field site compared to the Palo Verde field site. Because relative humidity was usually higher at Marana than at the Palo Verde field site, the likelihood of salt-induced plant injury probably would be greater at Marana.

Rainfall at Marana and at the Palo Verde field site was similar until late August. Marana received 1.25 in. more rain during September than the Palo Verde field site. An unusually large storm at the end of September and beginning of October resulted in 5.5 in. of rain at Marana. This represents more than 50% of the normal annual rainfall in this region. During the same period there was only 0.75 in. of rain at the Palo Verde field site.

The abnormally high amount of rainfall could have washed off salts accumulated on the leaf surfaces, but leaf tissue analysis of the cotton and alfalfa showed significantly higher amounts of both Na^+ and Cl^- in the high treatment plots (nominal 500 lbs/a·yr and nominal 1000 lbs/a·yr) than in the controls.

The Palo Verde field site mean maximum temperatures were 2.6 C higher than the mean maximum temperatures recorded at the Marana field site, for the duration of this study. The significance of differences in temperatures between the Palo Verde field site and Marana are unknown.

6.3. HARVEST YIELDS

6.3.1. Greenhouse

6.3.1.1. Cotton

Cotton yield at harvest depends upon the sequential development of the reproductive structures. Squares become flowers and flowers are transformed into mature bolls that contain the seed cotton. A decrease in any of these reproductive structures ultimately will affect harvest yield. The number of green bolls (seasonal average) was significantly higher on the treated plants (12.2 bolls/plant) than the controls (10.3 bolls/plant) except during the last two observations (Data Summary Volume Table J-4). Cotton plants treated with nominal 500 lbs/a·yr of simulated saline drift yielded significantly more seed cotton and lint/plant than the controls (Data Summary Volume Table I-1, I-4). This higher yield of seed cotton on the treated plants may have resulted from the timing of the termination of the cotton experiments in the north greenhouse. At termination the control plants had about 5 times more green bolls on a weight basis than the nominal 500 lbs/a·yr treated plants, indicating that the bolls of treated plants matured before the controls (Data Summary

Volume Table J-4). If all the green bolls on the control plants matured and opened, yield of the control might have been similar to or greater than the yield of the nominal 500 lbs/a·yr treated plants.

The number of flowers/plant (seasonal averages) was significantly reduced in the nominal 1000 lbs/a·yr treatment as compared to the control (Table 18). A consequence of such a reduction in flowering may be a decrease in the number of bolls and ultimately a decrease in the amount of seed cotton. A consistent, but nonsignificant reduction in the number of bolls/plant was observed from 9 September to 1 November in the nominal 1000 lbs/a·yr treated plants (Data Summary Volume Table J-5). There was a nonsignificant reduction in seed cotton, and lint weights were reduced by about 8% in the nominal 1000 lbs/a·yr treated plants as compared to the control plants (Data Summary Volume Table I-7). This 8% reduction may be attributed in part to the reduced numbers of flowers and bolls.

6.3.1.2. Alfalfa and Barley

Alfalfa and barley yields in both greenhouses were not significantly affected by any treatment, despite some observed foliar injury. These results were similar to the findings of Maas, Grattan and Ogata (1982), who observed that barley and alfalfa top growth was not significantly affected by salts applied by sprinkler irrigation.

Mulchi and Armbruster (1981) correlated yield losses with Na^+ and Cl^- content of corn and soybean leaf tissue sprayed with saline aerosol mist. For corn, a salt sensitive species, the authors predicted a 35.5% reduction in yield with tissue having a Cl^- content of 1% (10000 ppm) on a dry weight basis. For soybean, also a salt sensitive species, they predicted a 20% reduction in yield with tissue Cl^- content of 1% on a dry weight basis. Corn and soybean plants containing 1% Na^+ in their leaf tissue were projected to have a yield reduction of approximately 64% and 58%, respectively.

Since corn and soybean are salt-sensitive plants, the internal concentration of Cl^- and/or Na^+ necessary to produce similar yield losses for salt tolerant plants such as tobacco, barley, and alfalfa would probably be tolerant to foliar salts applied by sprinkler irrigation. They found that cotton, alfalfa and barley absorb 26000 ppm, 17500 ppm and 52500 ppm of Cl^-, respectively without reductions of top growth biomass.

In our greenhouse studies, significant yield reductions were not observed in part because levels of toxic ions sufficient to produce yield losses were not attained and cotton, alfalfa and barley are salt-tolerant species. The Na^+ and Cl^- tissue content of the nominal 500 lbs/a·yr treated cotton, alfalfa, and barley plants never exceeded 10000 ppm (Table 18). The Na^+ and Cl^- content for the nominal 500 lbs/a·yr treatment was 2872 and 7824 ppm for barley, 833 and 7508 ppm for alfalfa, and 4187 and 9901 ppm for cotton, respectively (Table 18). The differences in the amounts of Na^+ and Cl^- absorbed by the three species in the greenhouse study were probably dependent upon: 1) dosage; 2) number of applications; 3) amount of salts retained on the leaf surfaces; and 4) the quantity absorbed into the tissue.

The Na^+ and/or Cl^- did not accumulate to sufficient levels in the plant tissue to cause significant yield losses probably because these plants were treated with small, chronic doses of saline drift solution and these doses were insufficient to increase the internal concentrations to the toxic levels. Four months of spraying with the nominal 100 lbs/a·yr treatment solution (1.34 μg Cl^-/cm^2·day) would be required to deliver a total concentration of 176 μg Cl^-/cm^2, which is the level reported by Mulchi and Armbruster (1981) to induce a 10% yield reduction in the salt sensitive corn species. At the nominal 1000 lbs/a·yr treatment level (13.4 μg Cl^-/cm^2·day), about 27 calendar days would be required to reach a Cl^- concentration of 360 $\mu g/cm^2$, which is the level noted by Mulchi and Armbruster (1981) to induce a 10% yield reduction in soybean. These calculations demonstrate that long-term applications of salts would be required before salt induced yield losses could be expected in salt-tolerant species. Alfalfa was harvested on an average of every 21 days, which is an insufficient time to accumulate toxic quantities of Na^+ and/or Cl^-.

6.3.2. Field

6.3.2.1. Cotton

Although vegetative development and growth of the cotton plants did not appear to be adversely affected by the saline drift treatments, the reproductive development of flowers and squares to bolls may have been impacted. Independent hand-harvest and machine-harvest yield estimates were made in the different rows of the same cotton plots (Table 26). The hand-harvested yields from the nominal 10 lbs/a·yr treatment were not statistically different from the sprayed and unsprayed controls or the nominal 100 lbs/a·yr treatment. The nominal 100 lbs/a·yr and nominal 500 lbs/a·yr treatments had statistically lower yields than the sprayed control. Yield from the nominal 500 lbs/a·yr treatment were significantly lower than the nominal 10 lbs/a·yr treatment and the sprayed and unsprayed controls.

There were no statistical differences for yield in the machine harvested plots; however, there was a trend toward reduced yields with increasing treatment levels in the sprayed plots (Table 26). Yield from the unsprayed control was less than the yield from the nominal 10 lbs/a·yr treatment and was only slightly less than the yield from the nominal 100 lbs/a·yr treatment.

Yields from the sprayed controls in the hand-harvested and machine-harvested plots were greater than the yields from the corresponding unsprayed controls. Although nonsignificant, the hand-harvested plots showed a decrease in yield for the nominal 10 lbs/a·yr treatment compared to the unsprayed control. The different responses observed with the sprayed and unsprayed controls may be attributed in part to the slight nutrient content of the sprayed control treatment solution (Data Summary Volume Section C) and/or possible alterations to the canopy microclimate caused by the moisture provided by the sprayed control. The greater precision of the hand-harvested method, which involved harvesting seed cotton as it matured, may have aided in the detection of statistical differences.

The flower tagging study provided a possible explanation for the significant reduction in yield in the hand-harvested plots. The number of flowers produced was not different among the treatments; however the number of bolls was statistically different at the nominal 500 lbs/a·yr compared to the sprayed and unsprayed controls and the nominal 10 lbs/a·yr treatment (Table 27). Floral initiation did not appear to be affected by the simulated saline drift. In the treated plots, however, fewer of the flowers developed into mature bolls, and boll production in the simulated saline drift plots was consistently lower than in the controls. The simulated saline treatments may have had an effect on pollination and/or boll development. These results agree with the findings of Maas, Grattan and Ogata (1982) who observed that sprinkling for 6 weeks with saline solutions appeared to decrease the fresh weight of bolls by 37%. Studies by Busch and Turner (1965, 1967) comparing flood irrigation with sprinkler irrigation using water with 3000 ppm salt content found yield reduction of 32% in short staple cotton and 57% in long staple cotton in the sprinkler irrigated plants.

Other workers have investigated the affects of foliar applied salts on reproductive development. Hassan (1981) observed that NaCl sprayed on bean plants (Phaseolus vulgaris) stimulated vegetative growth but reduced flower, pod, and seed growth. Bernstein and Francois (1975) reported lower yields from bell peppers sprinkled with saline water. More leaf burn and lower yields were observed when plants were sprinkled at 2.3 day intervals (seasonal average) compared to 3.5 and 4.75 day intervals, and they attribute the yield reduction primarily to foliar salt absorption. Eisikowitch (1979/1980) reported that a salt sensitive ecotype of the horned poppy (Glaucium flavum, Crantz) has difficulty setting seed when exposed to sea spray.

Caution should be used when comparing the yield results of the greenhouse and field studies because of the different environmental conditions under which the plants were grown. The canopy characteristics, spacing of the plants, and root development were different. Field plants absorbed salts from both their foliar surfaces and soil, whereas greenhouse plants absorbed salts primarily from their leaf surfaces. Greenhouse plants were exposed to regulated temperatures and humidities, and modified light, whereas field plants were exposed to natural conditions similar to those in off-site agricultural areas near the Palo Verde Nuclear Generating Station.

6.3.2.2. Alfalfa and Cantaloupe

Alfalfa and cantaloupe harvest yields were not significantly affected by the saline treatments. However, over the season there was a nonsignificant decrease (2580 lbs/a) in the amount of alfalfa biomass produced in the nominal 1000 lbs/a·yr treatment compared to the controls. The tendency toward reduced harvest yield, in addition to the observed significant increase in chlorosis and necrosis, indicated that the vegetative development of the alfalfa treated with the nominal 1000 lbs/a·yr simulated saline drift was hindered. However, the nominal 500 lbs/a·yr treatment had a yield nearly identical to that of the controls.

The nominal 1000 lbs/a·yr treated greenhouse alfalfa did not show a similar yield reduction. This may be attributed in part to the more frequent greenhouse harvest that resulted in decreased exposure to the simulated saline drift. Therefore, no injuries or yield reductions were noted for the treated greenhouse alfalfa.

There were no significant differences in cantaloupe fruit yields. Lead content was increased from 0.75 ppm in the control to 1.06 ppm in the nominal 500 lbs/a·yr treatment (significant at the 0.069 level). These levels of lead are below the 7 ppm standard established by the Food and Drug Administration for lead content in food products (personal communication).

6.4. PHENOLOGICAL AND PHYSIOLOGICAL RESPONSES

6.4.1. Greenhouse

6.4.1.1. Cotton

Cotton plant heights were significantly reduced in both the nominal 500 and nominal 1000 lbs/a·yr treated plants compared to the controls, especially toward the end of the growing period when the salts had accumulated within the tissue (Table 18). The fresh and dry weights of the nominal 1000 lbs/a·yr treated cotton plants were significantly reduced as compared to the controls (Table 18). These results correspond with those of Maas and Hoffmann (1977), who reported that the growth rate and ultimate size of many plant species decrease as the soil Na^+ and Cl^- concentrations exceed a threshold level. The top growth of plants was frequently suppressed more than the root growth; however, not all plant species were affected equally. In contrast to this study and those of Maas and Hoffmann (1977), Maas, Grattan and Ogata (1982) reported that after six weeks of sprinkler irrigation the fresh and dry weights of cotton were not reduced. The difference between the results of this study and those of Maas, Grattan and Ogata (1982) may be attributed to the longer duration of treatment in this study.

In addition to growth reduction, the number of nodes/plant was significantly reduced on the nominal 500 lbs/a·yr treatment (Data Summary Volume Table J-4); however, the number of nodes/plant was not significantly reduced in the nominal 1000 lbs/a·yr treated plants. The reduced growth of the nominal 500 lbs/a·yr treated plants appears to have been caused by both node reduction and internode length reduction. In contrast, growth reduction in the nominal 1000 lbs/a·yr treated plants was caused by internode length reduction only.

Reduced growth of the simulated saline drift treated cotton plants may be caused by: 1) development of a water deficit or adverse water relations; 2) development of nutrient deficiencies or nutrient imbalances; and/or 3) accumulation of toxic levels of ions.

As salts accumulate within the foliage, there could be a corresponding water potential reduction resulting in a water deficit, decreased transpiration, and reduced growth. The water potential and transpiration in the nominal 500 and 1000 lbs/a·yr simulated saline drift treated cotton plants were not significantly different from the control plants (Data Summary Volume Tables K-4 to K-11, L-1). The results suggest that the effect of the saline drift on growth was caused by factors other than adverse changes in the water status of the plants.

None of the essential mineral nutrients were significantly decreased in the nominal 500 lbs/a·yr treated cotton plants as compared to the controls. Only Na^+ and Cl^- content were significantly increased in the treated plants. The high levels of Na^+ in the nominal 500 lbs/a·yr treated plants did not result in a corresponding reduction of the potassium ion concentration as reported in previous studies (Maas, Grattan and Ogata, 1982; Bernstein, 1975). The results of this study suggest that the effects of saline drift on growth were caused by factors other than adverse effects on plant nutrition.

Cotton tissue analysis showed that the Na^+ level of the nominal 500 lbs/a·yr treatment was six times the level of the controls and the Cl^- level was twice that of the controls. Greenway and Munns (1980) reported that growth reductions caused by toxic ions were generally greater than reductions predicted from water potential or osmotic effects alone. The authors reported that the growth and yield of avocado, soybean, and grape vines were reduced at such low Cl^- concentrations that adverse effects due to low water potential are implausible. These studies indicated that osmotic potential was probably not a major factor in reducing growth. The results of our study suggest that the effects of simulated saline drift may be caused by the toxicity of Na^+ and/or Cl^-.

Based on our results we are not able to explain the mechanism for the observed reduction in growth of the greenhouse cotton treated with nominal 500 and nominal 1000 lbs/a·yr simulated saline drift.

6.4.1.2. Alfalfa and Barley

Alfalfa and barley in the nominal 500 lbs/a·yr treatment sustained some leaf injury, but the vegetative growth, fresh and dry weights, and heights were not significantly reduced as compared to controls, except for two of the seven alfalfa harvests. These results are in agreement with Maas, Grattan and Ogata (1982) who found that sprinkler irrigation with saline solution did not affect the top growth of alfalfa and barley.

6.4.2. Field

Leaf temperatures of the treated cotton plants were significantly cooler than those of the control plants. The higher salt content in the treated tissue may have caused greater succulence, which could result in cooler leaves. No other differences were detected in the physiological responses of any of the field crops which is in agreement with the greenhouse results.

The phenological changes noted in the greenhouse were not observed in the field and these differences can not be explained by the tissue Na^+ and Cl^- levels. Cotton tissue of the field controls had more Na^+ and Cl^- than the nominal 500 lbs/a·yr treated greenhouse plants. These differences may be due to environmental factors.

6.5. FOLIAR INJURY

6.5.1. Greenhouse

No significant tip and marginal necrotic injury was observed on cotton and barley treated with the two highest rates of simulated saline drift (nominal 500 and nominal 1000 lbs/a·yr) until the latter part of the growing season. For example, tip, margin, and spot necrosis were first detected in the nominal 1000 lbs/a·yr treated cotton plants 19 days after initial spraying as compared to the controls. Because alfalfa plants were harvested on an average of every 21 days, salt deposition from the simulated saline drift apparently did not accumulate to a threshold level sufficient to cause injury.

In addition to necrosis, simulated saline drift caused chlorosis. The application of simulated saline drift to cotton and barley plants increased the level of chlorotic injury during the latter part of the growing period. The spot, marginal, and general surface chlorosis observed from 6 July to 18 July probably was caused by insecticide. During August, the general surface chlorosis of the nominal 500 lbs/a·yr treatment and the control was probably caused by nutrient deficiencies. However, from 30 August to biomass harvest, the percentage of leaves/plant showing chlorosis was significantly higher in the nominal 500 lbs/a·yr treatment (45.8% seasonal average), than in the controls (37.5% seasonal average), indicating that some of the general chlorosis may have been caused by the simulated saline drift (Data Summary Volume Table J-4).

Several previous investigations have shown that foliar injury is dependent upon the internal concentrations of Na^+ and Cl^- in the leaf tissue. Curtis, Lauver and Francis (1977) and Bernstein (1975) reported that moderate salt-induced injury symptoms developed in several salt-sensitive woody species when the leaves of these plants had accumulated about 2000 ppm of Na^+ or 5000 ppm of Cl^-. Hindawi, Raniere and Rea (1976) observed incipient injury occurred on young bush beans containing approximately 160 ppm of Na^+ and 3770 ppm of Cl^-.

The relationship between tissue content of Na^+ and Cl^- and foliar injury (chlorosis and necrosis) in this study is unclear. Chloride ion content in all three plant species exceeded 5000 ppm in controls and the nominal 500 lbs/a·yr treated plants. In addition, the Cl^- content in the cotton and alfalfa was significantly greater in the treated plants than in the controls; however, the Cl^- content in the barley was not statistically different in the treated plants as compared to the controls.

Both barley and cotton tissue contained Na^+ concentrations that exceeded the toxic levels reported by Bernstein (1975), Curtis, Lauver and Francis (1977) and Hindawi, Raniere and Rea (1976) whereas the Na^+ content of treated alfalfa was well below toxic levels.

While a number of investigators have observed that the accumulation of Na^+ and Cl^- to a specific level causes foliar injury, it is unclear which of the two ions induces the injury (Bernstein, 1975). McCune et al. (1977) reported that the degree of foliar injury in several woody and herbaceous plants was correlated with the Cl^- content in the tissue. Mass, Clark and Francois (1982), however, found that the degree of leaf injury in the pepper plant does not correlate with levels of Cl^-.

6.5.2. Field

It is apparent from the leaf tissue analyses that the Na^+ and Cl^- were absorbed into the foliage of the treated plants. The leaves in the control group in the cotton plants contained more than 18000 ppm Cl^-, and the leaves from the nominal 500 lbs/a·yr treated plants contained about 22500 ppm Cl^-. Both these values are well in excess of the 5000 ppm Cl^- suggested as a possible threshold level for toxic affects in some woody plants (Bernstein, 1975). The cotton tissue sampled from the nominal 500 lbs/a·yr plots had more than four and a half times more Na^+ than the control plants (4652 ppm Na^+ for the nominal 500 lbs/a·yr treatment group; 1006 ppm for the controls, significant at the 1% level). The increased level of the Na^+ was contrasted by significant decreases in boron, calcium and magnesium. Significant reductions also were observed in levels of copper and calcium, and nonsignificant reductions were observed for potassium, iron, manganese, and magnesium.

In contrast to the greenhouse cotton, the absorption of salts from the simulated saline drift treatments had very little effect on the foliage of the field cotton plants. There were indications that it actually enhanced vegetative growth. Because 38% of the control plants showed general chlorosis compared to only 29% of the treated plants (Data Summary Volume Table A-2), it would appear that the simulated saline drift, with its high concentration of essential elements for plant growth, was acting as a fertilizer. Foliar application is an efficient method of fertilization (Wittwer and Bukovac, 1969), although Peoples et al. (1980) found that foliar fertilizers applied to cotton grown in Arizona had no measurable effect on yield.

Alfalfa plants treated with nominal 1000 lbs/a·yr of simulated saline drift had significantly more leaflet necrosis and chlorosis than the controls. These results concur with the work of Maas, Grattan and Ogata (1982) who found that spraying alfalfa with saline solution resulted in some marginal necrosis. In our study, the leaf tissue from the nominal 1000 lbs/a·yr treatment at the final harvest contained less Na^+ and less Cl^- than the cotton tissue from the nominal 500 lbs/a·yr plots. This may be explained in part by the decreased number of application days on the alfalfa due to the repeated harvesting. The alfalfa was detrimentally affected at lower tissue Na^+ and Cl^- levels then was observed in the cotton. This suggests a greater susceptibility to damage from foliar applied salts. Maas, Grattan and Ogata (1982) also found that alfalfa is less tolerant to foliar salts than cotton.

The alfalfa tissue from the nominal 1000 lbs/a·yr plots had three and a half times more Na^+ than the control plants. Significant reductions were observed in levels of copper and calcium in the nominal 1000 lbs/a·yr treatment. A trend toward reduced levels was observed for potassium, iron, magnessium and mangenese in the nomir l 1000 lbs/a·yr alfalfa.

Greenhouse alfalfa did not show any foliar inj[illegible] ch[illegible]rved in the field. This may be explained in part by the more frequent h[illegible] [illegible] greenhouse and the corresponding decrease in exposure to the simulated saline drift.

The vegetative development of the cantaloupe plants showed no detectable effects from saline deposition. In contrast to the elevated Na^+ and Cl^- levels in the leaf tissue of cotton and alfalfa cantaloupe fruit did not show increased Na^+ and C[illegible]$^-$ levels.

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Data Summary Volume

for

an Assessment of Salt Drift on the Productivity of Agricultural Crops *in the Vicinity of the Palo Verde Nuclear Generating Station*

University of Arizona • College of Agriculture • August 1984

DATA SUMMARY VOLUME

for

AN ASSESSMENT OF SALT DRIFT ON THE PRODUCTIVITY OF AGRICULTURAL CROPS IN THE VICINITY OF THE PALO VERDE NUCLEAR GENERATING STATION

by

Kennith E. Foster, Paul G. Bartels,
Wallace C. Hofmann, and Martin M. Karpiscak

College of Agriculture

in cooperation with

University Analytical Center
Department of Nuclear and Energy Engineering
University of Arizona
Tucson, Arizona 85721

August 1984

TABLE OF CONTENTS

Page

Page

Page

Page

SECTION A

INTRODUCTION

The material contained in this volume is a summary of the data acquired during 1983 in a study to assess the effects of foliar salt deposition and accumulation on the foliage and productivity of selected crop plants. A discussion of the material and methods used and the results of this research program are present in another volume entitled An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Station.

SECTION B

ARIZONA PUBLIC SERVICES MAPPING PROJECT

PALO VERDE NUCLEAR GENERATING STATION

Arizona Public Services Mapping Project
Palo Verde Nuclear Generating Station

Introduction

In October 1983, the Arizona Remote Sensing Center, Office of Arid Lands Studies, College of Agriculture, University of Arizona, undertook an agricultural mapping project as a component of the Arizona Public Services Palo Verde Nuclear Generating Station environmental impact study. The mapping of the facility and land within a ten-mile radius of the plant was accomplished largely through the use of oblique small-format aerial photography. Map production, at a scale of 1 inch = 1 mile, included the delineation of active and dormant agriculture as well as specific crop identification.

Methodology

The general procedure followed for mapping included these steps:

1. Base map drafting
2. Aerial photograph acquisition
3. Photointerpretation
4. Land cover map production

Base Map Generation

The base maps for the site were derived from existing U.S. Geological Survey quandrangles. The study area covered parts of five 15 minute quad sheets at a scale of 1:62,500 (Table 1). Portions of these sheets were spliced and photographed onto high-contrast linecopy film, then enlarged and screened for a final positive base map scale of 1:62,500 on mylar. The screening reduces the density of topo map features (contours, buildings, roads) to reduce their confusion with land cover boundaries added in black. The mapping scale selected was considered a compromise between a minimum needed to describe features with spatial accuracy and a maximum allowable for convenient reduction (if desired) and efficient reproduction. The overall sheet size, 20 x 35 inches, can be processed with a conventional diazo (blueprint) machine. Prior to mylar reproduction, the base map negative was edited to remove undesireable features such as duplicate section numbers that result from splicing. A contour interval of 40 feet for all five sheets makes the actual splice difficult to discern on the final map.

Table 1. Topographic sheets used for base map.

Map	Scale	Date
Arlington	1:62,500	1962
Belmont Mountains	"	1962
Buckeye	"	1958
Cortez Peak	"	1960
Woolsey Peak	"	1951

The resulting base map is accurate in dimension to within 0.5 percent. Diazo mylar sheets reproduced from the original base are accurate to within 1 percent of the original topographic map. Paper diazo prints (blueline or blacklines) from the photo or diazo mylar sheets are dimensionally unstable due to their propensity to shrink or swell with changes in humidity. In addition, reproduction through a typical drum-type diazo machine produces stretching in one dimension. For these reasons, measurements of distance or area should be taken from the original photo or diazo mylar prints, or from copies reproduced photographically with controlled scale from these prints.

Many of the cultural features (roads, buildings, etc.) on the base map have been carried over from the original topographic maps. These features are relevant only for the year in which the original maps were compiled. Overlying land cover takes precedence over any and all base map depictions that conflict with the classification.

Acquisition of Aerial Photography

While land cover features can be accurately mapped from ground survey, the use of aerial photography allows mapping of many features with nearly equal accuracy with minimum ground data collection at a much higher level of efficiency. In addition, aerial photography retains a spatial record of surface phenomena through time, providing a historical record of features and allowing an interpreter to identify changes in features.

For the Palo Verde area, current aerial photography was not available for this mapping task; hence, the agricultural land cover survey was based upon oblique 35 mm aerial photography flown by this office on October 18, 1983 (Figure 1). To aid in identifying field units and other surface features, NASA high-altitude aerial photography taken June 6, 1972, was printed and mapped. The original 9 x 9 inch frames, at a contact scale of 1:120,000, were enlarged two times for a mapping scale of 1 inch to 1 mile, the base scale. Field boundaries and features, mapped onto an acetate overlay, were transferred to the base map with the use of a Kargl reflecting projector, minimizing the effects of photo distortion. These boundaries were adjusted during mapping to fit the section lines within which they are surveyed. Except for fields that have been subsequently realigned or abandoned, this field unit transcription greatly facilitated the identification and mapping of 1983 active field units and crops from oblique photography to the base map.

The current oblique photography was flown from a small aircraft during the morning hours of October 13, 1983. Ektachrome film was used, with a haze filter on the lens to reduce effects of turbidity in the air. Low obliques of fields within active agricultural areas were interspersed with high obliques to facilitate identification of specific units. Crop identification, performed from the air, was easily keyable to the aerials and onto the map.

To delimit the survey, a Landsat color composite (August 1973) was carried onboard the aircraft. A circle of 10 miles radius was drawn on this scene, which was used to locate the extent of active agriculture within this distance from the generating facility. Except for reference high obliques, detailed photography of field units was limited to active agricultural units.

Fallow and dormant fields were readily distinguished from active fields by their lack of vegetation. Fallow fields showed no observable vegetation, while the categorization of a field as dormant was based on the presence of wild vegetation, indicating a period of at least one year since cultivation. A number of field units mapped on the 1972 photography appeared in this latter category.

Crops were identified during the flight for key fields that could be observed on the photography. The appearance of the given crop on the photography was used as a guide to the interpretation of crops in other active agricultural areas. The principal image elements used for crop identification were color, texture, and pattern: alfalfa is distinguishable from cotton by a lighter tone of green and more yellow hue; wheat and small grains were distinguished by a yellow hue; cotton could be identified by a pattern of rows; lettuce, where indicated, was seen by very coarse texture indicating relatively small plant cover relative to soil exposure.

Land Use Tabulation

The areal extent of land use categories was measured with the aid of a Numonics 1224 graphics calculator. This instrument allowed areas, scaled in acres, to be measured for all land use units depicted on the map. Table 2 lists these area totals by land use.

Table 2. Land use summary
within a 10-mile radius

Land use	Area (acres)
Cotton	8348
Lettuce	180
Alfalfa/hay	4434
Wheat/small grains	1071
Fallow	13212
Dormant	1879

While some field units are depicted outside of the 10-mile radius, photographic coverage allowed accurate mapping only within this boundary.

Area Summary

Within the study area, the predominant cover is undisturbed vacant land. Agricultural uses, second in extent to vacant land, is scattered over several areas: along the eastern edge of the study area, agriculture is concentrated along the floodplain of the Hassayampa River; on the southeast, along the Gila River; on the Centennial Wash through the southern study area, and in several major blocks north of the generating facility and the main highway. Approximately 50 percent of the agricultural land is fallow, very likely the result of the U.S. Department of Agriculture's Payment-in-kind (PIK) program, initiated in 1983. Spatially, the greatest portion of active agriculture is planted in cotton and alfalfa/hay. Other crops of the area are spatially limited in extent. A portion of the fallow agricultural land is very likely used in other seasons since it showed very little evidence of successive vegetation.

Final Map

The final map product, drafted onto the mylar base, shows field boundaries as derived from the 1972 high-altitude photography and modified with the oblique 1983 photography, the study area radius, land classes indicated with symbols (see map legend), and locational information on the boundary. Map symbols have been selected to achieve visual contrast through reproduction and reduction, and may not be consistent with federal mapping agency conventions. (For a copy of the map refer to Figure 1 in An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Station.)

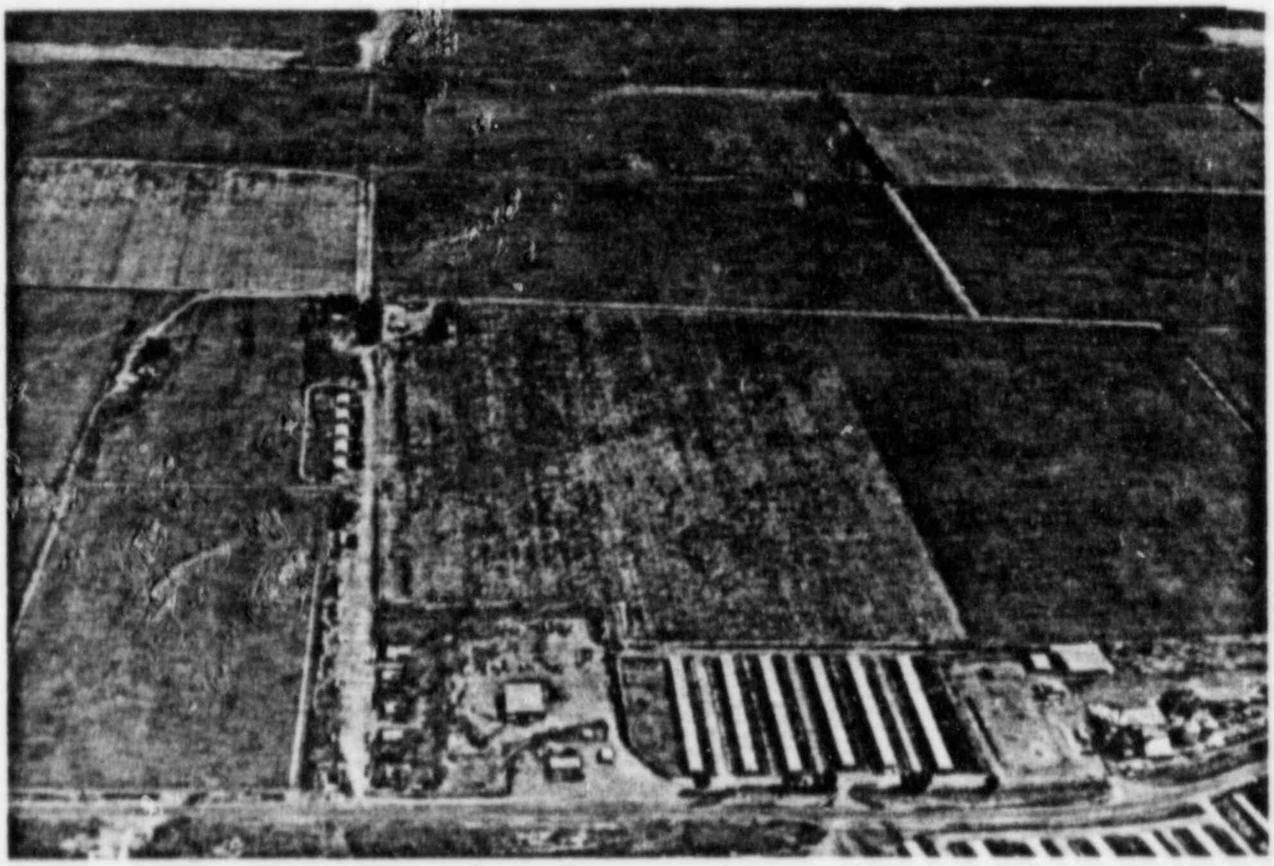


Figure 1. Oblique 35 mm aerial photograph of the Palo Verde area

SECTION C

CHEMICAL ANALYSIS OF COMPOSITE SOLUTIONS USED IN THE PROJECT:

AN ASSESSMENT OF SALT DRIFT ON THE PRODUCTIVITY OF AGRICULTURAL CROPS IN THE VICINITY OF THE PALO VERDE NUCLEAR GENERATING PLANT

UNIVERSITY ANALYTICAL CENTER

DEPARTMENT OF CHEMISTRY UNIVERSITY OF ARIZONA TUCSON, ARIZONA 85721
(602) 621-3180

-MEMORANDUM-

TO: Martin Karpiscak; OALS/APS

FROM: Susan B. Hopf

RE: Analysis of Composite Solutions for Salt Drift Study for Arizona Public Service

#840069 (6 slns.)	#840141 (18 slns.)	#840241 (33 slns.)
#840119 (17 slns.)	#840182 (25 slns.)	#840267 (3 slns.)
#840121 (62 slns.)	#840188 (9 slns.)	

DATE: 13 January 1984

The analysis results for 31 species of the 173 composite solutions used to spray in the field and greenhouse in the Salt Drift Study are enclosed in the accompanying report. Results for I and BO_3 are not complete at this time but will be sent later in a supplementary report. However, initial tests for I indicate none detected in the most concentrated field solutions.

SBH/dbs

Enclosure

UNIVERSITY ANALYTICAL CENTER
DEPARTMENT OF CHEMISTRY UNIVERSITY OF ARIZONA TUCSON, ARIZONA 85721
(602) 621-3180

-MEMORANDUM-

TO: Martin Karpiscak; OALS/APS

FROM: Susan B. Hopf SBH

RE: APS Composite Solutions - Supplementary Report

#840069 (6 slns.)	#840141 (18 slns.)	#840241 (33 slns.)
#840119 (17 slns.)	#840182 (25 slns.)	#840267 (3 slns.)
#840121 (62 slns.)	#840188 (9 slns.)	

DATE: 8 February 1984

Enclosed please find the results of the I^- and $BO_3^{\equiv}$ analyses that were missing from the previous final report of 13 January 1984. All results are expressed as mg/ℓ and it should be noted as before that where a zero appears in the table, the concentration should be read as less than the detection limit - not as 0 mg/ℓ. The tables herewith which include As, Se, Hg, HCO_3, I and phenol should replace those tables previously sent to you which were missing I^- concentrations.

The explanation of sample labelling and subcomposite labelling is included in the report of 13 January 1984.

If you have any questions, please call.

SBH/dbs

Enclosures

Chemical Analysis of Composite Solutions
Used in the Project:

An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Plant

Prepared by

University Analytical Center
Department of Chemistry
University of Arizona
Tucson, Arizona 85715

January 1984

INTRODUCTION

As part of the study: An Assessment of Salt Drift on the Productivity of Agricultural Crops in the Vicinity of the Palo Verde Nuclear Generating Plant, artificial solutions were prepared by Office of Arid Lands Studies (OALS) personnel to be sprayed on crops in the field and greenhouse environments. These artificial solutions simulated in concentration and species the treated sewage effluent to be used in cooling the generating station towers at the nuclear plant. The University Analytical Center (UAC) prepared the chemical analysis of these solutions, determining 31 various species of interest.

SAMPLING

The artificial solutions prepared by OALS ranged from 0 lbs/acre of salt deposited to 1000 lbs/acre. Each week, OALS personnel collected aliquots of each day's solution sprayed for each concentration. These composite solutions were brought to the UAC for chemical analysis.

The major species (Ca, Mg, K, Na, Cl^-, $SO_4^=$, NO_3^-), Total Dissolved Salts (TDS) and pH were determined for each composite solution. The minor species were determined in sub-composite solutions. These sub-composite solutions were prepared by UAC personnel by taking 50 ml of each of two (2) composite solutions and mixing thoroughly prior to analysis. If a discrepant result in the sub-composite was found (i.e., a result too high or too low relative to the other solutions of the same concentration), the original composite solutions used to prepared the sub-composite were analyzed.

Labelling the composite solutions upon receipt in the laboratory proceeded as follows: For field solutions, the date of the first day of the sampling period was recorded along with the solution ID:

0725-2NC

where 0725 = 25 July 1984 (first day of composite sampling period)
2 = concentration of solution
C = composite solution
NC = composite solution sampled at nozzle heads
where 2 = distilled water
3 = nominal 10 lbs/a·yr
4 = nominal 100 lbs/a·yr

For the greenhouse solutions, a similar procedure was used:

10-0725

where 0725 = 25 July 1983 (first day of composite sampling period)
10 = concentration of solution (lbs/acre)
NH = north greenhouse
SH = south greenhouse

A complete listing of all field solutions and sampling dates can be found in Part I-1 of Section I - Field Solutions. A complete listing of all greenhouse solutions and sampling dates can be found in Part II-1 of Section II - Greenhouse Solutions.

The sub-composite solutions were labelled in an identical manner:

A-4C (field solutions)
M-100 (greenhouse solutions)

where A; M = identity of sub-composite
4 = concentration of field solution
100 = concentration of greenhouse solution (lbs/acre)

A complete listing of the sub-composites is found in Parts I-1 and II-1 of Section I and Section II, respectively.

ANALYSIS

Appropriate dilution of the solution was made prior to analysis. Methods for each determination are described in the UAC Laboratory Manual prepared in October 1983 for this project and will not be reiterated here. The BO_3 determinations were carried out by the Soils, Water and Plant Testing Laboratory.

The determination for F^- was carried out using two different methods: (1) Ion Chromatography (Method APS13) for the composite solutions 0 lbs/acre salt deposition and (2) Specific Ion Electrode (Method APS21) for all other composites. This was done because in the more concentrated composite solutions, the Cl^- peak in Method APS13 was so large as to mask the F^- peak.

RESULTS

All results are expressed as mg/ℓ except for pH and are tabulated for convenience in Part I-2 for the Field Composites and Part II-2 for the Greenhouse Composites. Results for each concentration set of composites (e.g., 100 lb/acre composites) are listed together. Detection limits are indicated for each species and where a 0 appears in the table, the 0 should be read as less than the detection limit concentration. There are two detection limits indicated for F^-. The 0.03 mg/ℓ detection limit applies to all the Field Solutions-2 and all the 0-Greenhouse Solutions. The 0.2 mg/ℓ detection limit for F^- applies to all other solutions. I.S. indicates an insufficient amount of sample to complete the analysis.

Part I-3 and Part II-3 are graphs of the major species (except pH) plotted over sampling time. It should be noted that for the Greenhouse Composites, two graphs with different concentration ranges are provided - the lower concentrated solutions fell on or at the 0-axis when the concentration range was expanded to include the 1000 lb/acre solutions. For the Field Composites, Sampling Week 1 begins 27 May 1983 and the last week begins 28 November 1983. Gaps in the line are weeks in which no sample was taken. The first Sampling Week for the Greenhouse Solutions begins 23 June 1983 and the last begins 14 November 1983.

DISCUSSION

From the data, it appears that after the first several weeks when spraying techniques and methodologies were being perfected, the concentration of salts sprayed on the plants remained fairly constant with an upward trend towards the end of the sampling period. It should be noted that most of the 500 and all of the 1000 lb/acre composites as well as Field Solutions-4 were received with varying amounts of brown precipitate. In addition, the composite solutions of 10, 100, 500 lbs/acre taken in the greenhouse the week of 17 October 1983 and Samples 100-1003 and 100-1010 were received with a green precipitate - perhaps algae of some sort. The pH of these solutions is relatively basic.

The question of whether the composition of the composite solutions would change over time was addressed by reanalyzing one of the most concentrated field solutions: 0725-4C. This solution was first analyzed in late August and was reanalyzed in December 1983. The results of the comparison are given in Section III expressed as mg/ℓ except for pH. (The species with a dash were analyzed in the sub-composite solutions in December and therefore no comparison can be made.) The concentration of the various species does not appear to change over time - however, in several of the greenhouse solutions, a green algae-like solid has appeared at the bottom of the bottle. In specific, they are Samples 500-1003 and 500-1010, 100-0808, 100-0822, 100-0926, 100-1107 and 100-1114. In addition, the precipitate in Field Solution 1017-4C now has a greenish cast to it. It is suggested that the samples be stored at 4°C.

I. FIELD COMPOSITE SOLUTIONS

I. FIELD COMPOSITE SOLUTIONS

1. Identification of Solutions

FIELD SOLUTIONS

REQ #	SMP ID	SAMPLING DATES
830580	0527-2	5/27
	0527-3	5/27
	0527-4	5/27
830594	0607-2	6/7
	0607-3	6/7
	0607-4	6/7
840121	0702-2NC	7/2,5,6,7,8
	0702-3NC	7/2,5,6,7,8
	0702-4NC	7/2,5,6,7,8
840121	0711-2NC	7/11,12,13,14,16
	0711-3NC	7/11,12,13,14,16
	0711-4NC	7/11,12,13,14,16
840121	0718-2NC	7/18,19,20,21
	0718-3NC	7/18,19,20,21
	0718-4NC	7/18,19,20,21
840069	0725-2C	7/25,26,27,28,29
	0725-3C	7/25,26,27,28,29
	0725-4C	7/25,26,27,28,29
840069	0802-2C	8/2,3,4,5
	0802-3C	8/2,3,4,5
	0802-4C	8/2,3,4,5
840121	0812-2C	8/12,19,20
	0812-3C	8/12,19,20
	0812-4C	8/12,19,20
840121	0822-2C	8/22,23,24,25,26
	0822-3C	8/22,23,24,25,26
	0822-4C	8/22,23,24,25,26
840121	0829-2NC	8/29,30,31;9/1,2
	0829-3NC	8/29,30,31;9/1,2
	0829-4NC	8/29,30,31;9/1,2
840121	0906-2C	9/6,7,8,9
	0906-3C	9/6,7,8,9
	0906-4C	9/6,7,8,9
840141	0912-2C	9/12,13,14,15,16
	0912-3C	9/12,13,14,15,16
	0912-4C	9/12,13,14,15,16

FIELD SOLUTIONS

REQ #	SMP ID	SAMPLING DATES
840141	0919-2C	9/19,22
	0919-3C	9/19,22
	0919-4C	9/19,22
840121	0926-2C	9/26,27,27;10/7
	0926-3C	9/26,27,27;10/7
	0926-4C	9/26,27,27;10/7
840182	1010-2C	10/10,11,12,13,14
	1010-3C	10/10,11,12,13,14
	1010-4C	10/10,11,12,13,14
840188	1017-2C	10/17,18,19,20,21
	1017-3C	10/17,18,19,20,21
	1017-4C	10/17,18,19,20,21
840241	1031-2C	10/24,31;11/1,1,3
	1031-3C	10/24,31;11/1,1,3
	1031-4C	10/24,31;11/1,1,3
840241	1107-2C	11/7,8,9,10
	1107-3C	11/7,8,9,10
	1107-4C	11/7,8,9,10
840241	1114-2C	11/14,15,16,17,18
	1114-3C	11/14,15,16,17,18
	1114-4C	11/14,15,16,17,18
840267	1128-2C	11/28,29,30
	1128-3C	11/28,29,30
	1128-4C	11/28,29,30

FIELD SOLUTIONS
SUB-COMPOSITES

SUB-COMP ID	MIXTURE OF
A: 2NC	0702-2NC + 0711-2NC
3NC	0702-3NC + 0711-3NC
4NC	0702-4NC + 0711-4NC
B: 2NC	0718-2NC + 0829-2NC
3NC	0718-3NC + 0829-3NC
4NC	0718-4NC + 0829-4NC
C: 2C	0812-2C + 0822-2C
3C	0812-3C + 0822-3C
4C	0812-4C + 0822-4C
D: 2C	0906-2C + 0912-2C
3C	0906-3C + 0912-3C
4C	0906-4C + 0912-4C
E: 2C	0919-2C + 0926-2C
3C	0919-3C + 0926-3C
4C	0919-4C + 0926-4C
F: 2C	1017-2C + 1031-2C
3C	1017-3C + 1031-3C
4C	1017-4C + 1031-4C
G: 2C	1107-2C + 1114-2C
3C	1107-3C + 1114-3C
4C	1107-4C + 1114-4C
H: 2C	0725-2C + 0802-2C
3C	0725-3C + 0802-3C
4C	0725-4C + 0802-4C

I. FIELD COMPOSITE SOLUTIONS

2. Analytical Results (expressed as mg/ℓ)

FIELD SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
0527-2	158	5.17	1720	-	.84	.94
0607-2	33.4	1.97	337	-	.13	.17
0702-2NC	18.4	1.17	177	.073	.14	.11
0711-2NC	19.2	1.02	193	.061	0	.1
0718-2NC	.84	.065	.44	.054	.56	0
0725-2C	.54	.13	3.62	0	.28	0
0802-2C	.69	.14	3.62	0	.12	.1
0812-2C	.78	.086	2.12	.18	.16	0
0822-2C	1.01	.13	6.73	.37	0	0
0829-2NC	.8	.14	2.73	.24	.074	0
0906-2C	.84	.11	4.28	.27	.087	0
0912-2C	1.41	.18	11.7	.6	0	0
0919-2C	.67	.097	4.61	.29	.03	0
0926-2C	1.64	.18	10.4	.52	0	0
1010-2C	.68	.099	5.44	.31	0	0
1017-2C	.36	.05	2.52	.19	0	0
1031-2C	.88	.097	6.82	.44	.055	0
1107-2C	.64	.1	5.59	.36	0	0
1114-2C	1.49	.08	10.3	.52	0	0
1128-2C	.43	.054	1.07	.2	0	0
DETLIM	.04	.04	.02	.02	.05	.03,.2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
Ø527-2	198Ø	732	961	1.63	6Ø4Ø	8.2
Ø6Ø7-2	356	172	213	Ø	113Ø	7.13
Ø7Ø2-2NC	163	75.2	13Ø	Ø	594	6.9
Ø711-2NC	134	87.6	127	Ø	622	6.53
Ø718-2NC	.34	.37	.54	Ø	28	I.S.
Ø725-2C	2.31	1.Ø9	2.29	Ø	16	7
Ø8Ø2-2C	3.68	1.61	3.71	Ø	52	6.68
Ø812-2C	1.37	.76	1.91	Ø	48	6.8
Ø822-2C	5.63	1.83	5.37	Ø	86	6.27
Ø829-2NC	2.21	.52	2.46	Ø	22	6.65
Ø9Ø6-2C	4.1	1.72	3.46	Ø	28	6.34
Ø912-2C	8.42	5.38	8.2	Ø	24	6.21
Ø919-2C	2.89	1.24	2.45	Ø	24	I.S.
Ø926-2C	11	3.89	8.69	Ø	34	6.43
1Ø1Ø-2C	6.56	2.58	5.14	Ø	6Ø	6.38
1Ø17-2C	2.59	1.7	1.86	Ø	5Ø	6.35
1Ø31-2C	6.11	3.52	4.4	Ø	18	6.64
11Ø7-2C	6.Ø7	2.Ø7	3.34	Ø	1Ø	6.4
1114-2C	1Ø.4	4.18	6.32	Ø	22	6.61
1128-2C	8.34	1.94	3.54	Ø	2Ø	3.93
DETLIM	.Ø5	.15	.1	.25	Ø	-

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
Ø527-2	Ø	Ø	Ø	Ø	Ø	.42
Ø6Ø7-2	Ø	Ø	Ø	Ø	Ø	Ø
Ø7Ø2-2NC	A Ø	A Ø	A Ø	.23	A Ø	A Ø
Ø711-2NC	A Ø	A Ø	A Ø	.15	A Ø	A Ø
Ø718-2NC	B Ø	B Ø	B Ø	B .Ø83	B Ø	B Ø
Ø725-2C	Ø	Ø	Ø	Ø	Ø	H Ø
Ø8Ø2-2C	Ø	Ø	Ø	Ø	Ø	H Ø
Ø812-2C	C Ø	C Ø	C Ø	C .Ø93	C Ø	C Ø
Ø822-2C	C Ø	C Ø	C Ø	C .Ø93	C Ø	C Ø
Ø829-2NC	B Ø	B Ø	B Ø	B .Ø83	B Ø	B Ø
Ø9Ø6-2C	D Ø	D Ø	D Ø	D .Ø74	D Ø	D Ø
Ø912-2C	D Ø	D Ø	D Ø	D .Ø74	D Ø	D Ø
Ø919-2C	E Ø	E Ø	E Ø	E .Ø93	E Ø	E Ø
Ø926-2C	E Ø	E Ø	E Ø	E .Ø93	E Ø	E Ø
1Ø1Ø-2C	Ø	Ø	Ø	Ø	Ø	Ø
1Ø17-2C	F Ø	F Ø	F Ø	F .Ø93	F Ø	F Ø
1Ø31-2C	F Ø	F Ø	F Ø	F .Ø93	F Ø	F Ø
11Ø7-2C	G Ø	G Ø	G Ø	G .Ø46	G Ø	G Ø
1114-2C	G Ø	G Ø	G Ø	G .Ø46	G Ø	G Ø
1128-2C	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.2	5	.Ø4	.Ø3	.Ø4	.6

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
Ø527-2	Ø	Ø	Ø	Ø	Ø	-
Ø6Ø7-2	Ø	Ø	Ø	Ø	.Ø62	-
Ø7Ø2-2NC	A Ø	A Ø	A Ø	A Ø	A Ø	A Ø
Ø711-2NC	A Ø	A Ø	A Ø	A Ø	A Ø	A Ø
Ø718-2NC	B Ø	B Ø	B Ø	B Ø	B Ø	B Ø
Ø725-2C	Ø	Ø	Ø	H Ø	Ø	Ø
Ø8Ø2-2C	Ø	Ø	Ø	H Ø	Ø	Ø
Ø812-2C	C Ø	C Ø	C Ø	C Ø	C Ø	C Ø
Ø822-2C	C Ø	C Ø	C Ø	C Ø	C Ø	C Ø
Ø829-2NC	B Ø	B Ø	B Ø	B Ø	B Ø	B Ø
Ø9Ø6-2C	D Ø	D Ø	D Ø	D Ø	D Ø	D Ø
Ø912-2C	D Ø	D Ø	D Ø	D Ø	D Ø	D Ø
Ø919-2C	E Ø	E Ø	E Ø	E Ø	E Ø	E Ø
Ø926-2C	E Ø	E Ø	E Ø	E Ø	E Ø	E Ø
1Ø1Ø-2C	Ø	Ø	Ø	Ø	Ø	Ø
1Ø17-2C	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
1Ø31-2C	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
11Ø7-2C	G Ø	G Ø	G Ø	G Ø	G Ø	G Ø
1114-2C	G Ø	G Ø	G Ø	G Ø	G Ø	G Ø
1128-2C	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.Ø3	.Ø3	.2	.2	.1	.Ø5

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
Ø527-2	.ØØ2	.ØØ52	Ø	24.2	-	-
Ø6Ø7-2	Ø	Ø	Ø	9.26	-	-
Ø7Ø2-2NC	Ø	Ø	Ø	A Ø	A Ø	A Ø
Ø711-2NC	.ØØ2	Ø	Ø	A Ø	A Ø	A Ø
Ø718-2NC	Ø	Ø	Ø	B Ø	B Ø	B Ø
Ø725-2C	Ø	Ø	Ø	H Ø	H Ø	H Ø
Ø8Ø2-2C	Ø	Ø	Ø	H Ø	H Ø	H Ø
Ø812-2C	Ø	Ø	Ø	C Ø	C Ø	C Ø
Ø822-2C	Ø	Ø	Ø	C Ø	C Ø	C Ø
Ø829-2NC	Ø	Ø	Ø	B Ø	B Ø	B Ø
Ø9Ø6-2C	Ø	Ø	Ø	D Ø	D Ø	D Ø
Ø912-2C	Ø	Ø	Ø	D Ø	D Ø	D Ø
Ø919-2C	Ø	Ø	Ø	E Ø	E Ø	E Ø
Ø926-2C	Ø	Ø	Ø	E Ø	E Ø	E Ø
1Ø1Ø-2C	Ø	Ø	Ø	Ø	Ø	Ø
1Ø17-2C	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
1Ø31-2C	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
11Ø7-2C	G Ø	G Ø	G Ø	G Ø	G Ø	G Ø
1114-2C	G Ø	G Ø	G Ø	G Ø	G Ø	G Ø
1128-2C	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	BOD
Ø527-2	7.4
Ø6Ø7-2	Ø
Ø7Ø2-2NC	A Ø
Ø711-2NC	A Ø
Ø718-2NC	B Ø
Ø725-2C	Ø
Ø8Ø2-2C	Ø
Ø812-2C	C Ø
Ø822-2C	C Ø
Ø829-2NC	B Ø
Ø9Ø6-2C	D Ø
Ø912-2C	D Ø
Ø919-2C	E Ø
Ø926-2C	E Ø
1Ø1Ø-2C	Ø
1Ø17-2C	F Ø
1Ø31-2C	F Ø
11Ø7-2C	G Ø
1114-2C	G Ø
1128-2C	Ø

DETLIM .27

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
0527-3	124	4.08	1520	-	.76	.74
0607-3	104	5.89	1050	-	.59	.92
0702-3NC	52.8	3.16	515	.1	.37	A .25
0711-3NC	50.9	3.26	541	.14	.17	A .25
0718-3NC	36.3	2.23	223	9	.22	B .25
0725-3C	42.7	2.17	376	19.9	.47	.25
0802-3C	42.5	2.13	384	18.1	.3	.26
0812-3C	37.2	2.24	304	18.2	.06	C .28
0822-3C	34	2.12	414	18.7	.04	C .28
0829-3NC	32.4	2.24	356	18.2	.14	B .25
0906-3C	32.4	2.2	354	19	.29	.45
0912-3C	43.2	2.28	458	21.4	.14	0
0919-3C	39.1	2.11	496	18.1	.18	0
0926-3C	41	2.76	457	20.3	.094	.27
1010-3C	35.4	2.6	452	19.3	0	.32
1017-3C	35.4	2.19	491	18.7	.65	F .20
1031-3C	47.6	2.09	489	19.5	.12	F .20
1107-3C	51.2	1.96	486	19.1	.06	G 0
1114-3C	50	1.92	486	19.1	.05	G 0
1128-3C	47	2.01	463	19.1	.1	.26
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
0527-3	1540	630	652	1.29	4850	8.59
0607-3	1100	451	685	.73	3540	7.87
0702-3NC	671	230	344	.32	1900	6.74
0711-3NC	512	173	273	.36	1960	6.58
0718-3NC	464	175	247	.16	1340	6.87
0725-3C	323	153	249	.32	1330	6.66
0802-3C	323	149	242	.46	1290	6.78
0812-3C	417	167	263	0	1400	6.63
0822-3C	424	167	263	0	1440	6.59
0829-3NC	506	201	304	0	1430	7.07
0906-3C	519	245	292	0	1570	6.75
0912-3C	484	246	301	0	1570	6.71
0919-3C	403	234	269	0	1400	8.41
0926-3C	486	200	279	0	1550	6.6
1010-3C	460	194	279	0	1470	6.41
1017-3C	439	277	284	0	1510	6.3
1031-3C	631	256	316	0	1570	6.58
1107-3C	480	213	274	0	1570	6.3
1114-3C	566	216	302	0	1570	6.27
1128-3C	756	286	285	0	1570	4.64
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
0527-3	0	0	0	0	0	.56
0607-3	0	0	0	0	0	0
0702-3NC	A 0	A 0	A 0	A .33	A 0	A 0
0711-3NC	A 0	A 0	A 0	A .33	A 0	A 0
0718-3NC	B 0	B 0	B 0	B .20	B 0	B 0
0725-3C	0	0	0	.13	0	H 0
0802-3C	0	0	0	.11	0	H 0
0812-3C	C 0	C 0	C 0	C .19	C 0	C 0
0822-3C	C 0	C 0	C 0	C .19	C 0	C 0
0829-3NC	B 0	B 0	B 0	B .20	B 0	B 0
0906-3C	D 0	D 0	D 0	D .14	D 0	D 0
0912-3C	D 0	D 0	D 0	D .14	D 0	D 0
0919-3C	E 0	E 0	E 0	E .16	E 0	E 0
0926-3C	E 0	E 0	E 0	E .16	E 0	E 0
1010-3C	0	0	0	.089	0	0
1017-3C	F 0	F 0	F 0	F .12	F 0	F 0
1031-3C	F 0	F 0	F 0	F .12	F 0	F 0
1107-3C	G 0	G 0	G 0	G .14	G 0	G 0
1114-3C	G 0	G 0	G 0	G .14	G 0	G 0
1128-3C	0	0	0	.1	0	0
DETLIM	.2	5	.04	.03	.04	.6

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
0527-3	0	0	0	0	0	-
0607-3	0	0	0	0	.12	-
0702-3NC	A 0	A 0	A 0	A 0	A 0	A 0
0711-3NC	A 0	A 0	A 0	A 0	A 0	A 0
0718-3NC	B 0	B 0	B 0	B 0	B .10	B 0
0725-3C	0	0	0	H 0	0	.053
0802-3C	0	0	0	H 0	.1	.053
0812-3C	C 0	C 0	C 0	C 0	C 0	C 0
0822-3C	C 0	C 0	C 0	C 0	C 0	C 0
0829-3NC	B 0	B 0	B 0	B 0	B .10	B 0
0906-3C	D 0	D 0	D 0	D 0	D 0	D 0
0912-3C	D 0	D 0	D 0	D 0	D 0	D 0
0919-3C	E 0	E 0	E 0	E 0	E 0	E .071
0926-3C	E 0	E 0	E 0	E 0	E 0	E .071
1010-3C	0	0	0	0	0	0
1017-3C	F 0	F 0	F 0	F 0	F .14	F 0
1031-3C	F 0	F 0	F 0	F 0	F .14	F 0
1107-3C	G 0	G 0	G 0	G 0	G 0	G 0
1114-3C	G 0	G 0	G 0	G 0	G 0	G 0
1128-3C	0	0	0	0	0	0
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
0527-3	.0021	.0043	0	12.7	-	-
0607-3	0	.0034	0	10.4	-	-
0702-3NC	.006	0	0	A 0	A 0	A 0
0711-3NC	.006	0	0	A 0	A 0	A 0
0718-3NC	.003	0	0	B 0	B 0	B 0
0725-3C	0	0	0	H 0	H 0	H 0
0802-3C	0	0	0	H 0	H 0	H 0
0812-3C	0	0	0	C 0	C 0	C 0
0822-3C	0	0	0	C 0	C 0	C 0
0829-3NC	0	0	0	B 0	B 0	B 0
0906-3C	0	0	0	D 0	D 0	D 0
0912-3C	0	0	0	D 0	D 0	D 0
0919-3C	0	0	0	E 11.3	E 0	E 0
0926-3C	0	0	0	E 11.3	E 0	E 0
1010-3C	0	0	0	0	0	0
1017-3C	F 0	F 0	F 0	F 0	F 0	F 0
1031-3C	F 0	F 0	F 0	F 0	F 0	F 0
1107-3C	G 0	G 0	G 0	G 0	G 0	G 0
1114-3C	G 0	G 0	G 0	G 0	G 0	G 0
1128-3C	.004	0	0	6.88	0	0
DETLIM	.001	.002	.003	5	5	2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	BO3
Ø527-3	5.93
Ø6Ø7-3	5.34
Ø7Ø2-3NC	A 1.14
Ø711-3NC	A 1.14
Ø718-3NC	B .93
Ø725-3C	H 1.2Ø
Ø8Ø2-3C	H 1.2Ø
Ø812-3C	C .76
Ø822-3C	C .76
Ø829-3NC	B .93
Ø9Ø6-3C	D .93
Ø912-3C	D .93
Ø919-3C	E .76
Ø926-3C	E .76
1Ø1Ø-3C	.93
1Ø17-3C	F .87
1Ø31-3C	F .87
11Ø7-3C	G 1.Ø3
1114-3C	G 1.Ø3
1128-3C	1.25

DETLIM .27

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
0527-4	270	5	3230	-	1.26	1.89
0607-4	315	17.2	3190	-	1.87	2.58
0702-4NC	394	20.7	3010	.2	2.67	A 1.25
0711-4NC	395	20.1	3300	.24	2.97	A 1.25
0718-4NC	375	19.4	3760	81	2.97	B 2.40
0725-4C	449	21	3660	174	3.22	2.54
0802-4C	464	21.4	4180	164	3.57	3.01
0812-4C	424	21.4	4110	198	2.14	C 2.00
0822-4C	375	21	4310	208	2.26	C 2.00
0829-4NC	363	21.4	4240	207	3.09	B 2.40
0906-4C	458	22.1	4570	211	2.77	3.45
0912-4C	364	19.4	4210	175	1.79	1.55
0919-4C	395	20.6	4090	177	2.28	1.45
0926-4C	432	21.7	4600	209	1.69	1.5
1010-4C	391	21.7	4010	199	2.31	1.6
1017-4C	334	21.4	4470	169	1.61	F 1.30
1031-4C	441	23.3	4660	201	2.09	F 1.30
1107-4C	474	22.8	4330	194	2.34	G 1.10
1114-4C	471	23.3	5130	200	2.48	G 1.10
1128-4C	441	23.1	4730	199	2.19	1.35
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
0527-4	3420	1470	1510	2.65	11000	8.91
0607-4	3120	1340	1990	2.26	9540	7.85
0702-4NC	4210	1540	2300	1.98	12400	7.33
0711-4NC	3760	1340	2210	1.63	12700	7.26
0718-4NC	4440	2020	2700	2.98	13800	7.1
0725-4C	3840	1520	2530	2.44	13400	6.99
0802-4C	4140	1590	2810	2.18	14700	7.43
0812-4C	4300	1580	2700	2	14600	6.85
0822-4C	4440	1750	2740	1.73	15200	7.57
0829-4NC	5510	2940	3200	2.74	15700	6.37
0906-4C	5470	2610	2870	2.37	17200	6.79
0912-4C	4820	2660	3110	3.14	16400	7.34
0919-4C	4620	2740	3010	3.17	15600	7.12
0926-4C	5150	2460	2370	3.46	16000	6.84
1010-4C	4890	2000	3080	3.17	15700	6.56
1017-4C	4710	2890	3900	3.67	15900	8.89
1031-4C	4490	2330	3020	3.1	16300	6.77
1107-4C	4710	2190	2420	3.52	16500	6.65
1114-4C	5060	2240	3020	3.8	17000	6.93
1128-4C	6200	2590	2570	4.79	16300	6.73
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
------	---	---	---	---	---	---
Ø527-4	Ø	Ø	Ø	Ø	Ø	.94
Ø6Ø7-4	Ø	23.4	Ø	Ø	Ø	.79
Ø7Ø2-4NC	A .72	A 3Ø.1	A .14	A .8Ø	A Ø	A Ø
Ø711-4NC	A .72	A 3Ø.1	A .14	A .8Ø	A Ø	A Ø
Ø718-4NC	B .37	B 34.1	B .14	B .84	B .Ø4	B Ø
Ø725-4C	.36	32.2	.16	.79	.Ø4	H Ø
Ø8Ø2-4C	.31	33.5	.19	.7	.Ø5	H Ø
Ø812-4C	C .41	C 33.3	C .14	C .76	C .Ø4	C Ø
Ø822-4C	C .41	C 33.3	C .14	C .76	C .Ø4	C Ø
Ø829-4NC	B .37	B 34.1	B .14	B .84	B .Ø4	B Ø
Ø9Ø6-4C	D .27	D 58.0	D .14	D .82	D .Ø4	D Ø
Ø912-4C	D .27	D 58.Ø	D .14	D .82	D .Ø4	D Ø
Ø919-4C	E .27	E 43.7	E .14	E .82	E .Ø45	E Ø
Ø926-4C	E .27	E 43.7	E .14	E .82	E .Ø45	E Ø
1Ø1Ø-4C	.2	38.1	.11	.85	.Ø4	Ø
1Ø17-4C	F .23	F 37.6	F .12	F .74	F .Ø45	F Ø
1Ø31-4C	F .23	F 37.6	F .12	F .74	F .Ø45	F Ø
11Ø7-4C	G .54	G 46.8	G .24	G 1.Ø1	G .Ø51	G Ø
1114-4C	G .54	G 46.8	G .24	G 1.Ø1	G .Ø51	G Ø
1128-4C	.3	43.Ø	.2	.86	.Ø45	Ø
DETLIM	.2	5	.Ø4	.Ø3	.Ø4	.6

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
0527-4	0	0	0	0	0	-
0607-4	0	0	0	0	.30	-
0702-4NC	A .045	A 0	A 0	A 0	A .55	0
0711-4NC	A .045	A 0	A 0	A 0	A .55	0
0718-4NC	B .033	B 0	B 0	B 0	B .74	.27
0725-4C	H .045	0	0	H 0	.63	.56
0802-4C	H .045	0	0	H 0	.69	.58
0812-4C	C .037	C 0	C 0	C 0	C .70	C .54
0822-4C	C .037	C 0	C 0	C 0	C .70	C .54
0829-4NC	B .033	B 0	B 0	B 0	B .74	.52
0906-4C	D .041	D 0	D 0	D 0	D .70	D .49
0912-4C	D .041	D 0	D 0	D 0	D .70	D .49
0919-4C	E .052	E 0	E 0	E 0	E .67	E .48
0926-4C	E .052	E 0	E 0	E 0	E .67	E .48
1010-4C	.037	0	0	0	.57	.52
1017-4C	F .052	F 0	F 0	F 0	F 1.23	F .51
1031-4C	F .052	F 0	F 0	F 0	F 1.23	F .51
1107-4C	G .052	G 0	G 0	G .30	G .89	G .51
1114-4C	G .052	G 0	G 0	G .30	G .89	G .51
1128-4C	.045	0	0	0	.80	.52
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
Ø527-4	.ØØ31	.ØØ94	Ø	13.8	-	-
Ø6Ø7-4	.ØØ28	.Ø14	.ØØ14	19.2	-	-
Ø7Ø2-4NC	.Ø43	.Ø17	Ø	A 14.4	A Ø	A Ø
Ø711-4NC	.Ø46	.Ø17	Ø	A 14.4	A Ø	A Ø
Ø718-4NC	.Ø34	.Ø2	Ø	B 2Ø.4	B Ø	B Ø
Ø725-4C	.Ø13	.Ø18	Ø	12.7	H Ø	H Ø
Ø8Ø2-4C	.Ø13	.Ø15	Ø	37.2	H Ø	H Ø
Ø812-4C	.Ø1	.Ø14	Ø	C 44.1	C Ø	C Ø
Ø822-4C	.ØØ9	.Ø19	Ø	C 44.1	C Ø	C Ø
Ø829-4NC	.ØØ9	.Ø19	Ø	B 2Ø.4	B Ø	B Ø
Ø9Ø6-4C	.Ø14	.Ø21	Ø	D 34.2	D Ø	D Ø
Ø912-4C	.Ø14	.Ø18	Ø	D 34.2	D Ø	D Ø
Ø919-4C	.Ø11	.Ø19	Ø	E 39.1	E Ø	E Ø
Ø926-4C	.Ø16	.Ø2	Ø	E 39.1	E Ø	E Ø
1Ø1Ø-4C	.Ø14	.Ø23	Ø	13.8	Ø	Ø
1Ø17-4C	F .Ø19	F .Ø19	F Ø	F 23.7	F Ø	F Ø
1Ø31-4C	F .Ø19	F .Ø19	F Ø	F 23.7	F Ø	F Ø
11Ø7-4C	G .Ø22	G .Ø15	G Ø	G Ø	G Ø	G Ø
1114-4C	G .Ø22	G .Ø15	G Ø	G Ø	G Ø	G Ø
1128-4C	.Ø18	.Ø17	Ø	21.7	Ø	Ø
DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

FIELD SOLUTIONS

SAMPLE		BOD
0527-4		8.6
0607-4		7.73
0702-4NC	A	7.02
0711-4NC	A	7.02
0718-4NC	B	7.40
0725-4C		7.02
0802-4C		6.15
0812-4C	C	7.02
0822-4C	C	7.02
0829-4NC	B	7.40
0906-4C	D	7.46
0912-4C	D	7.46
0919-4C	E	7.79
0926-4C	E	7.79
1010-4C		7.46
1017-4C	F	6.83
1031-4C	F	6.83
1107-4C	G	5.28
1114-4C	G	5.28
1128-4C		8.33

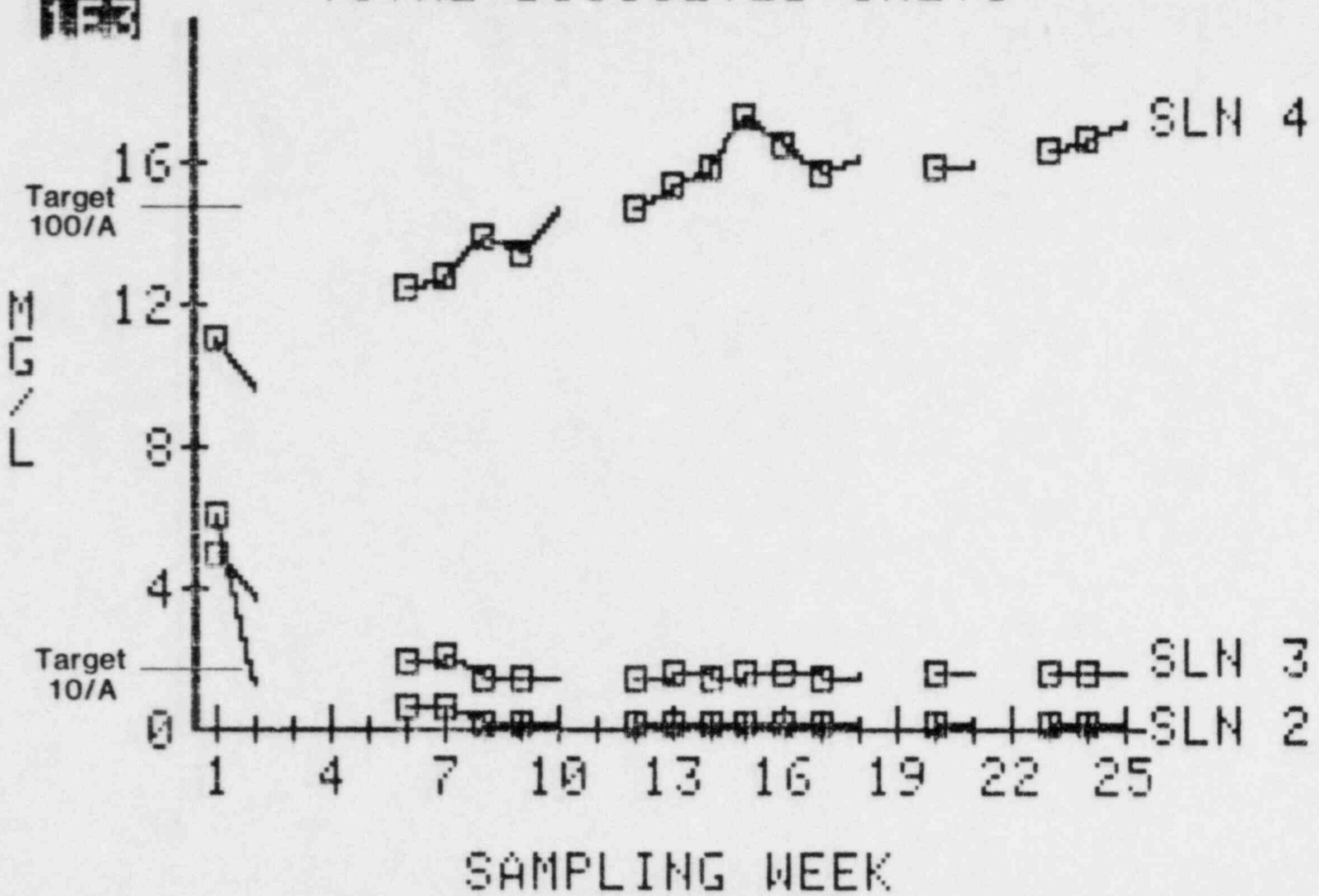
DETLIM .27

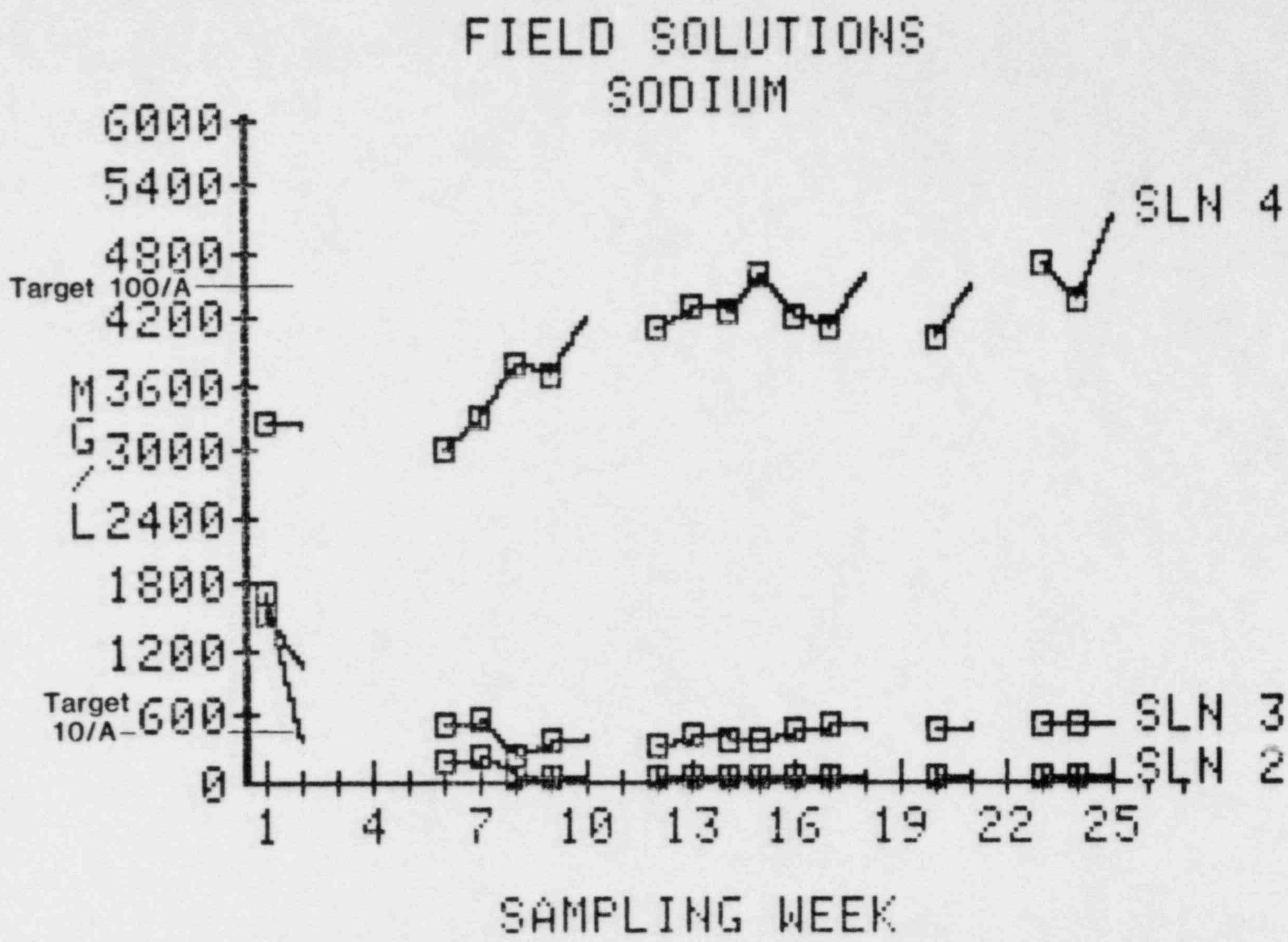
I.S. INSUFFICIENT SAMPLE

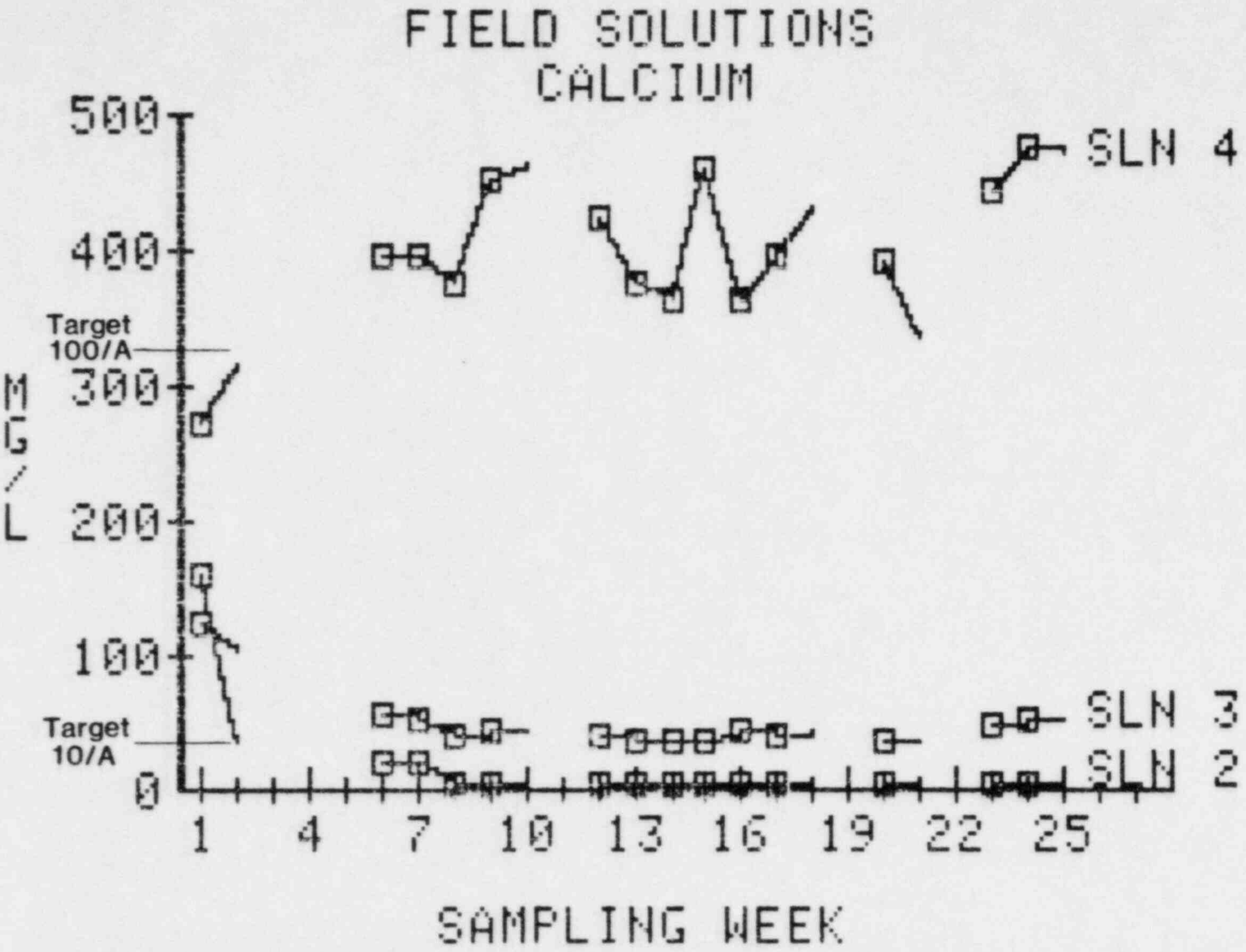
I. FIELD COMPOSITE SOLUTIONS

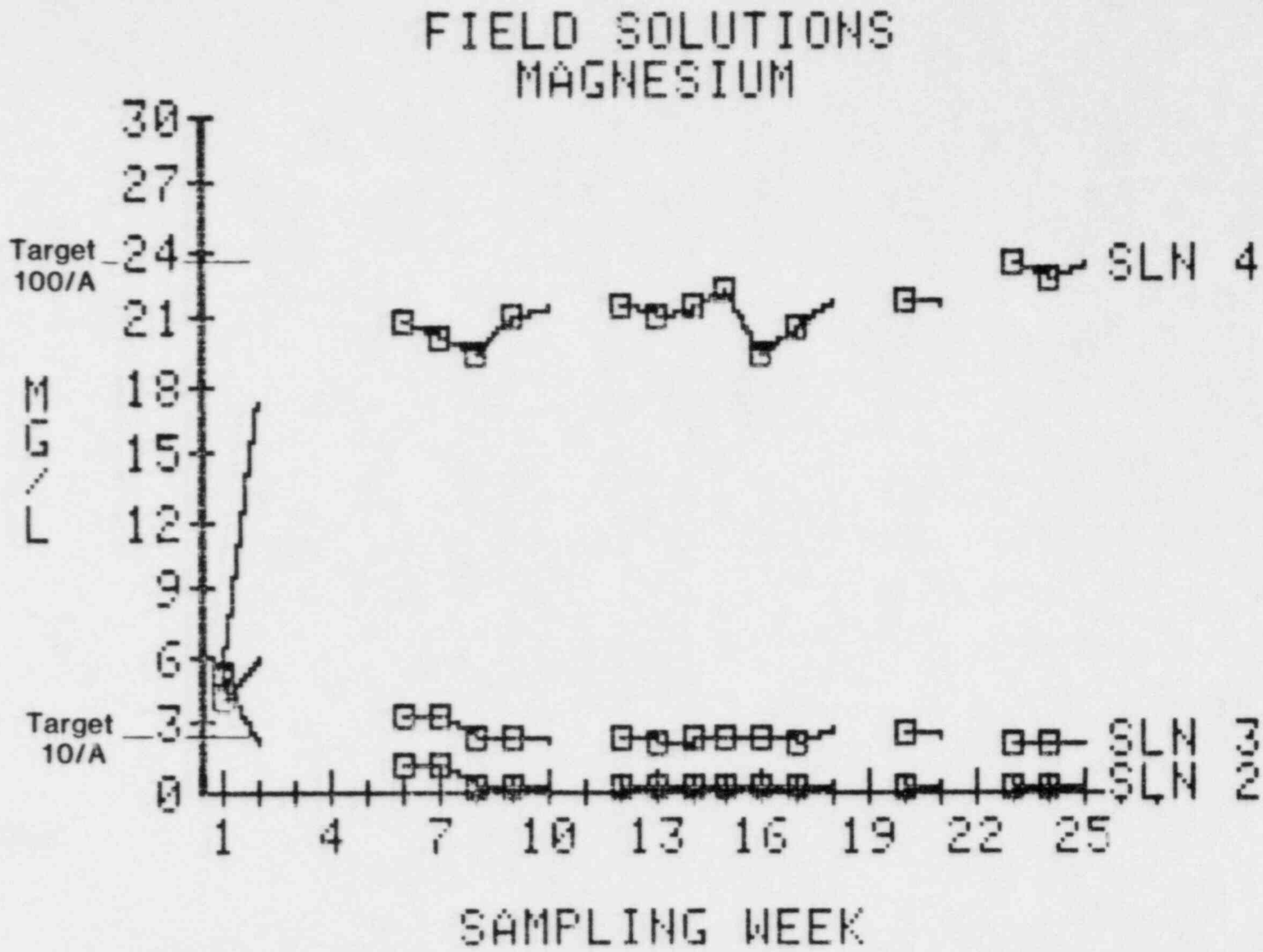
3. Graphs of Concentration versus Sampling Week

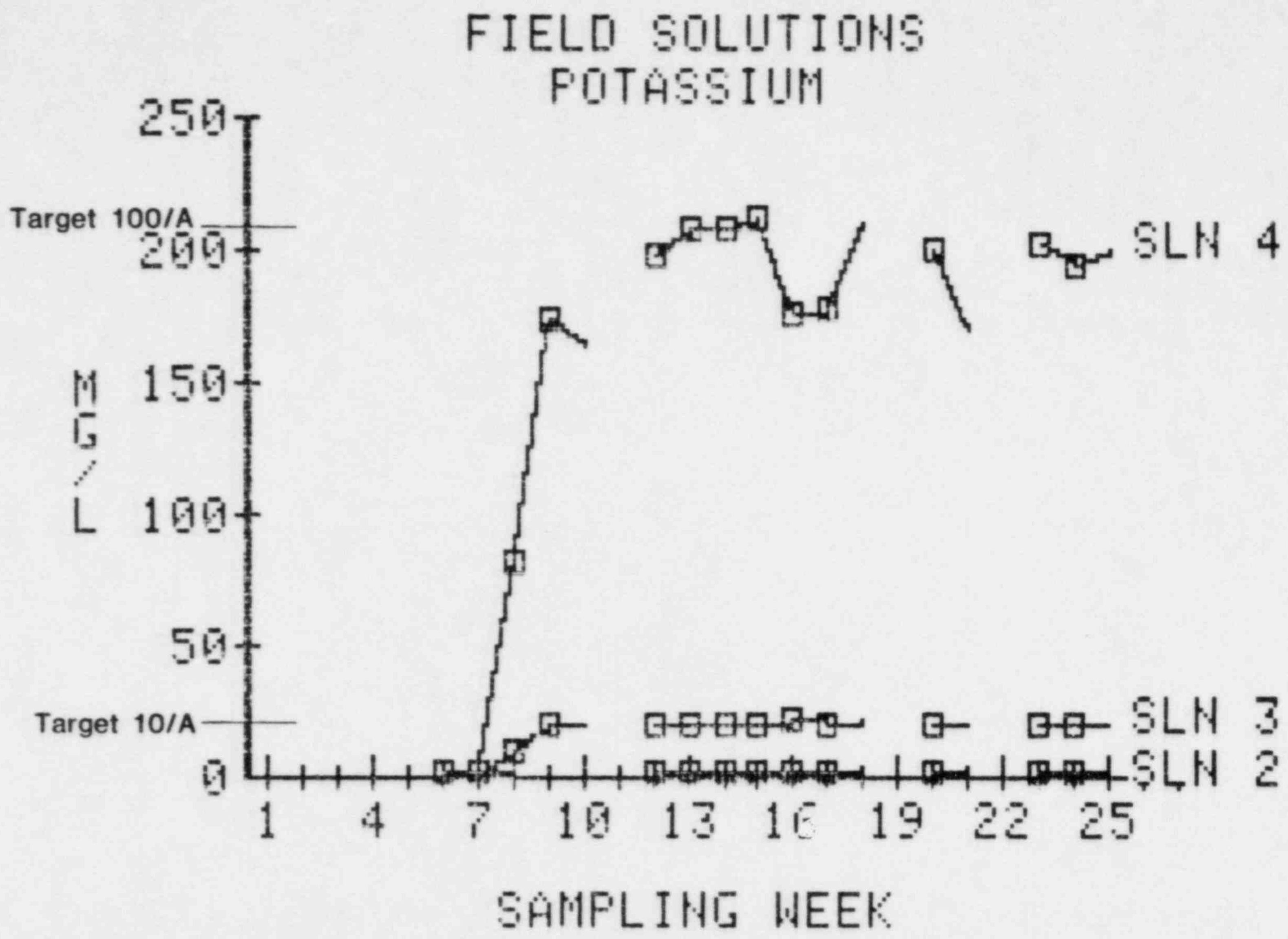
FIELD SOLUTIONS
TOTAL DISSOLVED SALTS

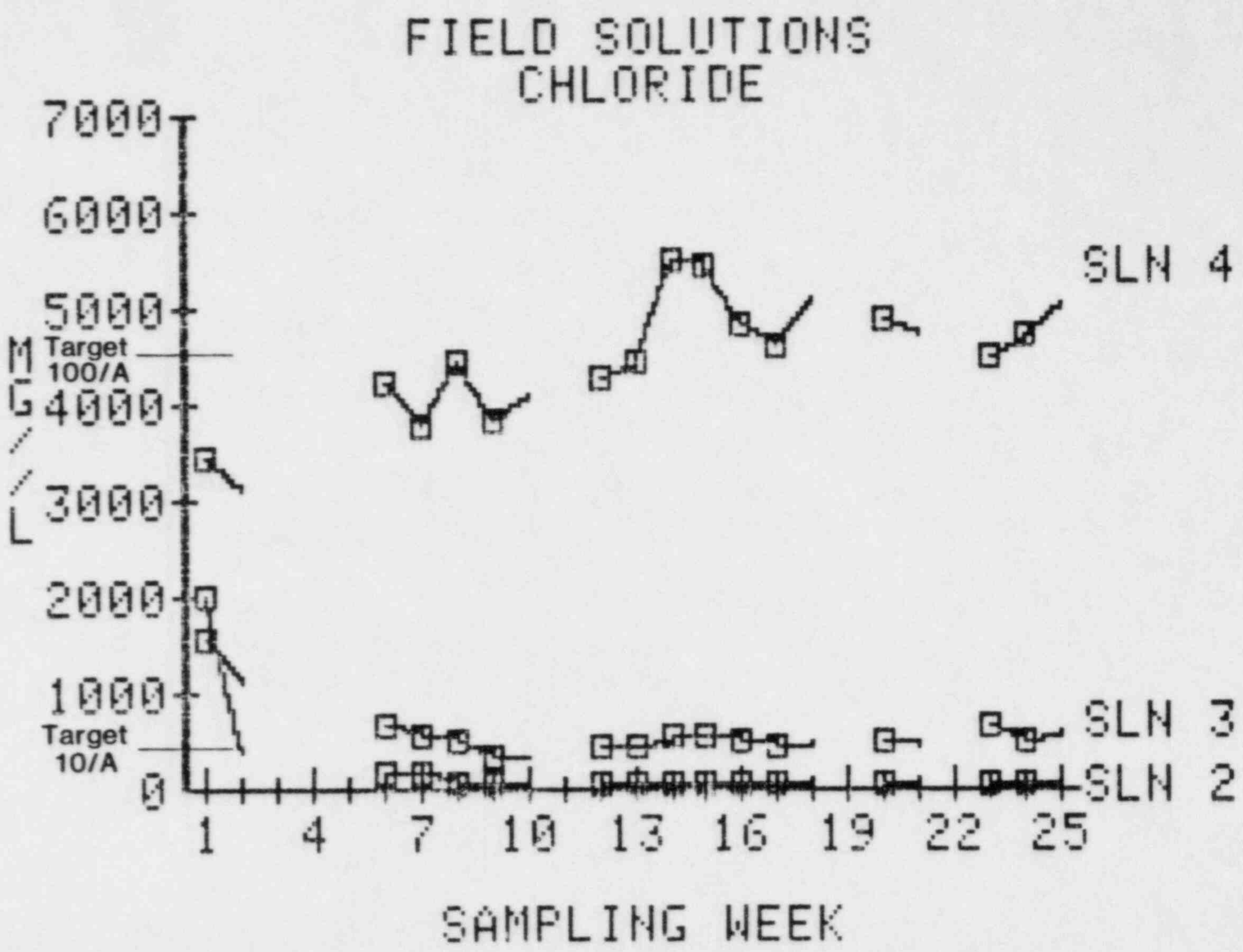


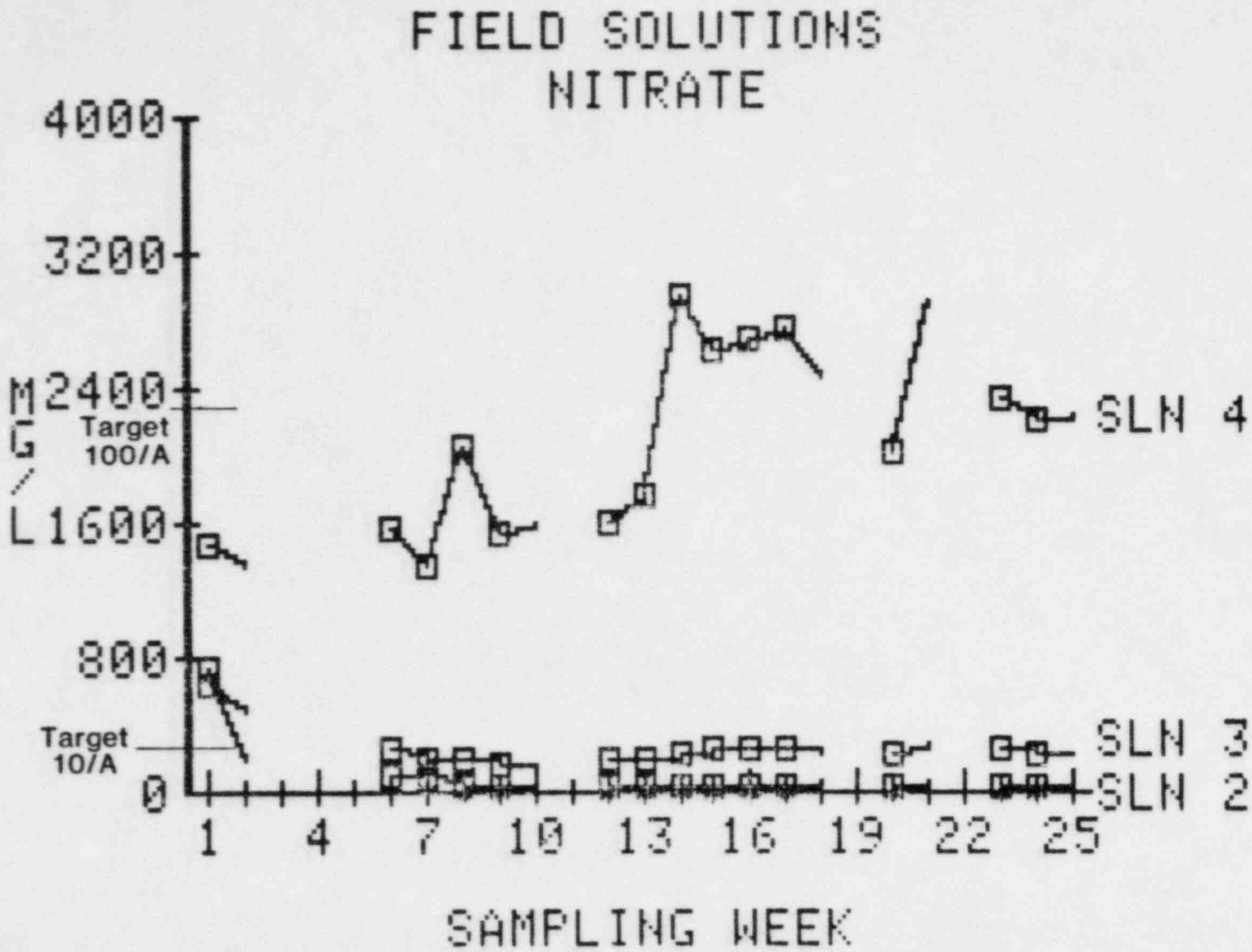

FIELD SOLUTIONS
SODIUM
MG/L
6000
5400
4800
Target 100/A
4200
3600
3000
2400
1800
1200
Target 10/A
600
0
1
4
7
10
13
16
19
22
25
SAMPLING WEEK
SLN 4
SLN 3
SLN 2


FIELD SOLUTIONS
CALCIUM
500
400
Target
100/A
300
M
G
/
L
200
100
Target
10/A
0
1
4
7
10
13
16
19
22
25
SAMPLING WEEK
SLN 4
SLN 3
SLN 2


FIELD SOLUTIONS
MAGNESIUM
MG/L
Target 100/A
Target 10/A
SLN 4
SLN 3
SLN 2
SAMPLING WEEK
30
27
24
21
18
15
12
9
6
3
0
1
4
7
10
13
16
19
22
25

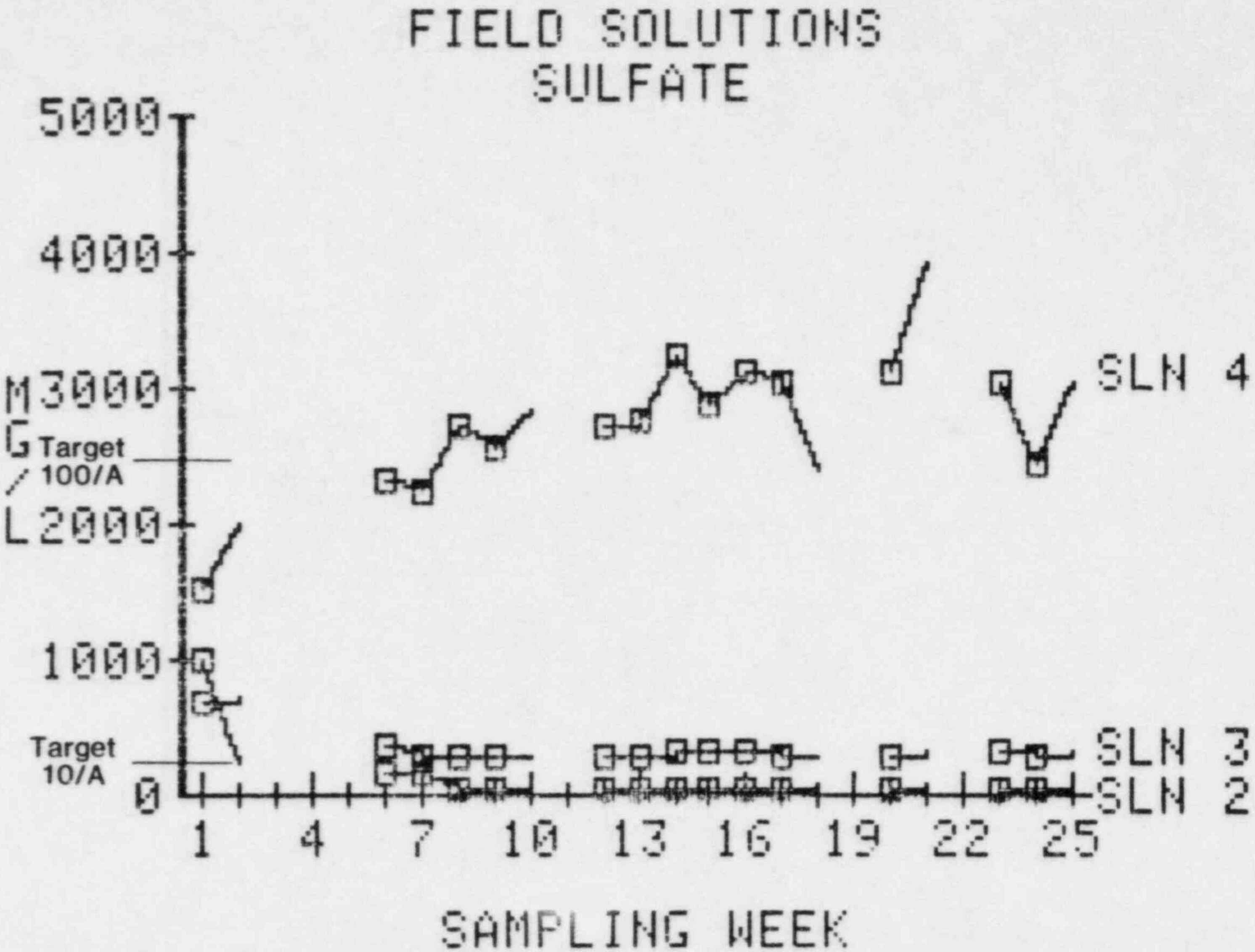

FIELD SOLUTIONS
POTASSIUM
M G / L
250
200
150
100
50
0
Target 100/A
Target 10/A
SLN 4
SLN 3
SLN 2
1
4
7
10
13
16
19
22
25
SAMPLING WEEK


FIELD SOLUTIONS
CHLORIDE
7000
6000
5000
Target
100/A
4000
3000
2000
1000
Target
10/A
0
MG/L
SLN 4
SLN 3
SLN 2
1
4
7
10
13
16
19
22
25
SAMPLING WEEK



FIELD SOLUTIONS
NITRATE
4000
3200
M
2400
G
/
L
1600
800
0
Target
100/A
Target
10/A
SLN 4
SLN 3
SLN 2
1
4
7
10
13
16
19
22
25
SAMPLING WEEK

C-40


FIELD SOLUTIONS
SULFATE
MG/L
Target 100/A
Target 10/A
5000
4000
3000
2000
1000
0
1
4
7
10
13
16
19
22
25
SAMPLING WEEK
SLN 4
SLN 3
SLN 2

II. GREENHOUSE COMPOSITE SOLUTIONS

II. GREENHOUSE COMPOSITE SOLUTIONS

1. Identification of Solutions

GREENHOUSE SOLUTIONS

REQ #	SMP ID	SAMPLING DATES
840121	0-0623	6/23,24,27-28,27,29
	10-0623	6/23-24,27-28,29-30
	100-0623	6/23-24,27-28,29-30
	500-0623	6/23-24,27-28,29-30
	DI0630G	6/30;7/1
840121	0-0705	7/5,7,8
	10-0705	7/5,7
	100-0705	7/5,7
	500-0705	7/5,7
840121	0-0711	7/11,13,15
	10-0708	7/8-11,12-13,15
	100-0708	7/8-11,12-13,15
	500-0708	7/8-11,12-13,15
840121	0-0718	7/18,19,20,21
	10-0719	7/19,20,21
	100-0719	7/19,20,21
	500-0719	7/19,20,21
	1000-0713	7/13-14-15-17,22
840121	0-0726	7/26,27,28
	10-0725	7/25-26,27-28
	100-0725	7/25-26,27-28
	500-0725	7/25-26,27-28
	1000-0725	7/25-26,27-28
840119	0-0802	8/1,3,4,5
	10-0729	7/29-8/1,8/2-3,4,5
	100-0729	7/29-8/1,8/2-3,4,5
	500-0729	7/29-8/1,8/2-3,4,5
	1000-0801	8/1-2-3,4,5
840121	0SH-0808	8/8,9,10,11,12
	0NH-0808	8/8,9,10,11,12
	10-0808	8/8,9,10,11,12
	100-0808	8/8,9,10,11,12
	500-0808	8/8,9,10,11,12
	1000-0808	8/8,9,10,11,12
840119	0SH-0815	8/15,16,17,18,19
	0NH-0815	8/15,16,17,18,19
	10-0815	8/15,16,17,18,19
	100-0815	8/15,16,17,18,19
	500-0815	8/15,16,17,18,19
	1000-0815	8/15,16,17,18,19

GREENHHOUSE SOLUTIONS

RED #	SMP ID	SAMPLING DATES
840121	ØSH-Ø822	8/22,24,25,26
	ØNH-Ø822	8/22,23,24,25,26
	1Ø-Ø822	8/22,23,24,25,26
	1ØØ-Ø822	8/22,23,24,25,26
	5ØØ-Ø822	8/22,23,24,25,26
	1ØØØ-Ø822	8/22,24,25,26
840119	ØSH-Ø829	8/29,30,31;9/1,2
	ØNH-Ø829	8/29,30,31;9/1,2
	1Ø-Ø829	8/29,30,31;9/1,2
	1ØØ-Ø829	8/29,30,31;9/1,2
	5ØØ-Ø829	8/29,30,31;9/1,2
	1ØØØ-Ø829	8/29,30,31;9/1,2
840121	ØSH-Ø906	9/6,8,9
	ØNH-Ø906	9/6,7,8,9
	1Ø-Ø906	9/6,7,8,9
	1ØØ-Ø906	9/6,7,8,9
	5ØØ-Ø906	9/6,7,8,9
	1ØØØ-Ø906	9/6,7,8,9
840141	ØSH-Ø912	9/12,13,14,15,16
	ØNH-Ø912	9/12,13,14,15,16
	1Ø-Ø912	9/12,13,14,15,16
	1ØØ-Ø912	9/12,13,14,15,16
	5ØØ-Ø912	9/12,13,14,15,16
	1ØØØ-Ø912	9/12,13,14,15,16
840141	ØSH-Ø919	9/19,20,21,22,23
	ØNH-Ø919	9/19,20,21,22,23
	1Ø-Ø919	9/19,20,21,22,23
	1ØØ-Ø919	9/19,20,21,22,23
	5ØØ-Ø919	9/19,20,21,22,23
	1ØØØ-Ø919	9/20,21,22,23
840182	ØSH-Ø927	9/27,28,29,30
	ØNH-Ø927	9/27,28,29,30
	1Ø-Ø926	9/26,27,28,29,30
	1ØØ-Ø926	9/26,27,28,29,30
	5ØØ-Ø926	9/26,27,28,29,30
	1ØØØ-Ø926	9/26,27,28,29,30
	Ø-Ø926	9/26(NH)
840182	ØSH-1ØØ3	10/3,4,5,6,7
	ØNH-1ØØ3	10/3,4,5,6,7
	1Ø-1ØØ3	10/3,4,5,6,7
	1ØØ-1ØØ3	10/3,4,5,6,7
	5ØØ-1ØØ3	10/3,4,5,6,7
	1ØØØ-1ØØ3	10/3,4,5,6,7

GREENHOUSE SOLUTIONS

RED #	SMP ID	SAMPLING DATES
840182	0SH-1010	10/10,11,12,13,14
	0NH-1010	10/10,11,12,13,14
	10-1010	10/10,11,12,13,14
	100-1010	10/10,11,12,13,14
	500-1010	10/10,11,12,13,14
	1000-1010	10/10,11,12,13,14
840188	0SH-1017	10/17,18,19,20,21
	0NH-1017	10/17,18,19,20,21
	10-1017	10/17,18,19,20,21
	100-1017	10/17,18,19,20,21
	500-1017	10/17,18,19,20,21
	1000-1017	10/17,18,19,20,21
840241	0SH-1024	10/24,25,26,27,28
	0NH-1024	10/24,26,27,28
	10-1024	10/24,26,27,28
	100-1024	10/24,26,27,28
	500-1024	10/24,26,27,28
	1000-1024	10/24,25,26,27,28
840241	0SH-1031	10/31:11/1,2,3,4
	0NH-1031	10/31:11/1,2,3,4
	10-1031	10/31:11/1,2,3,4
	100-1031	10/31:11/1,2,3,4
	500-1031	10/31:11/1,2,3,4
	1000-1031	10/31:11/1,2,3,4
840241	0SH-1107	11/7,8,9,10
	0NH-1107	11/7,8,9,10
	10-1107	11/7,8,9,10
	100-1107	11/7,8,9,10
	500-1107	11/7,8,9,10
	1000-1107	11/7,8,9,10
840241	0SH-1114	11/14,15,16,17,18
	0NH-1114	11/14,15,16,17,18
	10-1114	11/14,15,16,17,18
	100-1114	11/14,15,16,17,18
	500-1114	11/14,15,16,17,18
	1000-1114	11/14,15,16,17,18

GREENHOUSE SOLUTIONS
SUB-COMPOSITES

SUB-COMP ID	MIXTURE OF
L: Ø	Ø-Ø7Ø5 + Ø-Ø711
1Ø	1Ø-Ø7Ø5 + 1Ø-Ø7Ø8
1ØØ	1ØØ-Ø7Ø5 + 1ØØ-Ø7Ø8
5ØØ	5ØØ-Ø7Ø5 + 5ØØ-Ø7Ø8
M: Ø	Ø-Ø719 + Ø-Ø726
1Ø	1Ø-Ø719 + 1Ø-Ø725
1ØØ	1ØØ-Ø719 + 1ØØ-Ø725
5ØØ	5ØØ-Ø719 + 5ØØ-Ø725
1ØØØ	1ØØØ-Ø713 + 1ØØØ-Ø725
P: ØSH	ØSH-Ø8Ø8 + ØSH-Ø815
ØNH	ØNH-Ø8Ø9 + ØNH-Ø815
1Ø	1Ø-Ø8Ø8 + 1Ø-Ø815
1ØØ	1ØØ-Ø8Ø8 + 1ØØ-Ø815
5ØØ	5ØØ-Ø8Ø8 + 5ØØ-Ø815
1ØØØ	1ØØØ-Ø8Ø8 + 1ØØØ-Ø815
D: ØSH	ØSH-Ø822 + ØSH-Ø829
ØNH	ØNH-Ø822 + ØNH-Ø829
1Ø	1Ø-Ø822 + 1Ø-Ø829
1ØØ	1ØØ-Ø822 + 1ØØ-Ø829
5ØØ	5ØØ-Ø822 + 5ØØ-Ø829
1ØØØ	1ØØØ-Ø822 + 1ØØØ-Ø829
R: ØSH	ØSH-Ø9Ø6 + ØSH-Ø912
ØNH	ØNH-Ø9Ø6 + ØNH-Ø912
1Ø	1Ø-Ø9Ø6 + 1Ø-Ø912
1ØØ	1ØØ-Ø9Ø6 + 1ØØ-Ø912
5ØØ	5ØØ-Ø9Ø6 + 5ØØ-Ø912
1ØØØ	1ØØØ-Ø9Ø6 + 1ØØØ-Ø912
S: ØSH	ØSH-Ø919 + ØSH-Ø927
ØNH	ØNH-Ø919 + ØNH-Ø927
1Ø	1Ø-Ø919 + 1Ø-Ø926
1ØØ	1ØØ-Ø919 + 1ØØ-Ø926
5ØØ	5ØØ-Ø919 + 5ØØ-Ø926
1ØØØ	1ØØØ-Ø919 + 1ØØØ-Ø926

GREENHOUSE SOLUTIONS
SUB-COMPOSITES

SUB-COMP ID	MIXTURE OF
T: ØSH	ØSH-1003 + ØSH-1010
ØNH	ØNH-1003 + ØNH-1010
10	10-1003 + 10-1010
100	100-1003 + 100-1010
500	500-1003 + 500-1010
1000	1000-1003 + 1000-1010
W: ØSH	ØSH-1024 + ØSH-1031
ØNH	ØNH-1024 + ØNH-1031
10	10-1024 + 10-1031
100	100-1024 + 100-1031
500	500-1024 + 500-1031
1000	1000-1024 + 1000-1031
X: ØSH	ØSH-1107 + ØSH-1114
ØNH	ØNH-1107 + ØNH-1114
10	10-1107 + 10-1114
100	100-1107 + 100-1114
500	500-1107 + 500-1114
1000	1000-1107 + 1000-1114

II. GREENHOUSE COMPOSITE SOLUTIONS

2. Analytical Results (expressed as mg/ℓ)

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
Ø-Ø623	.1	Ø	.45	Ø	.32	Ø
DIØ630G	.1	Ø	.45	.023	.16	Ø
Ø-Ø705	1.14	.Ø65	1Ø	.16	.16	.11
Ø-Ø711	.49	Ø	4.64	Ø	.1	Ø
Ø-Ø718	.61	Ø	5.43	.13	.22	Ø
Ø-Ø726	.41	Ø	3.49	.18	Ø	Ø
Ø-Ø8Ø2	.31	Ø	2.51	.14	.11	Ø
Ø-Ø926	Ø	Ø	.27	Ø	Ø	Ø
DETLIM	.Ø4	.Ø4	.Ø2	.Ø2	.Ø5	.Ø3,.2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
0-0623	0	0	0	0	0	5.48
DI0630G	0	0	0	0	0	I.S.
0-0705	8.03	1.73	6.29	0	19	6.55
0-0711	3.56	1.46	2.42	0	68	6.33
0-0718	4.44	1.90	3.57	0	86	6.74
0-0726	2.83	.98	2.42	0	76	7.05
0-0802	2.04	.76	1.58	0	0	I.S.
0-0926	.18	0	.24	0	26	5.86
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
Ø-Ø623	Ø	Ø	Ø	Ø	Ø	Ø
DIØ63ØG	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.
Ø-Ø7Ø5	L Ø	L Ø	L Ø	L Ø	L Ø	L Ø
Ø-Ø711	L Ø	L Ø	L Ø	L Ø	L Ø	L Ø
Ø-Ø718	M Ø	M Ø	M Ø	M Ø	M Ø	M Ø
Ø-Ø726	M Ø	M Ø	M Ø	M Ø	M Ø	M Ø
Ø-Ø8Ø2	Ø	Ø	Ø	Ø	Ø	Ø
Ø-Ø926	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.2	5	.Ø4	.Ø3	.Ø4	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
------	---	---	---	---	---	---
Ø-Ø623	Ø	Ø	Ø	Ø	Ø	Ø
DIØ630G	I.S.	I.S.	I.S.	I.S.	I.S.	I.S.
Ø-Ø705	L Ø	L Ø	L Ø	L Ø	L Ø	L Ø
Ø-Ø711	L Ø	L Ø	L Ø	L Ø	L Ø	L Ø
Ø-Ø718	M Ø	M Ø	M Ø	M Ø	M Ø	M Ø
Ø-Ø726	M Ø	M Ø	M Ø	M Ø	M Ø	M Ø
Ø-Ø8Ø2	Ø	Ø	Ø	Ø	Ø	Ø
Ø-Ø926	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.Ø3	.Ø3	.2	.2	.1	.Ø5

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
Ø-Ø623	Ø	Ø	Ø	Ø	Ø	Ø
DIØ63ØG	Ø	Ø	Ø	I.S.	I.S.	I.S.
Ø-Ø705	Ø	Ø	Ø	L Ø	L Ø	L Ø
Ø-Ø711	Ø	Ø	Ø	L Ø	L Ø	L Ø
Ø-Ø718	Ø	Ø	Ø	M Ø	M Ø	M Ø
Ø-Ø726	Ø	Ø	Ø	M Ø	M Ø	M Ø
Ø-Ø8Ø2	Ø	Ø	Ø	Ø	Ø	Ø
Ø-Ø926	Ø	Ø	Ø	Ø	Ø	Ø
DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	BO3
Ø-Ø623	Ø
DIØ63ØG	.33
Ø-Ø7Ø5	L .44
Ø-Ø711	L .44
Ø-Ø718	M Ø
Ø-Ø726	M Ø
Ø-Ø8Ø2	.33
Ø-Ø926	Ø

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
------	---	---	---	---	---	---
ØSH-Ø8Ø8	.Ø88	Ø	.4	Ø	.17	Ø
ØSH-Ø815	.15	Ø	.63	.Ø4	1	Ø
ØSH-Ø822	.16	Ø	.79	.Ø42	Ø	Ø
ØSH-Ø829	.1	Ø	.46	.Ø7	.2	Ø
ØSH-Ø9Ø6	.43	Ø	122	.15	.Ø82	Ø
ØSH-Ø912	.11	Ø	11.4	.Ø55	Ø	Ø
ØSH-Ø919	.Ø9	Ø	11.7	.Ø35	.Ø4	Ø
ØSH-Ø927	3.7	.21	36.8	1.7	.78	Ø
ØSH-1ØØ3	Ø	Ø	1.12	Ø	Ø	Ø
ØSH-1Ø1Ø	Ø	Ø	.45	Ø	Ø	Ø
ØSH-1Ø17	Ø	Ø	.27	.Ø38	Ø	Ø
ØSH-1Ø24	Ø	Ø	.11	Ø	Ø	.Ø74
ØSH-1Ø31	.12	.Ø31	.52	.13	Ø	Ø
ØSH-11Ø7	Ø	Ø	.11	Ø	Ø	Ø
ØSH-1114	Ø	.Ø52	1.Ø3	.13	Ø	Ø

DETLIM	.Ø4	.Ø4	.Ø2	.Ø2	.Ø5	.Ø3,.2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
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ØSH-Ø8Ø8	.28	Ø	.12	Ø	12	6.Ø7
ØSH-Ø815	.3	Ø	Ø	Ø	8	4.22
ØSH-Ø822	.3Ø	.34	.26	Ø	8Ø	5.66
ØSH-Ø829	.42	Ø	Ø	Ø	34	6.55
ØSH-Ø9Ø6	227	Ø	1.89	Ø	324	6.38
ØSH-Ø912	1Ø.8	Ø	.21	Ø	26	5.91
ØSH-Ø919	11.8	Ø	Ø	Ø	24	5.86
ØSH-Ø927	34.7	19.7	22.6	Ø	152	6.33
ØSH-1ØØ3	1.44	Ø	.34	Ø	24	5.96
ØSH-1Ø1Ø	.4	Ø	.24	Ø	12	5.74
ØSH-1Ø17	.36	.34	.26	Ø	62	3.88
ØSH-1Ø24	.44	6.64	.34	Ø	28	5.96
ØSH-1Ø31	1.27	.46	.47	Ø	3Ø	6.11
ØSH-11Ø7	.27	Ø	Ø	Ø	Ø	5.82
ØSH-1114	1.28	Ø	.48	Ø	Ø	6.Ø7

DETLIM	.Ø5	.15	.1	.25	Ø	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
------	---	---	---	---	---	---
ØSH-Ø8Ø8	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØSH-Ø815	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØSH-Ø822	O Ø	O Ø	O Ø	O Ø	O Ø	O Ø
ØSH-Ø829	O Ø	O Ø	O Ø	O Ø	O Ø	O Ø
ØSH-Ø9Ø6	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØSH-Ø912	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØSH-Ø919	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØSH-Ø927	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØSH-1ØØ3	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØSH-1Ø1Ø	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØSH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØSH-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-11Ø7	X Ø	X Ø	X Ø	X .Ø37	X Ø	X Ø
ØSH-1114	X Ø	X Ø	X Ø	X .Ø37	X Ø	X Ø
DETLIM	.2	5	.Ø4	.Ø3	.Ø4	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
ØSH-Ø8Ø8	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØSH-Ø815	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØSH-Ø822	D Ø	D Ø	D Ø	D Ø	D Ø	D Ø
ØSH-Ø829	D Ø	D Ø	D Ø	D Ø	D Ø	D Ø
ØSH-Ø9Ø6	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØSH-Ø912	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØSH-Ø919	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØSH-Ø927	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØSH-1ØØ3	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØSH-1Ø1Ø	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØSH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØSH-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
ØSH-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
DETLIM	.Ø3	.Ø3	.2	.2	.1	.Ø5

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
ØSH-Ø8Ø8	Ø	Ø	Ø	P Ø	P Ø	P Ø
ØSH-Ø815	Ø	Ø	Ø	P Ø	P Ø	P Ø
ØSH-Ø822	Ø	Ø	Ø	D Ø	D Ø	D Ø
ØSH-Ø829	Ø	Ø	Ø	D Ø	D Ø	D Ø
ØSH-Ø9Ø6	Ø	Ø	Ø	R Ø	R Ø	R Ø
ØSH-Ø912	Ø	Ø	Ø	R Ø	R Ø	R Ø
ØSH-Ø919	Ø	Ø	Ø	S Ø	S Ø	S Ø
ØSH-Ø927	Ø	Ø	Ø	S Ø	S Ø	S Ø
ØSH-1ØØ3	Ø	T Ø	Ø	T Ø	T Ø	T Ø
ØSH-1Ø1Ø	Ø	Ø	Ø	T Ø	T Ø	T Ø
ØSH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØSH-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØSH-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
ØSH-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	BOD
ØSH-Ø8Ø8	F Ø
ØSH-Ø815	F Ø
ØSH-Ø822	D Ø
ØSH-Ø829	D Ø
ØSH-Ø9Ø6	R Ø
ØSH-Ø912	R Ø
ØSH-Ø919	S Ø
ØSH-Ø927	S Ø
ØSH-1ØØ3	T Ø
ØSH-1Ø1Ø	T Ø
ØSH-1Ø17	Ø
ØSH-1Ø24	W Ø
ØSH-1Ø31	W Ø
ØSH-11Ø7	X .33
ØSH-1114	X .33

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
0NH-0808	.14	0	.78	.03	.097	0
0NH-0815	.15	0	.86	.05	.19	0
0NH-0822	.12	0	.34	.034	0	0
0NH-0829	.1	0	.6	.08	.075	0
0NH-0906	.088	0	.67	.054	.05	0
0NH-0912	.052	0	.46	.047	.073	0
0NH-0919	.067	0	.56	0	.04	0
0NH-0927	.095	0	.53	.026	0	0
0NH-1003	.095	0	.67	0	0	0
0NH-1010	.68	0	.51	0	0	0
0NH-1017	0	0	.22	0	0	0
0NH-1024	0	0	.048	0	0	0
0NH-1031	0	0	.19	.079	0	0
0NH-1107	0	0	.082	0	0	0
0NH-1114	.11	0	1.12	.065	0	0
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
ØNH-Ø8Ø8	.54	Ø	.33	Ø	8	6.43
ØNH-Ø815	.66	Ø	.36	Ø	4	5.Ø1
ØNH-Ø822	.55	Ø	Ø	Ø	52	5.9
ØNH-Ø829	.49	.32	.39	Ø	22	5.65
ØNH-Ø9Ø6	.94	Ø	.71	Ø	4	5.95
ØNH-Ø912	.34	Ø	Ø	Ø	8	5.81
ØNH-Ø919	.34	Ø	Ø	Ø	Ø	5.87
ØNH-Ø927	.48	1.37	.48	Ø	6Ø	5.77
ØNH-1ØØ3	.73	Ø	.68	Ø	34	6
ØNH-1Ø1Ø	.38	Ø	.41	Ø	16	6.31
ØNH-1Ø17	.27	.32	.32	Ø	8	4.13
ØNH-1Ø24	Ø	Ø	Ø	Ø	59	6.Ø4
ØNH-1Ø31	.9	Ø	Ø	Ø	4	5.8
ØNH-11Ø7	.14	Ø	.25	Ø	Ø	6.28
ØNH-1114	1.53	.41	.45	Ø	33	5.82
DETLIM	.Ø5	.15	.1	.25	Ø	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
ØNH-Ø8Ø8	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
ØNH-Ø815	F Ø	F Ø	F Ø	F Ø	F Ø	F Ø
ØNH-Ø822	Q Ø	Q Ø	Q Ø	Q Ø	Q Ø	Q Ø
ØNH-Ø829	Q Ø	Q Ø	Q Ø	Q Ø	Q Ø	Q Ø
ØNH-Ø9Ø6	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØNH-Ø912	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØNH-Ø919	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØNH-Ø927	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØNH-1ØØ3	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØNH-1Ø1Ø	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØNH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØNH-1Ø24	W Ø	W Ø	W Ø	W .Ø37	W Ø	W Ø
ØNH-1Ø31	W Ø	W Ø	W Ø	W .Ø37	W Ø	W Ø
ØNH-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
ØNH-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
DETLIM	.2	5	.Ø4	.Ø3	.Ø4	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
ØNH-Ø8Ø8	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØNH-Ø815	P Ø	P Ø	P Ø	P Ø	P Ø	P Ø
ØNH-Ø822	O Ø	O Ø	O Ø	O Ø	O Ø	O Ø
ØNH-Ø829	O Ø	O Ø	O Ø	O Ø	O Ø	O Ø
ØNH-Ø9Ø6	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØNH-Ø912	R Ø	R Ø	R Ø	R Ø	R Ø	R Ø
ØNH-Ø919	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØNH-Ø927	S Ø	S Ø	S Ø	S Ø	S Ø	S Ø
ØNH-1ØØ3	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØNH-1Ø1Ø	T Ø	T Ø	T Ø	T Ø	T Ø	T Ø
ØNH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØNH-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØNH-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØNH-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
ØNH-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
DETLIM	.Ø3	.Ø3	.2	.2	.1	.Ø5

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
ØNH-Ø8Ø8	Ø	Ø	Ø	P Ø	P Ø	P Ø
ØNH-Ø815	Ø	Ø	Ø	P Ø	P Ø	P Ø
ØNH-Ø822	Ø	Ø	Ø	Q Ø	Q Ø	Q Ø
ØNH-Ø829	Ø	Ø	Ø	Q Ø	Q Ø	Q Ø
ØNH-Ø9Ø6	Ø	Ø	Ø	R Ø	R Ø	R Ø
ØNH-Ø912	Ø	Ø	Ø	R Ø	R Ø	R Ø
ØNH-Ø919	Ø	Ø	Ø	S Ø	S Ø	S Ø
ØNH-Ø927	Ø	Ø	Ø	S Ø	S Ø	S Ø
ØNH-1ØØ3	Ø	T Ø	Ø	T Ø	T Ø	T Ø
ØNH-1Ø1Ø	Ø	Ø	Ø	T Ø	T Ø	T Ø
ØNH-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
ØNH-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØNH-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
ØNH-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
ØNH-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø

DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	BO3
ØNH-Ø8Ø8	P Ø
ØNH-Ø815	P Ø
ØNH-Ø822	Q Ø
ØNH-Ø829	Q Ø
ØNH-Ø9Ø6	R Ø
ØNH-Ø912	R Ø
ØNH-Ø919	S Ø
ØNH-Ø927	S Ø
ØNH-1ØØ3	T Ø
ØNH-1Ø1Ø	T Ø
ØNH-1Ø17	Ø
ØNH-1Ø24	W Ø
ØNH-1Ø31	W Ø
ØNH-11Ø7	X Ø
ØNH-1114	X Ø

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
10-0623	9.31	.55	93.4	.12	0	0
10-0705	9.37	.53	97.4	.033	0	0
10-0708	8.9	.47	90.2	.041	0	0
10-0719	8.2	.44	83.1	1.37	.24	0
10-0725	8.14	.44	81.2	3.82	0	0
10-0729	9.44	.44	84.2	4.44	0	0
10-0808	9.49	.46	94.8	3.88	.12	0
10-0815	7.43	.42	89.4	4.34	.13	0
10-0822	7.44	.46	98.6	3.96	.27	0
10-0829	6.87	.45	98.3	4.91	.065	0
10-0906	5.83	.4	192	4.08	.092	0
10-0912	6.09	.4	118	3.83	.18	0
10-0919	8.86	.44	124	3.99	.12	0
10-0926	7.06	.41	128	3.87	0	0
10-1003	7.71	.48	105	4.14	0	0
10-1010	7.84	.43	115	4.12	0	0
10-1017	7.34	.44	126	3.68	.31	0
10-1024	7.63	.48	117	4.39	0	W 0
10-1031	7.18	.44	118	4.09	.054	W 0
10-1107	7.33	.46	112	3.97	0	X 0
10-1114	7.33	.47	140	4.59	0	X 0
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
10-0623	120	32.5	65.6	0	298	5.11
10-0705	108	44	71.8	0	306	I.S.
10-0708	89.5	24.8	61.3	0	280	6.66
10-0719	84.6	41.8	69.1	0	247	6.76
10-0725	95.3	43.5	73	0	260	6.96
10-0729	98	49.8	61.2	0	294	6.93
10-0808	92.2	42.7	61.6	0	280	6.4
10-0815	99.3	43.5	73	0	292	5.71
10-0822	100	45.4	64.7	0	324	6.04
10-0829	120	48.9	84	0	340	5.72
10-0906	101	302	65.2	0	900	6.56
10-0912	112	49.5	65.2	0	316	6.08
10-0919	111	56.1	67.3	0	328	6.23
10-0926	164	41.6	48.3	0	434	6.23
10-1003	121	51.7	61	0	364	6.42
10-1010	146	54.3	68.8	0	344	6.17
10-1017	124	63.6	67.5	.3	354	9.5
10-1024	137	67.8	66.4	0	376	6.23
10-1031	124	44.1	58.2	0	358	6.29
10-1107	124	51.2	62.3	0	332	6.36
10-1114	159	51.2	66.4	0	418	6.04
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
10-0623	0	0	0	0	0	0
10-0705	L 0	L 0	L 0	L .065	L 0	L 0
10-0708	L 0	L 0	L 0	L .065	L 0	L 0
10-0719	M 0	M 0	M 0	M 0	M 0	M 0
10-0725	M 0	M 0	M 0	M 0	M 0	M 0
10-0729	0	0	0	.06	0	0
10-0808	P 0	P 0	P 0	P .065	P 0	P 0
10-0815	P 0	P 0	P 0	P .065	P 0	P 0
10-0822	O 0	O 0	O 0	O .06	O 0	O 0
10-0829	O 0	O 0	O 0	O .06	O 0	O 0
10-0906	R 0	R 0	R 0	R .046	R 0	R 0
10-0912	R 0	R 0	R 0	R .046	R 0	R 0
10-0919	S 0	S 0	S 0	S .065	S 0	S 0
10-0926	S 0	S 0	S 0	S .065	S 0	S 0
10-1003	T 0	T 0	T 0	T .065	T 0	T 0
10-1010	T 0	T 0	T 0	T .065	T 0	T 0
10-1017	0	0	0	0	0	0
10-1024	W 0	W 0	W 0	W .093	W 0	W 0
10-1031	W 0	W 0	W 0	W .093	W 0	W 0
10-1107	X 0	X 0	X 0	X .065	X 0	X 0
10-1114	X 0	X 0	X 0	X .065	X 0	X 0
DETLIM	.2	5	.04	.03	.04	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
10-0623	0	0	0	0	0	0
10-0705	L 0	L 0	L 0	L 0	L 0	L 0
10-0708	L 0	L 0	L 0	L 0	L 0	L 0
10-0719	M 0	M 0	M 0	M 0	M 0	M 0
10-0725	M 0	M 0	M 0	M 0	M 0	M 0
10-0729	0	0	0	0	0	0
10-0808	P 0	P 0	P 0	P 0	P 0	P 0
10-0815	P 0	P 0	P 0	P 0	P 0	P 0
10-0822	O 0	O 0	O 0	O 0	O 0	O 0
10-0829	O 0	O 0	O 0	O 0	O 0	O 0
10-0906	R 0	R 0	R 0	R 0	R 0	R 0
10-0912	R 0	R 0	R 0	R 0	R 0	R 0
10-0919	S 0	S 0	S 0	S 0	S 0	S 0
10-0926	S 0	S 0	S 0	S 0	S 0	S 0
10-1003	T 0	T 0	T 0	T 0	T 0	T 0
10-1010	T 0	T 0	T 0	T 0	T 0	T 0
10-1017	0	0	0	0	0	0
10-1024	W 0	W 0	W 0	W 0	W 0	W 0
10-1031	W 0	W 0	W 0	W 0	W 0	W 0
10-1107	X 0	X 0	X 0	X 0	X 0	X 0
10-1114	X 0	X 0	X 0	X 0	X 0	X 0
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
1Ø-Ø623	.ØØ2	Ø	Ø	Ø	Ø	Ø
1Ø-Ø7Ø5	.ØØ2	Ø	Ø	L Ø	L Ø	L Ø
1Ø-Ø7Ø8	.ØØ2	Ø	Ø	L Ø	L Ø	L Ø
1Ø-Ø719	Ø	Ø	Ø	M Ø	M Ø	M Ø
1Ø-Ø725	Ø	Ø	Ø	M Ø	M Ø	M Ø
1Ø-Ø729	Ø	Ø	Ø	Ø	Ø	Ø
1Ø-Ø8Ø8	Ø	Ø	Ø	P Ø	P Ø	P Ø
1Ø-Ø815	Ø	Ø	Ø	P Ø	P Ø	P Ø
1Ø-Ø822	Ø	Ø	Ø	D Ø	D Ø	D Ø
1Ø-Ø829	Ø	Ø	Ø	D Ø	D Ø	D Ø
1Ø-Ø9Ø6	Ø	Ø	Ø	R Ø	R Ø	R Ø
1Ø-Ø912	Ø	Ø	Ø	R Ø	R Ø	R Ø
1Ø-Ø919	Ø	Ø	Ø	S Ø	S Ø	S Ø
1Ø-Ø926	Ø	Ø	Ø	S Ø	S Ø	S Ø
1Ø-1ØØ3	Ø	T Ø	Ø	T Ø	T Ø	T Ø
1Ø-1Ø1Ø	Ø	Ø	Ø	T Ø	T Ø	T Ø
1Ø-1Ø17	Ø	Ø	Ø	Ø	Ø	Ø
1Ø-1Ø24	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
1Ø-1Ø31	W Ø	W Ø	W Ø	W Ø	W Ø	W Ø
1Ø-11Ø7	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
1Ø-1114	X Ø	X Ø	X Ø	X Ø	X Ø	X Ø
DETLIM	.ØØ1	.ØØ2	.ØØ3	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE		BO3
10-0623		0
10-0705	L	.76
10-0708	L	.76
10-0719	M	0
10-0725	M	0
10-0729		0
10-0808	P	0
10-0815	P	0
10-0822	Q	0
10-0829	Q	0
10-0906	R	0
10-0912	R	.38
10-0919	R	.38
10-0926	S	0
10-1003	T	0
10-1010	T	0
10-1017		0
10-1024	W	0
10-1031	W	0
10-1107	X	.44
10-1114	X	.44

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
100-0623	42.3	4.86	894	.14	0	.32
100-0705	63.5	4.86	856	.12	0	.31
100-0708	71.9	4.34	772	.074	0	.31
100-0719	69	3.82	674	10.6	0	.27
100-0725	63.4	4.6	746	34.8	.49	.28
100-0729	85.6	3.87	732	48.1	.16	.28
100-0808	69	4.6	778	37.6	.2	0
100-0815	59.4	3.43	798	40.6	.26	.64
100-0822	77.4	3.95	765	34.8	.25	.47
100-0829	57.3	3.87	768	43.1	.11	.28
100-0906	84.5	4.08	782	33	.17	.52
100-0912	56.1	3.94	846	39.7	.21	.44
100-0919	82	4.5	935	38.6	.21	.28
100-0926	66.4	4.23	803	34.8	.13	.41
100-1003	68	4.46	821	36.4	.05	.28
100-1010	69.8	4.46	863	37	.084	.35
100-1017	69.4	4.43	884	39.4	.44	.37
100-1024	77.9	3.85	931	43.7	.16	W .43
100-1031	77.9	3.85	929	38.1	.3	W .45
100-1107	80.3	3.85	916	36.8	.1	X .41
100-1114	80.3	3.77	916	36.1	.1	X .41
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
100-0623	1120	325	1060	.98	3000	4.63
100-0705	985	373	611	.78	2850	6.51
100-0708	812	306	542	.67	2570	6.28
100-0719	774	306	578	.49	2520	6.71
100-0725	807	436	572	.49	2520	6.94
100-0729	824	396	579	.59	2680	6.9
100-0808	795	437	496	.51	2690	6.39
100-0815	883	471	595	.89	2750	6.33
100-0822	854	436	604	.73	2760	6.45
100-0829	953	523	633	.87	2770	5.9
100-0906	708	540	458	.76	2530	6.55
100-0912	812	463	620	.60	2630	6.18
100-0919	903	495	641	.70	2920	6.33
100-0926	816	510	565	.74	2790	6.64
100-1003	844	504	589	.86	2880	9.42
100-1010	876	484	612	.76	3000	8.36
100-1017	838	501	541	.82	2930	9.18
100-1024	1100	532	713	.66	3110	6.14
100-1031	1050	544	638	.64	3090	6.29
100-1107	828	427	510	.33	3100	6.24
100-1114	1020	533	603	.86	3130	6.4
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
100-0623	0	8.85	.06	.24	0	0
100-0705	L 0	L 9.73	L .05	L .24	L 0	L 0
100-0708	L 0	L 9.73	L .05	L .24	L 0	L 0
100-0719	M 0	M 7.0	M .052	M .2	M 0	M 0
100-0725	M 0	M 7.0	M .052	M .2	M 0	M 0
100-0729	0	2.67	.05	.19	0	0
100-0808	P 0	P 4.0	P .055	P .22	P 0	P 0
100-0815	P 0	P 4.0	P .055	P .22	P 0	P 0
100-0822	O 0	O 8.09	O .04	O .23	O 0	O 0
100-0829	O 0	O 8.09	O .04	O .23	O 0	O 0
100-0906	R 0	R 7.54	R .04	R .26	R 0	R 0
100-0912	R 0	R 7.54	R .04	R .26	R 0	R 0
100-0919	S 0	S 7.0	S .04	S .22	S 0	S 0
100-0926	S 0	S 7.0	S .04	S .22	S 0	S 0
100-1003	T 0	T 9.19	T .04	T .23	T 0	T 0
100-1010	T 0	T 9.19	T .04	T .23	T 0	T 0
100-1017	0	7.65	0	.065	0	0
100-1024	W 0	W 8.64	W .05	W .27	W 0	W 0
100-1031	W 0	W 8.64	W .05	W .27	W 0	W 0
100-1107	X 0	X 8.09	X .06	X .24	X 0	X 0
100-1114	X 0	X 8.09	X .06	X .24	X 0	X 0
DETLIM	.2	5	.04	.03	.04	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
100-0623	0	0	0	0	.1	0
100-0705	L 0	L 0	L 0	L 0	L .21	L 0
100-0708	L 0	L 0	L 0	L 0	L .21	L 0
100-0719	M 0	M 0	M 0	M 0	M .14	0
100-0725	M 0	M 0	M 0	M 0	M .14	.081
100-0729	0	0	0	0	.1	0
100-0808	P 0	P 0	P 0	P 0	P .14	P .091
100-0815	P 0	P 0	P 0	P 0	P .14	P .091
100-0822	O 0	O 0	O 0	O 0	O 0	O .091
100-0829	O 0	O 0	O 0	O 0	O 0	O .091
100-0906	R 0	R 0	R 0	R 0	R .10	R .081
100-0912	R 0	R 0	R 0	R 0	R .10	R .081
100-0919	S 0	S 0	S 0	S 0	S .10	S .10
100-0926	S 0	S 0	S 0	S 0	S .10	S .10
100-1003	T 0	T 0	T 0	T 0	T .21	T .096
100-1010	T 0	T 0	T 0	T 0	T .21	T .096
100-1017	0	0	0	0	.16	.086
100-1024	W 0	W 0	W 0	W 0	W .14	W .10
100-1031	W 0	W 0	W 0	W 0	W .14	W .10
100-1107	X 0	X 0	X 0	X 0	X .14	X .12
100-1114	X 0	X 0	X 0	X 0	X .14	X .12
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
100-0623	.016	0	0	0	0	0
100-0705	.013	.004	0	L 0	L 0	L 0
100-0708	.016	.004	0	L 0	L 0	L 0
100-0719	.012	.003	0	M 7.96	M 0	M 0
100-0725	.002	0	0	M 7.96	M 0	M 0
100-0729	0	.002	0	0	0	0
100-0808	0	0	0	P 0	P 0	P 0
100-0815	0	.004	0	P 0	P 0	P 0
100-0822	.002	0	0	O 0	O 0	O 0
100-0829	.004	.002	0	O 0	O 0	O 0
100-0906	.001	.006	0	R 0	R 0	R 0
100-0912	.0013	0	0	R 0	R 0	R 0
100-0919	.008	0	0	S 0	S 0	S 0
100-0926	.0054	0	0	S 0	S 0	S 0
100-1003	.0027	T .0037	0	T 8.04	T 0	T 0
100-1010	.001	0	0	T 8.04	T 0	T 0
100-1017	.0027	.005	0	5.38	0	0
100-1024	W .0049	W .0037	W 0	W 0	W 0	W 0
100-1031	W .0049	W .0037	W 0	W 0	W 0	W 0
100-1107	X .0036	X .0037	X 0	X 0	X 0	X 0
100-1114	X .0036	X .0037	X 0	X 0	X 0	X 0
DETLIM	.001	.002	.003	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE		BO3
100-0623		1.42
100-0705	L	1.91
100-0708	L	1.91
100-0719	M	1.20
100-0725	M	1.20
100-0729		1.09
100-0808	P	1.14
100-0815	P	1.14
100-0822	Q	1.31
100-0829	Q	1.31
100-0906	R	1.58
100-0912	R	1.58
100-0919	S	1.31
100-0926	S	1.31
100-1003	T	.65
100-1010	T	.65
100-1017		.65
100-1024	W	1.36
100-1031	W	1.36
100-1107	X	1.31
100-1114	X	1.31

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
500-0623	473	24.5	3980	.11	2.31	1.38
500-0705	433	23.4	3640	.088	2.81	1.3
500-0708	387	20.3	3660	.14	2.64	1.16
500-0719	397	20	3660	61.4	2.86	1.3
500-0725	397	19.8	3390	188	2.13	1.13
500-0729	395	18.3	3190	188	2.5	2.5
500-0808	447	20.3	3270	177	2.34	1.18
500-0815	320	17.1	3540	183	1.31	1.15
500-0822	375	20.8	3900	185	2.3	1.3
500-0829	294	19.3	3840	197	2.49	.82
500-0906	287	21.4	3980	187	1.62	3.15
500-0912	424	18.2	3490	167	2.28	2.1
500-0919	419	15.9	4180	189	3.04	1
500-0926	354	20.1	4140	183	1.74	1.2
500-1003	354	21.1	4200	189	2.36	1.08
500-1010	360	20.8	3900	186	1.83	.98
500-1017	340	21	3530	182	1.35	1.2
500-1024	360	20.4	4330	193	2.29	W 1.40
500-1031	360	20.7	4760	193	1.83	W 1.40
500-1107	355	20.8	4490	190	1.94	X 1.50
500-1114	355	21	4660	190	2.35	X 1.50
DETLIM	.04	.04	.02	.02	.05	.03,.2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
500-0623	5650	1540	2560	4.63	15100	5.65
500-0705	5000	2420	2570	4.25	14600	6.71
500-0708	3910	1540	2300	3.60	12800	6.55
500-0719	4509	2310	2420	3.11	13200	6.84
500-0725	4170	1930	2340	2.13	13500	7.11
500-0729	4170	1670	2540	2.22	13500	6.71
500-0808	4100	1670	2470	2.71	13400	6.85
500-0815	4140	1670	2540	2.11	13900	6.18
500-0822	4250	2010	2650	3.14	13800	7.48
500-0829	4710	2550	2900	3.38	13900	6.48
500-0906	4610	2400	2720	2.79	15100	6.86
500-0912	4290	2430	2790	3.56	14800	6.8
500-0919	4420	2540	2790	2.71	14900	7.04
500-0926	4450	2550	2690	2.96	14500	6.86
500-1003	4490	2260	2930	3.06	14400	7.46
500-1010	4600	2230	2720	3.12	15100	7.09
500-1017	4660	2880	2930	3.05	15300	9.03
500-1024	4790	2560	2850	3.15	15400	6.59
500-1031	4710	2730	3060	4.76	15500	6.68
500-1107	4500	2950	3240	3.29	15300	6.72
500-1114	5300	2930	2970	5.06	15400	6.71
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
500-0623	.23	34.8	.29	1.15	.045	Ø
500-0705	L .42	L 29.4	L .17	L 1.00	L .048	L Ø
500-0708	L .42	L 29.4	L .17	L 1.00	L .048	L Ø
500-0719	M .36	M 44.1	M .33	M 1.00	M .04	M Ø
500-0725	M .36	M 44.1	M .33	M 1.00	M .04	M Ø
500-0729	Ø	24.9	.22	.84	Ø	Ø
500-0808	P .34	P 41.4	P .22	P .88	P .04	P Ø
500-0815	P .34	P 41.4	P .22	P .88	P .04	P Ø
500-0822	O Ø	O 33.6	O .11	O .82	O .04	O Ø
500-0829	O Ø	O 33.6	O .11	O .82	O .04	O Ø
500-0906	R .34	R 31.0	R .14	1.49	R .045	R Ø
500-0912	R .34	R 31.0	R .14	1.04	R .045	R Ø
500-0919	S Ø	S 37.1	S .10	S .76	S .04	S .60
500-0926	S Ø	S 37.1	S .10	S .76	S .04	S .60
500-1003	T Ø	T 35.4	T .10	T .80	T Ø	T Ø
500-1010	T Ø	T 35.4	T .10	T .80	T Ø	T Ø
500-1017	Ø	40.6	.091	.091	Ø	Ø
500-1024	W Ø	W 32.0	W .14	W .90	W .045	W Ø
500-1031	W Ø	W 32.0	W .14	W .90	W .045	W Ø
500-1107	X Ø	X 33.7	X .11	X .88	X Ø	X Ø
500-1114	X Ø	X 33.7	X .11	X .88	X Ø	X Ø
DETLIM	.2	5	.04	.03	.04	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
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500-0623	.056	0	0	.29	.25	0
500-0705	L .054	L 0	L .24	L 0	L .33	L 0
500-0708	L .054	L 0	L .24	L 0	L .33	L 0
500-0719	M .062	M 0	M 0	M 0	M .52	.16
500-0725	M .062	M 0	M 0	M 0	M .52	.46
500-0729	.045	0	0	0	.57	.53
500-0808	P .037	P 0	P 0	P 0	P .48	P .51
500-0815	P .037	P 0	P 0	P 0	P .48	P .51
500-0822	Q .041	Q 0	Q 0	Q 0	Q .48	Q .49
500-0829	Q .041	Q 0	Q 0	Q 0	Q .48	Q .49
500-0906	R .030	R 0	R 0	R 0	R .35	R .48
500-0912	R .030	R 0	R 0	R 0	R .35	R .48
500-0919	S .037	S 0	S 0	S 0	S .46	S .49
500-0926	S .037	S 0	S 0	S 0	S .46	S .49
500-1003	T .045	T 0	0	T 0	T .61	T .51
500-1010	T .045	T 0	0	T 0	T .61	T .51
500-1017	.03	0	0	0	.46	.51
500-1024	W .037	W 0	W 0	W 0	W .76	W .53
500-1031	W .037	W 0	W 0	W 0	W .76	W .53
500-1107	X .058	X 0	X 0	X 0	X .76	X .49
500-1114	X .058	X 0	X 0	X 0	X .76	X .49
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
500-0623	.065	0	0	0	0	0
500-0705	.096	.022	0	L 7.34	L 0	L 0
500-0708	.099	.016	0	L 7.34	L 0	L 0
500-0719	.071	.02	0	M 20.4	M 0	M 0
500-0725	.014	.019	0	M 20.4	M 0	M 0
500-0729	.014	.019	0	31	0	0
500-0808	.012	.014	0	P 30.9	P 0	P 0
500-0815	.015	.019	0	P 30.9	P 0	P 0
500-0822	.013	.02	0	Q 27.7	Q 0	Q 0
500-0829	.012	.013	0	Q 27.7	Q 0	Q 0
500-0906	.016	.017	0	R 21.4	R 0	R 0
500-0912	.013	.014	0	R 21.4	R 0	R 0
500-0919	.016	.012	0	S 40.6	S 0	S 0
500-0926	.014	.017	0	S 40.6	S 0	S 0
500-1003	.018	T .0084	0	T 60.1	T 0	T 0
500-1010	.014	.014	0	T 60.1	T 0	T 0
500-1017	.015	.0092	0	15.8	0	0
500-1024	W .019	W .0092	W 0	W 8.68	W 0	W 0
500-1031	W .019	W .0092	W 0	W 8.68	W 0	W 0
500-1107	X .018	X .0084	X 0	X 5.33	X 0	X 0
500-1114	X .018	X .0084	X 0	X 5.33	X 0	X 0
DETLIM	.001	.002	.003	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE		BO3
500-0623		7.89
500-0705	L	6.53
500-0708	L	6.53
500-0719	M	7.46
500-0725	M	7.46
500-0729		6.48
500-0808	P	9.09
500-0815	P	9.09
500-0822	Q	7.24
500-0829	Q	7.24
500-0906	R	6.32
500-0912	R	6.32
500-0919	S	6.64
500-0926	S	6.64
500-1003	T	6.59
500-1010	T	6.59
500-1017		6.21
500-1024	W	6.21
500-1031	W	6.21
500-1107	X	7.24
500-1114	X	7.24

DETLIM .27

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CA	MG	NA	K	NH4	F
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1000-0713	872	50.4	6710	.97	7.84	2.55
1000-0725	988	46.3	8340	414	5.78	2
1000-0801	961	39.4	8680	423	6.91	1.9
1000-0808	946	49.4	7740	422	7.02	1.7
1000-0815	806	42.3	8990	418	5.27	4
1000-0822	793	47.7	8110	422	5.32	2.1
1000-0829	728	45.2	9790	458	7.98	2
1000-0906	811	50.4	9950	446	6.51	7
1000-0912	938	46	9800	427	5.86	1.8
1000-0919	931	48.3	10100	434	5.65	2.2
1000-0926	864	48	9640	434	4.41	1.85
1000-1003	814	47.8	9140	429	4.36	2.5
1000-1010	845	49.4	8640	438	5.84	1.25
1000-1017	822	48.3	6940	434	4.37	3.9
1000-1024	864	50.9	10900	441	4.53	W 2.55
1000-1031	847	48.2	10500	415	4.19	W 2.55
1000-1107	873	48.6	11000	415	4.43	X 2.90
1000-1114	967	47.4	10500	415	5.35	X 2.90
DETLIM	.04	.04	.02	.02	.05	.03..2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CL	NO3	SO4	PO4	TDS	PH
1000-0713	8070	5800	5080	5.42	30400	8
1000-0725	9600	4800	5700	5.78	31800	6.38
1000-0801	10400	4600	6180	5.06	32600	I.S.
1000-0808	9930	4160	6180	5.60	32900	7.66
1000-0815	9760	4380	6180	4.89	33200	6.46
1000-0822	9600	4600	6180	5.32	33400	7.35
1000-0829	10025	6210	5550	7.98	35200	7
1000-0906	11950	6500	6200	5.39	35500	7.57
1000-0912	9240	6240	6900	8.01	34900	I.S.
1000-0919	10100	6520	5900	7.16	34700	7.32
1000-0926	10300	5960	5440	6.82	33900	7.48
1000-1003	9400	6540	6500	6.61	34000	7.47
1000-1010	10100	5680	6530	6.44	34500	7.48
1000-1017	10900	5560	6770	7.00	36300	7.34
1000-1024	11900	6400	7230	5.74	36400	7.26
1000-1031	12300	5300	7480	6.42	36600	7.23
1000-1107	10700	5730	5820	4.76	36300	7.21
1000-1114	10700	5700	6170	10.6	38400	7.14
DETLIM	.05	.15	.1	.25	0	-

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	FE	SI	CU	ZN	AG	BA
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1000-0713	1.84	M 91.4	M .77	M 2.36	M .099	M .77
1000-0725	1.76	M 91.4	M .77	M 2.36	M .099	M .77
1000-0801	.93	107	.67	1.49	.099	1.3
1000-0808	P .45	P 86.2	P .57	P 1.32	P .063	P .83
1000-0815	P .45	P 86.2	P .57	P 1.32	P .063	P .83
1000-0822	Q 0	Q 80.9	Q .26	Q 1.21	Q .063	Q .60
1000-0829	Q 0	Q 80.9	Q .26	Q 1.21	Q .063	Q .60
1000-0906	R .64	R 73.0	R .37	1.21	R .099	R .65
1000-0912	R .64	R 73.0	R .37	1.52	R .099	R .65
1000-0919	S .41	S 90.2	S .20	S 1.44	S .069	S 1.06
1000-0926	S .41	S 90.2	S .20	S 1.44	S .069	S 1.06
1000-1003	T .41	T 79.9	T .16	.89	T .075	T .83
1000-1010	T .41	T 79.9	T .16	.98	T .075	T .83
1000-1017	.37	81.4	.16	1.46	.069	.68
1000-1024	W .44	W 78.2	W .19	W 1.42	W .063	W .77
1000-1031	W .44	W 78.2	W .19	W 1.42	W .063	W .77
1000-1107	X .34	X 66.2	X .19	X 1.62	X .069	X .89
1000-1114	X .34	X 66.2	X .19	X 1.62	X .069	X .89
DETLIM	.2	5	.04	.03	.04	.6

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	CD	CR	PB	BE	MN	SR
1000-0713	M .088	M .11	M .36	M .42	M .80	.081
1000-0725	M .088	M .11	M .36	M .42	M .80	.92
1000-0801	.078	.041	.44	0	1.1	.99
1000-0808	P .10	P .073	P .31	P 0	P 1.08	P .98
1000-0815	P .10	P .073	P .31	P 0	P 1.08	P .98
1000-0822	Q .094	Q .073	Q .33	Q 0	Q 1.08	Q 1.02
1000-0829	Q .094	Q .073	Q .33	Q 0	Q 1.08	Q 1.02
1000-0906	R .098	R .062	R .28	R .33	R 1.08	R .97
1000-0912	R .098	R .062	R .28	R .33	R 1.08	R .97
1000-0919	S .088	S 0	S .29	S 0	S 1.04	S .99
1000-0926	S .080	S 0	S .29	S 0	S 1.04	S .99
1000-1003	T .10	T .062	T .32	T 0	T 1.19	T .99
1000-1010	T .10	T .062	T .32	T 0	T 1.19	T .99
1000-1017	.082	.052	.34	0	1.51	1.03
1000-1024	W .098	W .041	W .29	W 0	W 1.64	W 1.04
1000-1031	W .098	W .041	W .29	W 0	W 1.64	W 1.04
1000-1107	X .10	X 0	X .26	X 0	X 1.91	X 1.02
1000-1114	X .10	X 0	X .26	X 0	X 1.91	X 1.02
DETLIM	.03	.03	.2	.2	.1	.05

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

SAMPLE	AS	SE	HG	HCO3	I	PHEN
1000-0713	.25	.033	0	M 56.8	M 0	M 0
1000-0725	.12	.038	0	M 56.8	M 0	M 0
1000-0801	.069	.038	0	60.4	0	0
1000-0808	.03	.037	0	P 75.0	P 0	P 0
1000-0815	.032	.04	0	P 75.0	P 0	P 0
1000-0822	.028	.039	0	Q 63.4	Q 0	Q 0
1000-0829	.033	.036	0	Q 63.4	Q 0	Q 0
1000-0906	.029	.03	0	R 74.8	R 0	R 0
1000-0912	.033	.044	0	R 74.8	R 0	R 0
1000-0919	.032	.043	0	S 51.8	S 0	S 0
1000-0926	.034	.043	0	S 51.8	S 0	S 0
1000-1003	.039	T .022	0	T 132	T 0	T 0
1000-1010	.038	.047	0	T 132	T 0	T 0
1000-1017	.038	.027	0	80	0	0
1000-1024	W .038	W .024	W 0	W 14.8	W 0	W 0
1000-1031	W .038	W .024	W 0	W 14.8	W 0	W 0
1000-1107	X .049	X .027	X 0	X 31.5	X 0	X 0
1000-1114	X .049	X .027	X 0	X 31.5	X 0	X 0

DETLIM	.001	.002	.003	5	5	2

I.S. INSUFFICIENT SAMPLE

GREENHOUSE SOLUTIONS

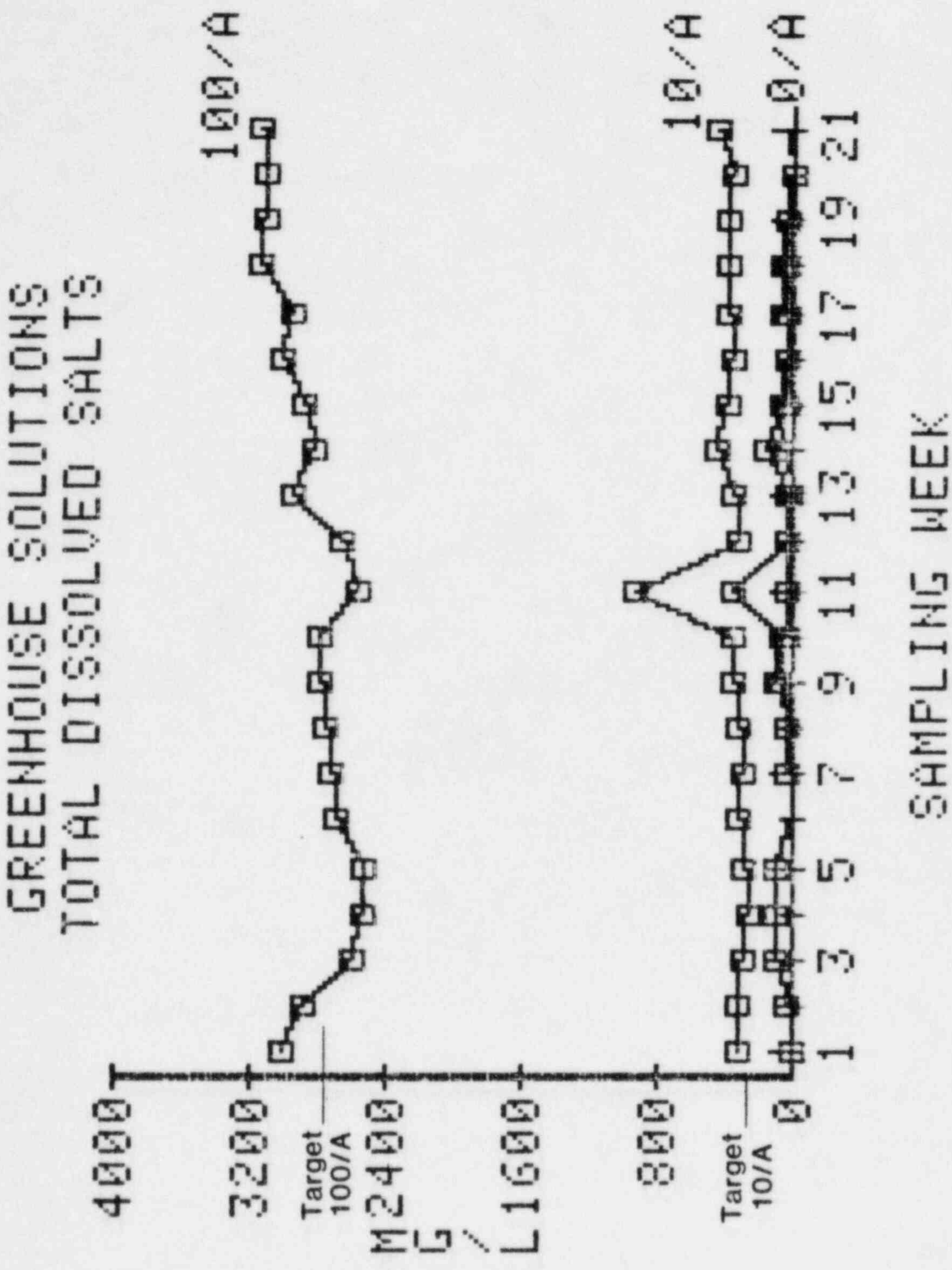
SAMPLE	BO3
1000-0713	M 10.9
1000-0725	M 10.9
1000-0801	14
1000-0808	P 14.3
1000-0815	P 14.3
1000-0822	Q 16.8
1000-0829	Q 16.8
1000-0906	R 14.0
1000-0912	R 14.0
1000-0919	S 11.1
1000-0926	S 11.1
1000-1003	T 11.3
1000-1010	T 11.3
1000-1017	11.1
1000-1024	W 10.6
1000-1031	W 10.6
1000-1107	X 13.1
1000-1114	X 13.1

DETLIM .27

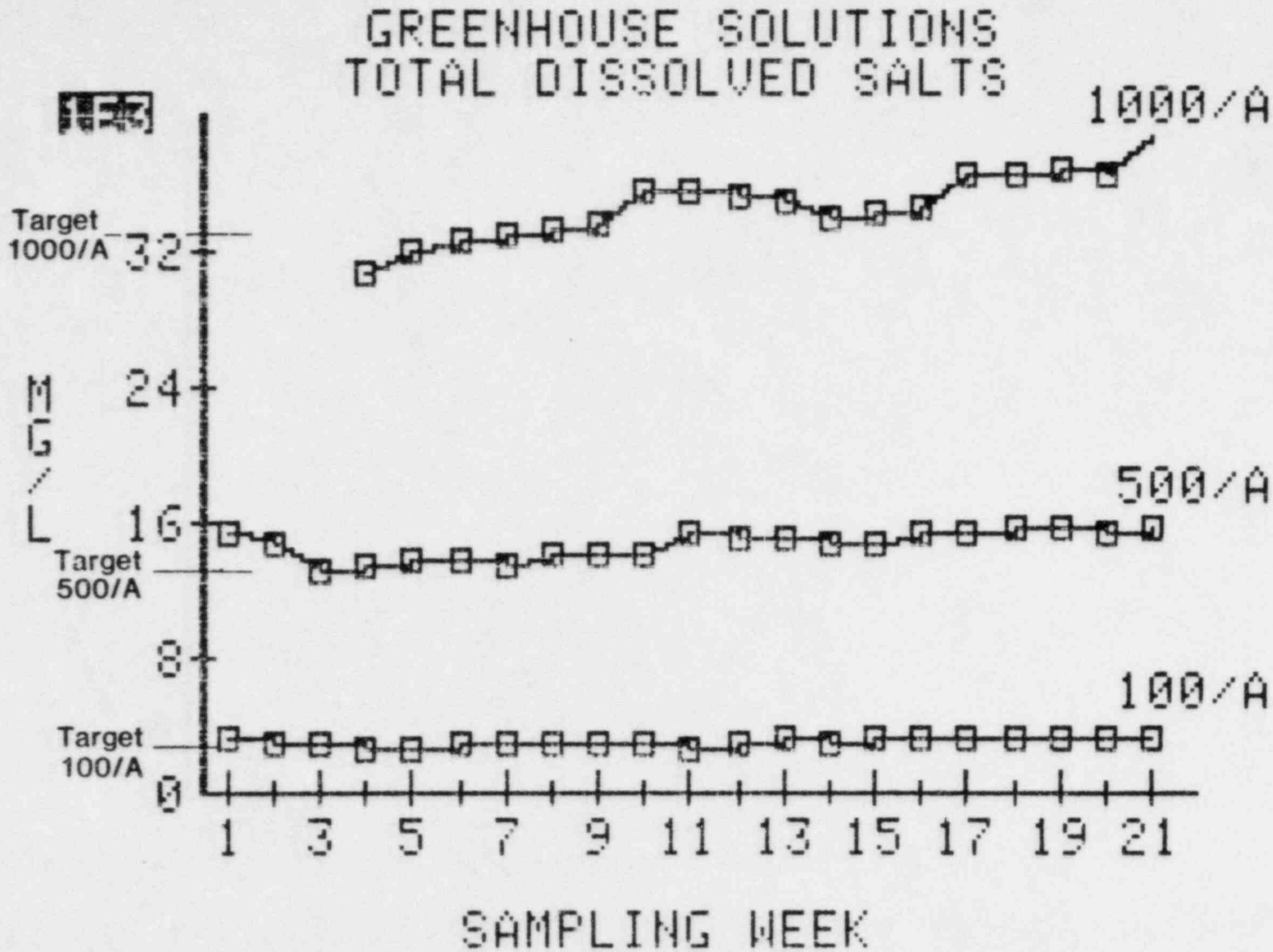
I.S. INSUFFICIENT SAMPLE

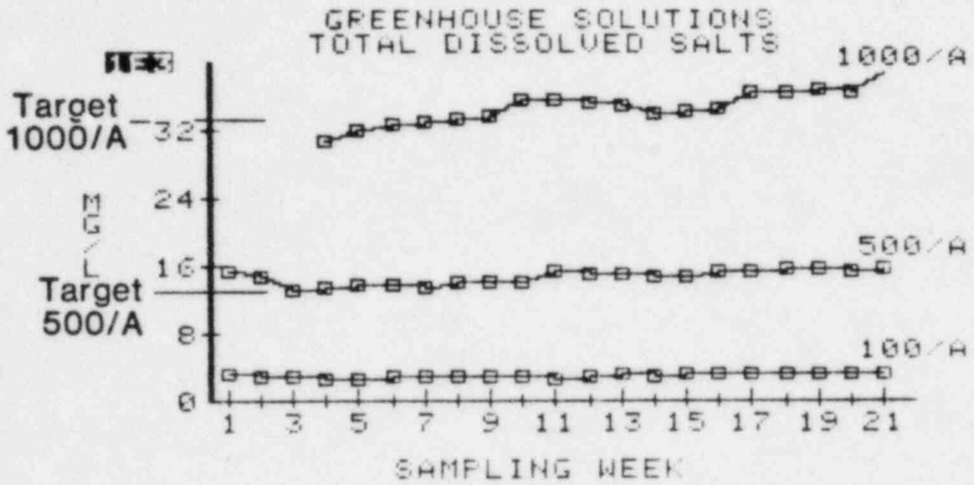
II. GREENHOUSE COMPOSITE SOLUTIONS

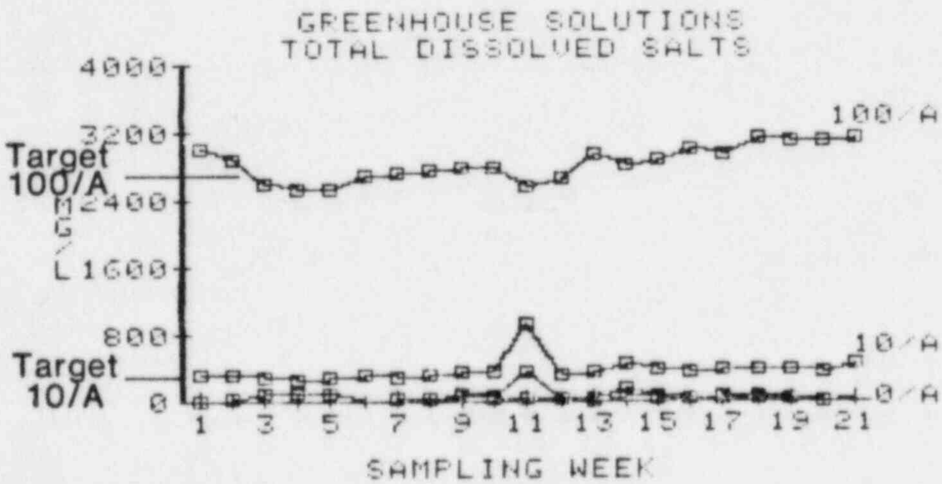
3. Graphs of Concentration versus Sampling Week

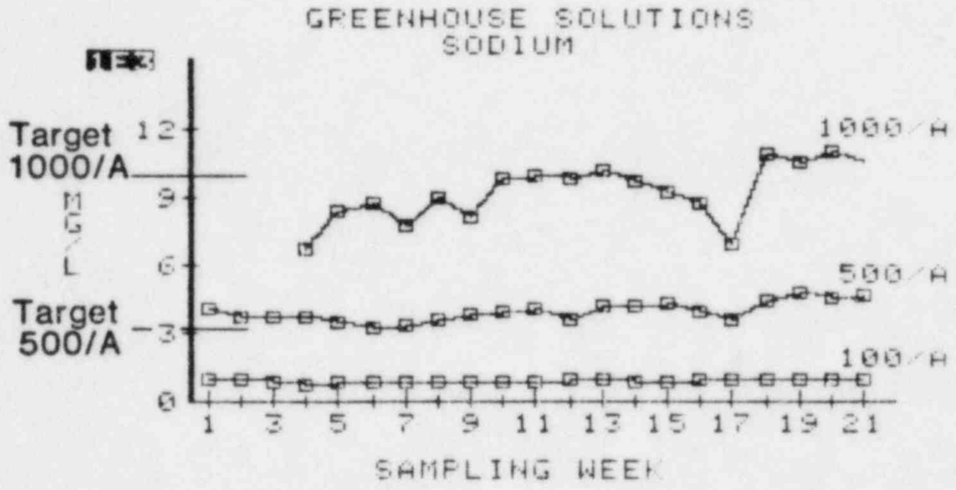


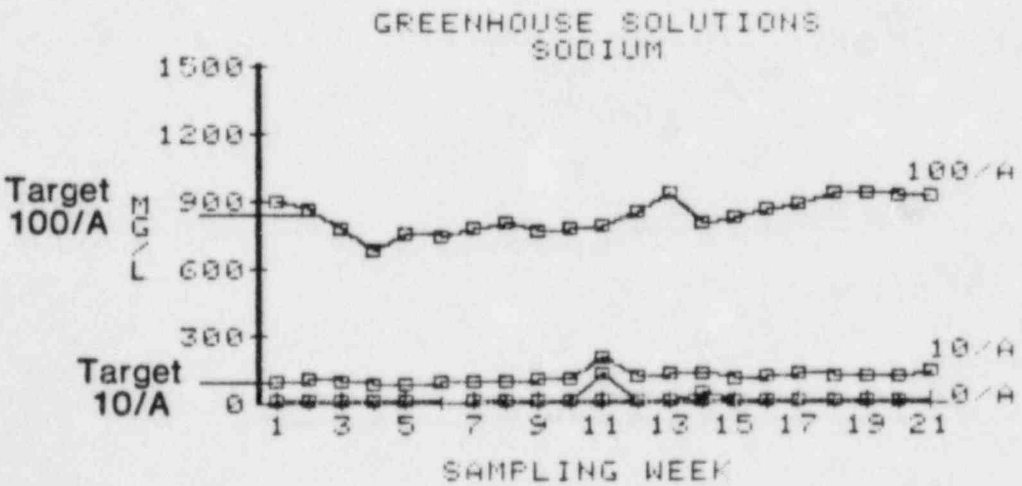
GREENHOUSE SOLUTIONS
TOTAL DISSOLVED SALTS
4000
3200
Target 100/A
2400
1600
800
Target 10/A
0
MG/L
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK
100/A
10/A
0/A

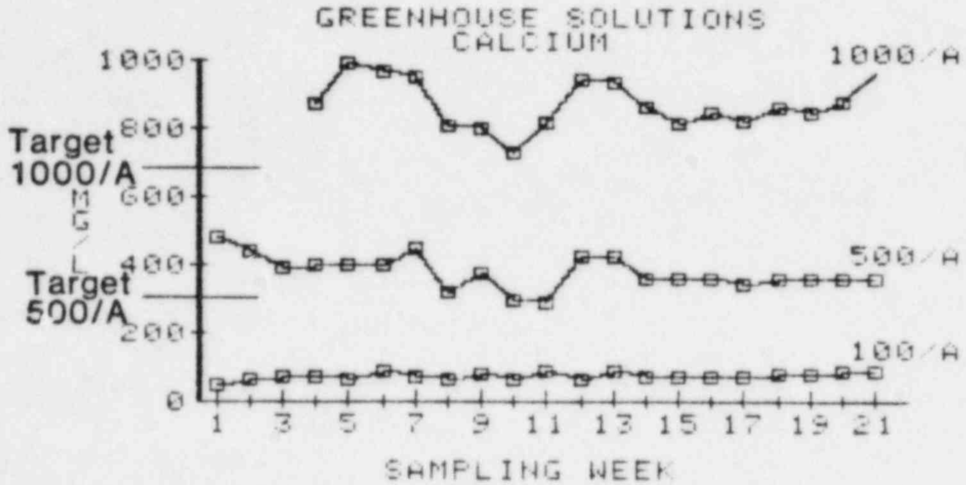

GREENHOUSE SOLUTIONS
TOTAL DISSOLVED SALTS
1000/A
500/A
100/A
Target 1000/A
Target 500/A
Target 100/A
32
24
16
8
0
M G / L
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
TOTAL DISSOLVED SALTS
1000/A
500/A
100/A
Target 1000/A
Target 500/A
MG/L
32
24
16
8
0
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK

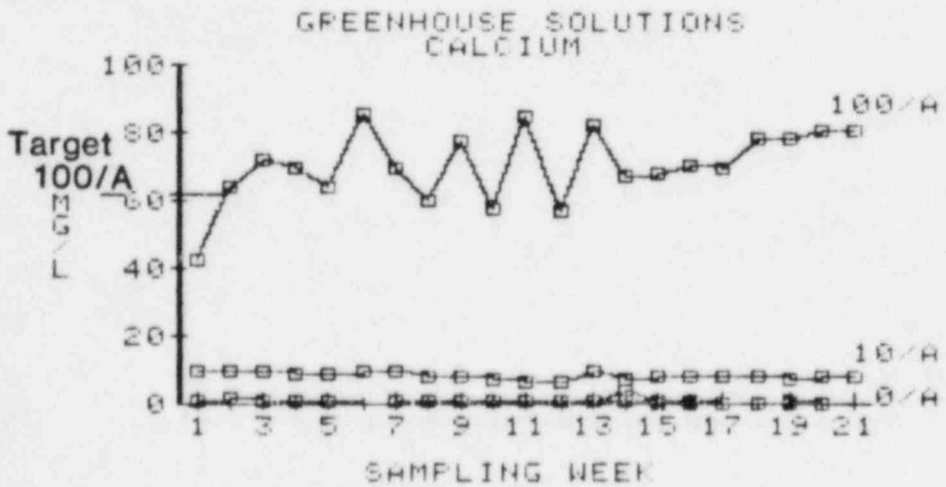

GREENHOUSE SOLUTIONS
TOTAL DISSOLVED SALTS
100/A
10/A
0/A
Target 100/A
Target 10/A
MG/L
4000
3200
2400
1600
800
0
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
SODIUM
Target 1000/A
Target 500/A
MG/L
SAMPLING WEEK
1000/A
500/A
100/A

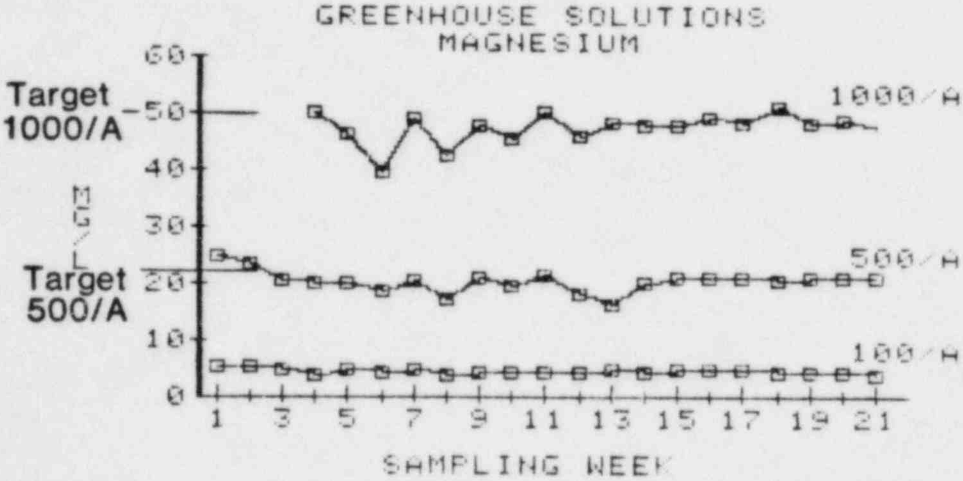

GREENHOUSE SOLUTIONS
SODIUM
Target 100/A
Target 10/A
MG/L
SAMPLING WEEK
100/A
10/A
0/A

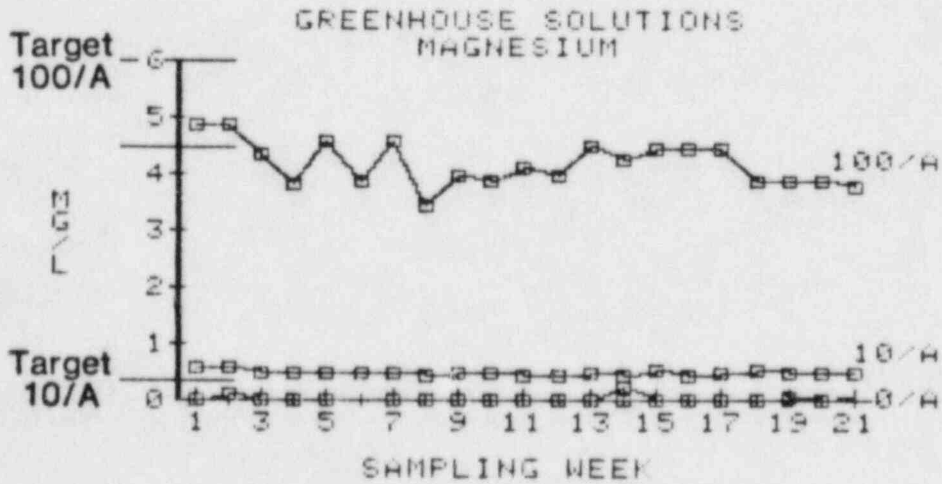


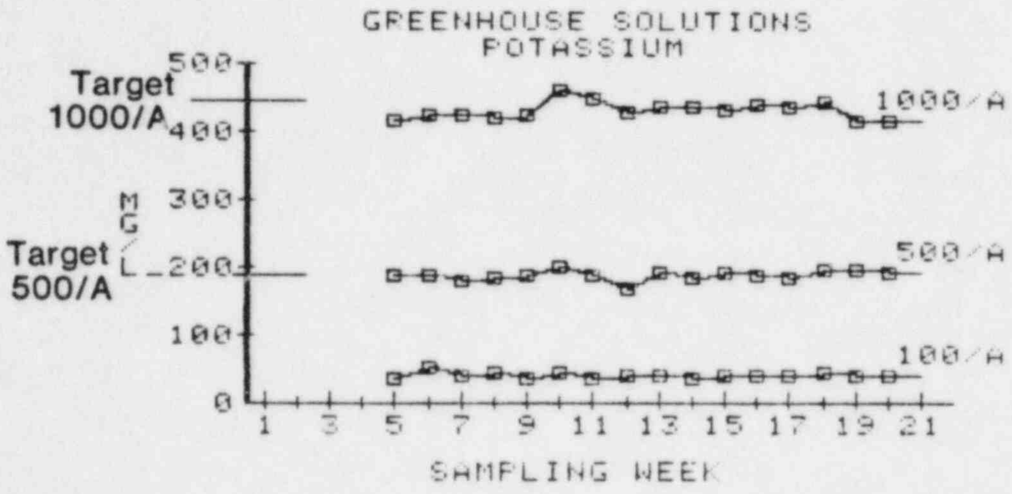
GREENHOUSE SOLUTIONS
CALCIUM
1000
800
600
400
200
0
Target
1000/A
Target
500/A
MG/L
1000/A
500/A
100/A
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK



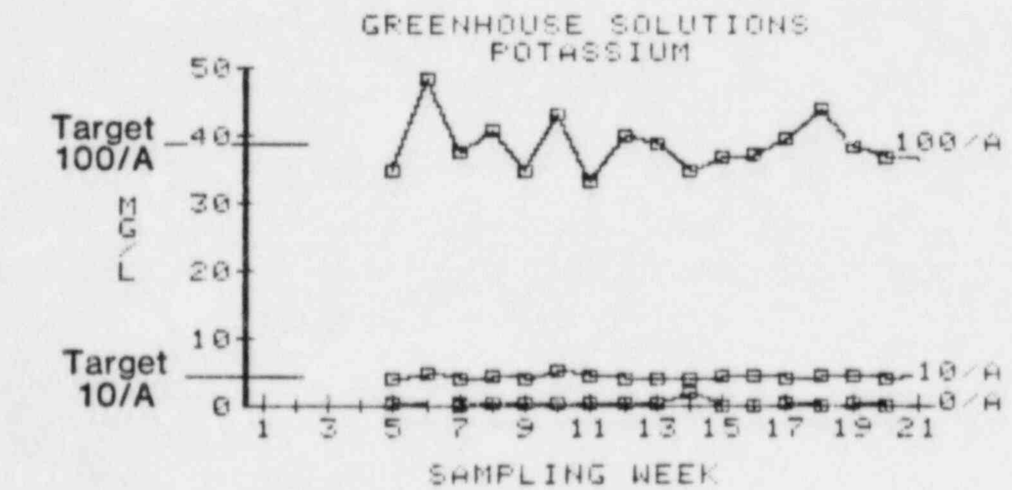
GREENHOUSE SOLUTIONS
CALCIUM
100
80
60
40
20
0
Target
100/A
MG/L
100/A
10/A
0/A
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
MAGNESIUM
Target 1000/A
Target 500/A
MG/L
1000/A
500/A
100/A
SAMPLING WEEK

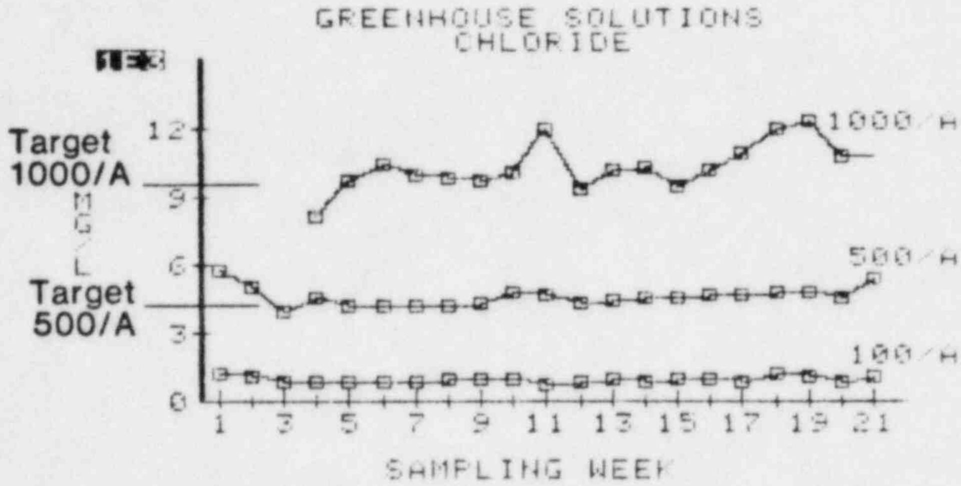

GREENHOUSE SOLUTIONS
MAGNESIUM
Target 100/A
Target 10/A
MG/L
100/A
10/A
0/A
SAMPLING WEEK

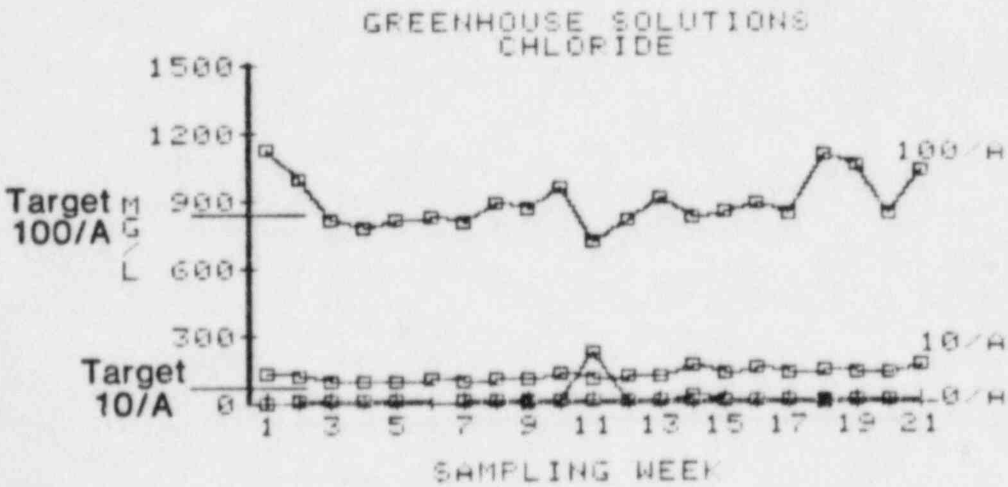


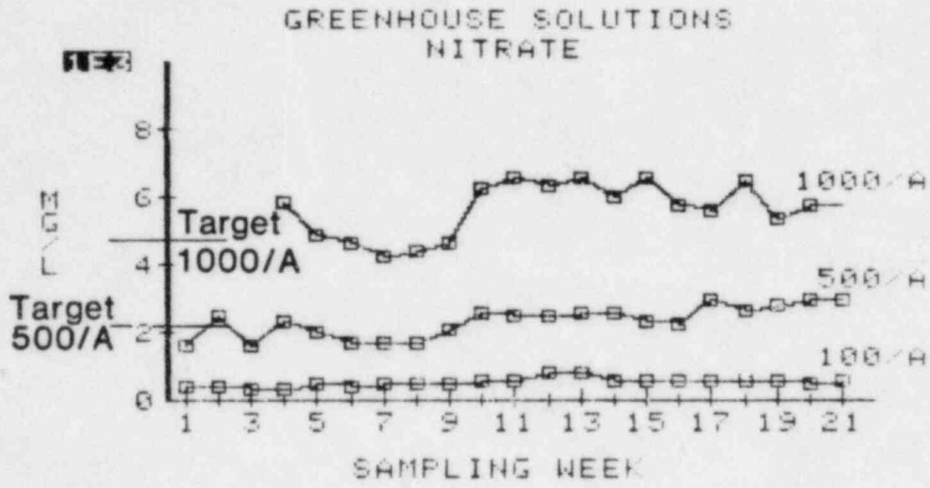
GREENHOUSE SOLUTIONS
POTASSIUM
Target 1000/A
Target 500/A
MG/L
500
400
300
200
100
0
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK
1000/A
500/A
100/A

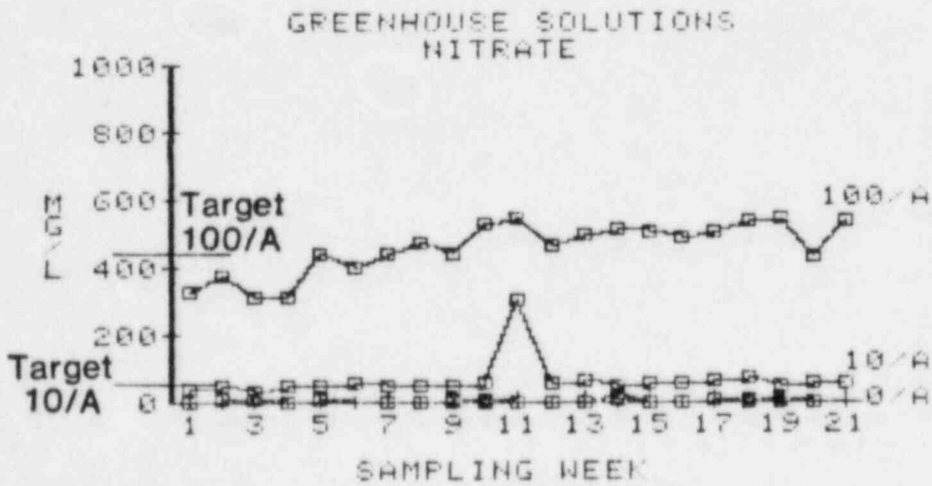


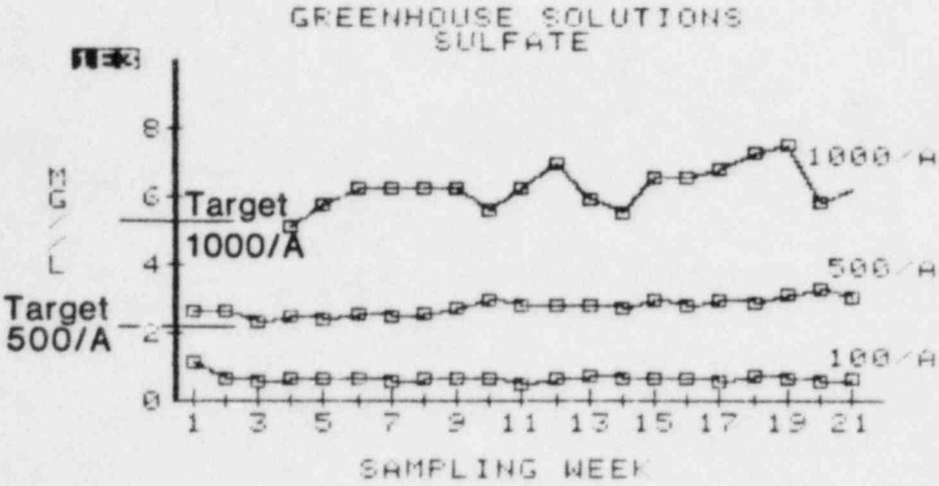
GREENHOUSE SOLUTIONS
POTASSIUM
Target 100/A
Target 10/A
MG/L
50
40
30
20
10
0
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK
100/A
10/A
0/A

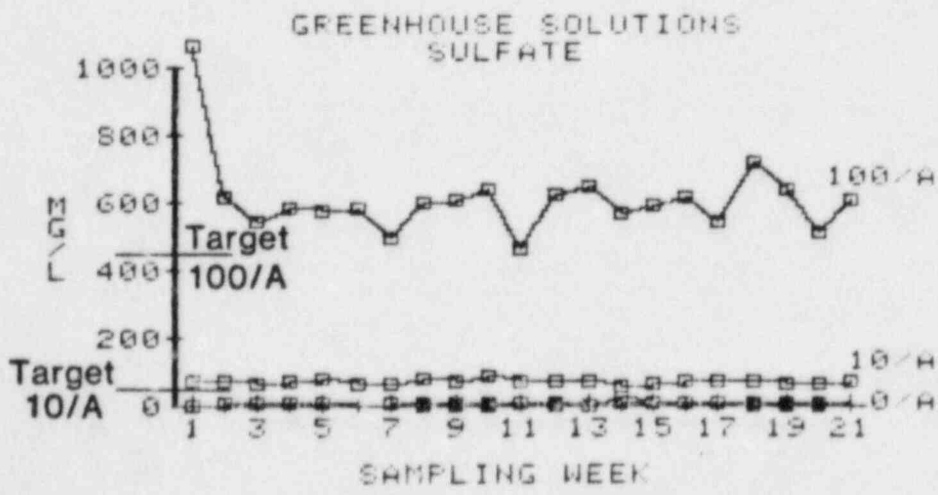

GREENHOUSE SOLUTIONS
CHLORIDE
Target
1000/A
Target
500/A
M
G
/
L
12
9
6
3
0
1000/A
500/A
100/A
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
CHLORIDE
1500
1200
900
600
300
0
Target
100/A
Target
10/A
M
G
/
L
100/A
10/A
1
3
5
7
9
11
13
15
17
19
21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
NITRATE
1E3
MG/L
Target 1000/A
Target 500/A
1000/A
500/A
100/A
SAMPLING WEEK


GREENHOUSE SOLUTIONS
NITRATE
MG/L
Target 100/A
Target 10/A
100/A
10/A
0/A
SAMPLING WEEK


GREENHOUSE SOLUTIONS
SULFATE
E3
8
6
4
2
0
MG/L
Target 1000/A
Target 500/A
1000/A
500/A
100/A
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK


GREENHOUSE SOLUTIONS
SULFATE
1000
800
600
400
200
0
MG/L
Target 100/A
Target 10/A
100/A
10/A
0/A
1 3 5 7 9 11 13 15 17 19 21
SAMPLING WEEK

III. COMPARISON OF CONCENTRATION OVER TIME FOR FIELD COMPOSITE 0725-4C (expressed as mg/ℓ)

COMPARISON OF
FIELD SOLUTION 0725-4C
OVER TIME

SPECIES	AUG.RUN	DEC.RUN
CA	449	449
MG	21	21.1
NA	3660	3600
K	174	171
NH4	3.22	2.88
F	2.54	
CL	3840	4150
NO3	1520	1960
SO4	2540	2350
PO4	2.44	
TDS	13400	13500
PH	6.99	7.15
FE	.36	.38
SI	32.2	36
CU	.16	.18
ZN	.79	.94
AG	.04	.04
BA	-	-
CD	0	0
CR	.07	0
PB	0	0
BE	-	-
MN	.63	.58
SR	.56	.53
AS	.013	.006
SE	.018	.015
HG	0	0
BO3		
I	-	-
PHEN	-	-

UNIVERSITY ANALYTICAL CENTER
DEPARTMENT OF CHEMISTRY UNIVERSITY OF ARIZONA TUCSON, ARIZONA 85721
(602) 621-3180

MEMORANDUM

TO: Martin Karpiscak, OALS

FROM: Susan B. Hopf

RE: Averages of APS/Salt Drift Data

DATE: 27 March 84

Enclosed please find the averages and standard deviations of the data for the APS Salt Drift study, for revision 2 of the simulated saline drift solutions, as per your request of 23 march 1984. I have included the data points used in the calculations for your information. % Na and % Cl were determined as follows:

$$\frac{\text{mg}/\ell\ \text{Na}}{\text{mg}/\ell\ \text{TDS}} \times 100 \quad \text{or} \quad \frac{\text{mg}/\ell\ \text{Cl}}{\text{mg}/\ell\ \text{TDS}} \times 100$$

No standard deviations were calculated for species (most particularly Pb) where all the data points were less than the detection limit, i.e.,0.

The ion sum was determined by the addition of the concentration for each species for each sampling date. Included in this sum are the minor species as well as the major ones listed herein.

There was some concern as to why the Ion Sum for the 0 lb/acre solutions varied so greatly from the TDS determined. There are several explanations for this. First, virtually all the species were at or below detection limit for these solutions and it is possible that some of them were present and contributed to the TDS but were not detectable. Secondly, in determining so many species, experimental error is compounded. Thirdly, the confidence limit for the TDS determination at these low concentrations is approximately ± 25 mg /ℓ. This value was arrived at from 19 determinations of our distilled-deionized water run concurrently with your 0 lb /acre solutions. The results of these 19 determinations are listed below:

Count	19	Mean	39
Maximum	84	Std Dev	22
Minimum	0		

As you can see, there is quite a bit of variation in the concentration.

If you have any questions or further concerns, please feel free to call.

Enclosures: 15

GREENHOUSE SOLUTIONS

0 lbs / acre

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	% NA	%CL
0-0726	.41	0	3.49	.18	2.83	.98	2.42	0	76	10.31	4.59	3.72
0-0802	.31	0	2.51	.14	2.04	.76	1.58	0	0	7.78	0	0
0-0926	0	0	.27	0	.18	0	.24	0	26	.69	1.04	.69
AVERAGE	.24	0	2.09	.11	1.68	.58	1.41	0	34	6.26	1.88	1.47

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
0SH-0806	.088	0	.4	0	.28	0	.12	0	12	1.06	3.33	2.33
0SH-0815	.15	0	.63	.04	.3	0	0	P 0	8	2.12	7.88	3.75
0SH-0822	.16	0	.79	.042	.30	.34	.26	Q 0	80	1.59	.99	.38
0SH-0829	.1	0	.46	.07	.42	0	0	Q 0	34	1.25	1.35	1.24
0SH-0906	.43	0	122	.15	227	0	1.89	R 0	324	352	37.65	70.06
0SH-0912	.11	0	11.4	.055	10.8	0	.21	R 0	26	22.6	43.85	41.54
0SH-0919	.09	0	11.7	.035	11.8	0	0	S 0	24	23.7	48.75	49.17
0SH-0927	3.7	.21	36.8	1.7	34.7	19.7	22.6	S 0	152	120	24.21	22.83
0SH-1003	0	0	1.12	0	1.44	0	.34	T 0	24	2.9	4.67	6
0SH-1010	0	0	.45	0	.4	0	.24	T 0	12	1.09	3.75	3.33
0SH-1017	0	0	.27	.038	.36	.34	.26	0	62	1.27	.44	.58
0SH-1024	0	0	.11	0	.44	6.64	.34	W 0	28	7.6	.39	1.57
0SH-1031	.12	.031	.52	.13	1.27	.46	.47	W 0	30	3	1.73	4.23
0SH-1107	0	0	.11	0	.27	0	0	X 0	0	.74	0	0
0SH-1114	0	.052	1.03	.13	1.28	0	.48	X 0	0	3.34	0	0
AVERAGE	.33	.2	12.5	.16	19.4	1.83	1.81	0	54	36.3	11.93	13.78

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
0NH-0808	.14	0	.78	.03	.54	0	.33	P 0	8	1.92	9.75	6.75
0NH-0815	.15	0	.86	.05	.66	0	.36	P 0	4	2.27	21.5	16.5
0NH-0822	.12	0	.34	.034	.55	0	0	Q 0	52	1.04	.65	1.06
0NH-0829	.1	0	.6	.08	.49	.32	.39	Q 0	22	2.06	2.73	2.23
0NH-0906	.088	0	.67	.054	.94	0	.71	R 0	4	2.51	16.75	23.5
0NH-0912	.052	0	.46	.047	.34	0	0	R 0	8	.97	5.75	4.25
0NH-0919	.067	0	.56	0	.34	0	0	S 0	0	1.01	0	0
0NH-0927	.095	0	.53	.026	.48	1.37	.48	S 0	60	2.98	.88	.8
0NH-1003	.095	0	.67	0	.73	0	.68	T 0	34	2.18	1.97	2.15
0NH-1010	.68	0	.51	0	.38	0	.41	T 0	16	1.98	3.19	2.38
0NH-1017	0	0	.22	0	.27	.32	.32	0	8	1.13	2.75	3.38
0NH-1024	0	0	.048	0	0	0	0	W 0	59	.085	.08	0
0NH-1031	0	0	.19	.079	.9	0	0	W 0	4	1.21	4.75	22.5
0NH-1107	0	0	.082	0	.14	0	.25	X 0	0	.47	0	0
0NH-1114	.11	0	1.12	.065	1.53	.41	.45	X 0	33	3.69	3.39	4.64
AVERAGE	.11	0	.51	.031	.55	.16	.29	0	21	1.7	4.94	6.01

footnote: % Na and % Cl based on TDS value

GREENHOUSE SOLUTIONS

0 lbs / acre

CA

COUNT	3
MINIMUM	0
MAXIMUM	.41
MEAN	.24
VAR	.03046666
STD DEV	.17454703

RANGE: 1 TO 3

NO3

COUNT	3
MINIMUM	0
MAXIMUM	.98
MEAN	.58
VAR	.17626666
STD DEV	.419

RANGE: 1 TO 3

%NA

COUNT	3
MINIMUM	0
MAXIMUM	4.59
MEAN	1.87666
VAR	3.86135
STD DEV	1.96503

RANGE: 1 TO 3

NA

COUNT	3
MINIMUM	.27
MAXIMUM	3.49
MEAN	2.09
VAR	1.8162666
STD DEV	1.3476893

RANGE: 1 TO 3

SO4

COUNT	3
MINIMUM	.24
MAXIMUM	2.42
MEAN	1.4133333
VAR	.80595555
STD DEV	.89775027

RANGE: 1 TO 3

%CL

COUNT	3
MINIMUM	0
MAXIMUM	3.72
MEAN	1.47
VAR	2.6106
STD DEV	1.6157351

RANGE: 1 TO 3

K

COUNT	3
MINIMUM	0
MAXIMUM	.18
MEAN	.10666666
VAR	>>>>>>>>>>
STD DEV	.07717224

RANGE: 1 TO 3

TDS

COUNT	3
MINIMUM	0
MAXIMUM	76
MEAN	34
VAR	994.66666
STD DEV	31.538336

RANGE: 1 TO 3

CL

COUNT	3
MINIMUM	.18
MAXIMUM	2.83
MEAN	1.6833333
VAR	1.2340222
STD DEV	1.1108655

RANGE: 1 TO 3

ION SUM

COUNT	3
MINIMUM	.69
MAXIMUM	10.31
MEAN	6.26
VAR	16.579266
STD DEV	4.0717645

RANGE: 1 TO 3

GREENHOUSE SOLUTIONS

0 lbs / acre - South House

CA	
COUNT	15
MINIMUM	Ø
MAXIMUM	3.7
MEAN	.32986666
VAR	.82287758
STD DEV	.90712600

RANGE: 1 TO 15

CL	
COUNT	15
MINIMUM	.27
MAXIMUM	227
MEAN	19.404
VAR	3156.5038
STD DEV	56.182771

RANGE: 1 TO 15

ION SUM	
COUNT	15
MINIMUM	.74
MAXIMUM	352
MEAN	36.284
VAR	7981.8602
STD DEV	89.341257

RANGE: 1 TO 15

MG	
COUNT	15
MINIMUM	Ø
MAXIMUM	.21
MEAN	.01953333
VAR	>>>>>>>>>
STD DEV	.05294130

RANGE: 1 TO 15

NO3	
COUNT	15
MINIMUM	Ø
MAXIMUM	19.7
MEAN	1.832
VAR	25.485269
STD DEV	5.0482937

RANGE: 1 TO 15

%NA	
COUNT	15
MINIMUM	Ø
MAXIMUM	48.75
MEAN	11.932666
VAR	285.4933
STD DEV	16.896547

RANGE: 1 TO 15

NA	
COUNT	15
MINIMUM	.11
MAXIMUM	122
MEAN	12.519333
VAR	943.89081
STD DEV	30.722806

RANGE: 1 TO 15

SO4	
COUNT	15
MINIMUM	Ø
MAXIMUM	22.6
MEAN	1.814
VAR	31.060464
STD DEV	5.5731915

RANGE: 1 TO 15

%CL	
COUNT	15
MINIMUM	Ø
MAXIMUM	70.06
MEAN	13.800666
VAR	453.66356
STD DEV	21.299379

RANGE: 1 TO 15

K	
COUNT	15
MINIMUM	Ø
MAXIMUM	1.7
MEAN	.15933333
VAR	.17196342
STD DEV	.41468472

RANGE: 1 TO 15

TDS	
COUNT	15
MINIMUM	Ø
MAXIMUM	324
MEAN	54.4
VAR	6596.9066
STD DEV	81.221343

RANGE: 1 TO 15

GREENHOUSE SOLUTIONS

0 lbs / acre-North House

CA

COUNT	15
MINIMUM	Ø
MAXIMUM	.68
MEAN	.11313333
VAR	.02546664
STD DEV	.15958273

RANGE: 1 TO 15

NO3

COUNT	15
MINIMUM	Ø
MAXIMUM	1.37
MEAN	.16133333
VAR	.12395822
STD DEV	.35207701

RANGE: 1 TO 15

%NA

COUNT	15
MINIMUM	Ø
MAXIMUM	21.5
MEAN	4.9426666
VAR	37.921232
STD DEV	6.1580218

RANGE: 1 TO 15

NA

COUNT	15
MINIMUM	.Ø48
MAXIMUM	1.12
MEAN	.50933333
VAR	.Ø8294808
STD DEV	.288ØØ7Ø9

RANGE: 1 TO 15

SO4

COUNT	15
MINIMUM	Ø
MAXIMUM	.71
MEAN	.292
VAR	.Ø5626933
STD DEV	.23721157

RANGE: 1 TO 15

%CL

COUNT	15
MINIMUM	Ø
MAXIMUM	23.5
MEAN	6.ØØ93333
VAR	6Ø.178073
STD DEV	7.7574527

RANGE: 1 TO 15

K

COUNT	15
MINIMUM	Ø
MAXIMUM	.Ø8
MEAN	.Ø31
VAR	>>>>>>>>>
STD DEV	.Ø2922Ø99

RANGE: 1 TO 15

TDS

COUNT	15
MINIMUM	Ø
MAXIMUM	6Ø
MEAN	2Ø.8
VAR	434.69333
STD DEV	2Ø.8493ØØ

RANGE: 1 TO 15

CL

COUNT	15
MINIMUM	Ø
MAXIMUM	1.53
MEAN	.55266666
VAR	.13Ø27288
STD DEV	.36Ø93335

RANGE: 1 TO 15

ION SUM

COUNT	15
MINIMUM	.Ø85
MAXIMUM	3.69
MEAN	1.7ØØ3333
VAR	.8798Ø155
STD DEV	.93797737

RANGE: 1 TO 15

GREENHOUSE SOLUTIONS

10 lbs / acre-100 lbs / acre

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
10-0725	8.14	.44	81.2	3.82	95.3	43.5	73	M 0	260	305	31.23	36.65
10-0729	9.44	.44	84.2	4.44	98	49.8	61.2	0	294	308	28.64	33.33
10-0808	9.49	.46	94.8	3.88	92.2	42.7	61.6	P 0	280	305	33.86	32.93
10-0815	7.43	.42	89.4	4.34	99.3	43.5	73	P 0	292	318	30.62	34.01
10-0822	7.44	.46	98.6	3.96	100	45.4	64.7	Q 0	324	321	30.43	30.86
10-0829	6.87	.45	98.3	4.91	120	48.9	84	Q 0	340	364	28.91	35.29
10-0906	5.83	.4	192	4.08	101	302	65.2	R 0	900	671	21.33	11.22
10-0912	6.09	.4	118	3.83	112	49.5	65.2	R 0	316	356	37.34	35.44
10-0919	8.86	.44	124	3.99	111	56.1	67.3	S 0	328	372	37.8	33.84
10-0926	7.06	.41	128	3.87	164	41.6	48.3	S 0	434	393	29.49	37.79
10-1003	7.71	.48	105	4.14	121	51.7	61	T 0	364	351	28.85	33.24
10-1010	7.84	.43	115	4.12	146	54.3	68.8	T 0	344	397	33.43	42.44
10-1017	7.34	.44	126	3.68	124	63.6	67.5	0	354	393	35.59	35.03
10-1024	7.63	.48	117	4.39	137	67.8	66.4	W 0	376	401	31.12	36.44
10-1031	7.18	.44	118	4.09	124	44.1	58.2	W 0	358	356	32.96	34.64
10-1107	7.33	.46	112	3.97	124	51.2	62.3	X 0	332	362	33.73	37.35
10-1114	7.33	.47	140	4.59	159	51.2	66.4	X 0	418	429	33.49	38.04
AVERAGE	7.59	.44	114	4.12	119	65.1	65.5	0	371	377	31.7	34.03

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
100-0725	63.4	4.6	746	34.8	807	436	572	M 0	2520	2680	29.6	32.02
100-0729	85.6	3.87	732	48.1	824	396	579	0	2680	2670	27.31	30.75
100-0808	69	4.6	778	37.6	795	437	496	P 0	2690	2620	28.92	29.55
100-0815	59.4	3.43	798	40.6	883	471	595	P 0	2750	2860	29.02	32.11
100-0822	77.4	3.95	765	34.8	854	436	604	Q 0	2760	2790	27.72	30.94
100-0829	57.3	3.87	768	43.1	953	523	633	Q 0	2770	2990	27.73	34.4
100-0906	84.5	4.08	782	33	708	540	458	R 0	2530	2620	30.91	27.98
100-0912	56.1	3.94	846	39.7	812	463	620	R 0	2630	2850	32.17	30.87
100-0919	82	4.5	935	38.6	903	495	641	S 0	2920	3110	32.02	30.92
100-0926	66.4	4.23	803	34.8	816	510	565	S 0	2790	2810	28.78	29.25
100-1003	68	4.46	821	36.4	844	504	589	T 0	2880	2890	28.51	29.31
100-1010	69.8	4.46	863	37	876	484	612	T 0	3000	2970	28.77	29.2
100-1017	69.4	4.43	884	39.4	838	501	541	0	2930	2890	30.17	28.6
100-1024	77.9	3.85	931	43.7	1100	532	713	W 0	3110	3410	29.94	35.37
100-1031	77.9	3.85	929	38.1	1050	544	638	W 0	3090	3290	30.06	33.98
100-1107	80.3	3.85	916	36.8	828	427	510	X 0	3100	2810	29.55	26.71
100-1114	80.3	3.77	916	36.1	1020	533	603	X 0	3130	3200	29.27	32.59
AVERAGE	72	4.1	836	38.4	877	484	586	0	2840	2910	29.44	30.86

footnote: % Na and % Cl based on TDS Value

GREENHOUSE SOLUTIONS

10 lbs / acre

CA	
COUNT	17
MINIMUM	5.83
MAXIMUM	9.49
MEAN	7.5888235
VAR	.91689263
STD DEV	.95754511

RANGE: 1 TO 17

CL	
COUNT	17
MINIMUM	92.2
MAXIMUM	164
MEAN	119.28235
VAR	450.80379
STD DEV	21.232140

RANGE: 1 TO 17

ION SUM	
COUNT	17
MINIMUM	305
MAXIMUM	671
MEAN	376.58823
VAR	6726.3596
STD DEV	82.014386

RANGE: 1 TO 17

MG	
COUNT	17
MINIMUM	.4
MAXIMUM	.48
MEAN	.44235294
VAR	>>>>>>>>>>
STD DEV	.02413915

RANGE: 1 TO 17

NO3	
COUNT	17
MINIMUM	41.6
MAXIMUM	302
MEAN	65.111764
VAR	3555.9339
STD DEV	59.631652

RANGE: 1 TO 17

% NA	
COUNT	17
MINIMUM	21.33
MAXIMUM	37.8
MEAN	31.695294
VAR	14.220599
STD DEV	3.7710210

RANGE: 1 TO 17

NA	
COUNT	17
MINIMUM	81.2
MAXIMUM	192
MEAN	114.20588
VAR	632.21230
STD DEV	25.143832

RANGE: 1 TO 17

SO4	
COUNT	17
MINIMUM	48.3
MAXIMUM	84
MEAN	65.535294
VAR	52.271684
STD DEV	7.2299159

RANGE: 1 TO 17

%CL	
COUNT	17
MINIMUM	11.22
MAXIMUM	42.44
MEAN	34.031764
VAR	38.958471
STD DEV	6.2416722

RANGE: 1 TO 17

K	
COUNT	17
MINIMUM	3.68
MAXIMUM	4.91
MEAN	4.1235294
VAR	.09554044
STD DEV	.30909617

RANGE: 1 TO 17

TDS	
COUNT	17
MINIMUM	260
MAXIMUM	900
MEAN	371.41176
VAR	19389.065
STD DEV	139.24462

RANGE: 1 TO 17

GREENHOUSE SOLUTIONS

100 lbs / acre

	CA
COUNT	17
MINIMUM	56.1
MAXIMUM	85.6
MEAN	72.041176
VAR	85.136533
STD DEV	9.2269460

RANGE: 1 TO 17

	CL
COUNT	17
MINIMUM	708
MAXIMUM	1100
MEAN	877.11764
VAR	9592.6906
STD DEV	97.942282

RANGE: 1 TO 17

	ION SUM
COUNT	17
MINIMUM	2620
MAXIMUM	3410
MEAN	2909.4117
VAR	49911.403
STD DEV	223.40860

RANGE: 1 TO 17

	MG
COUNT	17
MINIMUM	3.43
MAXIMUM	4.6
MEAN	4.1023529
VAR	.11438268
STD DEV	.33820509

RANGE: 1 TO 17

	NO3
COUNT	17
MINIMUM	396
MAXIMUM	544
MEAN	484.23529
VAR	1933.3560
STD DEV	43.969945

RANGE: 1 TO 17

	%NA
COUNT	17
MINIMUM	27.31
MAXIMUM	32.17
MEAN	29.438235
VAR	1.7717431
STD DEV	1.3310684

RANGE: 1 TO 17

	NA
COUNT	17
MINIMUM	732
MAXIMUM	935
MEAN	836.05882
VAR	4766.2895
STD DEV	69.038319

RANGE: 1 TO 17

	SO4
COUNT	17
MINIMUM	458
MAXIMUM	713
MEAN	586.41176
VAR	3504.1242
STD DEV	59.195643

RANGE: 1 TO 17

	%CL
COUNT	17
MINIMUM	26.71
MAXIMUM	35.37
MEAN	30.855882
VAR	5.2129287
STD DEV	2.2831839

RANGE: 1 TO 17

	K
COUNT	17
MINIMUM	33
MAXIMUM	48.1
MEAN	38.388235
VAR	13.789272
STD DEV	3.7133909

RANGE: 1 TO 17

	TDS
COUNT	17
MINIMUM	2520
MAXIMUM	3130
MEAN	2840
VAR	37729.401
STD DEV	194.24057

RANGE: 1 TO 17

GREENHOUSE SOLUTIONS

500 lbs / acre-1000 lbs / acre

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
500-0725	397	19.8	3390	188	4170	1930	2340	M 0	13500	12500	25.11	30.89
500-0729	395	18.3	3190	188	4170	1670	2540	0	13500	12200	23.63	30.89
500-0808	447	20.3	3270	177	4100	1670	2470	P 0	13400	12200	24.4	30.6
500-0815	320	17.1	3540	183	4140	1670	2540	P 0	13900	12500	25.47	29.78
500-0822	375	20.8	3800	185	4250	2010	2650	Q 0	13800	13400	27.54	30.8
500-0829	294	19.3	3840	197	4710	2550	2900	Q 0	13900	14600	27.63	33.88
500-0906	287	21.4	3980	187	4610	2400	2720	R 0	15100	14300	26.36	30.53
500-0912	424	18.2	3490	167	4290	2430	2790	R 0	14800	13700	23.58	28.99
500-0919	419	15.9	4180	189	4420	2540	2790	S 0	14900	14600	28.05	29.66
500-0926	354	20.1	4140	183	4450	2550	2690	S 0	14500	14500	28.55	30.69
500-1003	354	21.1	4200	189	4490	2260	2930	0	14400	14600	29.17	31.18
500-1010	360	20.8	3900	186	4600	2230	2720	0	15100	14100	25.83	30.46
500-1017	340	21	3530	182	4660	2880	2930	0	15300	14600	23.07	30.46
500-1024	360	20.4	4330	193	4790	2560	2850	W 0	15400	15200	28.12	31.1
500-1031	360	20.7	4760	193	4710	2730	3060	W 0	15500	15900	30.71	30.39
500-1107	355	20.8	4490	190	4500	2950	3240	I.0	15300	15800	29.35	29.41
500-1114	355	21	4660	199	5300	2930	2970	I 0	15400	16500	30.26	34.42
AVERAGE	364	19.8	3920	186	4490	2350	2770	0	14600	14200	26.87	30.83

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
1000-0725	988	46.3	8340	414	9600	4800	5700	.36	31800	30100	26.23	30.19
1000-0801	961	39.4	8680	423	10400	4600	6180	.44	32600	31500	26.63	31.9
1000-0808	946	49.4	7740	422	9930	4160	6180	.31	32900	29600	23.53	30.18
1000-0815	806	42.3	8990	418	9760	4380	6180	.31	33200	30800	27.08	29.4
1000-0822	793	47.7	8110	422	9600	4600	6180	.33	33400	29900	24.28	28.74
1000-0829	728	45.2	9790	458	10025	6210	5550	.33	35200	33000	27.81	28.48
1000-0906	811	50.4	9950	446	11950	6500	6200	.28	35500	36100	28.03	33.66
1000-0912	938	46	9800	427	9240	6240	6900	.28	34900	33800	28.08	26.48
1000-0919	931	48.3	10100	434	10100	6520	5900	.29	34700	34200	29.11	29.11
1000-0926	864	48	9640	434	10300	5960	5440	.29	33900	32900	28.44	30.38
1000-1003	814	47.8	9140	429	9400	6540	6500	.32	34000	33100	26.88	27.65
1000-1010	845	49.4	8640	438	10100	5680	6530	.32	34500	32500	25.04	29.28
1000-1017	822	48.3	6940	434	10900	5560	6770	.34	36300	31700	19.12	30.03
1000-1024	864	50.9	10900	441	11900	6400	7230	.29	36400	37900	29.95	32.69
1000-1031	847	48.2	10500	415	12300	5300	7460	.29	36600	37000	28.69	33.61
1000-1107	873	48.6	11000	415	10700	5730	5820	.26	36300	34700	30.3	29.48
1000-1114	967	47.4	10500	415	10700	5700	6170	.26	38400	34600	27.34	27.86
AVERAGE	870	47.3	9340	429	10400	5580	6290	.31	34700	33100	26.86	29.94

footnote: % Na and % Cl based on TDS value

GREENHOUSE SOLUTIONS

500 lbs / acre

	CA	CL	ION SUM
COUNT	17	17	17
MINIMUM	287	4100	12200
MAXIMUM	447	5300	16500
MEAN	364.47058	4491.7647	14188.235
VAR	1731.3078	87167.457	1597508.3
STD DEV	41.608988	295.24135	1263.9257

RANGE: 1 TO 17 | RANGE: 1 TO 17 | RANGE: 1 TO 17

	MG	NO3	%NA
COUNT	17	17	17
MINIMUM	15.9	1670	23.07
MAXIMUM	21.4	2950	30.71
MEAN	19.82352	2350.5882	26.872352
VAR	2.305327	176029.05	5.4555104
STD DEV	1.518330	419.55817	2.3357034

RANGE: 1 TO 17 | RANGE: 1 TO 17 | RANGE: 1 TO 17

	NA	SO4	%CL
COUNT	17	17	17
MINIMUM	3190	2340	28.99
MAXIMUM	4760	3240	34.42
MEAN	3922.9411	2772.3329	30.831176
VAR	216644.27	48629.747	1.8174911
STD DEV	465.45061	220.52153	1.3481436

RANGE: 1 TO 17 | RANGE: 1 TO 17 | RANGE: 1 TO 17

	K	TDS
COUNT	17	17
MINIMUM	167	13400
MAXIMUM	197	15500
MEAN	186.29411	14570.588
VAR	44.325232	542075.94
STD DEV	6.6577197	736.25807

RANGE: 1 TO 17 | RANGE: 1 TO 17

GREENHOUSE SOLUTIONS

1000 lbs / acre

	CA	CL	TDS
COUNT	17	17	17
MINIMUM	728	9240	31800
MAXIMUM	988	12300	38400
MEAN	870.47058	10406.176	34741.176
VAR	5063.3072	781092.57	2787126.1
STD DEV	71.156919	883.79441	1669.4688
RANGE:	1 TO 17	1 TO 17	1 TO 17

	MG	NO3	ION SUM
COUNT	17	17	17
MINIMUM	39.4	4160	29600
MAXIMUM	50.9	6540	37900
MEAN	47.270588	5581.1764	33141.176
VAR	7.7232503	612480.91	5614185.5
STD DEV	2.7790736	782.61160	2369.4272
RANGE:	1 TO 17	1 TO 17	1 TO 17

	NA	SO4	%NA
COUNT	17	17	17
MINIMUM	6940	5440	19.12
MAXIMUM	11000	7480	30.3
MEAN	9338.8235	6288.8235	26.855294
VAR	1250304.3	297998.55	6.9260708
STD DEV	1118.1701	545.89243	2.6317429
RANGE:	1 TO 17	1 TO 17	1 TO 17

	K	PB	%CL
COUNT	17	17	17
MINIMUM	414	.26	26.48
MAXIMUM	458	.44	33.66
MEAN	428.52941	.31176470	29.948235
VAR	146.95475	>>>>>>>>>	3.8690249
STD DEV	12.122489	.04176056	1.9669837
RANGE:	1 TO 17	1 TO 17	1 TO 17

FIELD SOLUTIONS

2C - 3C

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
0725-2C	.54	.13	3.62	0	2.31	1.09	2.29	0	16	10.3	22.63	14.44
0802-2C	.69	.14	3.62	0	3.68	1.61	3.71	0	52	13.7	6.96	7.08
0812-2C	.78	.086	2.12	.18	1.37	.76	1.91	C 0	48	7.46	4.42	2.85
0822-2C	1.01	.13	6.73	.37	5.63	1.83	5.37	C 0	86	21.1	7.83	6.55
0829-2NC	.8	.14	2.73	.24	2.21	.52	2.46	B 0	22	9.26	12.41	10.05
0906-2C	.84	.11	4.28	.27	4.1	1.72	3.46	D 0	28	14.9	15.29	14.64
0912-2C	1.41	.18	11.7	.6	8.42	5.38	8.2	D 0	24	36	48.75	35.08
0919-2C	.67	.097	4.61	.29	2.89	1.24	2.45	E 0	24	12.4	19.21	12.04
0926-2C	1.64	.18	10.4	.52	11	3.89	8.69	E 0	34	36.4	30.59	32.35
1010-2C	.68	.099	5.44	.31	6.56	2.58	5.14	0	60	20.8	9.07	10.93
1017-2C	.36	.05	2.52	.19	2.59	1.7	1.86	F 0	50	9.36	5.04	5.18
1031-2C	.88	.097	6.82	.44	6.11	3.52	4.4	F 0	18	22.4	37.89	33.94
1107-2C	.64	.1	5.59	.36	6.07	2.07	3.34	G 0	10	18.2	55.9	60.7
1114-2C	1.49	.08	10.3	.52	10.4	4.18	6.32	G 0	22	33.3	46.82	47.27
1128-2C	.43	.054	1.07	.2	8.34	1.94	3.54	0	20	15.6	5.35	41.7
AVERAGE	.86	.11	5.44	.3	5.44	2.27	4.21	0	34	18.8	21.88	22.32

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
0725-3C	42.7	2.17	376	19.9	323	153	249	0	1330	1170	28.27	24.29
0802-3C	42.5	2.13	384	18.1	323	149	242	0	1290	1160	29.77	25.04
0812-3C	37.2	2.24	304	18.2	417	167	263	C 0	1400	1210	21.71	29.79
0822-3C	34	2.12	414	18.7	424	167	263	C 0	1440	1320	28.75	29.44
0829-3NC	32.4	2.24	356	18.2	506	201	304	B 0	1430	1420	24.9	35.38
0906-3C	32.4	2.2	354	19	519	245	292	D 0	1570	1470	22.55	33.06
0912-3C	43.2	2.28	458	21.4	484	246	301	D 0	1570	1560	29.17	30.83
0919-3C	39.1	2.11	496	18.1	403	234	269	E 0	1400	1470	35.43	28.79
0926-3C	41	2.76	457	20.3	486	200	279	E 0	1550	1500	29.48	31.35
1010-3C	35.4	2.6	452	19.3	460	194	279	0	1470	1440	30.75	31.29
1017-3C	35.4	2.19	491	18.7	439	277	284	F 0	1510	1550	32.52	29.07
1031-3C	47.6	2.09	489	19.5	631	256	316	F 0	1570	1760	31.15	40.19
1107-3C	51.2	1.96	486	19.1	480	213	274	G 0	1570	1530	30.96	30.57
1114-3C	50	1.92	486	19.1	566	216	302	G 0	1570	1640	30.96	36.05
1120-3C	47	2.01	463	19.1	756	286	285	0	1570	1870	29.49	48.15
AVERAGE	40.7	2.2	431	19.1	481	214	280	0	1480	1470	29.06	32.22

footnote: %Na and %Cl based on TDS value

FIELD SOLUTIONS

#2 composite

CA	
COUNT	15
MINIMUM	.36
MAXIMUM	1.64
MEAN	.85733333
VAR	.13493955
STD DEV	.36734119

RANGE: 1 TO 15

CL	
COUNT	15
MINIMUM	1.37
MAXIMUM	11
MEAN	5.4453333
VAR	8.7502915
STD DEV	2.9580891

RANGE: 1 TO 15

ION SUM	
COUNT	15
MINIMUM	7.46
MAXIMUM	36.4
MEAN	18.745333
VAR	87.453731
STD DEV	9.3516699

RANGE: 1 TO 15

MG	
COUNT	15
MINIMUM	.05
MAXIMUM	.18
MEAN	.11153333
VAR	>>>>>>>>>
STD DEV	.03753729

RANGE: 1 TO 15

NO3	
COUNT	15
MINIMUM	.52
MAXIMUM	5.38
MEAN	2.2686666
VAR	1.7869715
STD DEV	1.3367765

RANGE: 1 TO 15

%NA	
COUNT	15
MINIMUM	4.42
MAXIMUM	55.9
MEAN	21.877333
VAR	294.67523
STD DEV	17.166107

RANGE: 1 TO 15

NA	
COUNT	15
MINIMUM	1.07
MAXIMUM	11.7
MEAN	5.4366666
VAR	9.7099155
STD DEV	3.1160737

RANGE: 1 TO 15

SO4	
COUNT	15
MINIMUM	1.06
MAXIMUM	8.69
MEAN	4.2093333
VAR	4.3577661
STD DEV	2.0875263

RANGE: 1 TO 15

%CL	
COUNT	15
MINIMUM	2.85
MAXIMUM	60.7
MEAN	22.32
VAR	302.02702
STD DEV	17.378924

RANGE: 1 TO 15

K	
COUNT	15
MINIMUM	0
MAXIMUM	.6
MEAN	.29933333
VAR	.02907288
STD DEV	.17050773

RANGE: 1 TO 15

TDS	
COUNT	15
MINIMUM	10
MAXIMUM	86
MEAN	34.266666
VAR	402.06222
STD DEV	20.051469

RANGE: 1 TO 15

FIELD SOLUTIONS

#3 composite

CA	
COUNT	15
MINIMUM	32.4
MAXIMUM	51.2
MEAN	40.74
VAR	36.750398
STD DEV	6.0622107

RANGE: 1 TO 15

CL	
COUNT	15
MINIMUM	323
MAXIMUM	756
MEAN	481.13333
VAR	11534.381
STD DEV	107.39824

RANGE: 1 TO 15

ION SUM	
COUNT	15
MINIMUM	1160
MAXIMUM	1870
MEAN	1471.3333
VAR	38104.885
STD DEV	195.20472

RANGE: 1 TO 15

MG	
COUNT	15
MINIMUM	1.92
MAXIMUM	2.76
MEAN	2.2013333
VAR	.04585154
STD DEV	.21412974

RANGE: 1 TO 15

NO3	
COUNT	15
MINIMUM	149
MAXIMUM	286
MEAN	213.6
VAR	1762.2399
STD DEV	41.979041

RANGE: 1 TO 15

%NA	
COUNT	15
MINIMUM	21.71
MAXIMUM	35.43
MEAN	29.057333
VAR	12.153231
STD DEV	3.4861484

RANGE: 1 TO 15

NA	
COUNT	15
MINIMUM	304
MAXIMUM	496
MEAN	431.06666
VAR	3554.3285
STD DEV	59.618189

RANGE: 1 TO 15

SO4	
COUNT	15
MINIMUM	242
MAXIMUM	316
MEAN	280.13333
VAR	408.24871
STD DEV	20.205165

RANGE: 1 TO 15

%CL	
COUNT	15
MINIMUM	24.29
MAXIMUM	48.15
MEAN	32.219333
VAR	33.245351
STD DEV	5.7658781

RANGE: 1 TO 15

K	
COUNT	15
MINIMUM	18.1
MAXIMUM	21.4
MEAN	19.113333
VAR	.76782158
STD DEV	.87625429

RANGE: 1 TO 15

TDS	
COUNT	15
MINIMUM	1290
MAXIMUM	1570
MEAN	1482.6666
VAR	8659.5522
STD DEV	93.056715

RANGE: 1 TO 15

FIELD SOLUTIONS

4C

SAMPLE	CA	MG	NA	K	CL	NO3	SO4	PB	TDS	ION SUM	%NA	%CL
0725-4C	449	21	3660	174	3840	1520	2530	0	13400	12300	27.31	2[illegible].66
0802-4C	464	21.4	4180	164	4140	1590	2810	0	14700	13500	28.44	28.16
0812-4C	424	21.4	4110	198	4300	1580	2700	C 0	14600	13400	28.15	29.45
0822-4C	375	21	4310	208	4440	1750	2740	C 0	15200	13900	28.36	29.21
0829-4NC	363	21.4	4240	207	5510	2940	3200	B 0	15700	16600	27.01	35.1
0906-4C	458	22.1	4570	211	5470	2610	2870	D 0	17200	16300	26.57	31.8
0912-4C	364	19.4	4210	175	4820	2660	3110	D 0	16400	15500	25.67	29.39
0919-4C	395	20.6	4090	177	4620	2740	3010	E 0	15600	15200	26.22	29.62
0926-4C	432	21.7	4600	209	5150	2460	2370	E 0	16000	15300	28.75	32.19
1010-4C	391	21.7	4010	199	4890	2000	3080	0	15700	14700	25.54	31.15
1017-4C	334	21.4	4470	169	4710	2890	3900	F 0	15900	16600	28.11	29.62
1031-4C	441	23.3	4660	201	4490	2330	3020	F 0	16300	15200	28.59	27.55
1107-4C	474	22.8	4330	194	4710	2190	2420	G 0	16500	14400	26.24	28.55
1114-4C	471	23.3	5130	200	5060	2240	3020	G 0	17000	16200	30.18	29.76
1128-4C	441	23.1	4730	199	6200	2590	2570	0	16300	16800	29.02	38.04
AVERAGE	418	21.7	4350	192	4820	2270	2890	0	15800	15060	27.61	30.55

footnote: %Na and %Cl based on TDS value

FIELD SOLUTIONS

#4 composite

	CA	CL	ION SUM	MG	NO3	%NA	NA	SO4	%CL	K	TDS
COUNT	15	15	15	15	15	15	15	15	15	15	15
MINIMUM	334	3840	12300	19.4	1520	25.54	3660	2370	27.55	164	13400
MAXIMUM	474	6200	16800	23.3	2940	30.18	5130	3900	38.04	211	17200
MEAN	418.4	4823.3333	15060	21.706666	2272.6666	27.610666	4353.3333	2890	30.55	192.33333	15766.666
VAR	1867.5730	332328.85	1707733.1	1.0859551	221032.87	1.7356716	116902.18	135839.99	7.3602657	237.55553	907555.21
STD DEV	43.215426	576.47970	1306.8026	1.0420917	470.14133	1.3174489	341.90960	368.56477	2.7129809	15.412836	952.65692
RANGE:	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15	1 TO 15

UNIVERSITY ANALYTICAL CENTER
DEPARTMENT OF CHEMISTRY UNIVERSITY OF ARIZONA TUCSON, ARIZONA 85721
(602) 621-3180

MEMORANDUM

TO: Martin Karpiscak; OALS/APS

FROM: Susan B. Hopf SBH

RE: Analyses #830540 and 840102, Teflon Filters

DATE: 12 February 1984

The analysis of the Teflon filters collected in the Greenhouse as part of the APS Salt Drift Study is now complete. The results are given in the enclosed tables. All concentrations are expressed as ng/m^3. As you can see from the tables, only the major species were determined. Arsenic was determined as per Joe Ray's request (Joe Ray is with the Arizona Health Sciences Center). It was determined only on the first set of fine particle filters since As is found predominantly in the fine particles. The second set was not analyzed for As for the reason explained below.

Sampling was performed by OALS personnel on a Sierra Instruments Model 244 Dichotomous Virtual Impactor (SN #175056). The two sampling periods were approximately the first three weeks of June 1983 and the first three weeks of September 1983. During the first sampling period, the salt spray treatment was applied intermittently and is indicated in the tables. The salt treatment was applied daily in the second sampling period. From the fine particle TSP data, it is obvious that the instrument during the second sampling period was not performing properly - either all the particles were being collected on the coarse filter, the hose to the fine particles was clogged or fastened incorrectly, or the hoses to the fine and coarse inlets were reversed. Thus, the data from the second sampling period most likely does not accurately reflect the size-separation of the particles. All the filters were weighed before and after sampling by University Analytical Center personnel using Method APS05, and analyzed as per Method APS06.

The gaps in the numbering system of the filters are those which were blank filters. The sampling date(s) as well as the total m^3 collected are included in the tables for your reference.

It was surprising to find no detectable Cl on the filters although it is normally not an abundant species in air particulate matter. In order to prove that the Cl peak was not being lost in the water dip of the ion chromatogram, one sample was spiked with 0.5 ppm Cl and there was 90% recovery of the spike.

In conclusion, there does not appear to be any significant difference in species concentrations between non-salt-spray days and salt-spray days.

If you have any questions, please call.

SBH/dbs

Enclosures

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	NA	K	MG	CA
3F	0516	1440	153	0	.9	1.1	5.9
C		1440	1021	13.5	8.3	9.2	65.3
4F	0517	1440	117	0	1	.7	2.8
C		1440	682	7.2	5.1	5	36.7
5F	0518-	2880	118	12.8	1	.7	4.9
C	0519	2880	641	3.1	4.6	4.4	35.3
6F	0520-	4320	72	.7	.6	.4	1.9
C	0522	4320	348	1.6	3	2.4	17.5
7F	0523	420	43	1.1	0	0	1.4
C		420	71	0	0	0	3
8F	0531	1440	138	3.9	3.4	1	2.6
C		1440	562	9	5.6	5.2	28.7
10F	0601	1440	146	6.6	1.6	1.4	4
C		1440	780	10.3	6	7.4	44.2
11F	0602	1260	83	16.3	2.3	.9	5.7
C		1260	475	5.6	3.6	3.7	24.8
12F(S)	0603	1440	100	2.9	1	.5	1
C		1440	529	5.2	4	3.8	24.2
13F	0604	1500	99	16.4	1.7	1	8
C		1500	543	6.7	3.9	3.6	27.9
14F	0605	1200	136	1.4	2.2	.6	2.1
C		1200	568	2.9	4.5	4.2	29.8
15F(S)	0606	1440	182	1.2	3.3	1	3.8
C		1440	878	3.6	8.2	6.5	46
16F(S)	0608	1440	145	6.6	3.5	1.1	5.8
C		1440	713	5.1	6.3	5	35.8
17F(S)	0609	1500	125	3	2.4	.7	3.1
C		1500	757	5.1	5.6	5.5	41.5
DETLIM			7	.3	.3	.2	.3

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	CL	NO3	SO4	NH4
3F	0516	1440	153	0	0	10.7	12
C		1440	1021	0	0	4	0
4F	0517	1440	117	0	0	11	12.5
C		1440	682	0	0	2.9	1.9
5F	0518-	2880	118	0	1	13.5	14
C	0519	2880	641	0	4.3	4.3	0
6F	0520-	4320	72	0	0	5	4.3
C	0522	4320	348	0	0	2	.2
7F	0523	420	43	0	0	0	3.7
C		420	71	0	1.2	0	42.5
9F	0531	1440	138	0	10.8	30.4	25.1
C		1440	562	2.6	8.2	8	1.9
10F	0601	1440	146	0	0	18.8	15.3
C		1440	780	5.2	7.2	9.5	0
11F	0602	1260	83	0	0	9.2	11
C		1260	475	2.3	0	4.8	0
12F(S)	0603	1440	100	0	0	11.3	12.2
C		1440	529	3.5	0	3.4	0
13F	0604	1500	99	0	0	10.9	10
C		1500	543	0	0	4.5	1.2
14F	0605	1200	136	0	19.4	14.8	13.6
C		1200	568	0	6.3	5.7	.7
15F(S)	0606	1440	182	0	0	26.8	21.9
C		1440	878	0	0	6.7	0
16F(S)	0608	1440	145	0	5.9	17.2	22.5
C		1440	713	.4	1	6	0
17F(S)	0609	1500	125	0	0	15.1	13.3
C		1500	757	.6	3.6	7.1	0
DETLIM			7	.3	1	.7	1

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	AS
3F	0516	1440	153	0
C		1440	1021	
4F	0517	1440	117	0
C		1440	682	
5F	0518-	2880	118	0
C	0519	2880	641	
6F	0520-	4320	72	0
C	0522	4320	348	
7F	0523	420	43	0
C		420	71	
8F	0531	1440	138	0
C		1440	562	
10F	0601	1440	146	0
C		1440	780	
11F	0602	1260	83	0
C		1260	475	
12F(S)	0603	1440	100	0
C		1440	529	
13F	0604	1500	99	0
C		1500	543	
14F	0605	1200	136	0
C		1200	568	
15F(S)	0606	1440	182	0
C		1440	878	
16F(S)	0608	1440	145	0
C		1440	713	
17F(S)	0609	1500	125	0
C		1500	757	
DETLIM			7	.007

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	NA	K	MG	CA
19F(S)	Ø61Ø	1488	157	2.1	2.4	.8	3
C		1488	761	6.4	5.6	6	44.5
2ØF	Ø611	141Ø	1Ø4	.8	2.4	.4	.5
C		141Ø	352	3.1	2.9	2.9	18.9
21F(S)	Ø613	144Ø	159	2.3	2.3	.9	3
C		144Ø	776	26	6.8	5.5	42.5
22F(S)	Ø614	15ØØ	162	2.8	2.6	.8	2.9
C		15ØØ	9Ø8	3	6	6.7	48.3
23F(S)	Ø615	1392	185	2.8	5.1	1.3	4.3
C		1392	943	6.4	6.1	5.9	42.2
24F	Ø619	132Ø	89	2.7	1.3	.5	1.4
C		132Ø	483	3.8	6.1	4.1	3Ø.2
ALL SAMPLES BELOW RECEIVED SALT SPRAY TREATMENT							
27F	Ø83Ø	1434	3	4.2	Ø	Ø	Ø
C		1434	642	3.1	4.3	3.5	25.3
28F	Ø831	1434	4Ø	1	Ø	Ø	1
C		1434	53Ø	1.2	2.6	2.9	19.3
29F	Ø9Ø1	1428	18	3.1	.9	.3	Ø
C		1428	87Ø	2	5.1	5.1	37.9
3ØF	Ø9Ø2	1542	2Ø	3.6	Ø	Ø	.6
C		1542	844	6	5.5	5.5	38.4
31F	Ø9Ø6	1434	17	Ø	Ø	Ø	Ø
C		1434	392	5.4	2.1	2.6	13.6
32F	Ø9Ø7	1446	13	Ø	Ø	Ø	Ø
C		1446	476	8	3.3	2.8	19.8
33F	Ø9Ø8	1416	23	Ø	Ø	Ø	Ø
C		1416	716	2.8	4.3	3.9	24.1
DETLIM			7	.3	.3	.2	.3

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	CL	NO3	SO4	NH4
19F(S)	0610	1488	157	0	0	21.2	19.7
C		1488	761	0	3.2	4.8	2.1
20F	0611	1410	104	0	7.4	19.5	20.3
C		1410	352	0	0	2.5	0
21F(S)	0613	1440	159	0	0	20	25.1
C		1440	776	0	0	3.1	0
22F(S)	0614	1500	162	0	4.1	24.8	25.4
C		1500	908	.6	10.3	8.7	6.2
23F(S)	0615	1392	185	0	109.3	19.2	12.9
C		1392	943	.6	0	7	0
24F	0619	1320	89	0	0	4.7	5
C		1320	483	7.3	5.5	10.5	0
ALL SAMPLES BELOW RECEIVED SALT SPRAY TREATMENT							
27F	0830	1434	3	0	0	5.7	7.3
C		1434	642	0	369	72.1	68.9
28F	0831	1434	40	0	0	3.4	3.7
C		1434	530	0	0	61.6	64.1
29F	0901	1428	18	0	0	4.9	5.8
C		1428	870	0	9.6	83.6	76.9
30F	0902	1542	20	0	0	4.7	6
C		1542	844	0	4.5	74.8	68
31F	0906	1434	17	0	0	1.2	1
C		1434	392	0	4.5	26.4	25.4
32F	0907	1446	13	0	0	3.5	3.3
C		1446	476	0	1.4	57.2	60.1
33F	0908	1416	23	0	0	5.9	7.4
C		1416	716	0	3	134.5	64.9
DETLIM			7	.3	1	.7	1

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	AS
19F(S)	0610	1488	157	0
C		1488	761	
20F	0611	1410	104	0
C		1410	352	
21F(S)	0613	1440	159	0
C		1440	776	
22F(S)	0614	1500	162	0
C		1500	908	
23F(S)	0615	1392	185	0
C		1392	943	
24F	0619	1320	89	0
C		1320	483	
DETLIM			7	.007

F: FINE PARTICLES
C: COARSE PARTICLES
(S): DAYS WITH SALT SPRAY

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	NA	K	MG	CA
34F	0909	1416	34	6.9	0	.2	1.6
C		1416	575	7.6	3.8	3.1	24.1
35F	0912	1440	21	0	0	.2	0
C		1440	592	6	5.2	4.3	30.1
36F	0913	1440	20	1	0	0	0
C		1440	342	1.2	2	2	10.8
37F	0914	1434	21	2.3	1.6	.3	0
C		1434	282	11.8	1.6	1.4	5.9
38F	0915	1440	24	15.9	0	.3	.4
C		1440	370	2.9	2.4	2.2	11.8
39F	0916	516	50	27.9	1.4	.3	0
C		516	490	3.9	2.1	2.3	16.3
40F	0919	1440	24	11.9	1.1	.2	0
C		1440	340	24	2	2.5	14
41F	0920	84	107	0	0	.3	0
C		84	452	69.8	.4	3.7	2.7
DETLIM			7	.3	.3	.2	.3

F: FINE PARTICLES
C: COARSE PARTICLES

GREENHOUSE AIR SAMPLING
(NG/M3)

FILTER ID	DATE	M3	TSP	CL	NO3	SO4	NH4
34F	0909	1416	34	0	0	5.8	4.9
C		1416	575	0	0	80.8	75.5
35F	0912	1440	21	0	2.8	2.1	2.8
C		1440	592	0	17.9	49.6	47.7
36F	0913	1440	20	0	0	2.9	3
C		1440	342	0	15.1	48.8	51.9
37F	0914	1434	21	0	0	2.2	0
C		1434	282	0	19	41.4	40.2
38F	0915	1440	24	0	0	3.6	3.3
C		1440	370	0	13.7	58.6	56.6
39F	0916	516	50	0	0	1.6	0
C		516	490	0	42.4	51.4	61.8
40F	0919	1440	24	0	6.1	1.6	0
C		1440	340	0	10.1	28.9	22.4
41F	0920	84	107	0	0	0	0
C		84	452	0	168.5	35.4	1.9
DETLIM			7	.3	1	.7	1

F: FINE PARTICLES
C: COARSE PARTICLES

SECTION D

SALT DEPOSITION DATA: GREENHOUSE

Salt accumulation was estimated by two methods. The first method involves the collection of simulated saline drift on a parafilm-covered petri dish, and the second method employs the analysis of the various salt solutions used in spraying. In the greenhouse study, both methods were performed on a weekly basis, and values obtained from these methods were used to estimate additive salt accumulation for each week.

Tables D-1 through D-5 of this appendix summarize the petri dish method data for the entire 1983 season. Each table is specific to a particular treatment level.

Figures D-1 through D-24 are graphs which compare targeted accumulation to the regression curves for both petri dish method data and solution analysis method data. Each table is specific to a particular crop/treatment combination. Note that the targeted accumulation curve takes into account a 25.8% hydration factor. Thus as an example, the 100 lbs/a/yr treatment is equivalent to 74.2 lbs of salt/a/yr.

Table D-1. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFFIN COVERED PETRI DISHES IN NORTH GREENHOUSE OVER TIME (0 lbs/a·yr nominal treatment). Each daily deposition value represents deposition of salt from one petri dish per week during the 1983 season. Accumulated values are an estimate based on a 5 day spray week of daily deposition values for the 1-week period associated with the sampling date.

Week	Sampling Date	Milligrams salt/m²·day		Milligrams salt/m² accumulated since 6/6	
		Nozzle A	Nozzle B	Nozzle A	Nozzle B
6/6-6/10	6/9	2.48	2.86	12.40	14.30
6/13-6/17	6/15	2.48	2.86	24.80	28.60
6/20-6/24	6/23	0.99	1.96	29.75	38.40
6/27-7/1	7/1	2.33	2.11	41.40	48.95
7/4-7/8	7/7 [a]	2.03	1.58	49.52	55.27
7/11-7/15	7/14	5.25	6.75	75.77	89.02
7/18-7/22	7/22	1.81	3.23	84.82	105.17
7/25-7/29	7/29	1.14	0.01	90.52	105.22
8/1-8/5	8/5	3.30	-0.06	107.02	105.22 [b]
8/8-8/12	8/12	1.81	-0.14	116.07	105.22 [b]
8/15-8/19	8/19	2.26	2.11	127.37	115.77
8/22-8/26	8/26	2.71	9.44	140.92	162.97
8/29-9/2	9/1	2.03	1.88	151.07	172.37
9/5-9/9	9/9 [a]	6.00	8.24	175.07	205.33
9/12-9/16	9/16	2.48	3.16	187.47	221.13
9/19-9/23	9/22	1.66	0.31	195.77	222.68
9/26-9/30	9/29	2.18	5.70	206.67	251.18
10/3-10/7	10/7	0.39	-0.29	208.62	251.18 [b]
10/10-10/14	10/14	4.28	4.95	230.02	275.93
10/17-10/21	10/21	3.16	3.08	245.82	291.33
10/24-10/28	10/28	3.16	3.16	261.62	307.13
10/31-11/4	11/4	2.63	1.43	274.77	314.28
11/7-11/11	11/10	-0.51	-0.36	274.77 [b]	314.28 [b]
11/14-11/18	11/18	3.08	4.13	290.17	334.93

[a]/Accumulated deposition values for this date were based on a 4 day week.

[b]/Accumulation data was calculated using 0 as the amount of salt accumulated.

Table D-2. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFILM COVERED PETRI DISHES IN NORTH GREENHOUSE OVER TIME (10 lbs/a·yr nominal treatment). Each daily deposition value represents deposition of salt from one petri dish per week during the 1983 season. Accumulation values are an estimate based on a 5 day spray week of daily deposition values for the 1-week period associated with the sampling date.

Week	Sampling Date	Milligrams salt/m^2·day		Milligrams salt/m^2 accumulated since 6/6	
		Nozzle A	Nozzle B	Nozzle A	Nozzle B
6/6-6/10	6/9	6.82	8.02	34.10	40.10
6/13-6/17	6/15	2.86	2.63	48.40	53.25
6/20-6/24	6/23	4.43	2.26	70.55	64.55
6/27-7/1	7/1	11.39	11.31	127.50	121.10
7/4-7/8	7/7 [a]	7.87	6.07	158.98	145.38
7/11-7/15	7/14	8.02	7.12	199.08	180.98
7/18-7/22	7/22	4.58	4.35	221.98	202.73
7/25-7/29	7/29	6.60	9.29	254.98	249.18
8/1-8/5	8/5	3.83	3.38	274.13	266.08
8/8-8/12	8/12	4.20	6.52	295.13	298.68
8/15-8/19	8/19	7.87	9.44	334.48	345.88
8/22-8/26	8/26	13.41	16.40	401.53	427.88
8/29-9/2	9/1	9.66	13.78	449.83	496.78
9/5-9/9	9/9 [a]	7.64	13.85	480.39	552.18
9/12-9/16	9/16	6.22	10.79	511.49	606.13
9/19-9/23	9/22	4.28	4.35	532.89	627.88
9/26-9/30	9/29	6.82	7.35	566.99	664.63
10/3-10/7	10/7	2.56	9.37	579.79	711.48
10/10-10/14	10/14	11.01	10.49	634.84	763.93
10/17-10/21	10/21	3.45	3.60	652.09	781.93
10/24-10/28	10/28	4.35	3.60	673.84	799.93
10/31-11/4	11/4	11.31	8.99	730.39	844.88
11/7-11/11	11/10	5.92	4.88	759.99	869.28
11/14-11/18	11/18	8.84	14.90	804.19	943.78

[a]/Accumulated deposition values for this date were based on a 4 day week.

Table D-3. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFILM COVERED PETRI DISHES IN NORTH GREENHOUSE OVER TIME (100 lbs/a·yr nominal treatment). Each daily deposition value represents deposition of salt from one petri dish per week during the 1983 growing season. Accumulated values are an estimate based on a 5 day spray week of daily deposition values for the 1-week period associated with the sampling date.

Week	Sampling Date	Milligrams salt/m^2·day		Milligrams salt/m^2 accumulated since 6/6	
		Nozzle A	Nozzle B	Nozzle A	Nozzle B
6/6-6/10	6/9	67.58	68.47	337.90	342.35
6/13-6/17	6/15	22.31	42.81	449.45	556.40
6/20-6/24	6/23	47.82	10.86	688.55	610.70
6/27-7/1	7/1	56.73	28.22	972.20	751.80
7/4-7/8	7/7 [a]	63.09	32.25	1224.56	892.80
7/11-7/15	7/14	40.49	41.84	1427.01	1102.00
7/18-7/22	7/22	22.83	22.68	1541.16	1215.40
7/25-7/29	7/29	35.85	25.68	1720.41	1343.80
8/1-8/5	8/5	47.67	56.05	1958.76	1624.05
8/8-8/12	8/12	51.49	47.37	2216.21	1860.9
8/15-8/19	8/19	58.07	42.96	2506.56	2075.70
8/22-8/26	8/26	37.65	32.56	2694.81	2238.50
8/29-9/2	9/1	49.09	48.12	2940.26	2479.10
9/5-9/9	9/9 [a]	30.61	44.98	3062.70	2659.02
9/12-9/16	9/16	29.64	61.44	3210.90	2966.22
9/19-9/23	9/22	20.81	23.28	3314.95	3082.62
9/26-9/30	9/29	43.11	42.06	3530.50	3292.92
10/3-10/7	10/7	60.09	91.44	3830.95	3750.12
10/10-10/14	10/14	20.74	52.01	3934.65	4010.17
10/17-10/21	10/21	59.72	54.33	4233.25	4281.82
10/24-10/28	10/28	115.16	102.59	4809.05	4794.77
10/31-11/4	11/4	66.38	62.34	5140.95	5106.47
11/7-11/11	11/10	51.41	41.84	5398.00	5315.67
11/14-11/18	11/18	49.92	69.00	5647.60	5660.67

[a]/Accumulated deposition values for this date were based on a 4 day week.

Table D-4. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFILM COVERED PETRI DISHES IN NORTH GREENHOUSE OVER TIME (500 lbs/a·yr nominal treatment). Each daily deposition value represents deposition of salt from one petri dish per week during the 1983 season. Accumulated values are an estimate based on a 5 day week of daily deposition values for the 1-week period associated with the sampling date.

Week	Sampling Date	Milligrams salt/m^2·day		Milligrams salt/m^2 accumulated since 6/6	
		Nozzle A	Nozzle B	Nozzle A	Nozzle B
6/6-6/10	6/9	83.14	101.69	415.70	508.45
6/13-6/17	6/15	114.64	102.67	988.90	1021.80
6/20-6/24	6/23	32.26	42.81	1150.20	1235.85
6/27-7/1	7/1	213.47	245.80	2217.55	2464.85
7/4-7/8	7/7 [a]	208.39	194.92	3051.11	3244.53
7/11-7/15	7/14	189.68	209.13	3999.51	4290.18
7/18-7/22	7/22	233.08	250.29	5164.91	5541.63
7/25-7/29	7/29	224.85	269.74	6289.16	6890.33
8/1-8/5	8/5	200.90	182.95	7293.66	7805.08
8/8-8/12	8/12	254.77	222.60	8567.51	8918.08
8/15-8/19	8/19	250.29	266.75	9818.96	10251.83
8/22-8/26	8/26	141.12	287.70	10524.56	11690.33
8/29-9/2	9/1	251.78	190.43	11783.46	12642.48
9/5-9/9	9/9 [a]	154.52	313.13	12401.54	13895.00
9/12-9/16	9/16	238.31	369.25	13593.09	15741.25
9/19-9/23	9/22	174.72	262.26	14466.69	17052.55
9/26-9/30	9/29	164.24	256.27	15287.89	18333.90
10/3-10/7	10/7	220.36	300.42	16389.69	19836.00
10/10-10/14	10/14	217.36	255.52	17476.49	21113.60
10/17-10/21	10/21	290.69	319.12	18929.94	22709.20
10/23-10/28	10/28	420.88	225.60	21034.34	23837.20
10/31-11/4	11/4	215.12	295.93	22109.94	25316.85
11/7-11/11	11/10	364.01	182.20	23929.99	26227.85
11/14-11/18	11/18	264.50	212.13	25252.49	27288.50

[a]/Accumulated deposition values for this date were based on a 4 day week.

Table D-5. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFILM COVERED PETRI DISHES IN SOUTH GREENHOUSE OVER TIME (1000 lbs/a·yr nominal treatment). Each daily deposition value represents deposition of salt from one petri dish per week during the 1983 season. Accumulated values are an estimate based on a 5 day spray week of daily deposition values for the 1-week period associated with the sampling date.

Week	Sampling Date	Milligrams salt/m^2·day		Milligrams salt/m^2/week accumulated since 7/11	
		Nozzle A	Nozzle B	Nozzle A	Nozzle B
7/11-7/15	7/14 [c]	563.78	401.42	1691.34	1204.26
7/18-7/22	7/22	256.27	407.41	2972.69	3241.31
7/25-7/29	7/29	583.98	340.07	5892.59	4941.66
8/1-8/5	8/5	706.69	690.98	9426.04	8396.56
8/8-8/12	8/12	583.98	533.85	12345.94	11065.81
8/15-8/19	8/19	685.74	784.50	15774.64	14988.31
8/22-8//26	8/26	621.39	506.92	18881.59	17522.91
8/29-9/2	9/1	592.21	537.59	21842.64	20210.86
9/5-9/9	9/9 [a]	205.39	264.50	22664.20	21268.86
9/12-9/16	9/16	411.15	496.44	24719.95	23751.06
9/19-9/23	9/22	465.77	438.85	27048.80	25945.21
9/26-9/30	9/29	344.56	518.14	28771.60	28535.91
10/3-10/7	10/7	513.65	375.98	31339.85	30415.81
10/10-10/14	10/14	505.72	488.74	33868.45	32859.51
10/17-10/21	10/21	410.40	388.70	35920.45	34803.01
10/24-10/28	10/28	452.30	542.08	38181.95	37513.41
10/31-11/4	11/4	473.25	515.90	40548.20	40092.91
11/7-11/11	11/10	601.19	513.65	43554.15	42661.16
11/14-11/18	11/18	631.87	539.84	46713.50	45360.36

[a]/Accumulated deposition values for this date were based on a 4 day week.

[c]/Accumulated deposition values for this date were based on a 3 day week.

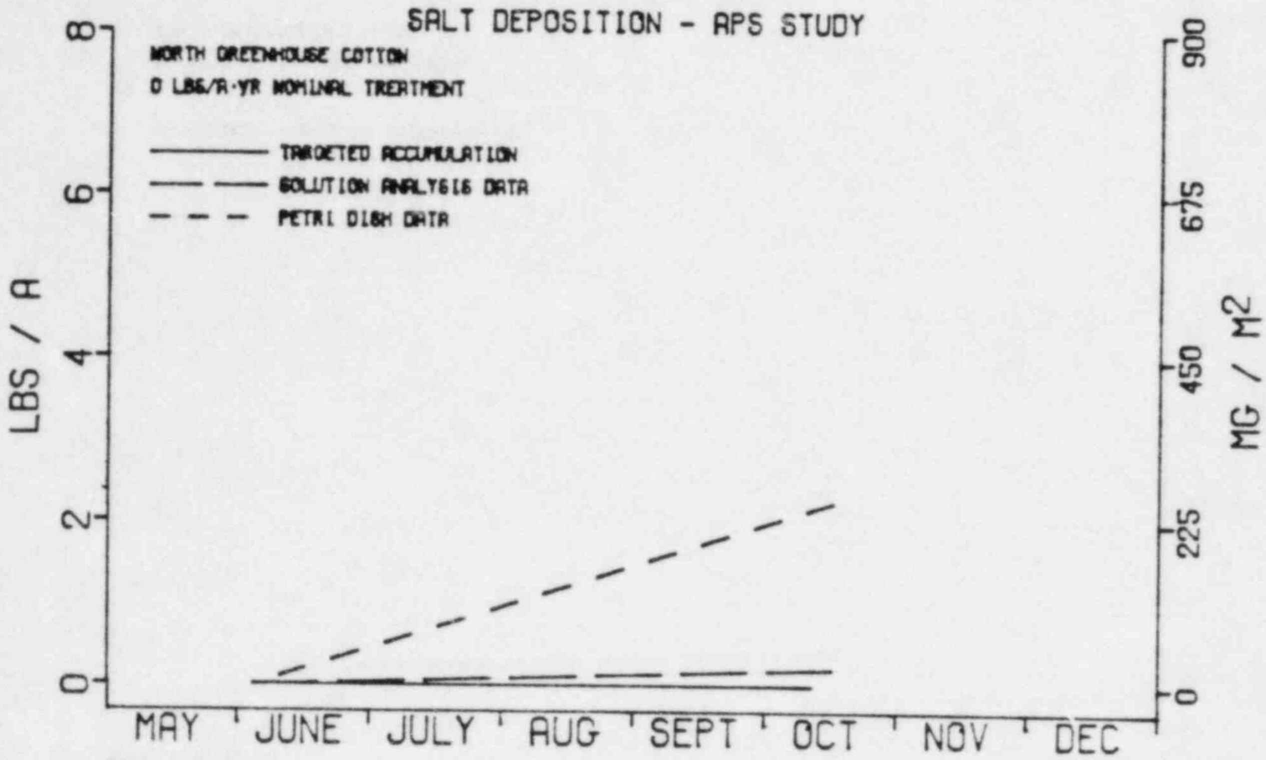


FIGURE D-1

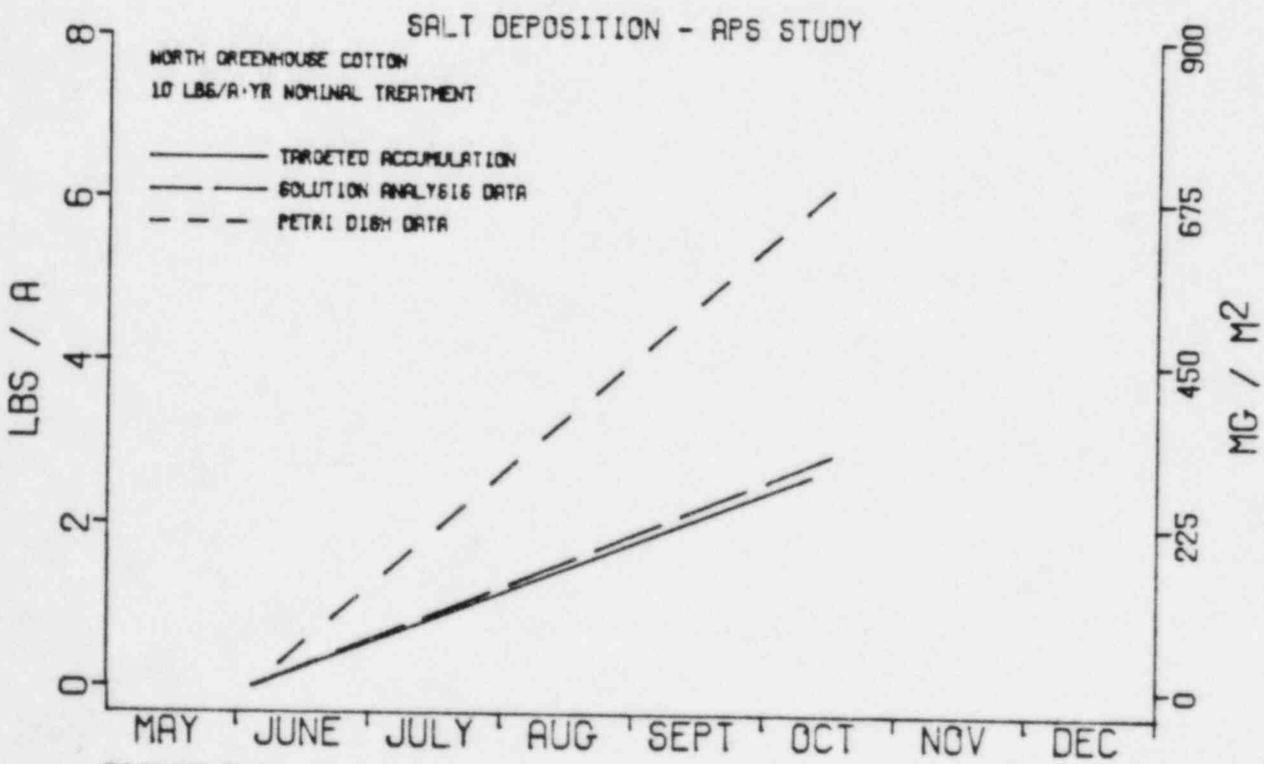


FIGURE D-2

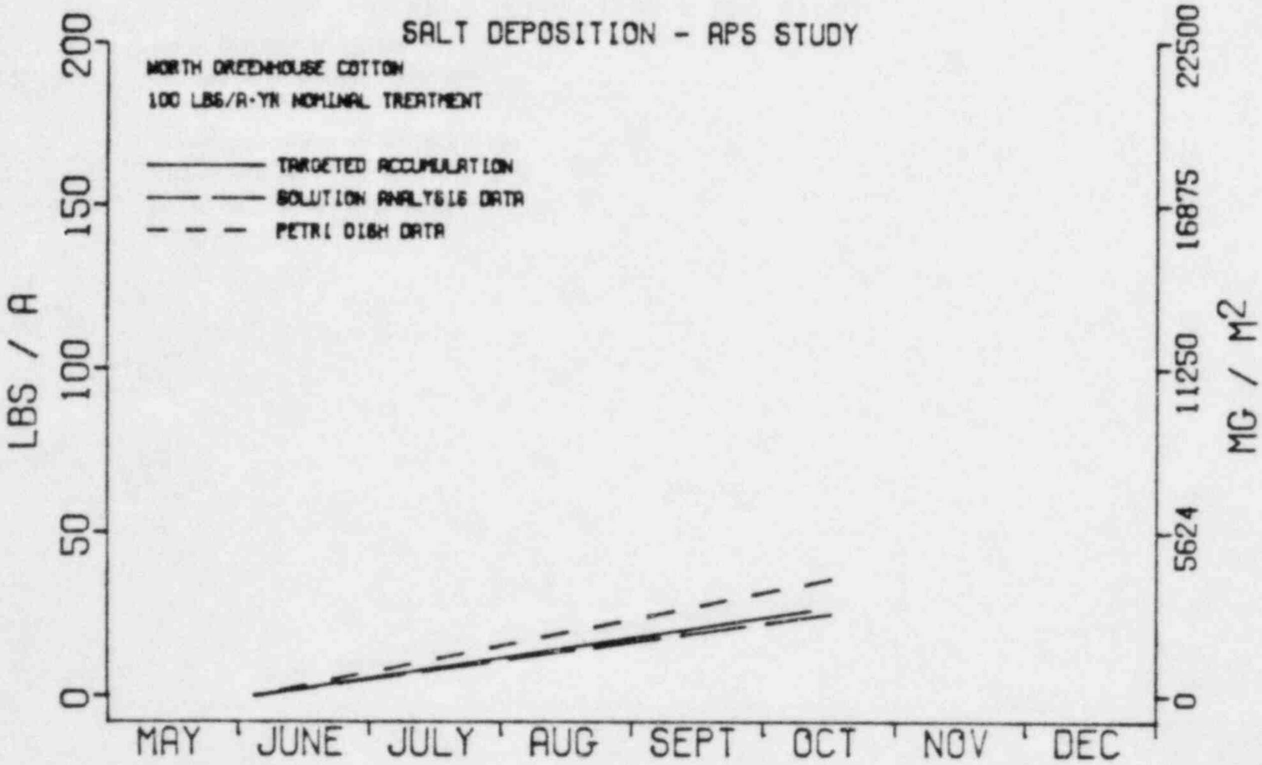


FIGURE D-3

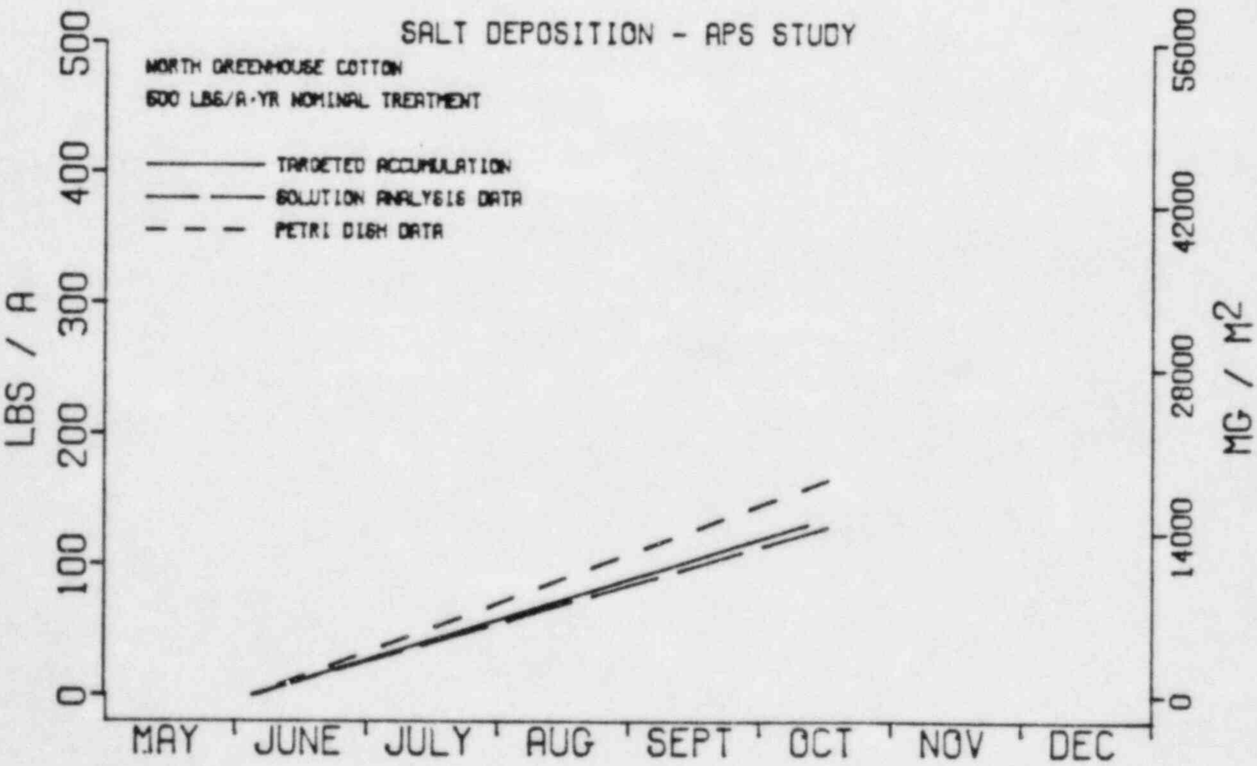


FIGURE D-4

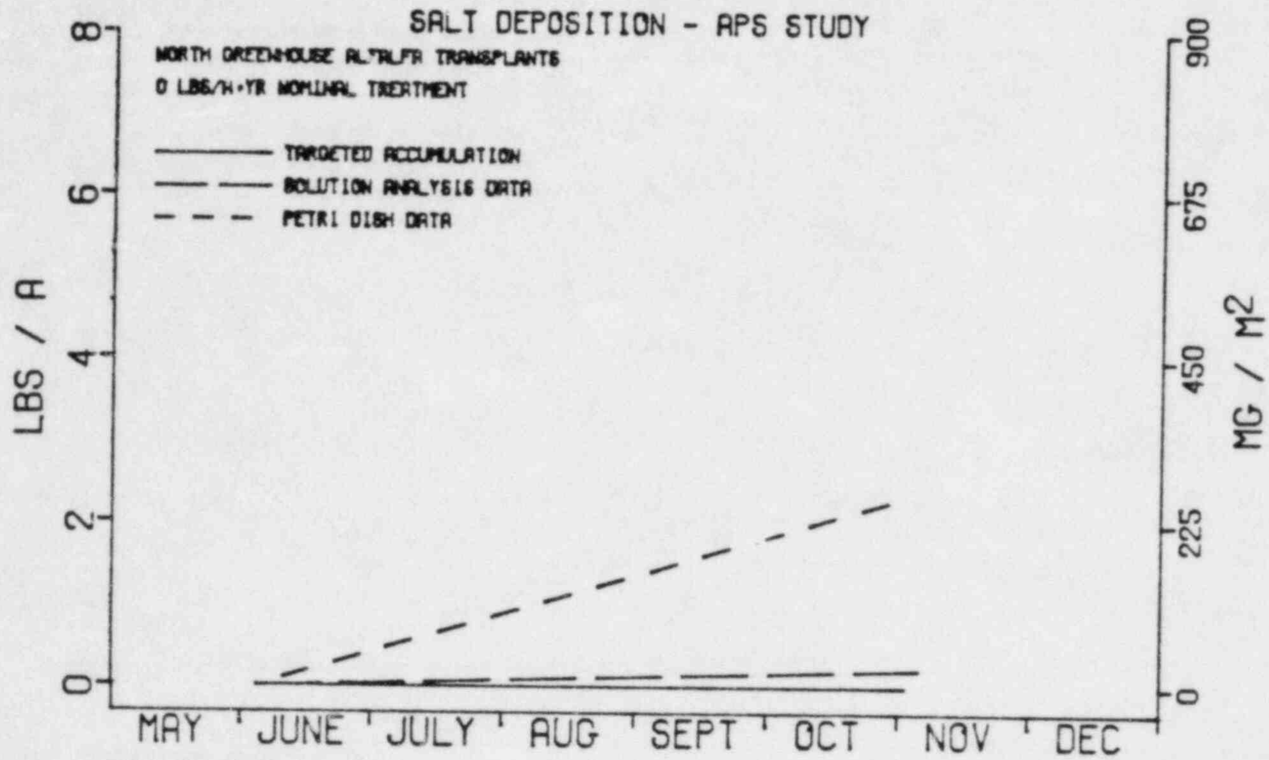
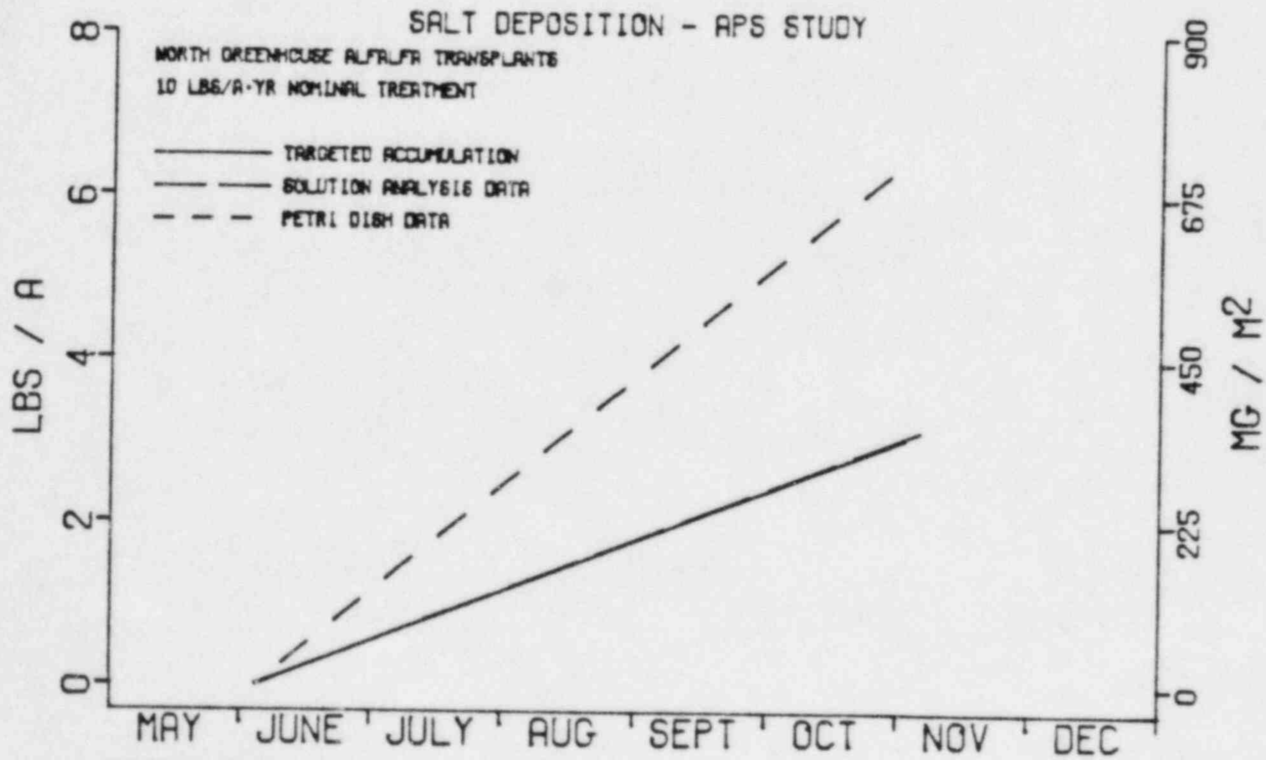


FIGURE D-5



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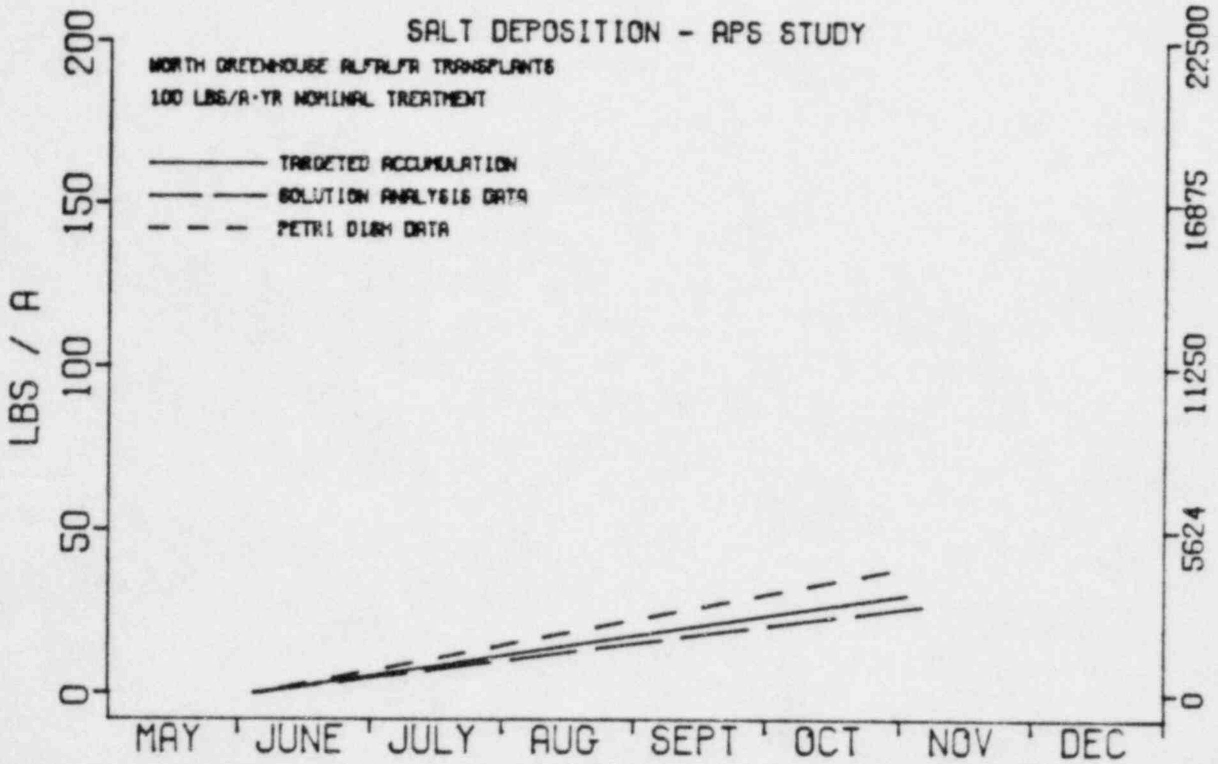


FIGURE D-7

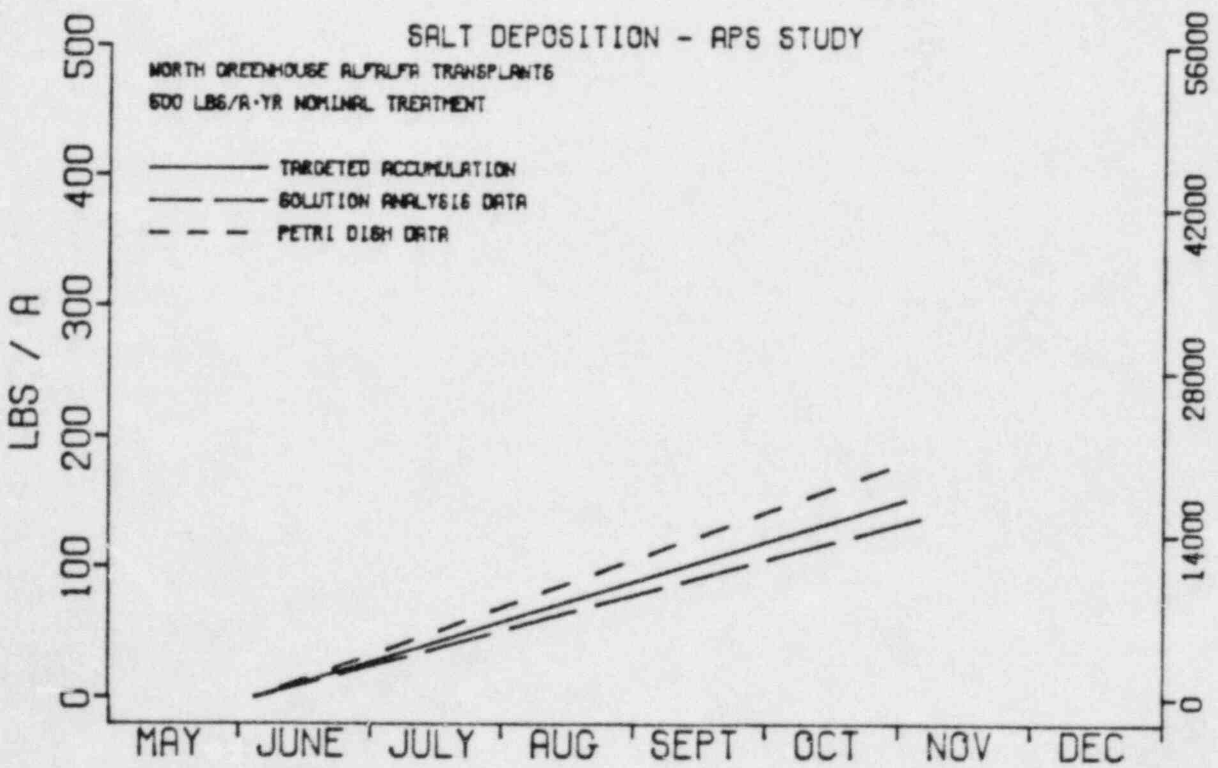


FIGURE D-8

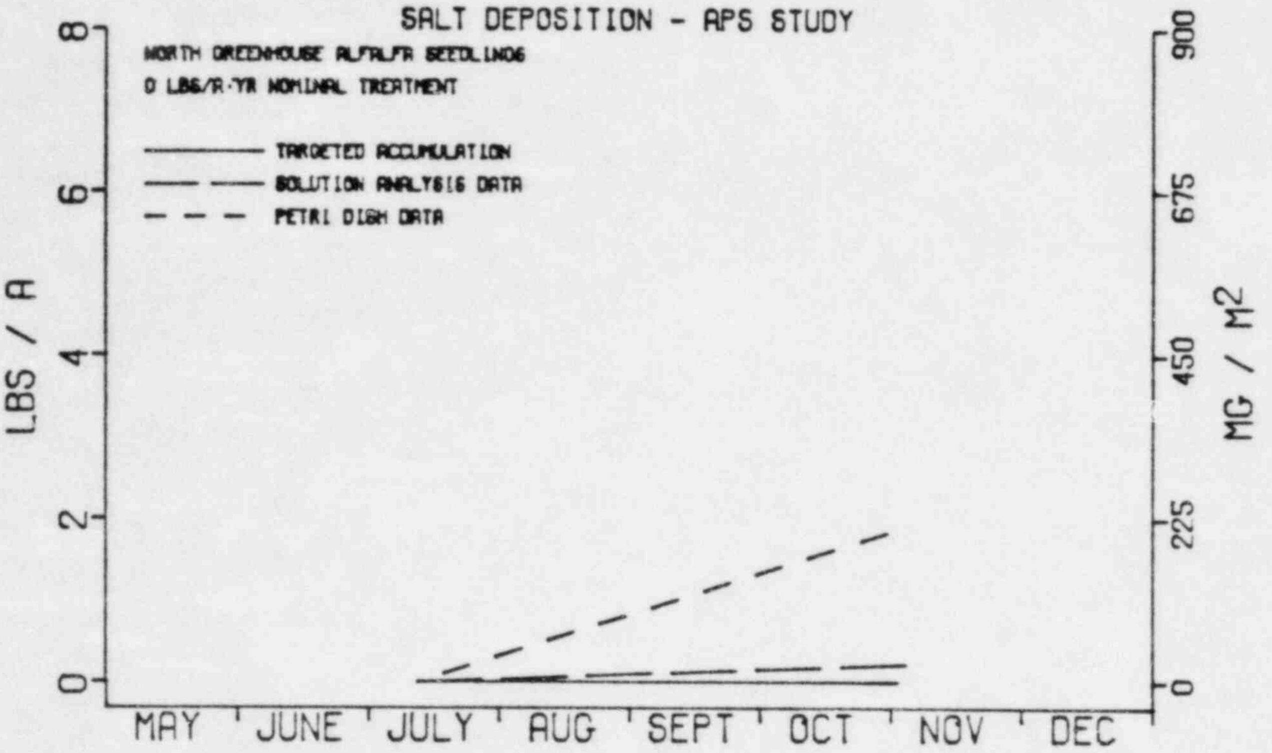


FIGURE D-9

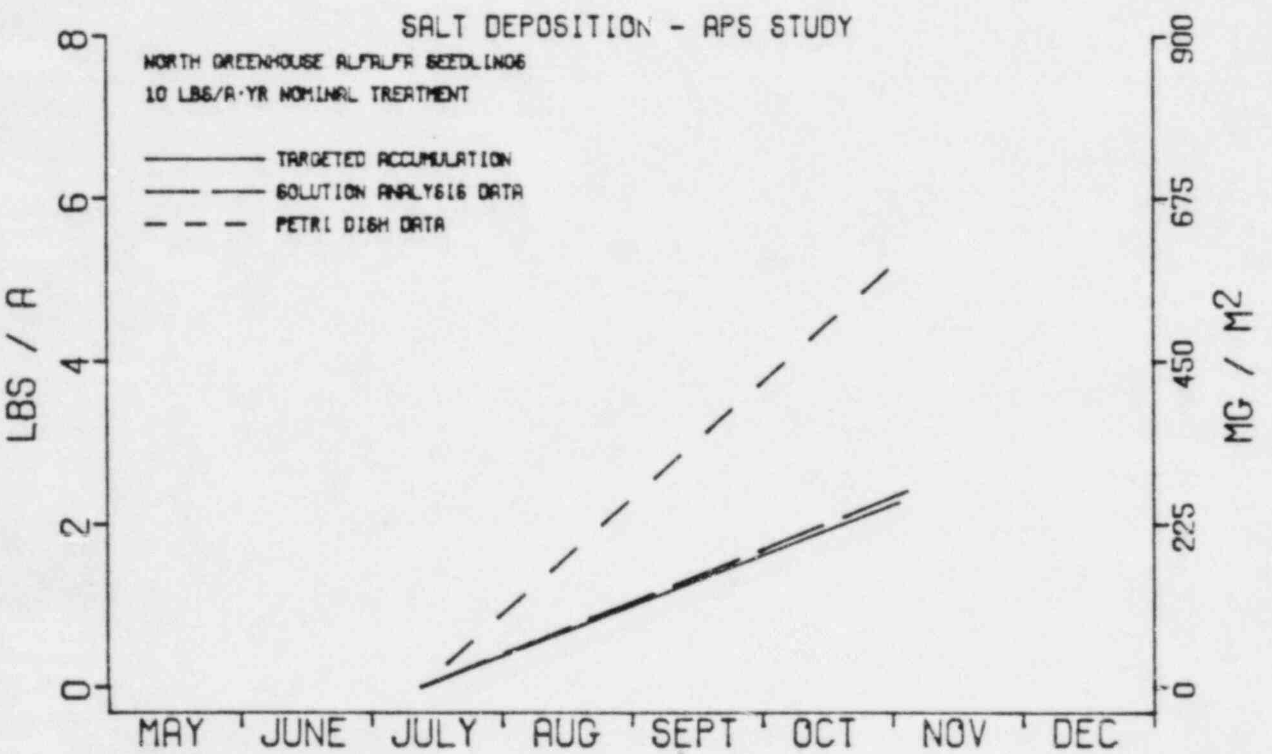


FIGURE D-10

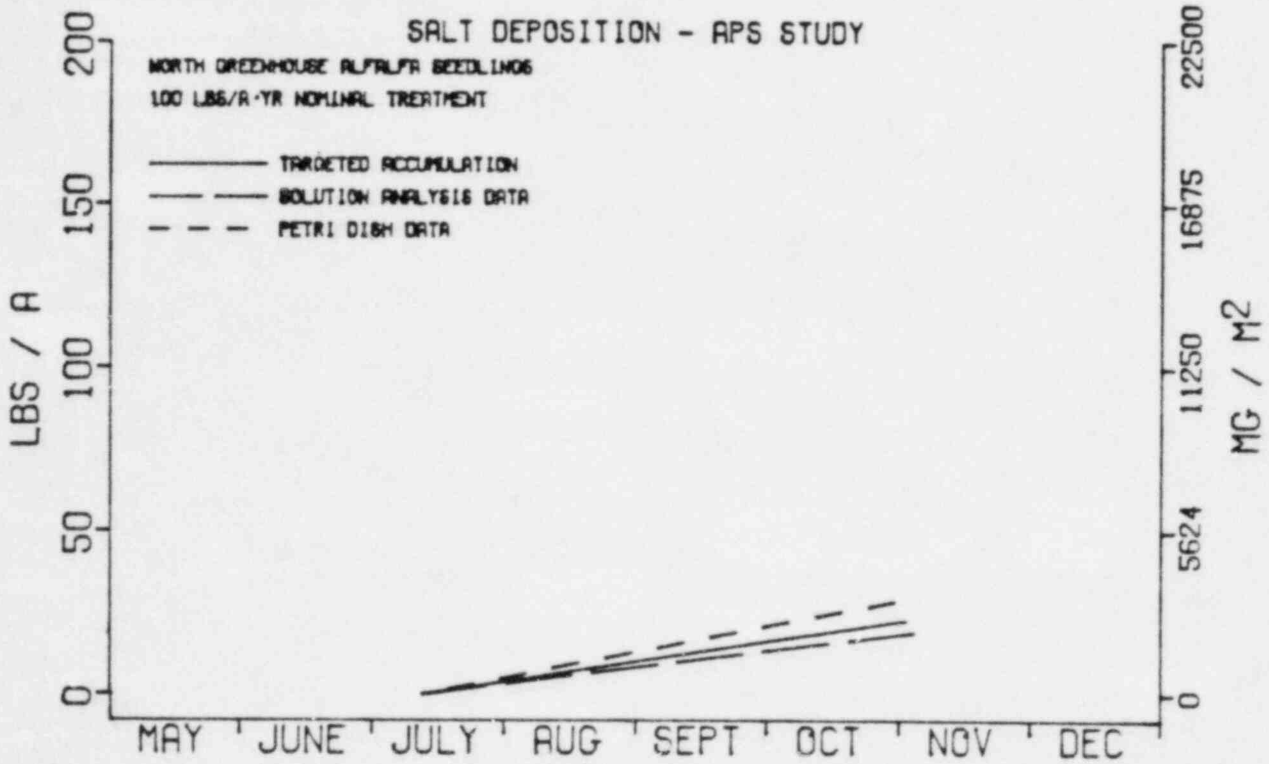


FIGURE D-11

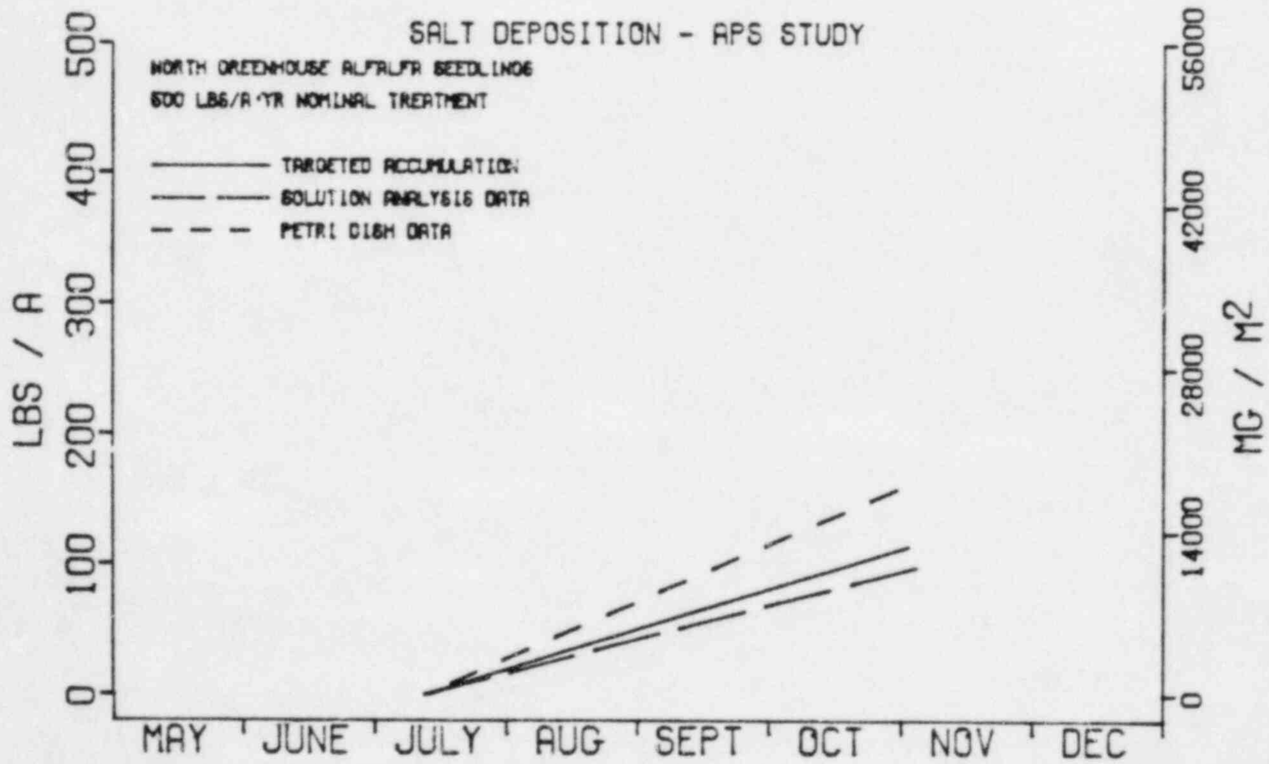


FIGURE D-12

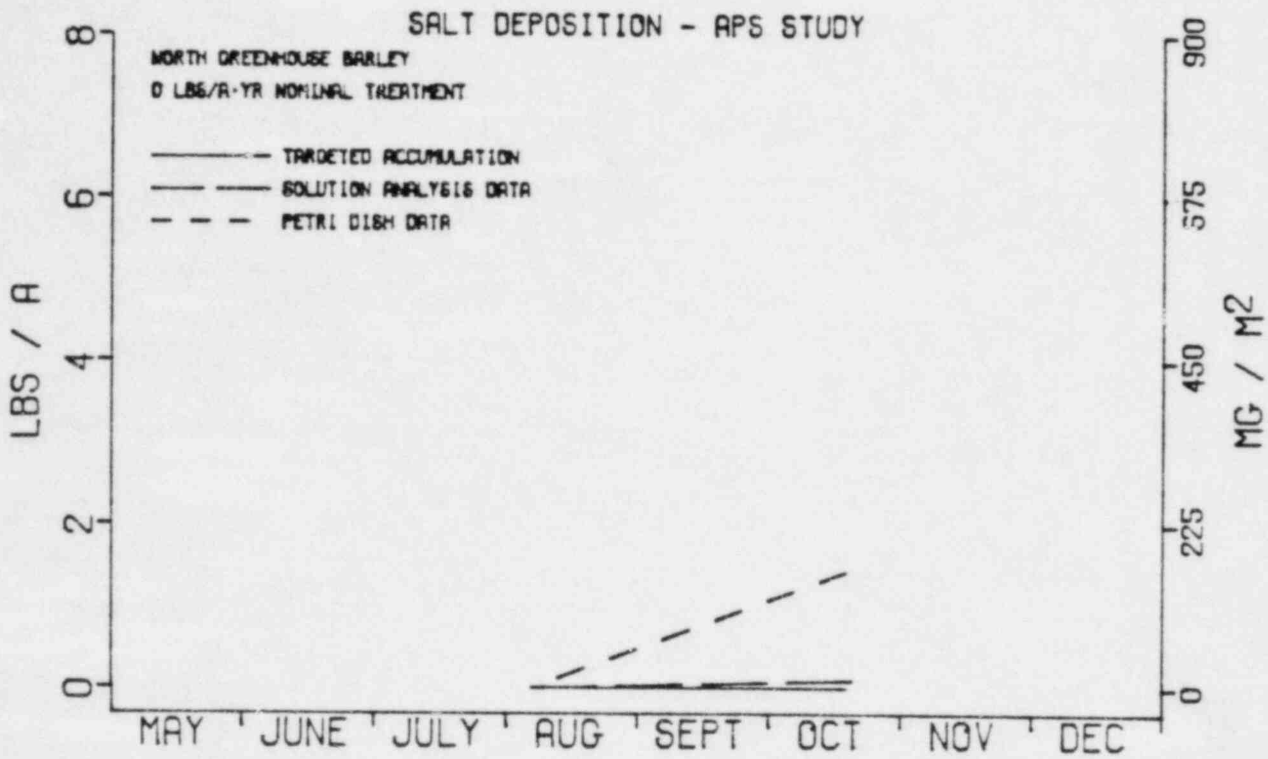


FIGURE D-13

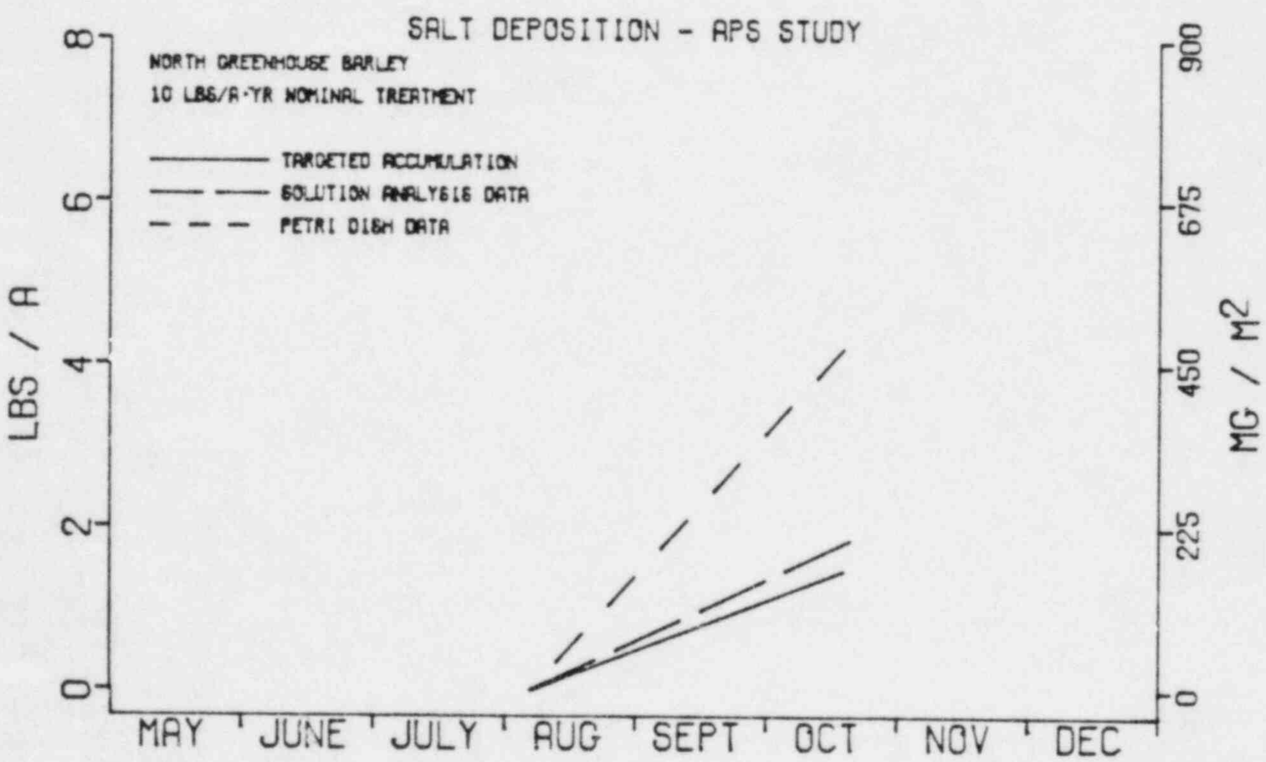


FIGURE D-14

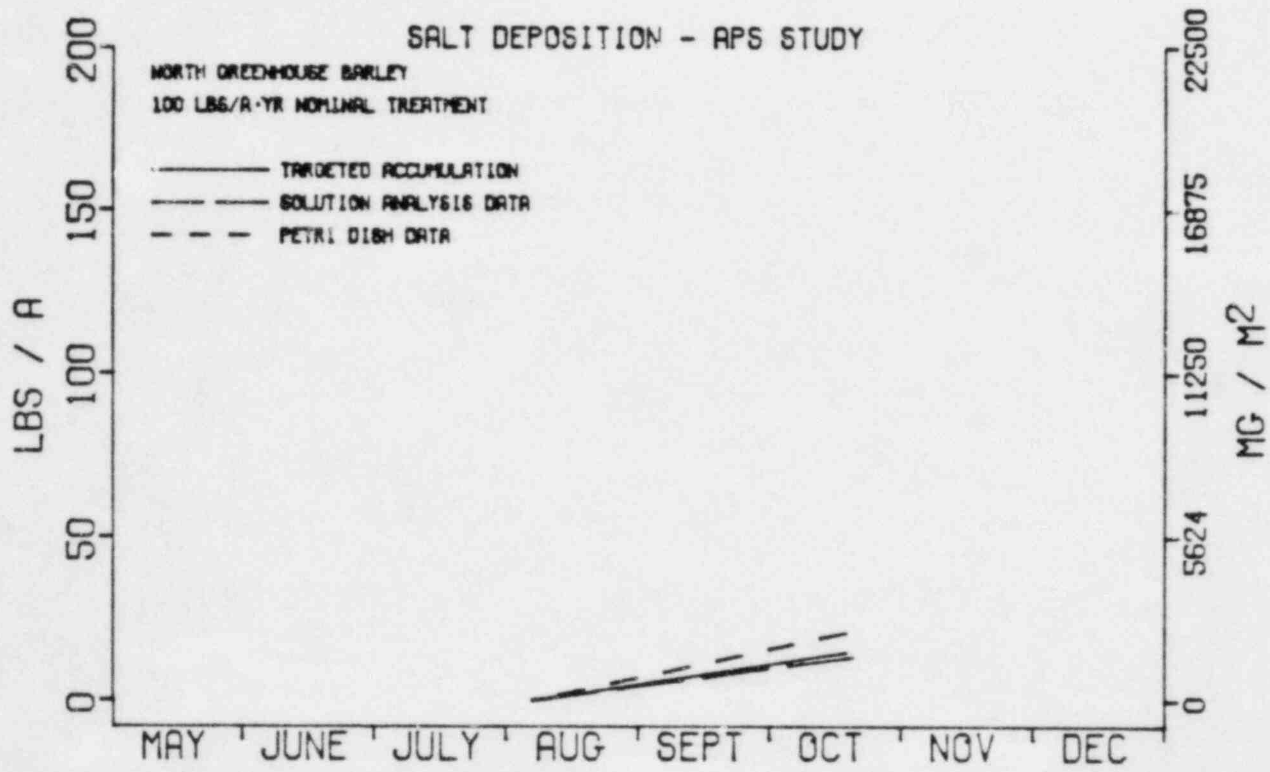


FIGURE D-15

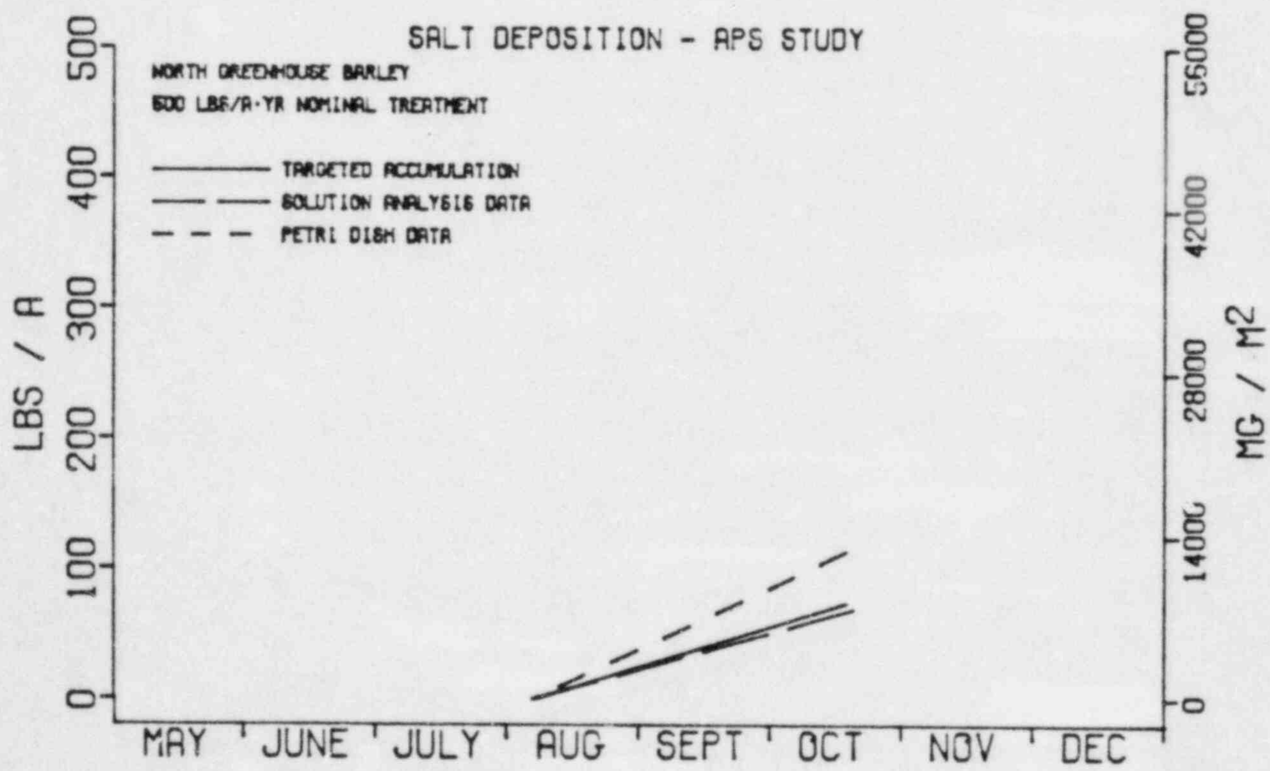


FIGURE D-16

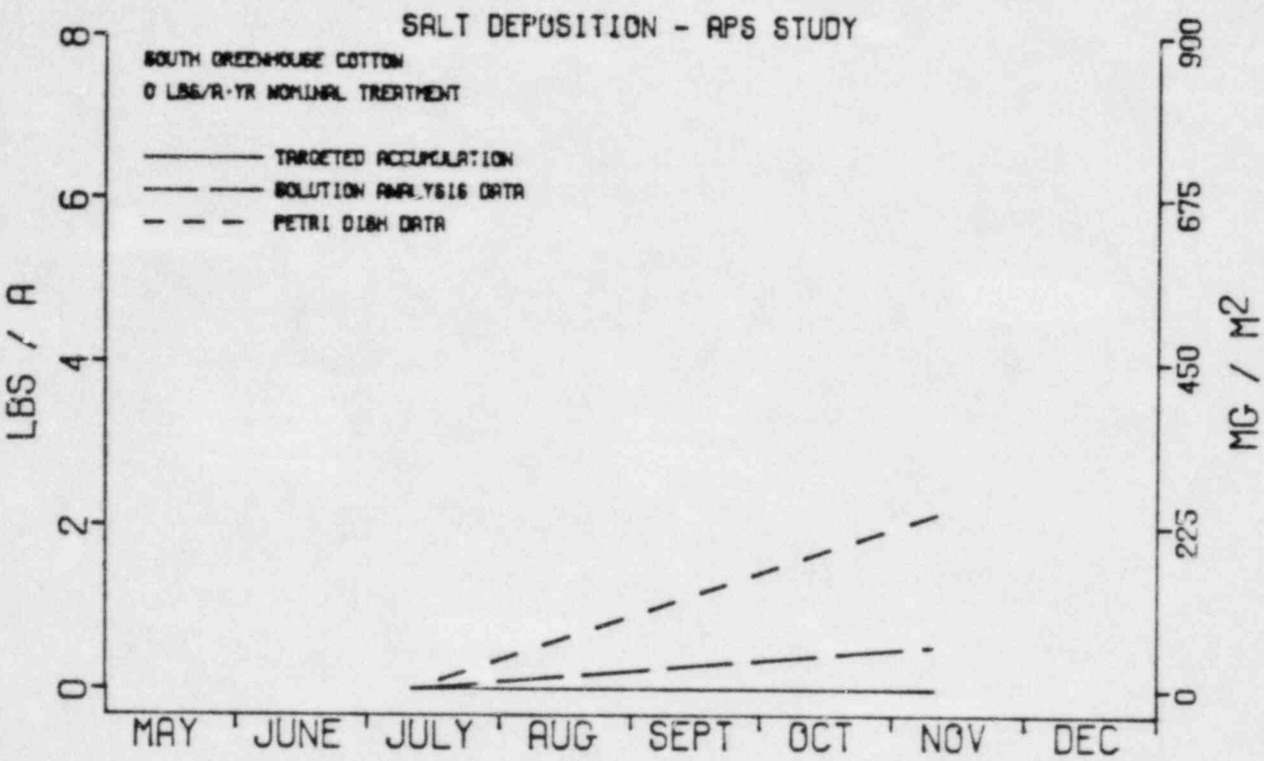


FIGURE D-17

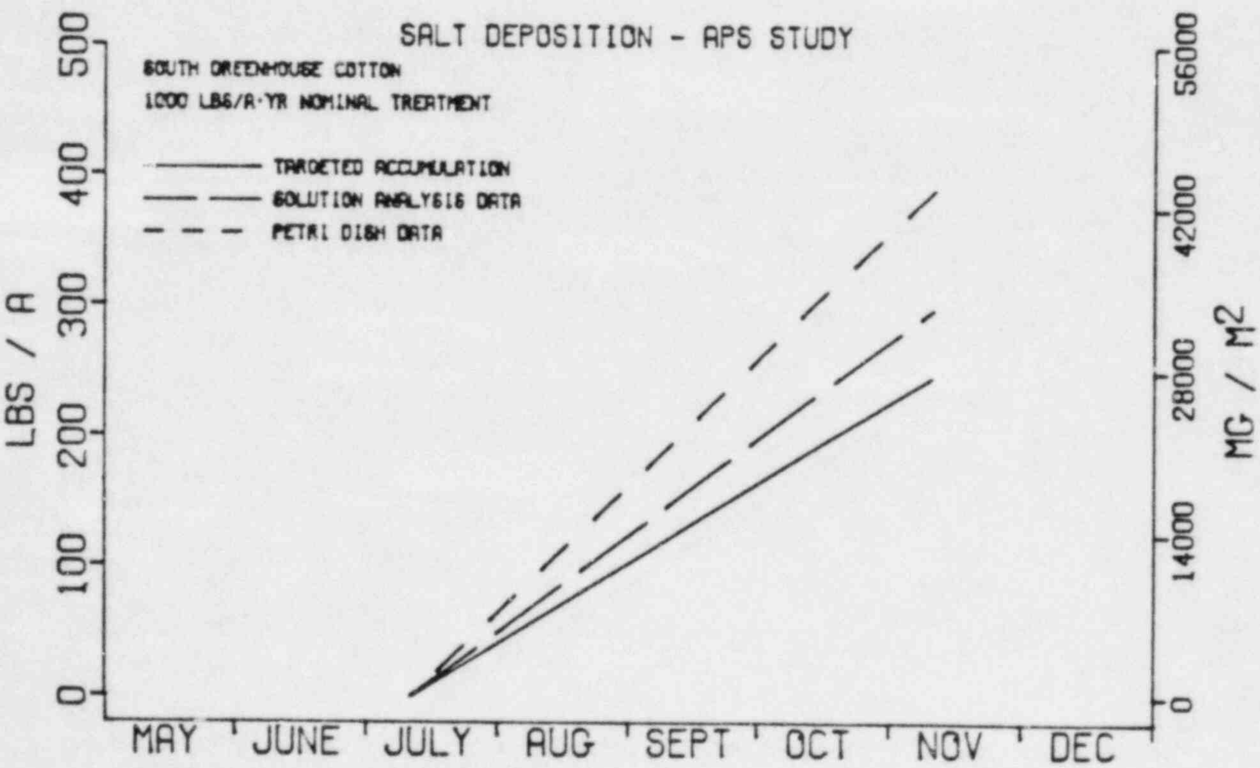


FIGURE D-18

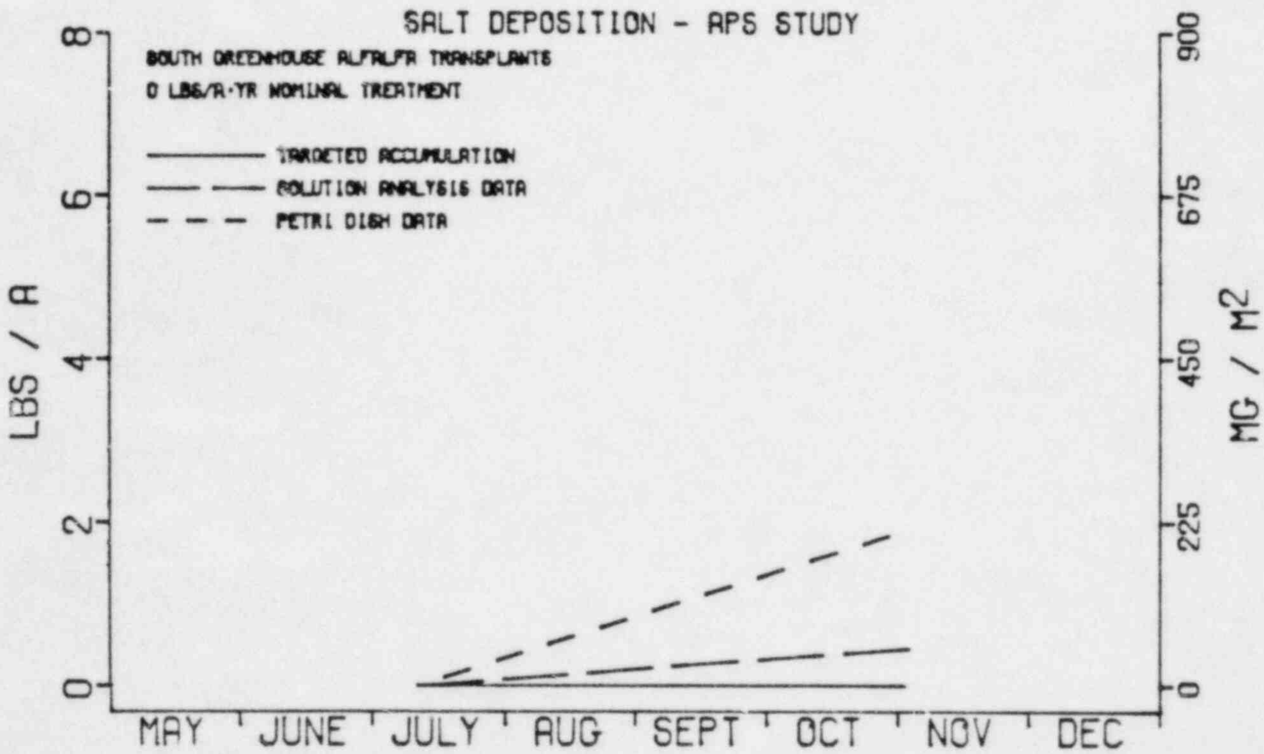


FIGURE D-19

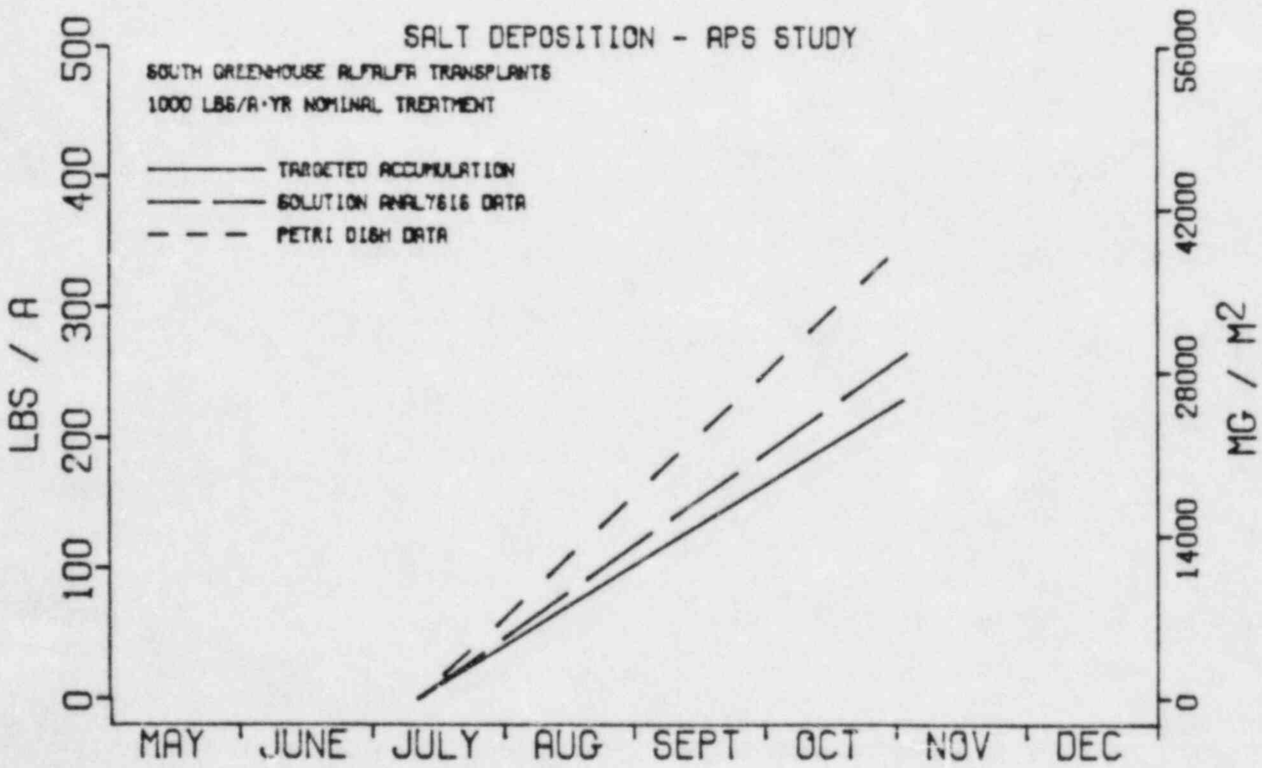


FIGURE D-20

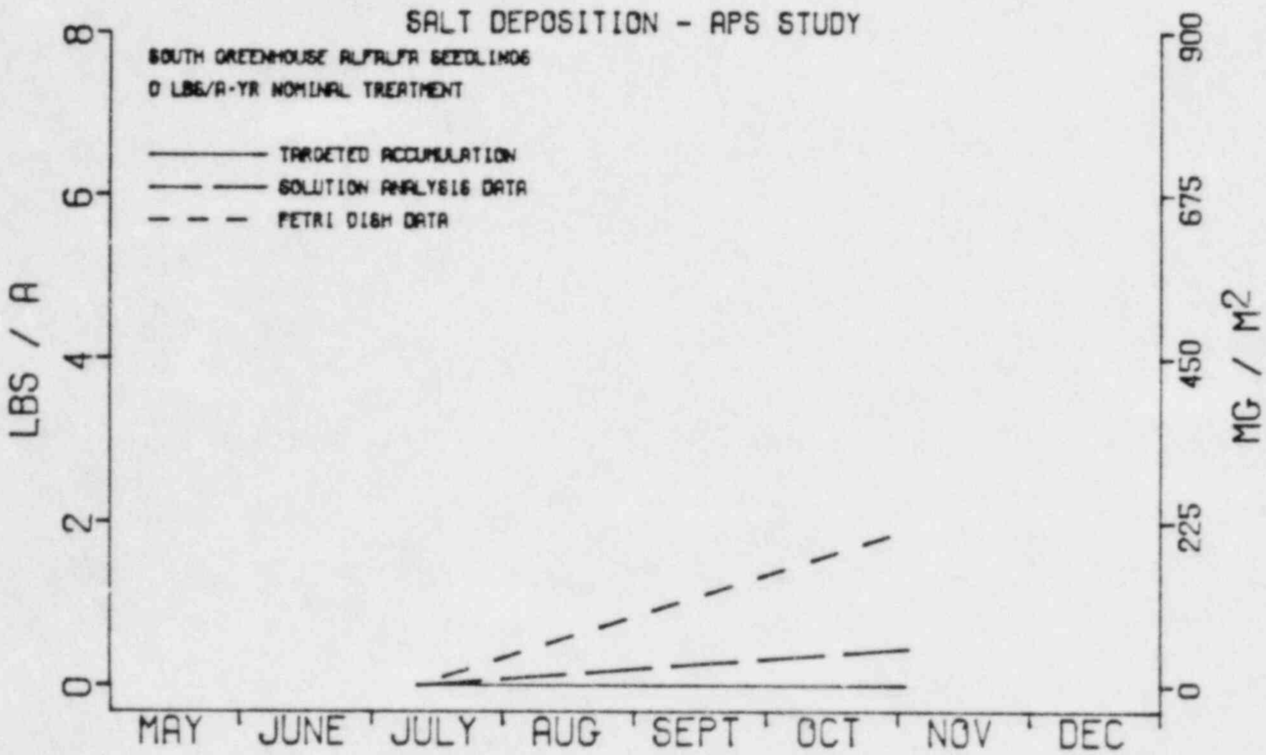


FIGURE D-21

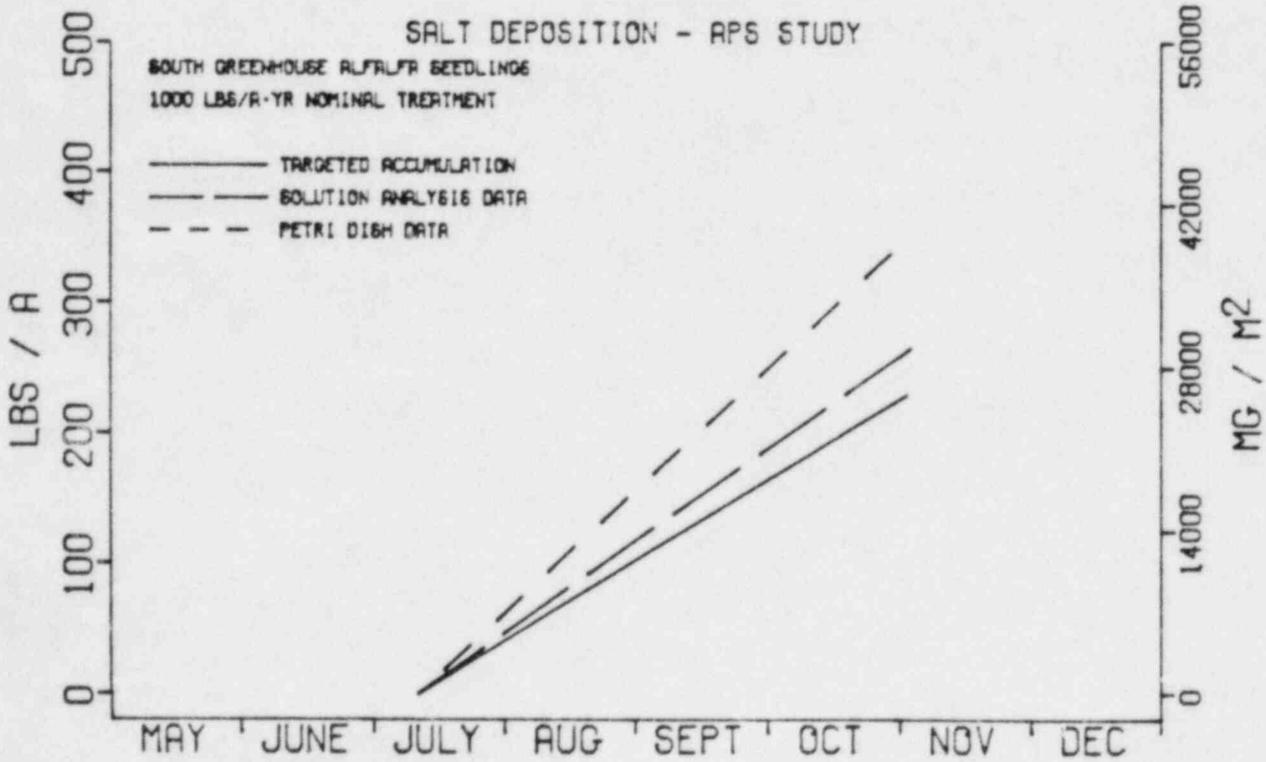


FIGURE D-22

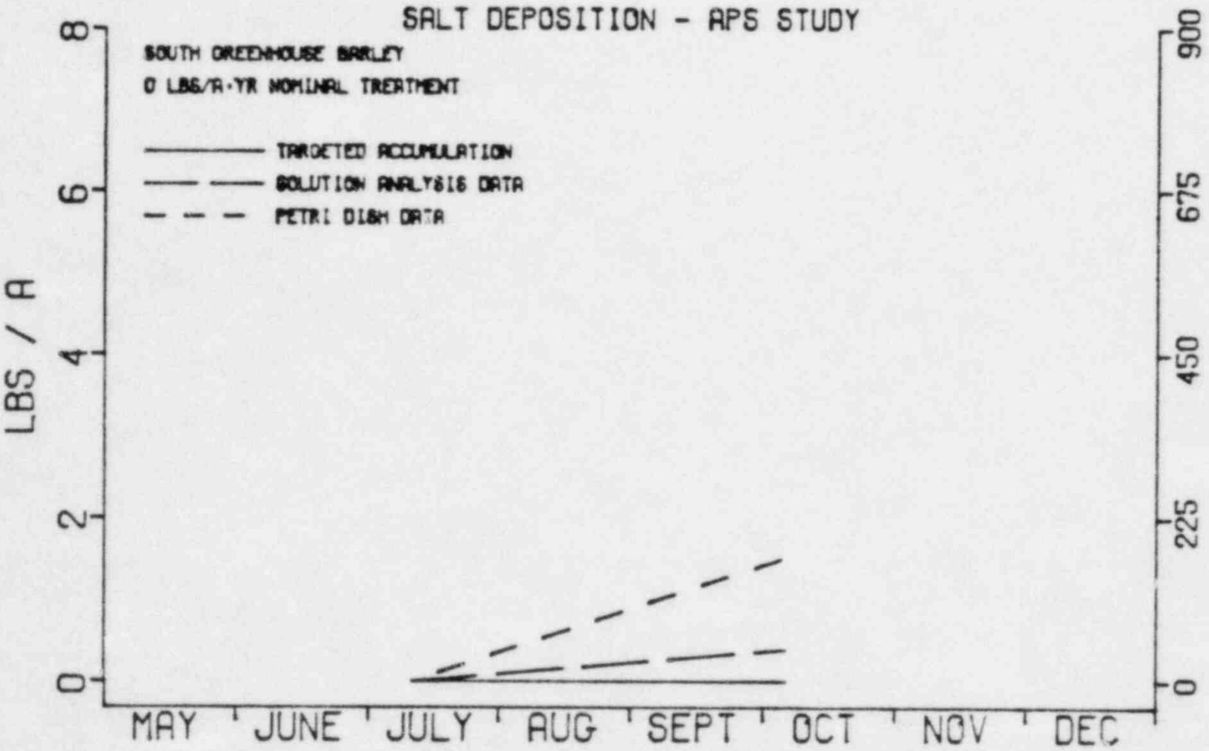


FIGURE D-23

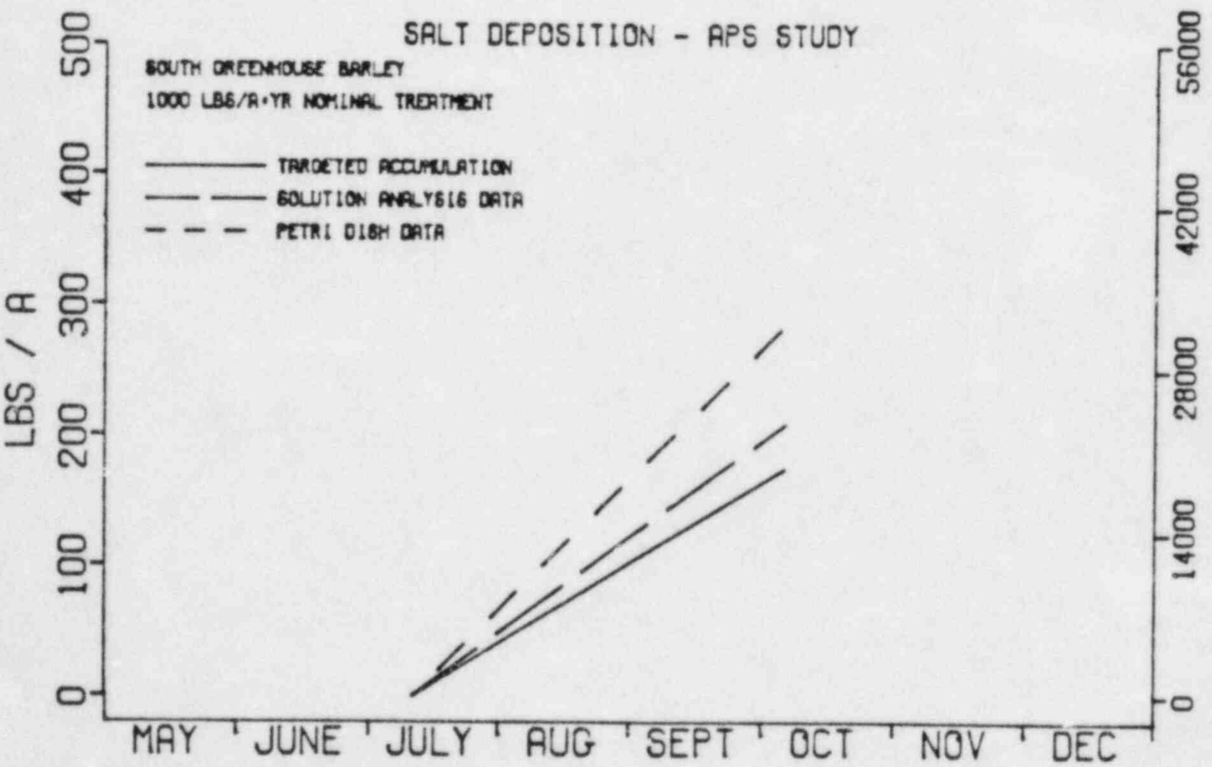


FIGURE D-24

SECTION E

SALT DEPOSITION DATA: FIELD

Salt accumulation for the field study was estimated by the same two methods employed in the greenhouse study (i.e., saline solution analysis and simulated saline drift sampling by the petri dish method). Sampling for each method was performed as conditions permitted. For analysis purposes, the growing season was divided into salt accumulation periods, and the final date of any particular accumulation period was defined by a sampling date.

Table E-1 of this appendix summarizes the petri dish method data for the entire 1983 season.

Table E-2 lists the dates and number of spray applications for each crop of the field study.

Figures E-1 through E-13 are graphs which compare targeted accumulation to the regression curve for both petri dish method data and solution analysis method data. Each table is specific to a particular crop/treatment combination. Note that the targeted accumulation curve takes into account a 25.8 percent hydration factor. Also note that the solution analysis curves for cantaloupe and cotton begin at a later date (i.e., July 17) than that of the other two curves. This is because the regression curve for solution analysis data only considers salt accumulation values for dates after the field spraying system was modified to prevent inter-treatment solution contamination. Thus the slope of the solution analysis curve will more accurately reflect the rate of accumulation. Accumulation during the first few solution sampling periods is reflected in the initial elevation of the curve.

Table E-1. ACCUMULATION OF SIMULATED SALINE DRIFT AS DETERMINED BY PARAFILM COVERED PETRI DISHES AT THE MARANA FIELD SITE OVER TIME (nominal treatments- 0, 10, 100, 500, and 1000 lbs/a·yr). Each daily deposition value represents the mean deposition of salt from three petri dishes per given date. Accumulated values are an estimate based on a 5 day spray week of daily deposition values for the period prior to the sampling date.

Sampling Date	0 lbs/a·yr: Mg salt/m^2·day	0 lbs/a·yr: Mg salt/m^2 accumulated since 5/24/83	10 lbs/a·yr: Mg salt/m^2·day	10 lbs/a·yr: Mg salt/m^2 accumulated since 5/24/83
6/17/83	2.78	52.84	2.71	51.42
7/7/83	4.05	109.58	11.16	207.67
7/18/83	2.78	129.05	7.57	260.66
8/5/83	2.03	157.51	4.95	329.97
8/26/83	0.39	163.31	6.45	426.68
9/8/83	2.86	189.01	5.85	479.31
9/23/83	1.96	210.55	4.13	524.72
10/17/83	3.90	273.00	7.20	639.85
11/30/83	- a	397.80	- a	870.25

Sampling Date	100 lbs/a·yr: Mg salt/m^2·day	100 lbs/a·yr: Mg salt/m^2 accumulated since 5/24/83	500 lbs/a·yr: Mg salt/m^2·day	500 lbs/a·yr: Mg salt/m^2 accumulated since 5/24/83
6/17/83	6.67	126.76	21.56	409.65
7/7/83	26.20	493.55	82.76	1568.33
7/18/83	38.92	765.98	211.60	3049.55
8/5/83	26.35	1134.87	159.38	5280.85
8/26/83	13.18	1332.58	88.08	6601.98
9/8/83	46.25	1748.84	332.29	9592.56
9/23/83	32.11	2102.05	98.55	10676.61
10/17/83	41.76	2770.24	142.54	12957.31
11/30/83	- a	4106.56	- a	17518.59

[a]/No deposition measurement made. Accumulation data based on daily deposition value from 10/17/83.

Table E-1 continued.

	1000 lbs/a·yr	
Sampling Date	Mg salt/m2·day	Mg salt/m2 accumulated since 7/19/83
8/5/83	296.15	4146.10
8/26/83	164.54	6614.20
10/17/83	433.59	22223.44
11/21/83	- a	33063.19

a/No deposition measurement made. Accumulation data based on daily deposition value from 10/17/83.

Table E-2. POTENTIAL AND ACTUAL DATES OF APPLICATION OF SIMULATED SALINE DRIFT SOLUTION AT THE MARANA FIELD SITE. Application rate was based on a 5-day week. Cotton crop was planted on May 2, 1983; cantaloupe crop was planted on May 24, 1983; alfalfa crop was a 3-year old established stand.

Date	Potential Spray Dates	Number of Spray Applications Made[a] Cotton	Cantaloupe	Alfalfa
May 24	*	1[b]	-	-
25	*	0 (I)	-	-
26	*	0 (I)	-	-
27	*	1	-	-
28		1	-	-
29				
30	*	0 (H)	-	-
31	*	1	-	-
June 1	*	0 (W)	-	-
2	*	0 (W)	-	-
3	*	1	-	-
4		1		
5				
6	*	1	1[b]	-
7	*	1	1	-
8	*	0 (M)	0 (M)	-
9	*	0 (W)	0 (W)	-
10	*	1	1	-
11				
12				
13	*	1	1	-
14	*	1	1	-
15	*	1	1	-
16	*	1	1	-
17	*	1	1	-
18				
19				
20	*	1	1	-
21	*	1	1	-
22	*	1	1	-

Table E-2 continued.

Date	Potential Spray Dates	-------Number of Spray Applications Made------- Cotton	Cantaloupe	Alfalfa
June 23	*	1	1	-
24	*	0 (W)	0 (W)	-
25		1	1	
26				
27	*	1	1	-
28	*	1	1	-
29	*	0 (I)	1	-
30	*	0 (I)	1	-
July 1	*	0 (I)	1	-
2		1	1	
3				
4	*	0 (H)	0 (H)	-
5	*	1	1	-
6	*	0 (W)	1	-
7	*	1	1	-
8	*	1	1	-
9				
10				
11	*	1	1	-
12	*	1	1	-
13	*	1	1	-
14	*	1	1	-
15	*	0 (M)	0 (M)	-
16		1	1	-
17				
18	*	1	1	-
19	*	1	1	1[b]
20	*	0 (I)	1	1
21	*	0 (I)	1	1
22	*	0 (R)	0 (R)	0 (R)
23				

Table E-2 continued.

Date	Potential Spray Dates	Cotton	Cantaloupe	Alfalfa
		Number of Spray Applications Made		
July 24				
25	*	2	2	0 (R)
26	*	1	1	0 (B)
27	*	2	1	1
28	*	2	1	1
29	*	1	2	1
30				
31				
Aug. 1	*	2	2	0 (B)
2	*	1	1	2
3	*	2	1	1
4	*	1	1	1
5	*	2	0 (I)	1
6				
7				
8	*	0 (I)	0 (I)	0 (I)
9	*	0 (I&R)	0 (I&R)	0 (I&R)
10	*	0 (R)	0 (R)	0 (R)
11	*	0 (R)	0 (R)	0 (R)
12	*	0 (R)	0 (R)	2
13				
14				
15	*	0 (R)	0 (R)	0 (R)
16	*	0 (R)	0 (R)	0 (R)
17	*	0 (R)	0 (R)	0 (R)
18	*	0 (R)	0 (R)	0 (R)
19	*	3	2	3
20		1	2	2
21				
22	*	2	2	1
23	*	2	1	1

Table E-2 continued.

Date	Potential Spray Dates	-------Number of Spray Applications Made-------		
		Cotton	Cantaloupe	Alfalfa
Aug. 24	*	3	0 (I)	3
25	*	3	0 (I)	2
26	*	3	0 (I)	3
27				
28				
29	*	0 (I)	3	2
30	*	0 (I)	3	2
31	*	0 (I)	3	2
Sept. 1	*	0 (I)	3	1
2	*	3	3	1
3				
4				
5	*	0 (H)	0 (H)	0 (H)
6	*	3	2	1
7	*	0 (R)	0 (R)	2
8	*	3	2	1
9	*	3	2	1
10				
11				
12	*	3	1	1
13	*	2	1	1
14	*	2	2	1
15	*	1	1	1
16	*	1	1	2
17				
18				
19	*	0 (I)	0 (I)	1
20	*	0 (I)	0 (I)	0 (I)
21	*	0 (I)	0 (I)	0 (I)
22	*	0 (I)	2	0 (I)
23	*	0 (R)	0 (R)	0 (R)

Table E-2 continued.

Date	Potential Spray Dates	-------Number of Spray Applications Made------- Cotton	Cantaloupe	Alfalfa
Sept. 24				
25				
26	*	2	1	2
27	*	2	2[c]	2
28	*	0 (W)	0 (W)[d]	0 (W)
29	*	0 (W&R)	-	0 (W&R)
30	*	0 (R)	-	0 (R)
Oct. 1				
2				
3	*	0 (R)	-	0 (R)
4	*	0 (R)	-	0 (R)
5	*	0 (R)	-	0 (R)
6	*	0 (R)	-	0 (R)
7	*	0 (R)	-	3
8				
9				
10	*	3	-	3
11	*	2	-	2
12	*	3	-	2
13	*	2	-	1
14	*	0 (W)	-	1
15				
16				
17	*	3	-	1
18	*	2	-	2
19	*	2	-	2
20	*	2	-	1
21	*	1	-	1
22				
23				
24	*	1	-	1

Table E-2 continued.

Date	Potential Spray Dates	Number of Spray Applications Made: Cotton	Cantaloupe	Alfalfa
Oct. 25	*	0 (W)	-	0 (W)
26	*	0 (W)	-	0 (W)
27	*	0 (W)	-	0 (W)
28	*	0 (W)	-	0 (W)
29				
30				
31	*	2	-	2
Nov. 1	*	1	-	1
2	*	2	-	2
3	*	2	-	2
4	*	0 (R)	-	0 (R)
5				
6				
7	*	1	-	1
8	*	0 (W)	-	1
9	*	2	-	1
10	*	2	-	2
11	*	0 (H)	-	0 (H)
12				
13				
14	*	2	-	2
15	*	2	-	0 (W)
16	*	1	-	2
17	*	1	-	2[c]
18	*	0 (W)	-	0 (W)
19				
20				
21	*	0 (R)	-	0 (R)[d]
22	*	0 (R)	-	-
23	*	0 (R)	-	-
24	*	0 (H)	-	-

Table E-2 continued.

Date	Potential Spray Dates	Number of Spray Applications Made: Cotton	Cantaloupe	Alfalfa
Nov. 25	*	-	-	-
26				
27				
28	*	3	-	-
29	*	3	-	-
30	*	2[c,d]	-	-
TOTALS:				
Cotton	137	137		
Cantaloupe	83		83	
Alfalfa	90			90

a/Letters in parentheses indicate why spray applications were not made:

(B)- Did not spray due to interference of commercial harvesting operations.

(H)- Did not spray because of holiday.

(I)- Did not spray because irrigation made soil too wet for travel.

(M)- Did not spray because of mechanical problems.

(R)- Did not spray because of rain or because of wet soil due to rain.

(W)- Did not spray because of excessive wind.

b/Starting spray application date.

c/Last spray application.

d/End of experimental spraying period.

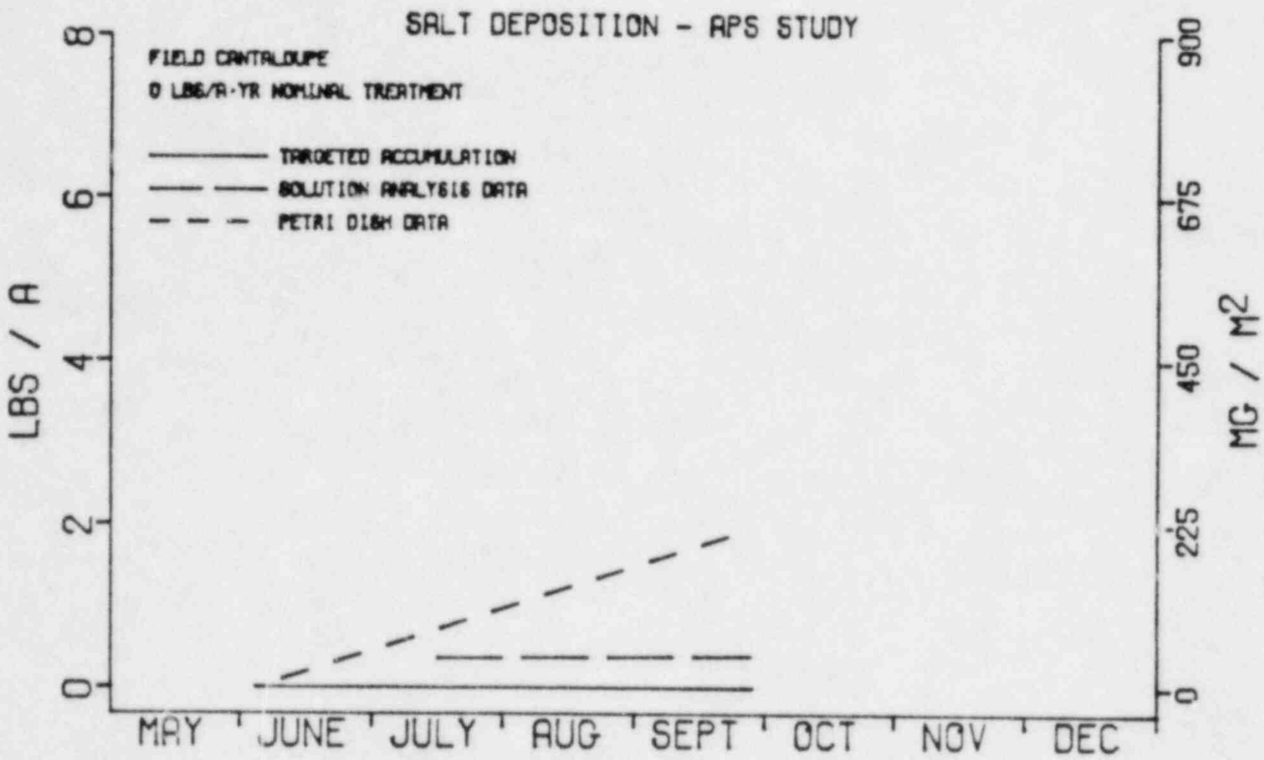


FIGURE E-1

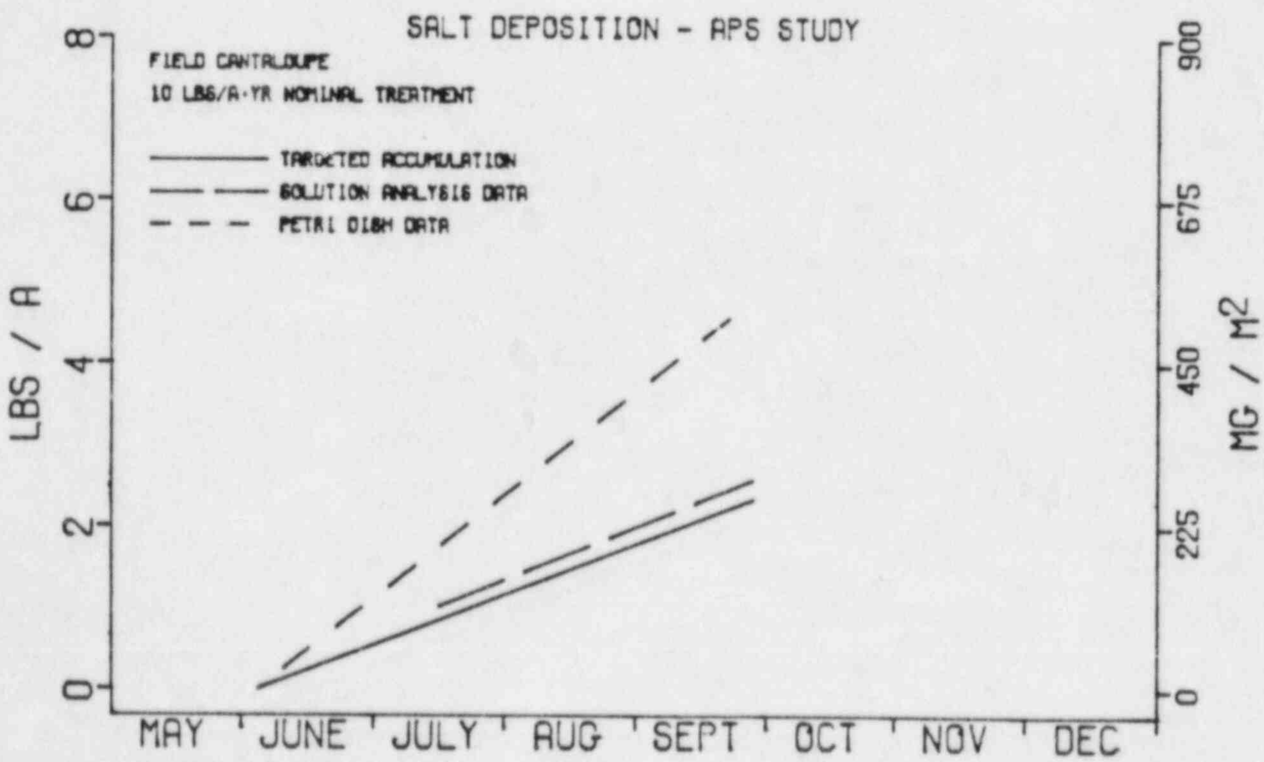


FIGURE E-2

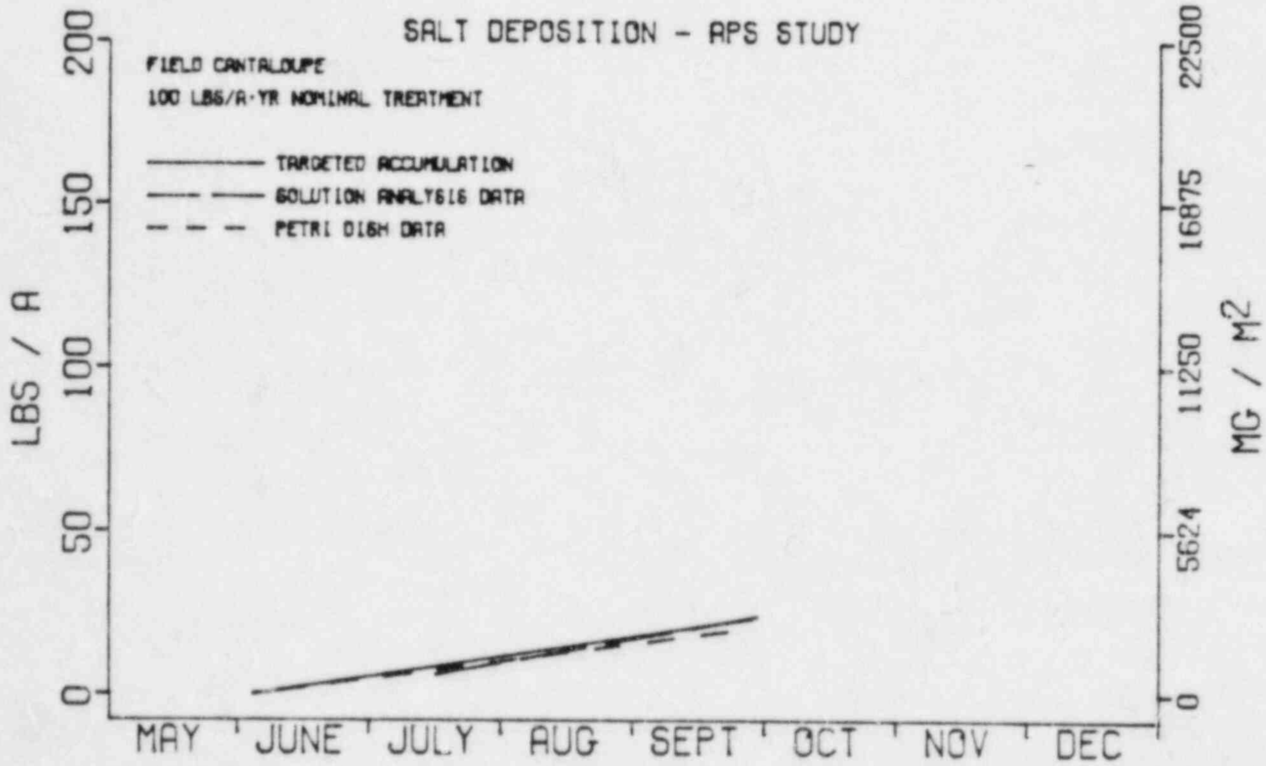


FIGURE E-3

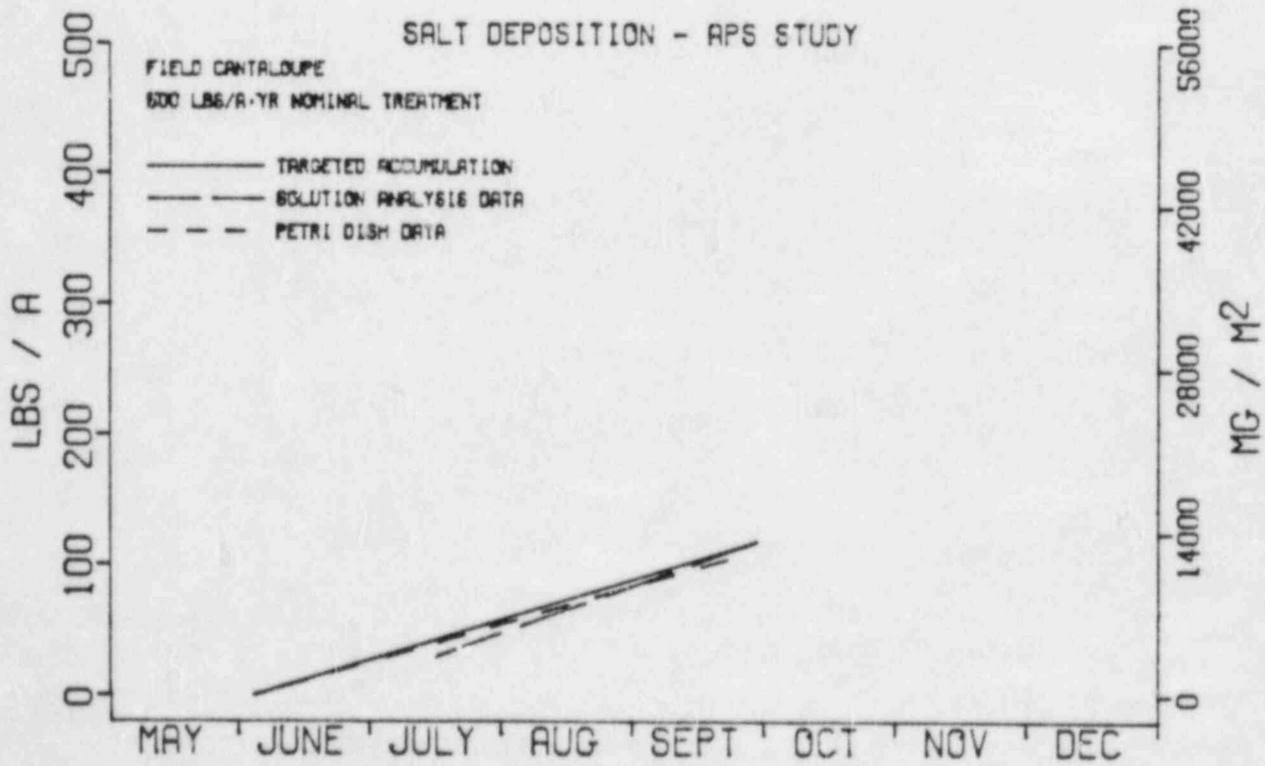


FIGURE E-4

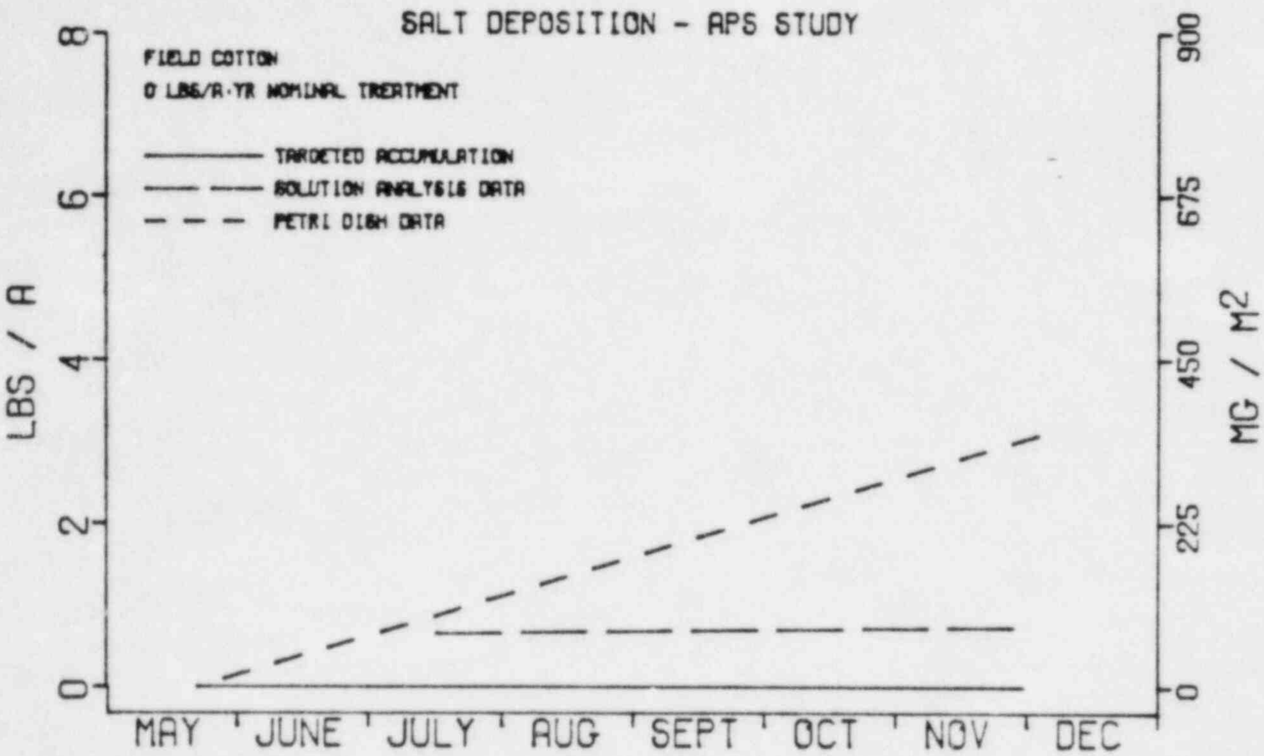


FIGURE E-5

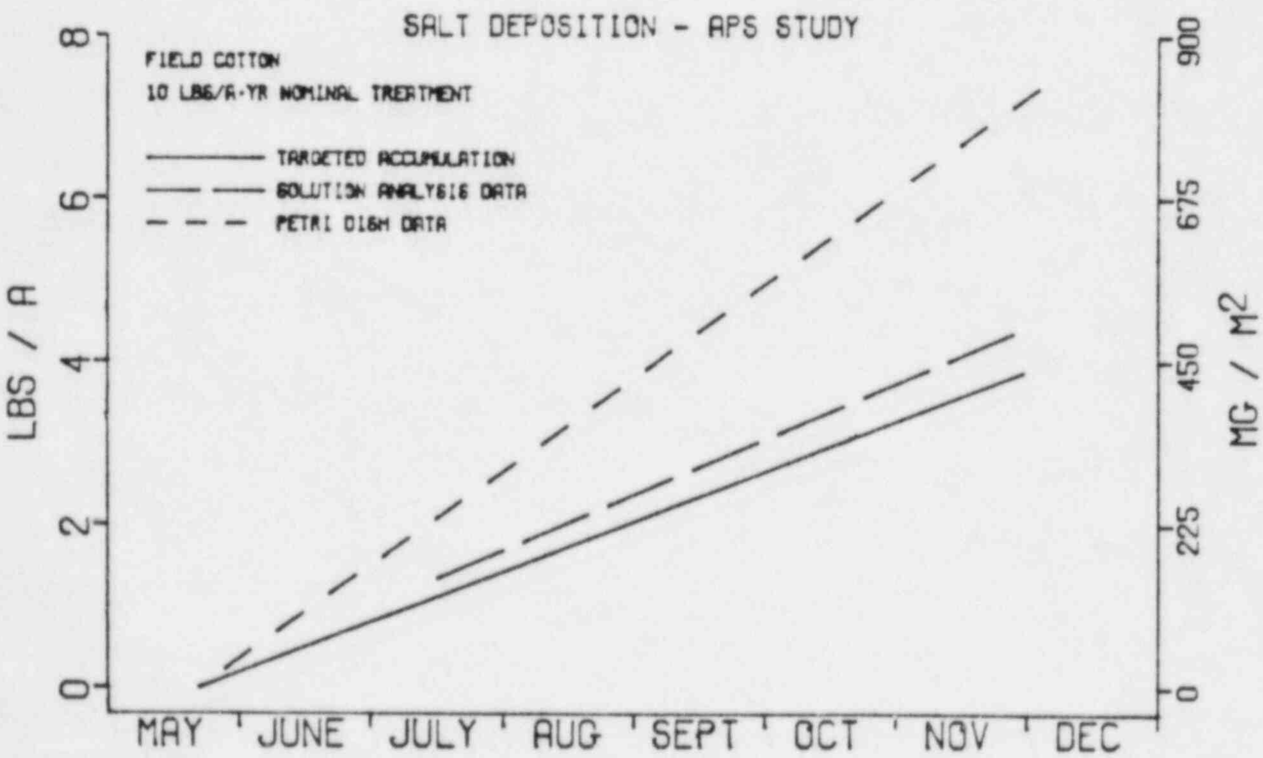


FIGURE E-6

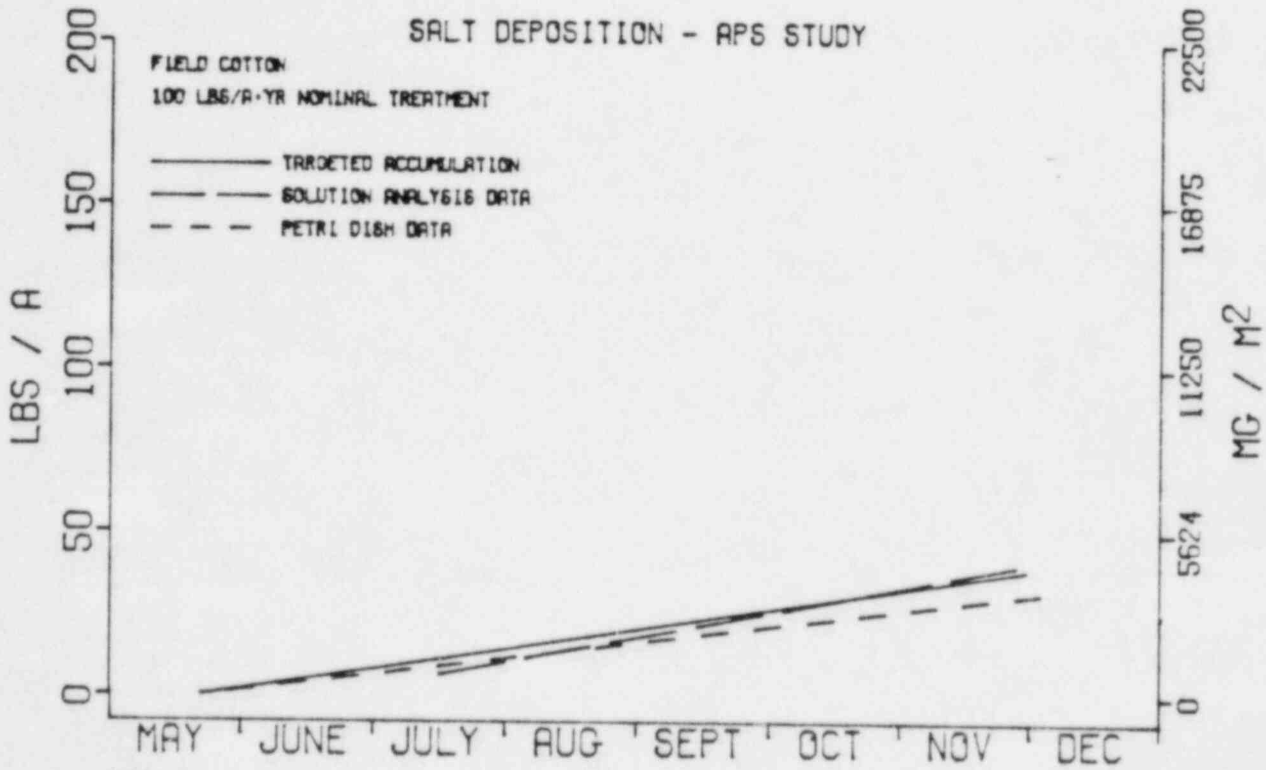


FIGURE E-7

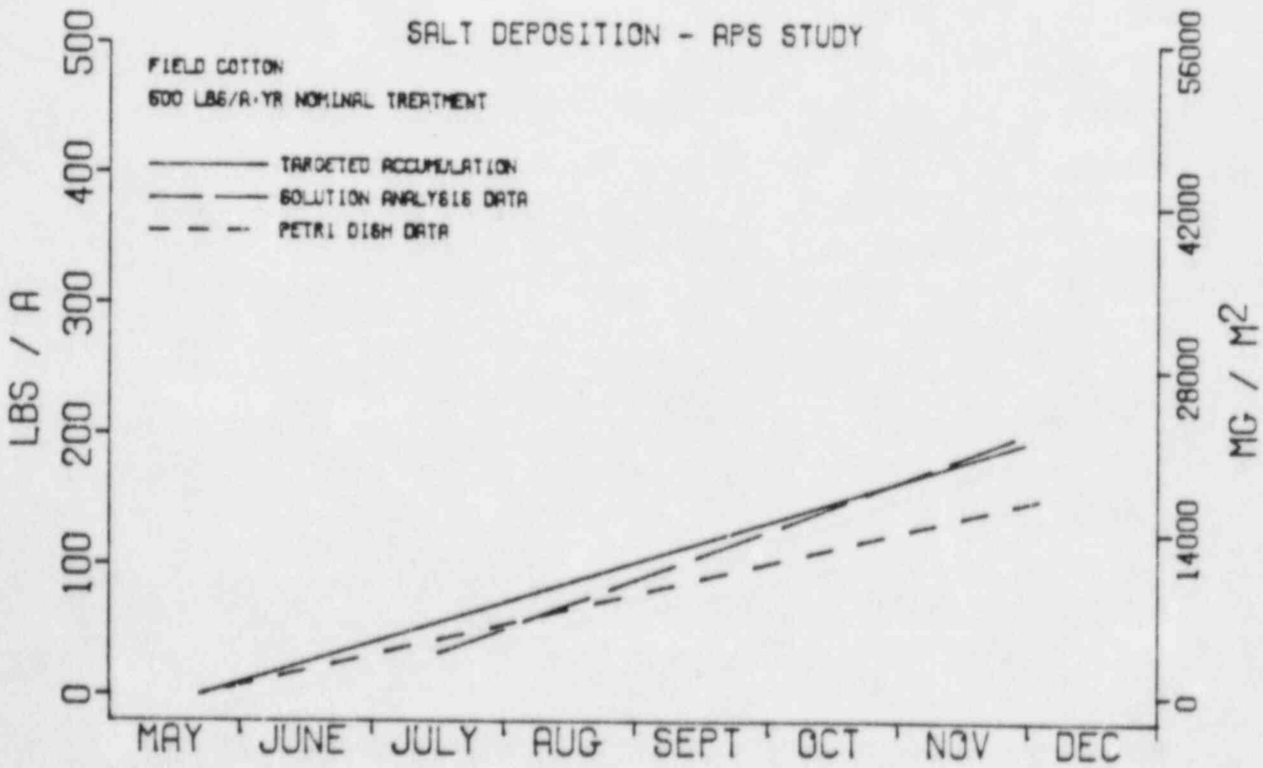


FIGURE E-8

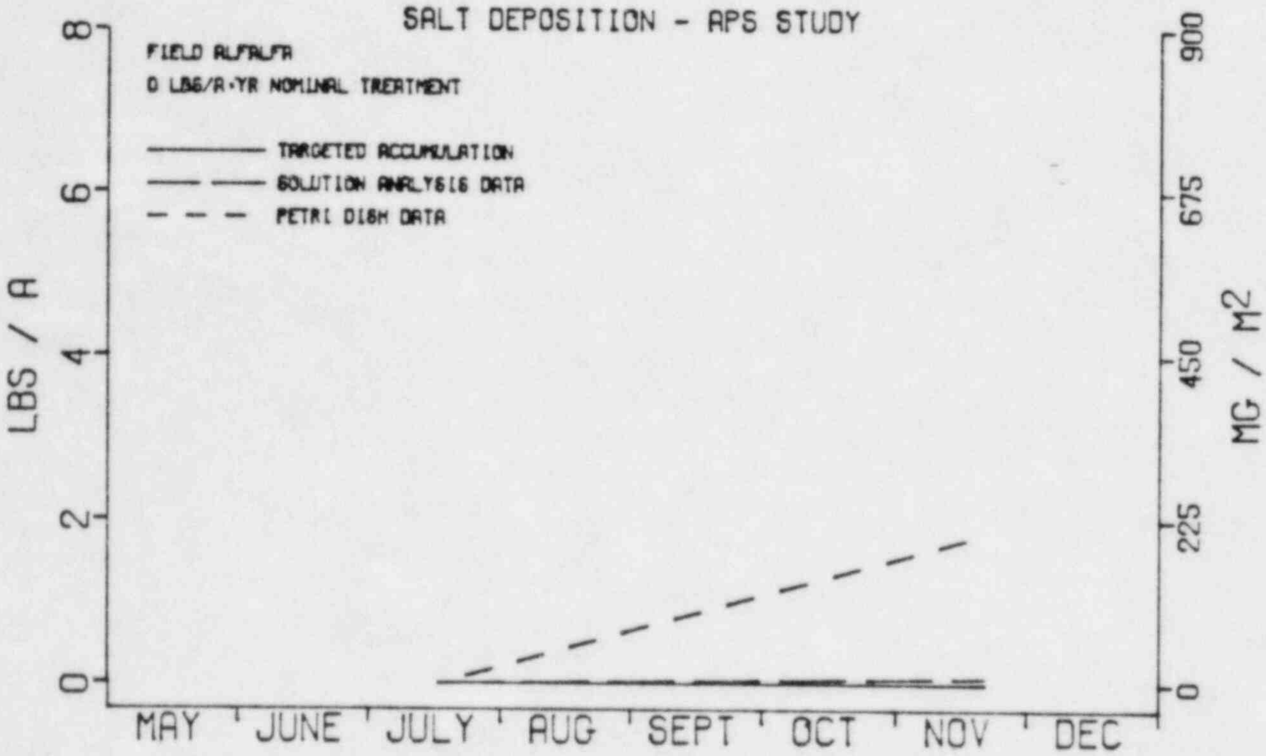


FIGURE E-9

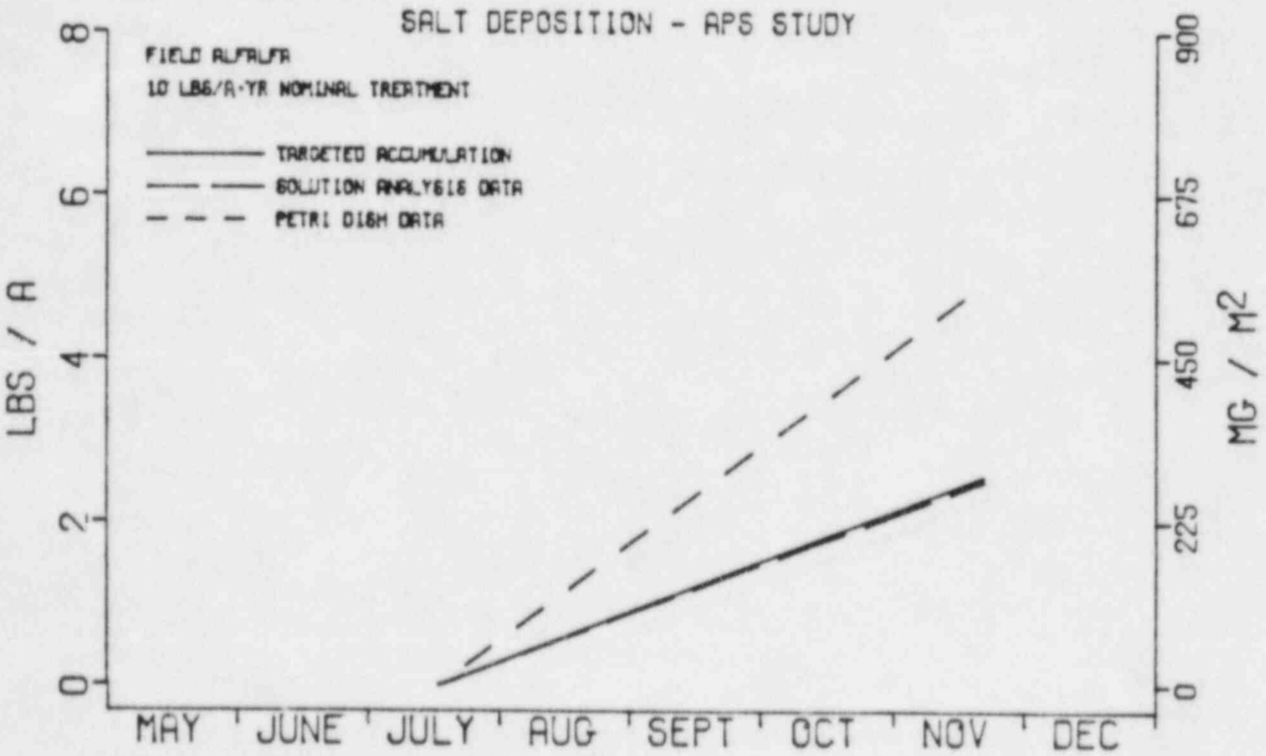


FIGURE E-10

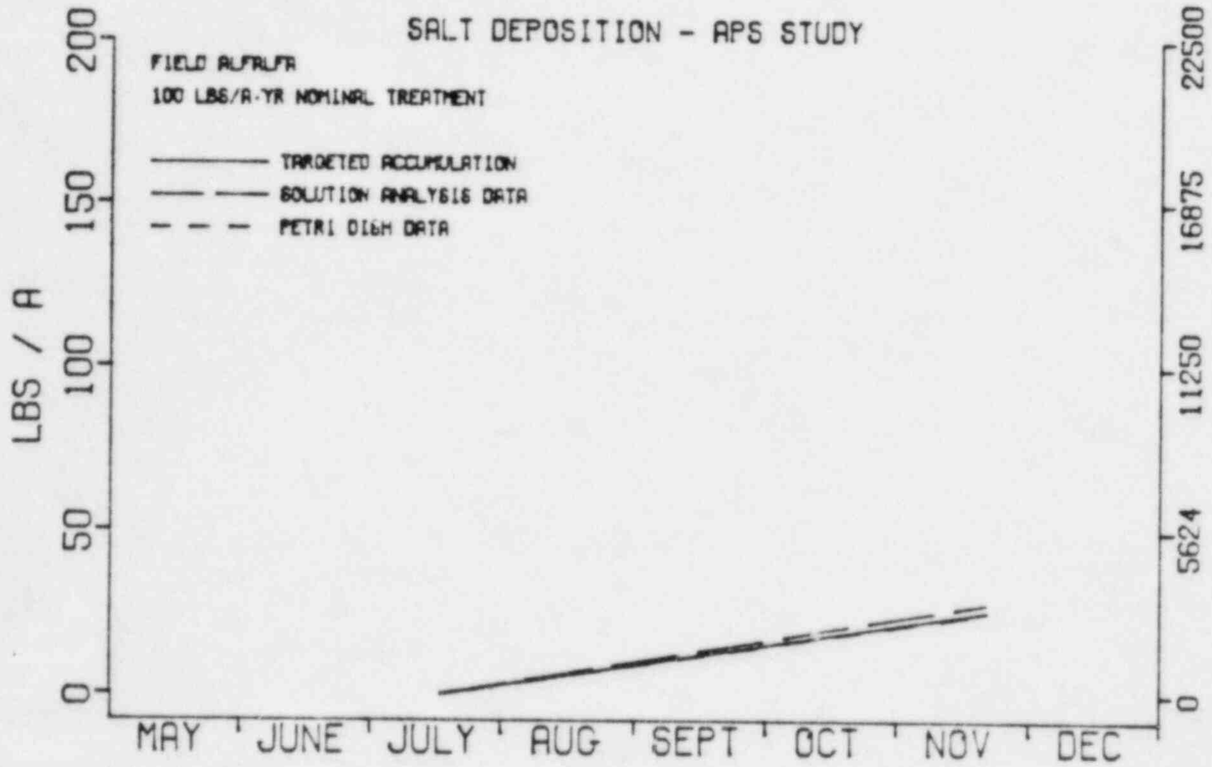


FIGURE E-11

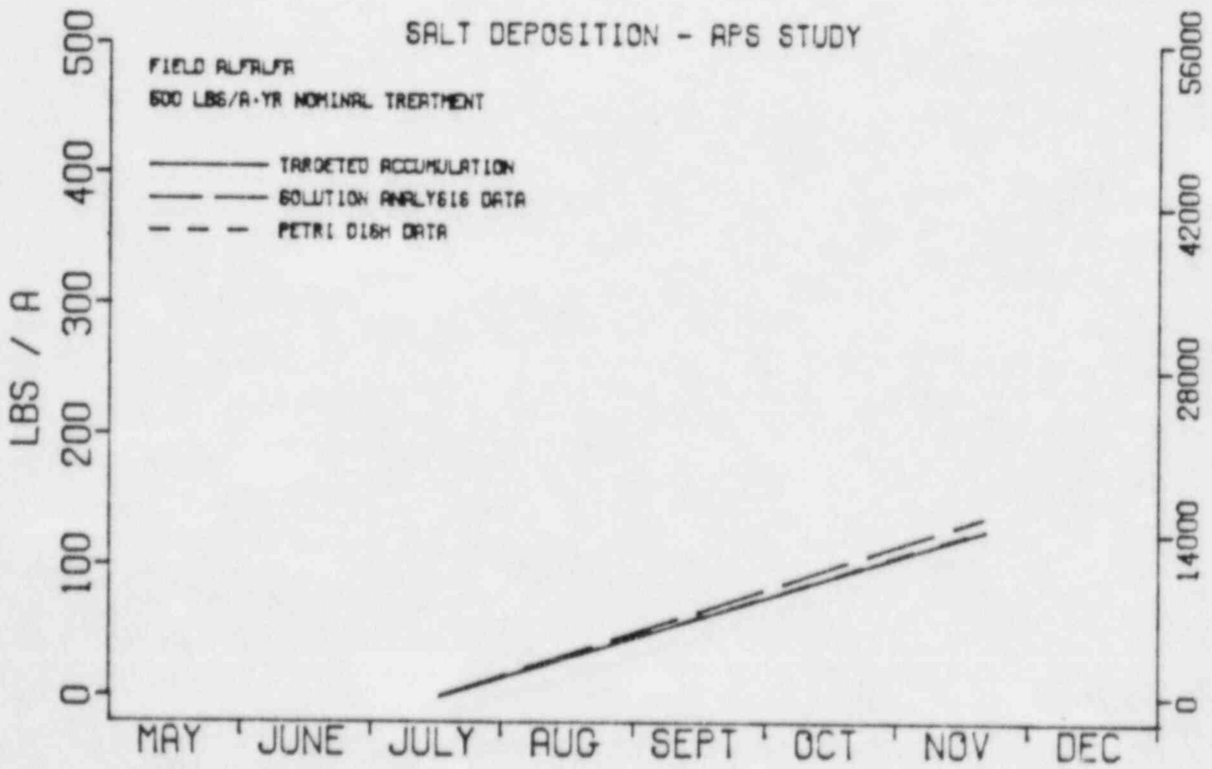
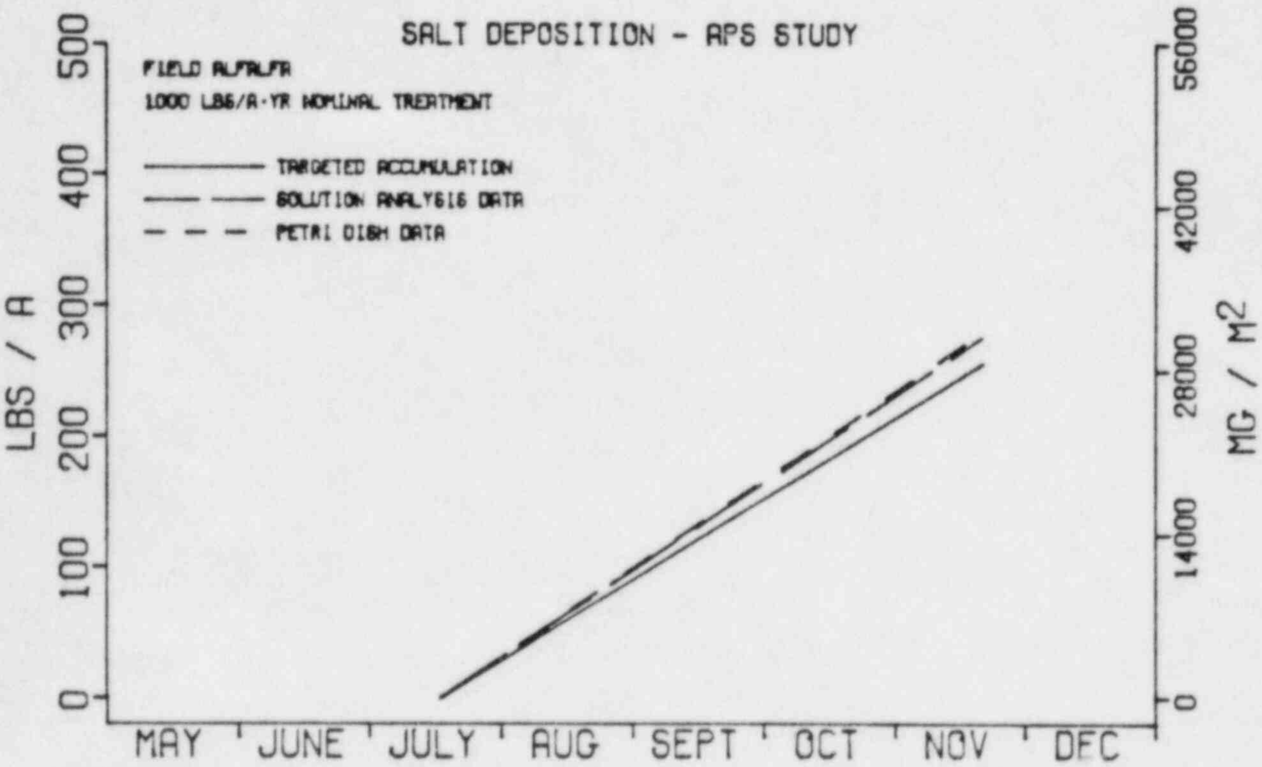


FIGURE E-12


SALT DEPOSITION - APS STUDY
FIELD ALFALFA
1000 LBS/A-YR NOMINAL TREATMENT
TARGETED ACCUMULATION
SOLUTION ANALYSIS DATA
PETRI DISH DATA
LBS / A
MG / M2
0
100
200
300
400
500
0
14000
28000
42000
56000
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
FIGURE E-13

SECTION F

TRACTOR SPRAYER NOZZLE DELIVERY RATES

Table F-1. TRACTOR SPRAYER NOZZLE DELIVERY RATES. Each value represents the mean for 13 nozzles on a given spray line.

Date	Nozzle Delivery Rate		
	Spray line 2 (ml/30 seconds)	Spray line 3 (ml/30 seconds)	Spray line 4 (ml/30 seconds)
5/23/83	46.08	47.92	47.62
6/6/83[a]	44.92	42.77	49.54
6/9/83	49.15	47.85	49.23
6/16/83	47.85	46.69	50.46
6/23/83	51.31	49.15	50.85
6/29/83	51.23	49.92	51.30
7/8/83	52.15	50.15	50.85
7/15/83	51.54	49.77	48.31
7/20/83	51.69	49.08	49.00
7/28/83	53.38	48.08	50.08
8/5/83	55.23	47.76	49.31
8/29/83	56.53	47.38	52.69
Average for first set of nozzles[b]	50.92	48.08	49.94
9/13/83	52.54	50.46	52.62
10/10/83	54.77	52.92	57.33
10/20/83	51.92	50.54	56.69
11/7/83	52.31	52.23	54.31
11/14/83	54.85	48.69	55.30
11/24/83	56.23	46.69	53.08
Average for second set of nozzles[c]	53.77	50.26	54.89
Average for both sets of nozzles	51.87	48.78	51.59

[a]/Nozzles not clean prior to measuring delivery rate.

[b]/First set of nozzles used from 5/23 to 8/29.

[c]/Second set of nozzles used from 9/13 to 11/29.

SECTION G

DROPLET PARTICLE SIZE DATA

Table G-1. DROPLET-PARTICLE SIZES FOR NORTH GREENHOUSE. Values were calculated from a sample of 100 droplet-particles generated by the SF2 nozzle operated at 80 psi pressure.

		Nominal treatment (lbs/a-yr)											
		0 lbs/a-yr			10 lbs/a-yr			100 lbs/a-yr			500 lbs/a-yr		
Date	Nozzle	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u
6/1/83	A	77.1	0	21	-	-	-	92.4	1	11	-	-	-
	B	78.4	0	20	-	-	-	87.3	1	17	-	-	-
6/15/83	A	83.4	0	14	82.7	0	13	87.2	1	13	90.7	0	14
	B	88.0	1	10	88.1	0	8	97.2	0	3	92.6	1	5
6/23/83	A	-	-	-	85.1	0	14	-	-	-	86.1	0	9
	B	-	-	-	79.8	0	32	-	-	-	82.7	0	21
6/29/83	A	-	-	-	68.4	0	39	-	-	-	62.7	0	38
	B	-	-	-	72.9	0	37	-	-	-	78.2	0	21
7/7/83	A	83.6	0	21	-	-	-	68.8	0	38	-	-	-
	B	84.7	0	14	-	-	-	76.0	0	20	-	-	-
7/14/83	A	-	-	-	121.9	15	11	-	-	-	102.6	4	1
	B	-	-	-	95.5	5	16	-	-	-	101.4	4	7
7/22/83	A	97.5	4	14	-	-	-	96.0	5	22	-	-	-
	B	109.4	6	8	-	-	-	108.9	9	9	-	-	-
7/29/83	A	-	-	-	103.0	8	15	-	-	-	104.5	5	6
	B	-	-	-	110.0	6	23	-	-	-	112.7	11	7
8/5/83	A	102.8	10	11	-	-	-	88.7	3	18	-	-	-
	B	99.6	7	7	-	-	-	108.2	4	10	-	-	-

Table G-1 continued.

		Nominal treatment (lbs/a·yr)											
		0 lbs/a·yr			10 lbs/a·yr			100 lbs/a·yr			500 lbs/a·yr		
Date	Nozzle	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u	Mass Mean Diameter (u)	% >150u	% <50u
8/12/83	A	-	-	-	108.6	8	12	-	-	-	106.6	7	13
	B	-	-	-	99.5	1	12	-	-	-	106.1	6	11
8/19/83	A	122.1	13	7	-	-	-	104.4	4	6	-	-	-
	B	116.2	9	7	-	-	-	116.4	14	10	-	-	-
8/26/83	A	-	-	-	99.0	3	16	-	-	-	108.4	10	14
	B	-	-	-	115.7	10	14	-	-	-	103.0	6	11
9/1/83	A	127.0	11	7	-	-	-	103.3	5	9	-	-	-
	B	124.9	12	3	-	-	-	91.1	4	18	-	-	-
9/9/83	A	-	-	-	97.4	5	13	-	-	-	91.4	2	18
	B	-	-	-	101.2	4	14	-	-	-	92.0	2	19
9/16/83	A	102.2	5	16	-	-	-	93.9	1	7	-	-	-
	B	102.4	6	14	-	-	-	99.8	4	15	-	-	-
9/22/83	A	-	-	-	95.4	3	10	-	-	-	104.6	5	5
	B	-	-	-	97.3	5	9	-	-	-	107.0	8	8
9/29/83	A	98.6	3	12	-	-	-	-	-	-	106.0	8	12
	B	100.2	5	12	-	-	-	-	-	-	114.7	12	13
10/7/83	A	-	-	-	102.8	4	13	-	-	-	101.8	9	13
	B	-	-	-	112.6	7	4	-	-	-	105.9	5	13
10/14/83	A	70.8	0	33	-	-	-	167.2	38	14	-	-	-
	B	132.5	16	13	-	-	-	149.1	35	6	-	-	-

Table G-1 continued.

Date	Nozzle	0 lbs/a·yr Mass Mean Diameter (u)	0 lbs/a·yr % >150u	0 lbs/a·yr % <50u	10 lbs/a·yr Mass Mean Diameter (u)	10 lbs/a·yr % >150u	10 lbs/a·yr % <50u	100 lbs/a·yr Mass Mean Diameter (u)	100 lbs/a·yr % >150u	100 lbs/a·yr % <50u	500 lbs/a·yr Mass Mean Diameter (u)	500 lbs/a·yr % >150u	500 lbs/a·yr % <50u
		Nominal treatment (lbs/a·yr)											
10/21/83	A	-	-	-	106.9	10	17	-	-	-	102.5	6	21
	B	-	-	-	100.4	5	11	-	-	-	104.9	5	19
10/28/83	A	119.5	14	9	-	-	-	119.5	13	6	-	-	-
	B	132.0	19	9	-	-	-	118.2	11	11	-	-	-
11/04/83	A	-	-	-	146.5	27	6	-	-	-	141.7	23	3
	B	-	-	-	137.1	21	10	-	-	-	150.2	28	5
11/10/83	A	138.9	19	6	-	-	-	138.7	28	5	-	-	-
	B	158.0	29	7	-	-	-	138.3	25	5	-	-	-
11/18/83	A	-	-	-	113.5	7	6	-	-	-	136.1	20	10
	B	-	-	-	138.2	28	11	-	-	-	134.9	21	6

Table G-2. DROPLET-PARTICLE SIZES FOR NORTH GREENHOUSE (with standard deviation). Values were calculated from a sample of 100 droplet-particles generated by the SF2 nozzle operated at 80 psi pressure.

		Nominal treatment (lbs/a·yr)							
		0 lbs/a·yr		10 lbs/a·yr		100 lbs/a·yr		500 lbs/a·yr	
Date	Nozzle	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation
6/1/83	A	77.1	25.8	-	-	92.4	29.1	-	-
	B	78.4	24.9	-	-	87.3	29.9	-	-
6/15/83	A	83.4	27.9	82.7	26.7	87.2	27.5	90.7	30.7
	B	88.0	28.8	88.1	27.0	97.2	28.7	92.6	28.5
6/23/83	A	-	-	85.1	28.3	-	-	86.1	28.9
	B	-	-	79.8	31.1	-	-	82.7	30.5
6/29/83	A	-	-	68.4	25.6	-	-	62.7	21.9
	B	-	-	72.9	27.7	-	-	78.2	26.2
7/7/83	A	83.6	30.7	-	-	68.8	25.9	-	-
	B	84.7	27.1	-	-	76.0	25.8	-	-
7/14/83	A	-	-	121.9	46.9	-	-	102.6	30.9
	B	-	-	95.5	36.3	-	-	101.4	35.5
7/22/83	A	97.5	37.1	-	-	96.0	39.2	-	-
	B	109.4	38.8	-	-	108.9	40.0	-	-
7/29/83	A	-	-	103.0	40.6	-	-	104.5	35.4
	B	-	-	110.0	48.0	-	-	112.7	40.7
8/5/83	A	102.8	39.9	-	-	88.7	32.6	-	-
	B	99.6	35.9	-	-	108.2	42.1	-	-

Table G-2 continued.

Date	Nozzle	0 lbs/a•yr Mass Mean Diameter (u)	0 lbs/a•yr Standard Deviation	10 lbs/a•yr Mass Mean Diameter (u)	10 lbs/a•yr Standard Deviation	100 lbs/a•yr Mass Mean Diameter (u)	100 lbs/a•yr Standard Deviation	500 lbs/a•yr Mass Mean Diameter (u)	500 lbs/a•yr Standard Deviation
		Nominal treatment (lbs/a•yr)							
8/12/83	A	-	-	108.6	40.5	-	-	106.6	39.6
	B	-	-	99.5	34.3	-	-	106.1	43.0
8/19/83	A	122.1	47.2	-	-	104.4	34.7	-	-
	B	116.2	42.6	-	-	116.4	45.2	-	-
8/26/83	A	-	-	99.0	37.0	-	-	108.4	41.5
	B	-	-	115.7	49.2	-	-	103.0	38.8
9/1/83	A	127.0	47.3	-	-	103.3	38.0	-	-
	B	124.9	46.7	-	-	91.1	35.1	-	-
9/9/83	A	-	-	97.4	37.1	-	-	91.4	35.0
	B	-	-	101.2	39.9	-	-	92.0	36.0
9/16/83	A	102.2	39.2	-	-	93.9	30.8	-	-
	B	102.4	37.7	-	-	99.8	37.1	-	-
9/22/83	A	-	-	95.4	33.9	-	-	104.6	36.3
	B	-	-	97.3	34.5	-	-	107.0	39.6
9/29/83	A	98.6	36.6	-	-	-	-	106.0	38.7
	B	100.2	38.0	-	-	-	-	114.7	46.6
10/7/83	A	-	-	102.8	38.5	-	-	101.8	39.6
	B	-	-	112.6	37.7	-	-	105.9	42.0
10/14/83	A	70.8	27.4	-	-	167.2	75.1	-	-
	B	132.5	57.0	-	-	149.1	57.5	-	-

Table G-2 continued.

		Nominal treatment (lbs/a•yr)							
		0 lbs/a•yr		10 lbs/a•yr		100 lbs/a•yr		500 lbs/a•yr	
Date	Nozzle	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation	Mass Mean Diameter (u)	Standard Deviation
10/21/83	A	-	-	106.9	44.5	-	-	102.5	43.1
	B	-	-	100.4	35.3	-	-	104.9	42.7
10/28/83	A	119.5	46.7	-	-	119.5	41.2	-	-
	B	132.0	53.3	-	-	118.2	46.2	-	-
11/04/83	A	-	-	146.5	58.5	-	-	141.7	52.0
	B	-	-	137.1	55.0	-	-	150.2	58.0
11/10/83	A	138.9	50.2	-	-	138.7	51.3	-	-
	B	158.0	62.3	-	-	138.3	47.2	-	-
11/18/83	A	-	-	113.5	35.9	-	-	136.1	55.9
	B	-	-	138.2	50.2	-	-	134.9	48.7

Table G-3. DROPLET-PARTICLE SIZES FOR FIELD STUDY. Within each replication values were calculated from a sample of 100 droplet-particles generated by the SF2 nozzle operated at 90 psi pressure.

		Nominal Treatment (lbs/a·yr)											
		0 lbs/a·yr				10 lbs/a·yr				100 lbs/a·yr			
Date	Replication	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.
6/17/83	1	91.1	2.0	9.0	28.6	97.9	2.0	12.0	33.2	84.4	0	13.0	26.2
	2	85.7	0	14.0	28.9	87.7	1.0	19.0	31.1	86.1	0	18.0	30.4
	3	87.3	0	10.0	28.4	80.1	0	7.0	23.3	101.3	1.0	4.0	29.6
	mean	88.0	0.7	11.0	28.6	88.6	1.0	12.7	29.2	90.6	0.3	11.7	28.7
7/07/83	1	103.7	7.0	10.0	35.6	84.9	1.0	15.0	28.5	83.4	0	16.0	27.5
	2	89.7	2.0	23.0	34.8	111.3	3.0	6.0	35.4	84.2	0	21.0	28.8
	3	97.5	3.0	17.0	37.0	127.1	21.0	7.0	44.8	78.1	1.0	28.0	27.6
	mean	97.0	4.0	16.7	35.8	107.8	8.33	9.3	36.2	81.9	0.3	21.7	28.0
7/18/83	1	97.8	3.0	11.0	31.7	92.3	1.0	8.0	29.5	96.9	2.0	7.0	28.5
	2	77.2	0	18.0	24.4	75.9	0	17.0	23.1	88.6	2.0	10.0	28.9
	3	81.5	2.0	14.0	26.5	101.5	3.0	4.0	31.6	108.4	8.0	2.0	34.0
	mean	85.5	1.7	14.3	27.5	89.9	1.3	9.7	28.1	98.0	4.0	6.3	30.5
8/05/83	1	96.2	3.0	16.0	36.2	86.8	1.0	20.0	32.2	90.1	1.0	8.0	29.1
	2	106.3	14.0	23.0	47.8	84.4	5.0	17.0	32.2	100.5	7.0	10.0	37.6
	3	92.1	5.0	18.0	36.5	94.1	3.0	24.0	38.2	113.1	12.0	12.0	45.5
	mean	98.[illegible]	7.3	19.0	40.2	88.4	3.0	20.3	34.2	101.2	6.7	10.0	37.4
8/26/83	1	122.6	13.0	4.0	41.1	135.7	19.0	10.0	55.4	104.6	6.0	18.0	40.4
	2	116.9	7.0	9.0	46.6	108.8	7.0	10.0	39.5	111.1	10.0	40.0	57.5
	3	121.3	12.5	5.0	37.2	143.4	22.0	4.0	43.5	117.7	12.0	13.0	48.9
	mean	120.3	10.8	6.0	41.7	129.3	16.0	8.0	46.1	111.1	9.3	23.7	48.9
9/08/83	1	93.5	2.0	22.0	36.8	91.9	4.4	21.1	37.3	99.5	4.0	17.0	38.8
	2	97.1	4.0	19.0	38.4	106.6	5.0	12.0	43.6	125.8	14.0	4.0	44.7
	3	105.2	6.0	14.0	40.9	110.3	6.0	14.0	41.0	95.6	6.0	21.0	40.0
	mean	98.6	4.0	18.3	38.7	102.9	5.1	15.7	40.6	107.0	8.0	14.0	41.2

Table G-3 continued.

		Nominal Treatment (lbs/a·yr)											
		0 lbs/a·yr				10 lbs/a·yr				100 lbs/a·yr			
Date	Replication	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.	Mass Mean Diameter (u)	% >150u	% <50u	Standard Dev.
9/16/83	1	105.1	7.0	13.0	39.4	93.9	0	11.0	32.8	94.1	2.0	7.0	27.7
	2	103.0	5.0	9.0	36.6	89.0	2.0	16.0	32.5	90.8	2.0	14.0	31.3
	3	100.7	2.0	7.0	33.7	101.8	5.0	10.0	35.4	95.8	1.0	8.0	32.1
	mean	102.9	4.7	9.7	36.6	94.9	2.3	12.3	33.5	93.6	1.7	9.7	30.4
9/22/83	1	109.2	8.3	18.3	46.5	104.2	3.0	6.0	35.0	98.7	4.0	10.0	34.6
	2	115.7	10.0	12.0	43.5	96.4	3.3	13.3	36.4	109.0	7.0	5.0	37.0
	3	110.9	10.0	15.0	43.3	118.8	13.0	7.0	45.7	106.4	8.0	10.0	38.5
	mean	111.9	9.4	15.1	44.4	106.5	6.4	8.8	39.0	104.7	6.3	8.3	36.7
10/17/83	1	70.7	0	31.0	27.2	74.5	0	25.0	28.3	91.2	1.0	9.0	29.9
	2	74.4	1.0	31.0	28.5	67.7	0	30.0	25.1	62.8	0	50.0	26.9
	3	66.5	0	29.0	24.6	70.0	0	26.0	25.6	74.4	1.0	33.0	30.4
	mean	70.5	0.3	30.3	26.8	70.7	0	27.0	26.3	76.1	0.7	30.7	29.1

SECTION H

CLIMATIC DATA: GREENHOUSE, MARANA FIELD SITE,

MARANA DESERT SITE, AND PALO VERDE FIELD SITE

Table H-1. RELATIVE HUMIDITY AT THE EAST END OF THE NORTH GREENHOUSE: time and duration when relative humidity was greater than or equal to 75%. Time is expressed in the 24-hour time system, with days beginning at 1:00 h.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
6/16/83	none recorded	none recorded
6/17/83	4:20-5:50 23:20-1:00	2 h. 0 m.
6/18/83	1:00-6:50	5 h. 50 m.
6/19/83	2:50-5:50	3 h. 0 m.
6/20/83	1:20-5:50	4 h. 30 m.
6/21/83	4:50-5:50	1 h. 0 m.
6/22/83	5:50 only	-
6/23/83	3:50-6:20 21:50-1:00	5 h. 40 m.
6/24/83	1:00-7:20 0:50-1:00	7 h. 30 m.
6/25/83	1:00-6:20 0:50-1:00	6 h. 30 m.
6/26/83	1:00-6:20	6 h. 20 m.
6/27/83	3:20-5:50 20:50-1:00	6 h. 40 m.
6/28/83	1:00-7:20 21:20-1:00	10 h. 0 m.
6/29/83	1:00-7:20 23:20-1:00	9 h. 0 m.
6/30/83	1:00-7:20 20:20-1:00	12 h. 0 m.
7/1/83	1:00-7:50 0:20-1:00	7 h. 30 m.
7/2/83	1:00-7:20	6 h. 20 m.
7/3/83	3:50-5:50 22:50-23:20	2 h. 30 m.
7/4/83	1:50-5:50	4 h. 0 m.
7/5/83	3:20-5:50	2 h. 30 m.
7/6/83	0:02-1:00	0 h. 58 m.
7/7/83	1:02-8:02 19:02-1:00	11 h. 58 m.

Table H-1 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
7/8/83	1:02-9:02 17:32-0:32	15 h. 0 m.
7/9/83	1:32-9:32 19:32-0:32	13 h. 0 m.
7/10/83	1:00-8:32 20:02-1:00	12 h. 30 m.
7/11/83	1:00-8:02 22:02-1:00	11 h. 0 m.
7/12/83	1:00-8:02 21:02-1:00	11 h. 0 m
7/13/82	1:00-9:02 22:32-23:32	9 h. 2 m.
7/14/83	3:32-8:32 19:32-22:02 0:32-1:00	7 h. 58 m.
7/15/83	1:00-8:02 20:02-1:00	12 h. 0 m.
7/16/83	1:00-8:02 22:32-1:00	9 h. 30 m.
7/17/83	1:00-7:32	6 h. 32 m.
7/18/83	1:32-7:02 20:32-0:32	9 h. 30 m.
7/19/83	3:02-7:32 22:02-1:00	7 h. 28 m.
7/20/83	1:00-9:02 19:32-1:00	13 h. 30 m.
7/21/83	1:00-8:32 17:56-1:00	14 h. 36 m.
7/22/83	1:00-10:26 17:56-1:00	16 h. 30 m.
7/23/83	1:00-9:56 16:26-1:00	17 h. 30 m.
7/24/83	1:00-9:26 18:56-1:00	14 h. 30 m.
7/25/83	1:00-8:26 21:56-1:00	10 h. 30 m.
7/26/83	1:00-6:26 17:26-1:00	13 h. 0 m.

Table H-1 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
7/27/83	1:00-1:00	24 h. 0 m.
7/28/83	1:00-10:56 19:26-23:56	14 h. 26 m.
7/29/83	2:56-8:26 18:56-1:00	11 h. 34 m.
7/30/83	1:00-10:26 17:26-1:00	17 h. 0 m.
7/31/83	1:00-9:56 15:26-1:00	18 h. 30 m.
8/1/83	1:00-9:26 18:26-1:00	15 h. 0 m.
8/2/83	1:00-8:26 9:56 16:26-1:00	16 h. 0 m.+
8/3/83	1:00-8:56 18:26-1:00	14 h. 30 m.
8/4/83	1:00-10:26 18:56-1:00	15 h. 30 m.
8/5/83	1:00-9:56 14:56-1:00	19 h. 0 m.
8/6/83	1:00-9:56 19:26-1:00	14 h. 30 m.
8/7/83	1:00-9:26 16:56-1:00	16 h. 30 m.
8/8/83	1:00-8:26 16:56-1:00	15 h. 30 m.
8/9/83	1:00-9:26 16:26-1:00	17 h. 0 m.
8/10/83	1:00-10:26 16:26-1:00	18 h. 0 m.
8/11/83	1:00-10:35 17:35-1:00	17 h. 0 m.
8/12/83	1:00-9:35 19:05-1:00	14 h. 30 m.
8/13/83	1:00-9:35 16:35-1:00	17 h. 0 m.
8/14/83	1:00-10:05 17:05-1:00	17 h. 0 m.

Table H-1 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
8/15/83	1:00-9:05 16:05-1:00	17 h. 0 m.
8/16/83	1:00-11:05 16:05-1:00	19 h. 0 m.
8/17/83	1:00-12:35 16:05-1:00	20 h. 30 m.
8/18/83	1:00-8:35 19:05-1:00	13 h. 30 m.
8/19/83	1:00-9:35	8 h. 35 m.
8/20/83	1:35-9:35 22:35-1:00	10 h. 25 m.
8/21/83	1:00-9:05 22:35-1:00	10 h. 30 m.
8/22/83	1:00-9:05	8 h. 5 m.
8/23/83	3:05-8:35	5 h. 30 m.
8/24/83	None recorded	None recorded
8/25/83	2:35-8:35	6 h. 0 m.
8/26/83	2:05-8:35	6 h. 30 m.
8/27/83	8:05-8:35	0 h. 30 m.
8/28/83	4:05-10:05 17:35-1:00	13 h. 25 m.
8/29/83	1:00-9:05	8 h. 5 m.
8/30/83	3:05-9:05	6 h. 0 m.
8/31/83	5:13-8:43	3 h. 30 m.
9/1/83	4:43-9:43 19:13 only	5 h. 0 m.+
9/2/83	2:13-8:13	6 h. 0 m.
9/3/83	7:43-8:13	0 h. 30 m.
9/4/83	8:13 only 23:13-1:00	1 h. 47 m.+
9/5/83	1:00-9:43	8 h. 43 m.
9/6/83	2:43-9:43 15:43 only	7 h. 0 m.+

Table H-1 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
9/7/83	2:13-10:43 17:13-1:00	16 h. 17 m.
9/8/83	1:00-9:13 18:13-1:00	15 h. 0 m.
9/9/83	1:00-8:13 22:43-1:00	9 h. 30 m.
9/10/83	1:00-6:43 21:43-1:00	9 h. 0 m.
9/11/83	1:00-7:43 18:13-1:00	13 h. 30 m.
9/12/83	1:00-8:13 17:43-1:00	14 h. 30 m.
9/13/83	1:00-9:43 18:43-1:00	15 h. 0 m.
9/14/83	1:00-9:43 18:13-1:00	15 h. 30 m.
9/15/83	1:00-10:13 16:43-1:00	17 h. 30 m
9/16/83	1:00-14:43 15:13-1:00	23 h. 30 m.
9/17/83	1:00-10:43 17:13-1:00	17 h. 30 m.
9/18/83	1:00-10:43 17:13-1:00	17 h. 30 m.
9/19/83	1:00-9:25 15:55-1:00	17 h. 30 m.
9/20/83	1:00-10:25 15:55-1:00	18 h. 30 m.
9/21/83	1:00-10:55 17:25-1:00	17 h. 30 m.
9/22/83	1:00-10:55 14:55-1:00	20 h. 0 m.
9/23/83	1:00-9:25 16:55-1:00	16 h. 30 m.
9/24/83	1:00-12:25 16:25-1:00	20 h. 0 m.
9/25/83	1:00-11:25 16:55-1:00	18 h. 30 m.
9/26/83	1:00-10:25 16:55-1:00	17 h. 30 m.

Table H-1 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
9/27/83	1:00-8:55 17:55-1:00	15 h. 0 m.
9/28/83	1:00-8:55 11:55-13:25 14:55-1:00	19 h. 30 m.
9/29/83	1:00-1:00	24 h. 0 m.
9/30/83	1:00-11:55 15:55-1:00	20 h. 0 m.
9/31/83	1:00-14:25 15:55-1:00	22 h. 30 m.
10/1/83	1:00-11:25 15:55-1:00	19 h. 30 m.
10/2/83	1:00-1:00	24 h. 0 m.
10/3/83	1:00-10:25 15:55-16:25 18:25-1:00	16 h. 30 m.
10/4/83	1:00-11:25 14:55-1:00	20 h. 30 m.
10/5/83	1:00-10:25 18:55-1:00	15 h. 30 m.
10/6/83	1:00-10:55 19:55-1:00	15 h. 0 m.
10/7/83	1:00-9:25 19:55-1:00	13 h. 30 m.
10/8/83	1:00-10:25 16:55-1:00	17 h. 30 m.
10/9/83	1:00-9:55	9 h. 55 m.

Table H-2. RELATIVE HUMIDITY AT THE WEST END OF THE NORTH GREENHOUSE: time and duration when relative humidity was greater than or equal to 75%. Time is expressed in the 24-hour time system, with days beginning at 1:00 h.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
6/16/83	None recorded	None recorded
6/17/83	5:48 only 6:48-7:18 0:18-1:00	1 h. 12 m.+
6/18/83	1:00-6:18	5 h. 18 m.
6/19/83	1:18-5:48 0:18-1:00	5 h. 12 m.
6/20/83	1:00-5:48 6:48 only	4 h. 48 m.+
6/21/83	2:18-5:48	3 h. 30 m.
6/22/83	4:48-5:48 7:18 only 19:48-20:18 23:48-1:00	2 h. 42 m.
6/23/83	1:00-7:48 18:48-20:18 21:48-1:00	11 h. 30 m.
6/24/83	1:00-6:48 19:18-20:18 23:18-1:00	8 h. 30 m.
6/25/83	1:00-6:48 22:48-1:00	8 h. 0 m.
6/26/83	1:00-7:18 1:00 only	6 h. 18 m.+
6/27/83	1:00-6:48 19:18-1:00	11 h. 30 m.
6/28/83	1:00-7:48 20:18-1:00	11 h. 30 m.
6/29/83	1:00-7:48	6 h. 48 m.
6/30/83	1:48-7:18 21:18-1:00	9 h. 12 m.
7/1/83	1:00-7:48	6 h. 48 m.
7/2/83	1:18-7:18	6 h. 0 m.
7/3/83	2:18-7:18 22:18-1:00	7 h. 42 m.
7/4/83	1:00-7:18 19:48-1:00	11 h. 30 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
7/5/83	1:00-7:18 17:48-1:00	13 h. 30 m.
7/6/83	1:00-7:18 19:53-1:00	11 h. 25 m.
7/7/83	1:00-7:53 17:23-1:00	14 h. 30 m.
7/8/83	1:00-8:23 17:23-1:00	15 h. 0 m.
7/9/83	1:00-9:23 18:23-1:00	15 h. 0 m.
7/10/83	1:00-8:23 18:53-1:00	13 h. 30 m.
7/11/83	1:00-8:23 19:23-1:00	13 h. 0 m.
7/12/83	1:00-7:53 19:23-1:00	12 h. 30 m.
7/13/83	1:00-8:23 19:53-0:53	12 h. 23 m.
7/14/83	3:53-7:23 18:23-22:53 23:53-1:00	9 h. 7 m.
7/15/83	1:00-7:23 19:23-1:00	12 h. 0 m.
7/16/83	1:00-7:23 19:23-1:00	12 h. 0 m.
7/17/83	1:00-7:23 20:53-1:00	10 h. 30 m.
7/18/83	1:00-7:23 18:53-1:00	12 h. 30 m.
7/19/83	1:00-7:23 20:23-1:00	11 h. 0 m.
7/20/83	1:00-7:23 18:23-1:00	13 h. 0 m.
7/21/83	1:00-7:53 18:14-1:00	13 h. 39 m.
7/22/83	1:00-9:44 18:14-1:00	15 h. 30 m.
7/23/83	1:00-8:14 16:14-1:00	16 h. 0 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
7/24/83	1:00-8:44 18:44-1:00	14 h. 0 m.
7/25/83	1:00-8:14 17:44-1:00	14 h. 30 m.
7/26/83	1:00-7:44 15:14-1:00	16 h. 30 m.
7/27/83	1:00-8:44 14:14-1:00	18 h. 30 m.
7/28/83	1:00-8:44 18:44-1:00	14 h. 0 m.
7/29/83	1:00-14:44 18:14-1:00	20 h. 30 m.
7/30/83	1:00-10:14 16:44-1:00	17 h. 30 m.
7/31/83	1:00-10:14 15:14-1:00	19 h. 0 m.
8/1/83	1:00-9:44 18:44-1:00	15 h. 0 m.
8/2/83	1:00-8:14 15:44-1:00	16 h. 30 m.
8/3/83	1:00-9:44 18:44-1:00	15 h. 0 m.
8/4/83	1:00-11:14 17:44-1:00	17 h. 30 m.
8/5/83	1:00-9:14 14:44-1:00	18 h. 30 m.
8/6/83	1:00-9:44 19:14-1:00	14 h. 30 m.
8/7/83	1:00-9:14 16:44-1:00	16 h. 30 m.
8/8/83	1:00-9:44 16:44-1:00	17 h. 0 m.
8/9/83	1:00-9:14 14:14 only 16:14-1:00	17 h. 0 m.+
8/10/83	1:00-9:44 15:14-1:00	17 h. 30 m.
8/11/83	1:00-11:56 17:26-1:00	18 h. 30 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
8/12/83	1:00-10:26 18:56-1:00	15 h. 30 m.
8/13/83	1:00-9:56 15:56-1:00	18 h. 0 m.
8/14/83	1:00-10:26 17:26-1:00	17 h. 0 m.
8/15/83	1:00-11:26 15:26-1:00	20 h. 0 m.
8/16/83	1:00-11:56 15:26-1:00	20 h. 30 m.
8/17/83	1:00-1:00	24 h. 0 m.
8/18/83	1:00-8:56 15:56-16:56 20:56-1:00	13 h. 0 m.
8/19/83	1:00-9:56	8 h. 56 m.
8/20/83	2:26-8:56 23:56-1:00	7 h. 34 m.
8/21/83	1:00-8:26 18:26-19:26 23:56-1:00	9 h. 30 m.
8/22/83	1:00-9:56 15:56-16:56 18:26 only	9 h. 56 m.+
8/23/83	2:56-9:56	7 h. 0 m.
8/24/83	5:26-6:26 7:26-9:26	3 h. 0 m.
8/25/83	2:56-9:26 18:56-19:26	8 h. 0 m.
8/26/83	2:26-6:26 7:26-8:56 17:26-18:56	7 h 0 m.
8/27/83	7:56-8:56 18:26-20:26	3 h. 0 m
8/28/83	4:26-9:56 16:26-1:00	14 h. 4 m.
8/29/83	1:00-9:26 17:56-18:26	8 h. 56 m.
8/30/83	4:56-7:56 18:52-19:52	4 h. 0 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
8/31/83	3:52-8:52 17:52-18:22	5 h. 30 m.
9/1/83	5:22-6:22 7:22-9:22 17:52-20:22	5 h. 30 m.
9/2/83	3:22-6:22 7:52 only 17:52-21:22	6 h. 30 m.+
9/3/83	7:52 only 18:52-20:22	1 h. 30 m.+
9/4/83	22:52-1:00	2 h. 8 m.
9/5/83	1:00-8:22 18:22 only	8 h. 22 m.+
9/6/83	3:22-8:22 14:52-16:22	6 h. 30 m.
9/7/83	2:22-10:52 18:22-1:00	15 h. 8 m.
9/8/83	1:00-9:52 17:52-1:00	16 h. 0 m.
9/9/83	1:00-9:52 18:52-1:00	15 h. 0 m.
9/10/83	1:00-10:52 18:22-1:00	16 h. 30 m.
9/11/83	1:00-9:52 18:52-1:00	15 h. 0 m.
9/12/83	1:00-8:22 19:52-1:00	12 h. 30 m.
9/13/83	1:00-9:52 18:52-1:00	15 h. 0 m.
9/14/83	1:00-10:22 18:22-1:00	16 h. 0 m.
9/15/83	1:00-10:52 17:22-1:00	17 h. 30 m.
9/16/83	1:00-1:00	24 h. 0 m.
9/17/83	1:00-11:22 14:52 only 15:52-1:00	19 h. 30 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
9/18/83	1:00-11:22 12:22 only 13:22-14:22 16:52-1:00	19 h. 30 m.+
9/19/83	1:00-10:16 16:46-1:00	17 h. 30 m.
9/20/83	1:00-10:16 16:46-1:00	17 h. 30 m.
9/21/83	1:00-10:16 17:46-1:00	16 h. 30 m.
9/22/83	1:00-11:16 14:16-1:00	21 h. 0 m.
9/23/83	1:00-11:16 13:46-1:00	21 h. 30 m.
9/24/83	1:00-13:46 16:16-1:00	21 h. 30 m.
9/25/83	1:00-11:16 16:16-1:00	19 h. 0 m.
9/26/83	1:00-10:46 13:16-1:00	21 h. 30 m.
9/27/83	1:00-8:46 16:16-1:00	16 h. 30 m.
9/28/83	1:00-8:46 11:16-1:00	21 h. 30 m.
9/29/83	1:00-1:00	24 h. 0 m.
9/30/83	1:00-1:00	24 h. 0 m.
9/31/83	1:00-1:00	24 h. 0 m.
10/1/83	1:00-1:00	24 h. 0 m.
10/2/83	1:00-1:00	24 h. 0 m.
10/3/83	1:00-11:46 12:46-16:16 18:46-1:00	20 h. 30 m.
10/4/83	1:00-10:46 16:46-1:00	18 h. 0 m.
10/5/83	1:00-10:16 16:16-16:46 19:16-1:00	15 h. 30 m.

Table H-2 continued.

Date	Time when relative humidity was ≥75%	Total hours when relative humidity was ≥75%
10/6/83	1:00-11:16 17:16-18:46 19:46-1:00	17 h. 0 m.
10/7/83	1:00-10:46 16:46-17:16 20:16-1:00	15 h. 0 m.
10/8/83	1:00-9:16 16:46-17:16 20:46-1:00	13 h. 0 m.
10/9/83	1:00-9:16	8 h. 16 m.

Table H-3. THE NUMBER OF 30-MINUTE RECORDING PERIODS IN WHICH THE RELATIVE HUMIDITY WAS GREATER THAN OR EQUAL TO 75% FOR EACH DAY THAT A HYGROTHERMOGRAPH WAS OPERATING AT A PARTICULAR FIELD SITE. Dashes indicate missing values.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
6/4/83	0	-	-
6/5/83	0	-	-
6/6/83	0	-	-
6/7/83	0	-	-
6/8/83	0	-	-
6/9/83	0	-	-
6/10/83	0	0	-
6/11/83	0	0	-
6/12/83	0	0	-
6/13/83	0	0	-
6/14/83	0	0	-
6/15/83	0	0	-
6/16/83	0	0	-
6/17/83	0	0	-
6/18/83	0	0	-
6/19/83	0	0	-
6/20/83	0	0	-
6/21/83	0	0	-
6/22/83	0	0	-
6/23/83	0	0	-
6/24/83	0	0	-
6/25/83	0	0	-
6/26/83	0	0	-
6/27/83	0	0	-
6/28/83	0	0	-
6/29/83	0	0	-
6/30/83	0	0	-
7/1/83	0	0	-
7/2/83	0	0	-

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
7/3/83	0	0	-
7/4/83	0	0	-
7/5/83	0	0	-
7/6/83	0	0	-
7/7/83	0	0	-
7/8/83	24	0	-
7/9/83	11	0	-
7/10/83	10	0	-
7/11/83	15	0	-
7/12/83	0	0	-
7/13/83	0	0	-
7/14/83	0	0	-
7/15/83	0	0	0
7/16/83	0	0	0
7/17/83	0	0	0
7/18/83	0	0	0
7/19/83	0	0	0
7/20/83	7	0	6
7/21/83	36	33	29
7/22/83	45	19	-
7/23/83	31	16	-
7/24/83	15	27	-
7/25/83	12	19	-
7/26/83	16	3	-
7/27/83	3	0	-
7/28/83	17	4	-
7/29/83	15	0	-
7/30/83	9	1	-
7/31/83	27	10	-
8/1/83	27	11	-

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
8/2/83	21	23	-
8/3/83	22	23	-
8/4/83	25	16	-
8/5/83	35	15	-
8/6/83	22	9	-
8/7/83	24	0	-
8/8/83	33	13	-
8/9/83	48	32	-
8/10/83	48	31	-
8/11/83	48	21	-
8/12/83	39	18	-
8/13/83	45	14	-
8/14/83	47	8	-
8/15/83	48	28	-
8/16/83	48	37	-
8/17/83	48	48	-
8/18/83	48	35	-
8/19/83	46	21	-
8/20/83	-	22	-
8/21/83	-	24	-
8/22/83	-	20	-
8/23/83	-	19	21
8/24/83	36	20	7
8/25/83	42	15	0
8/26/83	45	7	0
8/27/83	48	14	0
8/28/83	48	5	7
8/29/83	48	16	16
8/30/83	48	19	0
8/31/83	46	15	0

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
9/1/83	44	23	4
9/2/83	48	17	0
9/3/83	45	12	0
9/4/83	45	10	0
9/5/83	48	11	6
9/6/83	48	18	15
9/7/83	48	29	20
9/8/83	48	22	16
9/9/83	48	22	12
9/10/83	47	15	0
9/11/83	48	9	0
9/12/83	39	15	0
9/13/83	47	22	1
9/14/83	34	17	0
9/15/83	47	14	4
9/16/83	48	27	20
9/17/83	46	22	12
9/18/83	46	21	12
9/19/83	48	27	17
9/20/83	48	20	24
9/21/83	48	23	17
9/22/83	48	19	26
9/23/83	48	39	28
9/24/83	48	32	32
9/25/83	48	24	22
9/26/83	40	25	17
9/27/83	43	30	8
9/28/83	43	18	12
9/29/83	48	35	44
9/30/83	44	30	43

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
10/1/83	48	48	48
10/2/83	48	36	48
10/3/83	48	35	39
10/4/83	48	26	44
10/5/83	48	40	31
10/6/83	48	35	30
10/7/83	43	24	27
10/8/83	48	31	28
10/9/83	47	28	27
10/10/83	40	25	26
10/11/83	36	17	24
10/12/83	32	3	17
10/13/83	22	13	0
10/14/83	12	9	0
10/15/83	30	16	10
10/16/83	30	14	13
10/17/83	33	14	19
10/18/83	30	14	21
10/19/83	35	4	34
10/20/83	32	7	30
10/21/83	29	5	26
10/22/83	29	2	23
10/23/83	28	5	19
10/24/83	32	0	29
10/25/83	15	1	12
10/26/83	0	0	0
10/27/83	6	0	7
10/28/83	27	9	24
10/29/83	27	8	24
10/30/83	27	5	22

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
10/31/83	26	4	24
11/1/83	25	5	21
11/2/83	29	0	25
11/3/83	31	6	28
11/4/83	37	7	35
11/5/83	34	15	34
11/6/83	32	11	31
11/7/83	30	8	26
11/8/83	27	0	19
11/9/83	25	0	25
11/10/83	27	0	24
11/11/83	27	0	24
11/12/83	25	0	18
11/13/83	24	8	20
11/14/83	25	4	25
11/15/83	18	0	17
11/16/83	7	0	3
11/17/83	17	0	17
11/18/83	13	0	0
11/19/83	17	0	6
11/20/83	4	12	0
11/21/83	41	24	41
11/22/83	35	21	33
11/23/83	29	16	27
11/24/83	28	14	25
11/25/83	44	10	39
11/26/83	31	0	29
11/27/83	31	2	27
11/28/83	30	6	29
11/29/83	29	13	28

Table H-3 continued.

Date	Marana Field Site	Palo Verde Field Site	Marana Desert Site
11/30/83	-	10	-
12/1/83	-	19	-
12/2/83	-	38	-
12/3/83	-	48	-
12/4/83	-	19	-

Table H-4. DAILY MAXIMUM AND MINIMUM TEMPERATURES RECORDED IN THE EAST AND WEST ENDS OF THE NORTH GREENHOUSE. Dashes indicate missing values.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
5/18/83	22.5	28.0	-5.5	9.0	9.0	0
5/19/83	23.0	30.0	-7.0	11.5	11.5	0
5/20/83	22.5	29.5	-7.0	14.0	13.5	0.5
5/21/83	23.0	31.0	-8.0	12.5	12.5	0
5/22/83	24.0	33.0	-9.0	13.5	13.5	0
5/23/83	28.0	32.5	-4.5	14.5	14.5	0
5/24/83	28.5	33.5	-5.0	16.0	16.5	-0.5
5/25/83	30.5	34.0	-3.5	16.5	17.0	-0.5
5/26/83	28.0	37.0	-9.0	18.5	18.5	0
5/27/83	27.0	37.5	-10.5	19.0	19.5	-0.5
5/28/83	28.0	38.5	-10.5	19.0	20.5	-1.5
5/29/83	28.0	38.0	-10.0	19.5	20.0	-0.5
5/30/83	26.5	38.0	-11.5	20.5	21.0	-0.5
5/31/83	26.5	35.0	-8.5	19.5	20.0	-0.5
6/1/83	25.0	33.0	-8.0	18.5	19.5	-1.0
6/2/83	23.5	32.0	-8.5	16.0	16.0	0
6/3/83	25.0	33.0	-8.0	14.5	14.5	0
6/4/83	22.0	33.0	-11.0	14.5	15.0	-0.5
6/5/83	21.5	32.0	-9.5	14.0	14.5	-0.5
6/6/83	24.5	33.0	-8.5	14.5	15.0	-0.5
6/7/83	28.5	33.5	-5.0	17.0	17.5	-0.5
6/8/83	25.5	34.0	-8.5	17.0	17.5	-0.5
6/9/83	28.0	35.0	-7.0	18.0	18.5	-0.5
6/10/83	30.5	35.0	-4.5	17.0	18.0	-1.0
6/11/83	27.0	37.0	-10.0	17.5	17.5	0
6/12/83	26.0	35.0	-9.0	18.0	19.0	-1.0
6/13/83	29.5	36.0	-6.5	16.5	17.0	-0.5
6/14/83	28.5	35,0	-6.5	16.5	16.0	0.5
6/15/83	34.0	37.0	-3.0	18.0	18.5	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
6/16/83	29.5	33.5	-4.0	18.0	18.5	-0.5
6/17/83	29.5	38.0	-8.5	19.0	19.5	-0.5
6/18/83	27.5	38.5	-11.0	18.5	19.0	-0.5
6/19/83	25.5	38.0	-12.5	16.0	17.0	-1.0
6/20/83	28.0	37.5	-9.5	17.0	18.0	-1.0
6/21/83	28.0	36.0	-8.0	17.5	18.5	-1.0
6/22/83	26.5	31.5	-5.0	18.0	19.0	-1.0
6/23/83	27.0	30.5	-3.5	16.5	19.5	-3.0
6/24/83	28.5	32.5	-4.0	18.5	19.5	-1.0
6/25/83	26.5	32.5	-6.0	15.5	17.0	-1.5
6/26/83	25.5	32.5	-7.0	15.5	17.0	-1.5
6/27/83	27.5	36.0	-8.5	15.5	17.0	-1.5
6/28/83	30.0	32.5	-2.5	17.5	18.0	-0.5
6/29/83	31.0	38.0	-7.0	16.5	17.5	-1.0
6/30/83	30.0	33.0	-3.0	17.5	17.5	0
7/1/83	29.5	35.0	-5.5	18.0	19.0	-1.0
7/2/83	29.0	36.0	-7.0	17.5	18.5	-1.0
7/3/83	28.5	38.0	-9.5	16.5	17.0	-0.5
7/4/83	29.5	37.5	-8.0	17.5	19.0	-1.5
7/5/83	33.0	38.5	-5.5	18.5	19.5	-1.0
7/6/83	34.5	37.0	-2.5	20.0	24.0	-4.0
7/7/83	33.0	36.0	-3.0	21.0	24.5	-3.5
7/8/83	32.0	40.5	-8.5	23.0	23.0	0
7/9/83	32.0	36.0	-4.0	23.0	23.0	0
7/10/83	36.0	40.0	-4.0	23.0	23.0	0
7/11/83	39.5	37.0	2.5	22.0	23.0	-1.0
7/12/83	37.0	42.5	-5.5	22.5	23.5	-1.0
7/13/83	36.5	36.0	0.5	21.0	22.5	-1.5
7/14/83	35.5	38.0	-2.5	21.0	23.0	-2.0
7/15/83	35.0	35.5	-0.5	21.5	22.0	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
7/16/83	35.0	37.0	-2.0	21.0	22.5	-1.5
7/17/83	35.0	36.5	-1.5	20.0	21.0	-1.0
7/18/83	34.5	41.0	-6.5	20.5	21.5	-1.0
7/19/83	36.5	36.5	0	21.0	23.5	-2.5
7/20/83	32.5	36.0	-3.5	21.5	24.0	-2.5
7/21/83	31.5	33.5	-2.0	23.0	23.5	-0.5
7/22/83	32.5	34.5	-2.0	24.0	24.0	0
7/23/83	36.0	37.5	-1.5	23.5	24.5	-1.0
7/24/83	35.5	36.0	-0.5	23.0	24.0	-1.0
7/25/83	34.0	39.5	-5.5	23.5	24.0	-0.5
7/26/83	32.5	35.5	-3.5	22.5	24.0	-1.5
7/27/83	33.0	30.0	3.0	22.0	23.0	-1.0
7/28/83	33.5	33.5	0	21.5	23.0	-1.5
7/29/83	29.5	35.0	-5.5	22.0	24.0	-2.0
7/30/83	31.0	37.0	-6.0	22.0	23.5	-1.5
7/31/83	31.0	39.0	-8.0	22.0	23.0	-1.0
8/1/83	32.5	41.5	-9.0	22.5	24.0	-1.5
8/2/83	39.0	37.0	2.0	22.5	24.0	-1.5
8/3/83	33.0	39.0	-6.0	23.0	24.0	-1.0
8/4/83	33.0	36.0	-3.0	22.5	24.0	-1.5
8/5/83	33.0	39.0	-7.0	22.5	23.5	-1.0
8/6/83	31.5	35.0	-3.5	22.5	23.5	-1.0
8/7/83	33.5	35.5	-2.0	23.0	24.0	-1.0
8/8/83	37.5	39.0	-1.5	22.0	24.0	-2.0
8/9/83	37.0	35.5	1.5	22.0	23.5	-1.5
8/10/83	33.5	39.5	-6.0	22.5	23.0	-0.5
8/11/83	30.5	37.0	-6.5	23.0	23.5	-0.5
8/12/83	32.0	38.0	-6.0	21.5	22.5	-1.0
8/13/83	31.5	35.5	-4.0	22.5	23.0	-0.5
8/14/83	31.0	36.0	-5.0	23.0	23.5	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
8/15/83	31.5	40.5	-9.0	22.5	23.0	-0.5
8/16/83	32.5	43.0	-10.5	22.5	23.0	-0.5
8/17/83	28.5	33.0	-4.5	21.0	23.0	-2.0
8/18/83	31.5	37.5	-6.0	20.0	20.5	-0.5
8/19/83	36.0	37.0	-1.0	20.0	20.5	-0.5
8/20/83	33.0	34.0	-1.0	20.5	20.5	0
8/21/83	33.5	34.0	-0.5	19.5	20.0	-0.5
8/22/83	27.5	36.5	-9.0	19.0	19.0	0
8/23/83	29.5	45.0	-15.5	19.5	19.5	0
8/24/83	29.0	39.5	-10.5	21.0	22.0	-1.0
8/25/83	31.0	37.0	-6.0	19.0	19.0	0
8/26/83	33.0	38.5	-5.5	21.5	20.5	1.0
8/27/83	31.5	38.0	-6.5	23.5	23.0	0.5
8/28/83	32.5	38.0	-5.5	23.5	24.0	0.5
8/29/83	34.0	42.5	-8.5	21.5	21.5	0
8/30/83	35.5	38.5	-3.0	22.0	22.0	0
8/31/83	36.5	34.0	2.5	22.5	22.5	0
9/1/83	34.5	39.5	-5.0	22.5	23.0	-0.5
9/2/83	36.5	34.0	2.5	22.5	22.5	0
9/3/83	35.0	34.0	1.0	23.5	23.5	0
9/4/83	33.5	33.0	0.5	22.5	23.5	-1.0
9/5/83	33.5	33.0	0.5	21.5	22.5	-1.0
9/6/83	34.5	37.5	-3.0	23.0	23.0	0
9/7/83	33.5	30.5	3.0	20.5	22.5	-2.0
9/8/83	32.5	37.5	-5.0	20.0	21.5	-1.5
9/9/83	35.5	43.5	-8.0	20.5	21.5	-1.0
9/10/83	35.0	38.0	-3.0	20.0	23.5	3.5
9/11/83	34.0	42.0	-8.0	20.5	23.0	-2.5
9/12/83	34.0	39.5	-5.5	20.0	21.0	-1.0
9/13/83	32.5	36.0	-3.5	21.5	22.0	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
9/14/83	32.0	34.5	-2.5	21.5	22.0	-0.5
9/15/83	33.5	33.0	0.5	22.5	23.0	-0.5
9/16/83	27.0	28.5	-1.5	20.0	21.5	-1.5
9/17/83	29.5	33.5	-4.0	19.5	20.5	-1.0
9/18/83	29.5	34.0	-4.5	20.0	21.0	-1.0
9/19/83	33.5	34.0	-0.5	20.5	21.5	-1.0
9/20/83	32.5	34.5	-2.0	21.5	21.5	0
9/21/83	33.0	31.0	2.0	19.5	20.0	-0.5
9/22/83	38.5	34.5	4.0	19.0	20.5	-1.5
9/23/83	27.0	29.0	-2.0	18.0	19.0	-1.0
9/24/83	29.0	29.0	0	19.0	20.0	-1.0
9/25/83	30.5	30.5	0	18.0	18.5	-0.5
9/26/83	29.5	34.5	5.0	18.5	19.0	-0.5
9/27/83	30.0	33.0	-3.0	18.5	19.5	-1.0
9/28/83	29.5	31.5	-2.0	17.0	19.0	-2.0
9/29/83	24.0	27.5	-3.5	17.0	19.0	-2.0
9/30/83	28.0	34.0	-6.0	17.5	18.5	-1.0
10/1/83	21.5	25.5	-4.0	17.5	19.0	-1.5
10/2/83	24.0	30.5	-6.5	17.5	18.0	-0.5
10/3/83	23.0	24.0	-1.0	16.5	17.0	-0.5
10/4/83	26.0	27.0	-1.0	16.0	17.0	-1.0
10/5/83	28.5	28.0	0.5	16.5	16.5	0
10/6/83	28.0	29.0	-1.0	16.5	17.0	-0.5
10/7/83	28.0	36.5	-8.5	16.5	17.0	-0.5
10/8/83	28.5	38.0	0.5	18.0	18.5	-0.5
10/9/83	29.0	35.5	-6.5	15.5	17.0	-1.5
10/10/83	29.5	31.0	-1.5	17.0	17.5	0.5
10/11/83	27.5	31.5	-4.0	15.5	15.5	0
10/12/83	26.5	36.0	0.5	12.5	13.5	-1.0
10/13/83	25.0	35.5	-10.5	12.5	13.0	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
10/14/83	32.0	34.5	-2.5	14.0	15.0	-1.0
10/15/83	26.5	31.0	-4.5	12.5	13.0	-0.5
10/16/83	26.5	32.0	-5.5	14.5	15.0	-0.5
10/17/83	24.5	28.0	-3.5	15.0	15.5	-0.5
10/18/83	27.0	31.5	-4.5	14.0	14.0	0
10/19/83	27.0	32.5	-5.5	16.0	16.0	0
10/20/83	25.5	28.5	-3.0	13.5	14.0	-0.5
10/21/83	27.5	31.5	-4.0	13.0	13.5	-0.5
10/22/83	28.0	32.0	-4.0	13.5	14.0	-0.5
10/23/83	27.0	32.0	-5.0	14.0	14.5	-0.5
10/24/83	26.5	-	-	14.0	-	-
10/25/83	31.0	-	-	14.5	-	-
10/26/83	27.0	-	-	17.0	-	-
10/27/83	29.0	-	-	15.0	-	-
10/28/83	26.0	-	-	13.0	-	-
10/29/83	26.0	-	-	14.0	-	-
10/30/83	26.5	-	-	14.0	-	-
10/31/83	26.5	-	-	15.0	-	-
11/1/83	29.0	27.5	1.5	15.5	17.5	-2.0
11/2/83	26.5	28.0	-1.5	13.5	14.0	-0.5
11/3/83	25.0	25.5	-0.5	14.5	15.5	-1.0
11/4/83	27.0	28.0	-1.0	14.5	15.0	-0.5
11/5/83	28.5	28.0	0.5	12.5	13.0	-0.5
11/6/83	29.0	27.5	1.5	12.0	12.5	-0.5
11/7/83	29.5	27.5	2.0	12.0	12.5	-0.5
11/8/83	32.5	27.0	5.5	13.0	14.0	-1.0
11/9/83	28.5	26.0	2.5	9.5	10.5	-1.0
11/10/83	28.5	24.5	4.0	9.5	10.5	-1.0
11/11/83	29.0	26.0	3.0	9.5	10.0	-0.5
11/12/83	30.0	26.5	3.5	9.5	10.0	-0.5

Table H-4 continued.

Date	Maximum temperature, C		Temperature difference (west-east), C	Minimum temperature, C		Temperature difference (west-east), C
	West	East		West	East	
11/13/83	31.5	26.5	5.0	12.0	13.0	-1.0
11/14/83	30.0	26.5	3.5	10.0	11.0	-1.0
11/15/83	29.0	25.5	3.5	7.5	8.5	-1.0
11/16/83	28.5	25.0	3.5	7.5	8.5	-1.0
11/17/83	31.0	25.5	4.5	8.0	9.0	-1.0
11/18/83	28.0	25.5	2.5	9.5	10.5	-1.0
11/19/83	26.0	24.0	2.0	5.5	6.5	-1.0
11/20/83	28.0	25.5	2.5	5.0	6.0	-1.0
11/21/83	14.0	14.5	-0.5	7.5	9.0	-1.5
11/22/83	17.0	22.0	-5.0	8.5	8.5	0
11/23/83	18.0	24.5	-6.5	11.0	8.5	2.5
11/24/83	23.5	28.0	-4.5	10.0	7.5	2.5
11/25/83	13.5	14.0	-0.5	8.5	8.5	0
11/26/83	17.0	23.5	-6.5	8.5	8.0	0.5
11/27/83	17.5	24.5	-7.0	9.0	6.5	2.5
11/28/83	20.5	23.5	-3.0	10.0	6.5	3.5
11/29/83	24.0	23.0	1.0	11.5	7.5	4.0
11/30/83	27.0	26.0	1.0	9.5	8.5	1.0
12/1/83	16.5	18.0	-1.5	12.0	12.0	0
12/2/83	16.0	17.5	-1.5	11.5	12.0	-0.5
12/3/83	20.5	19.0	1.5	11.5	11.5	0

Table H-5. DAILY MAXIMUM AND MINIMUM RELATIVE HUMIDITY MEASUREMENTS FROM THE WEST AND EAST ENDS OF NORTH GREENHOUSE. Dashes indicate missing values.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
5/18/83	78.0	69.0	9.0	40.0	35.0	5.0
5/19/83	82.0	86.0	-4.0	44.0	35.0	9.0
5/20/83	77.0	75.0	2.0	45.0	38.0	7.0
5/21/83	82.0	81.0	1.0	37.0	31.0	6.0
5/22/83	80.0	75.0	5.0	37.0	32.0	5.0
5/23/83	79.0	75.0	4.0	46.0	38.0	8.0
5/24/83	79.0	77.0	2.0	47.0	40.0	7.0
5/25/83	81.0	80.0	1.0	51.0	39.0	12.0
5/26/83	84.0	86.0	-2.0	57.0	35.0	22.0
5/27/83	80.0	81.0	-1.0	55.0	36.0	19.0
5/28/83	83.0	83.0	0	52.0	34.0	18.0
5/29/83	81.0	83.0	-2.0	61.0	35.0	26.0
5/30/83	83.0	84.0	-1.0	67.0	37.0	30.0
5/31/83	82.0	81.0	1.0	59.0	38.0	21.0
6/1/83	77.0	78.0	-1.0	41.0	34.0	7.0
6/2/83	79.0	80.0	-1.0	46.0	37.0	9.0
6/3/83	81.0	84.0	-3.0	58.0	34.0	14.0
6/4/83	80.0	81.0	-1.0	60.0	28.0	32.0
6/5/83	78.0	78.0	0	63.0	28.0	25.0
6/6/83	79.0	77.0	2.0	49.0	32.0	17.0
6/7/83	76.0	72.0	4.0	55.0	35.0	20.0
6/8/83	77.0	76.0	1.0	31.0	27.0	4.0
6/9/83	79.0	78.0	1.0	36.0	32.0	4.0
6/10/83	77.0	74.0	3.0	40.0	34.0	6.0
6/11/83	83.0	79.0	4.0	36.0	31.0	5.0
6/12/83	71.0	64.0	7.0	37.0	31.0	6.0
6/13/83	81.0	79.0	2.0	25.0	24.0	1.0
6/14/83	79.0	79.0	0	44.0	33.0	11.0
6/15/83	75.0	70.0	5.0	34.0	26.0	8.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
6/16/83	83.0	83.0	0	39.0	31.0	8.0
6/17/83	75.0	77.0	-2.0	39.0	34.0	5.0
6/18/83	87.0	85.0	2.0	28.0	26.0	2.0
6/19/83	84.0	81.0	3.0	53.0	32.0	21.0
6/20/83	85.0	82.0	3.0	34.0	28.0	6.0
6/21/83	81.0	77.0	4.0	35.0	30.0	5.0
6/22/83	78.0	75.0	3.0	35.0	31.0	4.0
6/23/83	84.0	80.0	4.0	56.0	49.0	7.0
6/24/83	87.0	85.0	2.0	58.0	40.0	18.0
6/25/83	85.0	83.0	2.0	55.0	43.0	12.0
6/26/83	85.0	82.0	3.0	57.0	41.0	16.0
6/27/83	84.0	84.0	0	53.0	27.0	26.0
6/28/83	90.0	89.0	1.0	49.0	44.0	5.0
6/29/83	86.0	86.0	0	37.0	17.0	20.0
6/30/83	81.0	89.0	-8.0	49.0	40.0	9.0
7/1/83	88.0	89.0	-1.0	49.0	39.0	10.0
7/2/83	83.0	85.0	-2.0	49.0	33.0	16.0
7/3/83	80.0	80.0	0	50.0	30.0	20.0
7/4/83	83.0	81.0	2.0	53.0	39.0	14.0
7/5/83	82.0	79.0	3.0	51.0	39.0	12.0
7/6/83	86.0	78.0	8.0	53.0	44.0	9.0
7/7/83	86.0	85.0	1.0	53.0	48.0	5.0
7/8/83	89.0	90.0	-1.0	65.0	45.0	20.0
7/9/83	88.0	90.0	-2.0	62.0	55.0	7.0
7/10/83	88.0	89.0	-1.0	50.0	46.0	4.0
7/11/83	88.0	89.0	-1.0	41.0	50.0	-9.0
7/12/83	87.0	86.0	1.0	56.0	38.0	18.0
7/13/83	88.0	88.0	0	50.0	50.0	0
7/14/83	84.0	83.0	1.0	51.0	47.0	4.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
7/15/83	86.0	88.0	-2.0	52.0	54.0	-2.0
7/16/83	87.0	88.0	-1.0	47.0	49.0	-2.0
7/17/83	87.0	86.0	1.0	45.0	46.0	-1.0
7/18/83	88.0	81.0	7.0	54.0	36.0	18.0
7/19/83	88.0	79.0	9.0	38.0	33.0	5.0
7/20/83	88.0	88.0	0	59.0	56.0	3.0
7/21/83	90.0	91.0	-1.0	63.0	60.0	3.0
7/22/83	88.0	92.0	-4.0	59.0	58.0	1.0
7/23/83	88.0	91.0	-3.0	49.0	54.0	-5.0
7/24/83	87.0	89.0	-2.0	45.0	56.0	-11.0
7/25/83	87.0	89.0	-2.0	53.0	46.0	7.0
7/26/83	90.0	89.0	1.0	56.0	54.0	2.0
7/27/83	90.0	90.0	0	57.0	78.0	-21.0
7/28/83	90.0	90.0	0	53.0	57.0	-4.0
7/29/83	89.0	89.0	0	73.0	52.0	21.0
7/30/83	88.0	88.0	0	68.0	49.0	19.0
7/31/83	90.0	91.0	-1.0	69.0	44.0	25.0
8/1/83	89.0	89.0	0	35.0	59.0	-24.0
8/2/83	89.0	91.0	-2.0	60.0	41.0	19.0
8/3/83	90.0	92.0	-2.0	45.0	67.0	-22.0
8/4/83	89.0	88.0	1.0	47.0	66.0	-19.0
8/5/83	90.0	91.0	-1.0	48.0	62.0	-14.0
8/6/83	90.0	92.0	-2.0	48.0	61.0	-13.0
8/7/83	88.0	89.0	-1.0	54.0	63.0	-9.0
8/8/83	90.0	91.0	-1.0	49.0	53.0	-4.0
8/9/83	90.0	91.0	-1.0	61.0	57.0	4.0
8/10/83	91.0	92.0	-1.0	53.0	56.0	-3.0
8/11/83	91.0	92.0	-1.0	55.0	73.0	-18.0
8/12/83	90.0	91.0	-1.0	48.0	67.0	-19.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
8/13/83	89.0	90.0	-1.0	58.0	68.0	-10.0
8/14/83	90.0	90.0	0	55.0	67.0	-12.0
8/15/83	90.0	91.0	-1.0	44.0	71.0	-27.0
8/16/83	91.0	92.0	-1.0	41.0	71.0	-30.0
8/17/83	90.0	92.0	-2.0	62.0	75.0	-13.0
8/18/83	91.0	93.0	-2.0	44.0	56.0	-12.0
8/19/83	89.0	93.0	-4.0	44.0	50.0	-6.0
8/20/83	90.0	90.0	0	40.0	47.0	-7.0
8/21/83	90.0	91.0	-1.0	43.0	47.0	-4.0
8/22/83	89.0	90.0	-1.0	43.0	52.0	-19.0
8/23/83	84.0	88.0	-4.0	21.0	60.0	-39.0
8/24/83	79.0	82.0	-3.0	42.0	56.0	-14.0
8/25/83	85.0	89.0	-4.0	42.0	48.0	-6.0
8/26/83	81.0	85.0	-4.0	44.0	55.0	-11.0
8/27/83	80.0	77.0	3.0	48.0	63.0	-15.0
8/28/83	88.0	86.0	2.0	50.0	66.0	-16.0
8/29/83	88.0	90.0	-2.0	44.0	57.0	-13.0
8/30/83	81.0	85.0	-4.0	48.0	57.0	-9.0
8/31/83	81.0	77.0	4.0	54.0	53.0	1.0
9/1/83	84.0	81.0	3.0	42.0	51.0	-9.0
9/2/83	82.0	82.0	0	55.0	53.0	2.0
9/3/83	80.0	76.0	4.0	54.0	55.0	-1.0
9/4/83	83.0	80.0	3.0	53.0	53.0	0
9/5/83	88.0	88.0	0	56.0	54.0	2.0
9/6/83	84.0	83.0	1.0	50.0	61.0	-11.0
9/7/83	90.0	88.0	2.0	59.0	37.0	22.0
9/8/83	90.0	88.0	2.0	44.0	62.0	-18.0
9/9/83	90.0	86.0	4.0	29.0	55.0	-26.0
9/10/83	90.0	83.0	7.0	47.0	58.0	-11.0
9/11/83	91.0	87.0	4.0	55.0	30.0	25.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
9/12/83	90.0	89.0	1.0	56.0	47.0	9.0
9/13/83	85.0	87.0	-2.0	59.0	49.0	10.0
9/14/83	88.0	87.0	1.0	64.0	55.0	9.0
9/15/83	89.0	89.0	0	62.0	60.0	2.0
9/16/83	91.0	90.0	1.0	77.0	74.0	3.0
9/17/83	91.0	90.0	1.0	73.0	61.0	12.0
9/18/83	91.0	90.0	1.0	72.0	61.0	11.0
9/19/83	91.0	91.0	0	60.0	62.0	-2.0
9/20/83	92.0	93.0	-1.0	65.0	62.0	3.0
9/21/83	91.0	93.0	-2.0	57.0	69.0	-12.0
9/22/83	91.0	90.0	1.0	71.0	52.0	19.0
9/23/83	92.0	91.0	1.0	73.0	64.0	9.0
9/24/83	92.0	93.0	-1.0	70.0	71.0	-1.0
9/25/83	92.0	93.0	-1.0	67.0	67.0	0
9/26/83	92.0	91.0	1.0	70.0	52.0	18.0
9/27/83	90.0	90.0	0	63.0	58.0	5.0
9/28/83	92.0	90.0	2.0	63.0	63.0	0
9/29/83	92.0	91.0	1.0	81.0	78.0	3.0
9/30/83	92.0	93.0	-1.0	74.0	47.0	27.0
10/1/83	93.0	93.0	0	88.0	69.0	19.0
10/2/83	93.0	94.0	-1.0	82.0	54.0	28.0
10/3/83	92.0	94.0	-2.0	85.0	76.0	9.0
10/4/83	93.0	92.0	1.0	74.0	67.0	7.0
10/5/83	90.0	93.0	-3.0	69.0	71.0	-2.0
10/6/83	91.0	92.0	-1.0	67.0	58.0	9.0
10/7/83	90.0	92.0	-2.0	66.0	38.0	18.0
10/8/83	91.0	92.0	-1.0	69.0	39.0	30.0
10/9/83	90.0	91.0	-1.0	65.0	43.0	12.0
10/10/83	90.0	91.0	-1.0	63.0	56.0	7.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
10/11/83	91.0	90.0	1.0	59.0	48.0	11.0
10/12/83	91.0	90.0	1.0	49.0	33.0	16.0
10/13/83	90.0	90.0	0	51.0	27.0	24.0
10/14/83	89.0	89.0	0	37.0	28.0	9.0
10/15/83	89.0	91.0	-2.0	61.0	45.0	16.0
10/16/83	88.0	91.0	-3.0	61.0	44.0	17.0
10/17/83	90.0	92.0	-2.0	57.0	51.0	6.0
10/18/83	90.0	91.0	-1.0	62.0	48.0	14.0
10/19/83	89.0	91.0	-2.0	67.0	50.0	17.0
10/20/83	90.0	91.0	-1.0	63.0	55.0	-8.0
10/21/83	90.0	92.0	-2.0	63.0	49.0	-14.0
10/22/83	90.0	91.0	-1.0	61.0	47.0	-14.0
10/23/83	90.0	91.0	-1.0	62.0	48.0	-14.0
10/24/83	91.0	-	-	55.0	-	-
10/25/83	88.0	-	-	40.0	-	-
10/26/83	66.0	-	-	41.0	-	-
10/27/83	85.0	-	-	41.0	-	-
10/28/83	89.0	-	-	67.0	-	-
10/29/83	90.0	-	-	66.0	-	-
10/30/83	90.0	-	-	65.0	-	-
10/31/83	90.0	-	-	67.0	-	-
11/1/83	87.0	87.0	0	53.0	58.0	-5.0
11/2/83	91.0	91.0	0	62.0	64.0	-2.0
11/3/83	92.0	92.0	0	70.0	70.0	0
11/4/83	93.0	93.0	0	62.0	63.0	-1.0
11/5/83	93.0	93.0	0	56.0	65.0	-9.0
11/6/83	92.0	92.0	0	54.0	66.0	-12.0
11/7/83	92.0	92.0	0	52.0	61.0	-9.0
11/8/83	92.0	92.0	0	39.0	64.0	-25.0

Table H-5 continued.

Date	Maximum relative humidity		Relative humidity difference (west-east), %	Minimum relative humidity		Relative humidity difference (west-east), %
	West	East		West	East	
11/9/83	93.0	92.0	1.0	35.0	57.0	-22.0
11/10/83	93.0	92.0	1.0	37.0	57.0	-20.0
11/11/83	93.0	92.0	1.0	35.0	62.0	-27.0
11/12/83	92.0	92.0	0	31.0	58.0	-27.0
11/13/83	93.0	92.0	1.0	36.0	66.0	-20.0
11/14/83	93.0	92.0	1.0	33.0	59.0	-26.0
11/15/83	92.0	91.0	1.0	33.0	60.0	-27.0
11/16/83	92.0	90.0	2.0	35.0	62.0	-27.0
11/17/83	93.0	92.0	1.0	20.0	34.0	-14.0
11/18/83	92.0	92.0	0	35.0	37.0	-2.0
11/19/83	83.0	84.0	-1.0	13.0	18.0	-5.0
11/20/83	88.0	87.0	1.0	9.0	15.0	-6.0
11/21/83	91.0	88.0	3.0	71.0	72.0	-1.0
11/22/83	88.0	89.0	-1.0	66.0	47.0	19.0
11/23/83	79.0	83.0	-4.0	29.0	15.0	14.0
11/24/83	70.0	79.0	-9.0	21.0	6.0	15.0
11/25/83	82.0	86.0	-4.0	65.0	63.0	2.0
11/26/83	79.0	84.0	-5.0	36.0	20.0	16.0
11/27/83	59.0	70.0	-11.0	30.0	15.0	15.0
11/28/83	61.0	68.0	-7.0	29.0	20.0	9.0
11/29/83	58.0	70.0	-12.0	19.0	19.0	0
11/30/83	77.0	77.0	0	15.0	14.0	1.0
12/1/83	90.0	91.0	-1.0	76.0	76.0	0
12/2/83	93.0	93.0	0	87.0	85.0	2.0
12/3/83	92.0	92.0	0	65.0	72.0	-7.0

Table H-6. DAILY MAXIMUM AND MINIMUM TEMPERATURES RECORDED AT THE MARANA FIELD SITE, MARANA DESERT SITE AND THE PALO VERDE FIELD SITE. Dashes indicate missing values.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
6/4/83	-	35.5	-	-	-	10.5	-	-
6/5/83	-	35.5	-	-	-	12.5	-	-
6/6/83	-	36.0	-	-	-	12.5	-	-
6/7/83	-	38.0	-	-	-	15.5	-	-
6/8/83	-	39.0	-	-	-	17.0	-	-
6/9/83	-	38.5	-	-	-	16.0	-	-
6/10/83	-	36.0	39.0	3.0	-	16.5	15.5	-1.0
6/11/83	-	38.5	36.5	-2.0	-	13.5	15.5	2.0
6/12/83	-	39.0	33.5	-5.5		16.0	21.0	5.0
6/13/83	-	35.5	38.0	2.5	-	17.5	15.5	-2.0
6/14/83	-	36.5	39.5	3.0	-	10.0	13.0	3.0
6/15/83	-	38.5	40.0	1.5	-	15.0	15.5	0.5
6/16/83	-	39.0	40.5	1.5	-	17.0	18.0	1.0
6/17/83	-	39.5	41.5	2.0	-	17.5	18.5	1.0
6/18/83	-	40.5	41.5	1.0	-	18.5	16.5	-2.0
6/19/83	-	41.5	41.0	-0.5	-	17.0	16.0	-1.0
6/20/83	-	40.5	40.0	-0.5	-	14.0	16.0	2.0
6/21/83	-	37.0	39.5	2.5	-	17.0	16.5	-0.5
6/22/83	-	39.5	39.5	0	-	16.0	16.0	0
6/23/83	-	37.5	38.5	1.0	-	16.5	16.0	-0.5
6/24/83	-	38.0	38.0	0	-	16.5	15.0	-1.5
6/25/83	-	37.5	38.0	0.5	-	13.5	14.5	1.0
6/26/83	-	37.5	37.5	0	-	14.0	14.5	0.5
6/27/83	-	36.5	36.5	0	-	14.5	16.0	1.5
6/28/83	-	38.0	37.5	-0.5	-	17.0	15.5	-1.5
6/29/83	-	38.0	39.0	1.0	-	16.0	14.0	-2.0
6/30/83	-	38.0	39.0	1.0	-	16.0	15.0	-1.0
7/1/83	-	37.5	39.0	1.5	-	17.5	14.5	-3.0

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
7/2/83	-	38.0	37.5	-0.5	-	15.5	15.5	0
7/3/83	-	38.0	37.0	-1.0	-	11.5	17.5	6.0
7/4/83	-	38.5	38.0	-0.5	-	15.5	19.5	4.0
7/5/83	-	41.5	41.0	-0.5	-	16.5	17.5	1.0
7/6/83	-	40.5	41.5	1.0	-	27.0	24.0	-3.0
7/7/83	-	37.5	39.5	2.0	-	25.5	28.5	3.0
7/8/83	-	37.0	38.0	1.0	-	22.0	26.0	4.0
7/9/83	-	35.0	37.5	2.5	-	22.5	26.0	3.5
7/10/83	-	37.0	40.0	3.0	-	22.0	22.5	0.5
7/11/83	-	37.5	40.5	3.0	-	21.0	22.0	1.0
7/12/83	-	39.0	42.5	3.5	-	23.5	22.5	-1.0
7/13/83	-	39.5	42.5	3.0	-	24.0	23.0	-1.0
7/14/83	41.5	39.0	39.5	0.5	25.5	24.0	22.0	-2.0
7/15/83	38.5	38.5	37.5	-1.0	23.5	22.5	26.0	3.5
7/16/83	40.5	38.0	36.0	-2.0	22.0	20.0	18.5	-1.5
7/17/83	41.5	39.5	36.5	-3.0	20.0	17.0	15.5	-1.5
7/18/83	43.0	41.0	37.5	-3.5	20.5	18.0	17.0	-1.0
7/19/83	41.0	39.5	38.0	-1.5	26.0	24.0	19.0	-5.0
7/20/83	38.0	35.0	33.5	-1.5	22.5	22.0	25.0	3.0
7/21/83	31.5	30.5	34.0	3.5	21.5	21.5	23.5	2.0
7/22/83	-	30.5	34.5	4.0	-	22.5	22.5	0
7/23/83	-	34.0	36.5	2.5	-	23.0	23.0	0
7/24/83	-	35.0	38.0	3.0	-	22.5	24.0	1.5
7/25/83	-	35.5	35.5	0	-	24.0	22.0	-2.0
7/26/83	-	35.5	37.0	1.5	-	22.0	22.0	0
7/27/83	-	34.5	37.5	3.0	-	23.0	22.0	-1.0
7/28/83	-	34.0	37.5	3.5	-	20.5	22.0	1.5
7/29/83	-	33.5	37.5	4.0	-	23.0	23.0	0
7/30/83	-	34.0	36.0	2.0	-	24.0	24.5	0.5

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
7/31/83	-	35.5	39.0	3.5	-	21.5	23.0	1.5
8/1/83	-	35.5	38.0	2.5	-	22.5	23.5	1.0
8/2/83	-	34.5	38.0	3.5	-	22.5	24.0	1.5
8/3/83	-	35.5	39.5	4.0	-	23.0	25.5	2.5
8/4/83	-	33.0	38.5	5.5	-	23.5	24.0	0.5
8/5/83	-	35.5	40.5	5.0	-	21.5	23.0	1.5
8/6/83	-	34.5	39.5	5.0	-	21.5	24.0	2.5
8/7/83	-	33.5	36.0	2.5	-	23.0	28.0	5.0
8/8/83	-	32.5	38.5	6.0	-	22.0	24.0	2.0
8/9/83	-	31.0	33.5	2.5	-	20.0	22.5	2.5
8/10/83	-	30.0	34.5	4.5	-	20.5	21.5	1.0
8/11/83	-	31.5	35.0	3.5	-	22.0	23.5	1.5
8/12/83	-	33.0	38.0	5.0	-	21.0	22.0	1.0
8/13/83	-	33.0	40.0	7.0	-	21.0	20.0	-1.0
8/14/83	-	33.0	39.5	6.5	-	22.0	23.5	1.5
8/15/83	-	31.5	36.5	5.0	-	21.0	23.5	2.5
8/16/83	-	31.0	34.5	3.5	-	21.5	24.0	2.5
8/17/83	-	26.0	28.5	2.5	-	20.0	22.5	2.5
8/18/83	-	29.0	29.0	0	-	19.0	22.0	3.0
8/19/83	-	30.0	33.0	3.0	-	19.5	19.0	-0.5
8/20/83	-	-	33.0	-	-	-	19.5	-
8/21/83	-	-	33.0	-	-	-	20.0	-
8/22/83	-	-	34.5	-	-	-	17.5	-
8/23/83	37.5	30.0	35.0	5.0	24.5	21.0	16.5	-4.5
8/24/83	37.5	30.0	34.5	4.5	21.0	18.0	20.5	2.5
8/25/83	38.5	29.5	36.5	7.0	18.0	16.0	15.0	-1.0
8/26/83	41.0	31.0	39.0	8.0	22.5	19.0	17.5	-1.5
8/27/83	39.5	30.0	39.5	9.5	23.0	20.5	20.5	0
8/28/83	36.5	30.5	36.0	5.5	23.0	23.0	23.0	0

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
8/29/83	38.5	30.0	38.0	8.0	21.5	22.0	23.5	1.5
8/30/83	40.5	30.5	40.0	9.5	21.5	21.0	21.5	0.5
8/31/83	41.5	31.0	38.5	7.5	23.5	21.0	22.0	1.0
9/1/83	40.5	37.5	37.5	0	22.5	21.0	24.5	3.5
9/2/83	41.5	32.0	38.5	6.5	23.0	20.5	22.0	1.5
9/3/83	43.5	32.5	38.5	6.0	24.5	21.5	23.5	2.0
9/4/83	42.0	31.0	38.0	7.0	24.0	20.5	19.5	-1.0
9/5/83	38.5	30.0	37.0	7.0	22.0	21.5	23.0	1.5
9/6/83	38.0	30.0	38.0	8.0	21.0	20.0	22.5	2.5
9/7/83	36.5	28.0	36.0	8.0	21.0	19.5	21.0	1.5
9/8/83	38.5	29.5	37.5	8.0	21.5	20.0	20.0	0
9/9/83	39.5	30.0	36.0	6.0	22.5	20.5	22.0	1.5
9/10/83	38.0	29.0	36.5	7.5	24.0	21.0	24.0	3.0
9/11/83	38.5	30.0	35.0	5.0	24.0	23.0	20.5	-2.5
9/12/83	37.0	30.0	34.5	4.5	23.5	21.5	24.5	3.0
9/13/83	41.0	30.0	36.5	6.5	21.5	20.0	21.5	1.5
9/14/83	41.0	30.5	36.5	6.0	25.5	22.0	22.0	0
9/15/83	37.0	30.0	34.5	4.5	22.5	20.5	24.5	4.0
9/16/83	36.0	27.0	33.0	6.0	22.0	20.5	22.0	1.5
9/17/83	35.0	28.5	33.0	4.5	22.0	20.5	20.0	-0.5
9/18/83	35.5	29.0	33.5	4.5	21.5	20.0	22.5	2.5
9/19/83	36.0	29.5	32.5	3.0	22.0	22.0	22.0	0
9/20/83	34.0	28.0	33.0	5.0	21.5	21.0	23.0	2.0
9/21/83	38.5	29.0	34.5	5.5	20.5	19.5	18.0	-1.5
9/22/83	37.0	29.0	33.5	4.5	20.0	18.5	19.0	0.5
9/23/83	32.5	26.0	29.5	3.5	18.0	17.5	20.0	2.5
9/24/83	30.5	26.0	30.0	4.0	19.5	19.0	20.0	1.0
9/25/83	35.0	27.5	32.5	5.0	18.0	18.0	18.0	0
9/26/83	37.0	29.0	31.5	2.5	19.5	18.5	18.0	-0.5

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
9/27/83	34.5	28.0	31.5	3.5	19.0	17.5	15.5	-2.0
9/28/83	31.5	27.0	32.0	5.0	18.0	17.5	14.0	-3.5
9/29/83	22.5	20.5	22.0	1.5	18.0	17.0	17.5	0.5
9/30/83	25.0	24.0	26.0	2.0	17.5	17.5	15.5	-2.0
10/1/83	20.0	19.0	22.5	3.5	15.5	16.5	15.0	-1.5
10/2/83	23.0	21.5	28.0	6.5	16.0	16.5	14.5	-2.0
10/3/83	25.5	22.0	28.5	6.5	16.0	16.5	14.0	-2.5
10/4/83	25.5	23.0	30.0	7.0	16.0	16.5	16.0	-0.5
10/5/83	28.0	26.0	28.0	2.0	16.0	16.0	17.0	-1.0
10/6/83	29.0	26.0	29.0	3.0	15.0	15.0	13.5	-1.5
10/7/83	31.0	27.5	32.0	4.5	16.0	15.5	14.5	-1.0
10/8/83	27.5	26.5	31.5	5.0	17.5	17.0	15.5	-1.5
10/9/83	29.5	27.5	33.5	6.0	16.0	16.0	14.5	-1.5
10/10/83	30.0	28.0	34.0	6.0	16.0	15.5	14.0	-1.5
10/11/83	29.5	27.0	34.5	7.5	13.5	13.0	12.0	-1.0
10/12/83	29.0	26.5	34.0	7.5	11.0	11.0	10.0	-1.0
10/13/83	32.0	31.0	33.5	2.5	12.5	12.0	8.0	-4.0
10/14/83	29.0	30.0	30.5	0.5	13.0	11.5	9.5	-2.0
10/15/83	28.0	29.5	29.5	0	9.0	8.5	8.0	-0.5
10/16/83	28.5	31.5	32.5	1.0	14.0	12.5	10.5	-2.0
10/17/83	26.5	28.0	28.5	0.5	15.5	13.5	14.0	0.5
10/18/83	27.5	31.5	33.5	2.0	12.0	11.0	13.5	2.5
10/19/83	26.5	30.5	33.0	2.5	14.0	13.0	13.5	0.5
10/20/83	26.0	30.5	33.5	3.0	12.0	11.5	10.0	-1.5
10/21/83	30.0	34.5	34.0	-0.5	12.0	10.5	9.0	-1.5
10/22/83	33.0	33.0	34.0	1.0	14.0	13.0	8.5	-4.5
10/23/83	30.5	33.0	34.5	1.5	14.0	13.5	9.5	-4.0
10/24/83	28.5	32.0	33.0	1.0	14.0	12.0	9.5	-2.5
10/25/83	25.5	26.5	31.0	4.5	12.5	11.5	12.0	0.5

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
10/26/83	24.0	24.5	29.5	5.0	17.0	16.5	16.0	-0.5
10/27/83	25.0	29.5	29.0	-0.5	13.5	12.5	13.5	1.0
10/28/83	27.0	30.5	30.5	0	11.0	11.0	10.5	-0.5
10/29/83	29.5	32.0	31.5	-0.5	13.0	12.0	9.0	-3.0
10/30/83	29.0	32.0	32.5	0.5	13.5	12.5	12.5	0
10/31/83	29.5	32.5	32.0	-0.5	14.5	13.5	10.5	-3.0
11/1/83	29.5	31.5	31.0	-0.5	12.0	11.5	10.0	-1.5
11/2/83	26.0	28.5	28.5	0	12.5	11.0	11.5	0.5
11/3/83	24.5	27.5	31.5	4.0	13.0	12.5	8.5	-4.0
11/4/83	26.0	25.5	28.5	3.0	13.0	12.0	14.0	2.0
11/5/83	24.0	27.5	29.0	1.5	11.5	11.0	9.5	-1.5
11/6/83	25.0	29.0	30.0	1.0	11.5	11.0	8.5	-2.5
11/7/83	27.0	30.0	30.5	0	11.0	10.5	7.0	-3.5
11/8/83	24.5	27.0	28.5	1.5	10.5	9.0	10.0	1.0
11/9/83	24.5	27.0	25.5	-1.5	6.5	5.5	0.0	-5.5
11/10/83	24.5	28.5	27.5	-1.0	7.5	6.5	5.5	-1.0
11/11/83	26.0	30.0	28.5	-1.5	8.5	8.0	3.0	-5.0
11/12/83	25.5	29.5	29.0	-0.5	8.5	8.0	9.5	1.5
11/13/83	25.5	28.5	28.0	-0.5	12.0	10.5	14.0	3.5
11/14/83	22.0	26.0	26.0	0	7.0	6.0	5.5	-0.5
11/15/83	27.0	28.5	28.0	-0.5	4.0	3.0	2.5	-0.5
11/16/83	25.0	30.0	28.5	-1.5	7.0	6.0	1.5	-4.5
11/17/83	24.0	29.0	26.5	-2.5	7.0	6.0	3.5	-2.5
11/18/83	21.0	23.0	26.0	3.0	7.5	4.5	12.5	8.0
11/19/83	18.0	22.0	23.0	1.0	-0.5	-1.5	4.5	6.0
11/20/83	23.0	25.5	23.0	-2.5	2.5	1.0	0.5	-0.5
11/21/83	16.5	16.5	16.5	0	4.0	4.5	1.5	-3.0
11/22/83	11.0	14.0	17.0	3.0	1.0	0.0	-2.0	-2.0
11/23/83	12.5	17.0	17.5	0.5	0.0	-0.5	-1.5	-1.0

Table H-6 continued.

Date	Maximum temperature, C			Temperature difference (Palo Verde-Marana) (C)	Minimum temperature, C			Temperature difference (Palo Verde-Marana), (C)
	Marana Desert Site	Marana Field Site	Palo verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
11/24/83	17.5	20.0	18.0	-2.0	0.0	-1.0	-1.0	0
11/25/83	12.5	11.5	16.0	4.5	2.5	2.0	5.0	3.0
11/26/83	11.0	14.0	15.0	1.0	-1.5	-2.0	-0.5	1.5
11/27/83	11.0	15.5	19.0	3.5	-3.5	-3.5	-3.5	0
11/28/83	15.0	18.5	17.0	-1.5	-2.5	-2.0	-5.0	-3.0
11/29/83	17.0	20.5	17.5	-3.0	-0.5	-1.0	-5.0	-4.0
11/30/83	-	-	19.0	-	-	-	-2.5	-
12/1/83	-	-	18.0	-	-	-	3.5	-
12/2/83	-	-	19.5	-	-	-	6.5	-
12/3/83	-	-	16.0	-	-	-	4.0	-
12/4/83	-	-	19.5	-	-	-	5.5	-

Table H-7. DAILY MAXIMUM AND MINIMUM RELATIVE HUMIDITY MEASUREMENTS RECORDED AT THE MARANA FIELD SITE, MARANA DESERT SITE AND PALO VERDE FIELD SITE. Dashes indicate missing data.

Date	Maximum relative humidity			Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity			Relative humidity difference (Palo Verde-Marana), %
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
6/4/83	-	39.0	-	-	-	0.0	-	-
6/5/83	-	31.0	-	-	-	0.0	-	-
6/6/83	-	25.0	-	-	-	0.0	-	-
6/7/83	-	24.0	-	-	-	0.0		-
6/8/83	-	28.0	-	-	-	0.0	-	-
6/9/83	-	33.0	-	-	-	0.0	-	-
6/10/83	-	58.0	54.0	-4.0	-	7.0	11.0	4.0
6/11/83	-	39.0	49.0	10.0	-	10.0	12.0	2.0
6/12/83	-	41.0	54.00	13.0	-	5.0	18.0	13.0
6/13/83	-	32.0	54.0	22.0	-	15.0	3.0	-12.0
6/14/83	-	41.0	35.0	-6.0	-	8.0	0.0	-8.0
6/15/83	-	29.0	30.0	1.0	-	2.0	2.0	0.0
6/16/83	-	36.0	38.0	2.0	-	6.0	4.0	-2.0
6/17/83	-	33.0	36.0	3.0	-	8.0	2.0	-6.0
6/18/83	-	34.0	32.0	-2.0	-	1.0	0.0	-1.0
6/19/83	-	36.0	23.0	-13.0	-	0.0	0.0	0.0
6/20/83	-	28.0	28.0	0.0	-	0.0	1.0	1.0
6/21/83	-	27.0	29.0	2.0	-	3.0	4.0	1.0
6/22/83	-	38.0	54.0	16.0	-	6.0	10.0	4.0
6/23/83	-	35.0	51.0	16.0	-	3.0	10.0	7.0
6/24/83	-	39.0	59.0	20.0	-	0.0	8.0	8.0
6/25/83	-	29.0	50.0	21.0	-	0.0	5.0	5.0
6/26/83	-	29.0	51.0	22.0	-	0.0	8.0	8.0
6/27/83	-	31.0	51.0	20.0	-	0.0	17.0	17.0
6/28/83	-	34.0	48.0	14.0	-	3.0	12.0	9.0
6/29/83	-	54.0	47.0	-7.0	-	1.0	3.0	2.0
6/30/83	-	60.0	42.0	-18.0	-	0.0	4.0	4.0
7/1/83	-	51.0	38.0	-13.0	-	3.0	4.0	1.0

Table H-7 continued.

Date	Maximum relative humidity			Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity			Relative humidity difference (Palo Verde-Marana), %
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
7/2/83	-	54.0	47.0	-7.0	-	2.0	8.0	6.0
7/3/83	-	52.0	43.0	-9.0	-	8.0	18.0	10.0
7/4/83	-	59.0	54.0	-5.0	-	17.0	20.0	3.0
7/5/83	-	59.0	71.0	12.0	-	14.0	22.0	8.0
7/6/83	-	41.0	54.0	13.0	-	16.0	17.0	1.0
7/7/83	-	73.0	46.0	-27.0	-	29.0	23.0	-6.0
7/8/83	-	91.0	65.0	-26.0	-	37.0	35.0	-2.0
7/9/83	-	86.0	61.0	-25.0	-	47.0	37.0	-10.0
7/10/83	-	87.0	68.0	-19.0	-	39.0	17.0	-22.0
7/11/83	-	86.0	67.0	-19.0	-	32.0	13.0	-19.0
7/12/83	-	60.0	59.0	-1.0	-	28.0	19.0	-9.0
7/13/83	-	60.0	49.0	-11.0	-	26.0	20.0	-6.0
7/14/83	52.0	58.0	60.0	2.0	11.0	23.0	26.0	3.0
7/15/83	56.0	64.0	57.0	-7.0	21.0	28.0	24.0	-4.0
7/16/83	48.0	67.0	65.0	-2.0	5.0	17.0	23.0	6.0
7/17/83	31.0	57.0	62.0	5.0	2.0	10.0	17.0	7.0
7/18/83	28.0	57.0	63.0	6.0	0.0	18.0	18.0	0.0
7/19/83	31.0	51.0	65.0	14.0	2.0	19.0	25.0	6.0
7/20/83	90.0	91.0	84.0	-7.0	25.0	33.0	34.0	1.0
7/21/83	90.0	91.0	89.0	-2.0	49.0	69.0	56.0	-13.0
7/22/83	-	91.0	86.0	-5.0	-	74.0	52.0	-22.0
7/23/83	-	89.0	84.0	-5.0	-	60.0	52.0	-8.0
7/24/83	-	86.0	89.0	3.0	-	48.0	51.0	3.0
7/25/83	-	78.0	90.0	12.0	-	43.0	40.0	-3.0
7/26/83	-	84.0	80.0	-4.0	-	45.0	31.0	-14.0
7/27/83	-	76.0	71.0	-5.0	-	52.0	34.0	-18.0
7/28/83	-	87.0	78.0	-9.0	-	44.0	39.0	-5.0
7/29/83	-	87.0	74.0	-13.0	-	51.0	31.0	-20.0
7/30/83	-	79.0	75.0	-4.0	-	54.0	43.0	-11.0

Table H-7 continued.

Date	Maximum relative humidity: Marana Desert Site	Maximum relative humidity: Marana Field Site	Maximum relative humidity: Palo Verde Field Site	Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity: Marana Desert Site	Minimum relative humidity: Marana Field Site	Minimum relative humidity: Palo Verde Field Site	Relative humidity difference (Palo Verde-Marana), %
7/31/83	-	86.0	82.0	-4.0	-	54.0	44.0	-10.0
8/1/83	-	88.0	88.0	-	-	49.[illegible]	43.0	-6.0
8/2/83	-	90.0	88.0	-2.0	-	[illegible].0	55.0	-3.0
8/3/83	-	87.0	87.0	0	-	48.0	42.0	-6.0
8/4/83	-	84.0	86.0	2.0	-	59.0	43.0	-16.0
8/5/83	-	87.0	85.0	-2.0	-	55.0	36.0	-19.0
8/6/83	-	90.0	81.0	-9.0	-	58.0	46.0	-12.0
8/7/83	-	86.0	71.0	-15.0	-	64.0	43.0	-21.0
8/8/83	-	89.0	82.0	-7.0	-	63.0	43.0	-20.0
8/9/83	-	95.0	90.0	-5.0	-	11.0	61.0	50.0
8/10/83	-	95.0	90.0	-[illegible].0	-	82.0	64.0	-18.0
8/11/83	-	90.0	88.0	-2.0	-	76.0	56.0	-20.0
8/12/83	-	91.0	84.0	-7.0	-	67.0	44.0	-23.0
8/13/83	-	90.0	84.0	-6.0	-	74.0	40.0	-34.0
8/14/83	-	91.0	89.0	-2.0	-	73.0	47.0	-26.0
8/15/83	-	93.0	9[illegible].0	-3.0	-	80.0	57.0	-23.0
8/16/83	-	92.0	88.0	-4.0	-	81.0	68.0	-13.0
8/17/83	-	93.0	90.0	-3.0	-	87.0	78.0	-9.0
8/18/83	-	92.0	90.0	-2.0	-	75.0	66.0	-9.0
8/19/83	-	9[illegible].0	91.0	-1.0	-	72.0	52.0	-20.0
8/20/83	-	-	90.0	-	-	-	52.0	-
8/21/83	-	-	88.0	-	-	-	45.0	-
8/22/83	-	-	89.0	-	-	-	41.0	-
8/23/83	[illegible]6.0	86.0	90.0	4.0	22.0	73.0	41.0	-32.0
8/24/83	79.0	90.0	87.0	-3.0	12.0	49.0	40.0	-9.0
8/25/83	63.0	89.0	91.0	2.0	14.0	70.0	41.0	-29.0
8/26/83	71.0	89.0	82.0	-7.0	15.0	66.0	32.0	-34.0
8/27/83	74.0	90.0	81.0	-9.0	22.0	79.0	38.0	-41.0
8/28/83	83.0	90.0	79.0	-11.0	30.0	77.0	43.0	-34.0

Table H-7 continued.

Date	Maximum relative humidity			Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity			Relative humidity difference (Palo Verde-Marana), %
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
8/29/83	86.0	90.0	87.0	-3.0	25.0	81.0	39.0	-42.0
8/30/83	74.0	90.0	87.0	-3.0	19.0	81.0	36.0	-45.0
8/31/83	67.0	91.0	87.0	-4.0	20.0	73.0	42.0	-31.0
9/1/83	76.0	91.0	85.0	-6.0	20.0	66.0	49.0	-17.0
9/2/83	74.0	90.0	88.0	-2.0	15.0	75.0	40.0	-35.0
9/3/83	67.0	88.0	84.0	-4.0	12.0	70.0	32.0	-38.0
9/4/83	59.0	88.0	83.0	-5.0	10.0	65.0	20.0	-45.0
9/5/83	81.0	89.0	87.0	-2.0	24.0	77.0	40.0	-37.0
9/6/83	85.0	92.0	89.0	-3.0	31.0	75.0	38.0	-37.0
9/7/83	89.0	92.0	91.0	-1.0	33.0	86.0	50.0	-36.0
9/8/83	85.0	91.0	87.0	-4.0	26.0	84.0	46.0	-38.0
9/9/83	80.0	91.0	87.0	-4.0	23.0	79.0	54.0	-25.0
9/10/83	67.0	89.0	84.0	-5.0	28.0	74.0	35.0	-39.0
9/11/83	67.0	85.0	84.0	-1.0	22.0	74.0	37.0	-37.0
9/12/83	73.0	88.0	83.0	-5.0	31.0	65.0	40.0	-25.0
9/13/83	75.0	90.0	86.0	-4.0	18.0	71.0	49.0	-22.0
9/14/83	55.0	84.0	83.0	-1.0	15.0	69.0	39.0	-30.0
9/15/83	79.0	87.0	83.0	-4.0	31.0	74.0	45.0	-29.0
9/16/83	84.0	89.0	87.0	-2.0	30.0	83.0	56.0	-27.0
9/17/83	80.0	90.0	89.0	-1.0	38.0	74.0	59.0	-15.0
9/18/83	84.0	90.0	88.0	-2.0	36.0	72.0	61.0	-11.0
9/19/83	89.0	91.0	86.0	-5.0	35.0	81.0	68.0	-13.0
9/20/83	89.0	92.0	86.0	-6.0	41.0	82.0	50.0	-32.0
9/21/83	88.0	91.0	88.0	-3.0	26.0	78.0	43.0	-35.0
9/22/83	90.0	93.0	88.0	-5.0	25.0	78.0	49.0	-29.0
9/23/83	91.0	94.0	92.0	-2.0	38.0	87.0	62.0	-25.0
9/24/83	91.0	93.0	91.0	-2.0	50.0	87.0	65.0	-22.0
9/25/83	91.0	93.0	91.0	-2.0	31.0	84.0	53.0	-31.0
9/26/83	87.0	92.0	89.0	-3.0	28.0	72.0	44.0	-28.0

Table H-7 continued.

Date	Maximum relative humidity			Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity			Relative humidity difference (Palo Verde-Marana), %
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
9/27/83	81.0	91.0	91.0	0.0	26.0	72.0	44.0	-28.0
9/28/83	93.0	92.0	89.0	-3.0	47.0	72.0	33.0	-39.0
9/29/83	91.0	94.0	92.0	-2.0	64.0	79.0	69.0	-10.0
9/30/83	92.0	95.0	92.0	-3.0	74.0	87.0	55.0	-32.0
10/1/83	93.0	95.0	92.0	-3.0	89.0	92.0	82.0	-10.0
10/2/83	93.0	94.0	93.0	-1.0	77.0	90.0	59.0	-31.0
10/3/83	91.0	93.0	92.0	-1.0	64.0	88.0	65.0	-23.0
10/4/83	90.0	92.0	91.0	-1.0	72.0	86.0	50.0	-36.0
10/5/83	90.0	93.0	91.0	-2.0	52.0	79.0	71.0	-8.0
10/6/83	92.0	93.0	92.0	-1.0	41.0	77.0	57.0	-20.0
10/7/83	90.0	92.0	92.0	0.0	35.0	73.0	46.0	-27.0
10/8/83	87.0	91.0	92.0	1.0	56.0	77.0	45.0	-32.0
10/9/83	90.0	92.0	91.0	-1.0	44.0	74.0	40.0	-34.0
10/10/83	89.0	92.0	92.0	0.0	42.0	73.0	32.0	-41.0
10/11/83	90.0	93.0	91.0	-2.0	24.0	55.0	13.0	-42.0
10/12/83	88.0	93.0	79.0	-14.0	18.0	55.0	10.0	-45.0
10/13/83	73.0	89.0	87.0	-2.0	5.0	35.0	8.0	-27.0
10/14/83	64.0	87.0	85.0	-2.0	21.0	38.0	22.0	-16.0
10/15/83	86.0	94.0	86.0	-8.0	33.0	45.0	29.0	-16.0
10/16/83	83.0	92.0	85.0	-7.0	30.0	38.0	26.0	-12.0
10/17/83	83.0	90.0	79.0	-11.0	39.0	51.0	40.0	-11.0
10/18/83	90.0	93.0	82.0	-11.0	38.0	41.0	23.0	-18.0
10/19/83	91.0	93.0	76.0	-17.0	54.0	54.0	18.0	-36.0
10/20/83	90.0	94.0	80.0	-14.0	44.0	41.0	22.0	-19.0
10/21/83	90.0	93.0	80.0	-13.0	35.0	42.0	20.0	-22.0
10/22/83	86.0	90.0	77.0	-13.0	23.0	32.0	19.0	-13.0
10/23/83	85.0	90.0	79.0	-11.0	31.0	36.0	17.0	-19.0
10/24/83	89.0	89.0	71.0	-18.0	34.0	37.0	21.0	-16.0
10/25/83	91.0	92.0	75.0	-17.0	33.0	37.0	22.0	-15.0

Table H-7 continued.

Date	Maximum relative humidity: Marana Desert Site	Maximum relative humidity: Marana Field Site	Maximum relative humidity: Palo Verde Field Site	Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity: Marana Desert Site	Minimum relative humidity: Marana Field Site	Minimum relative humidity: Palo Verde Field Site	Relative humidity difference (Palo Verde-Marana), %
10/26/83	53.0	60.0	53.0	-7.0	39.0	45.0	27.0	-18.0
10/27/83	86.0	89.0	68.0	-21.0	42.0	35.0	33.0	-2.0
10/28/83	90.0	92.0	82.0	-10.0	39.0	40.0	29.0	-11.0
10/29/83	90.0	91.0	80.0	-11.0	28.0	30.0	28.0	-2.0
10/30/83	86.0	89.0	77.0	-12.0	34.0	35.0	25.0	-10.0
10/31/83	85.0	88.0	79.0	-9.0	33.0	34.0	24.0	-10.0
11/1/83	88.0	91.0	77.0	-14.0	31.0	34.0	24.0	-10.0
11/2/83	89.0	90.0	72.0	-18.0	44.0	47.0	33.0	-14.0
11/3/83	92.0	92.0	79.0	-13.0	49.0	50.0	27.0	-23.0
11/4/83	92.0	93.0	78.0	-15.0	47.0	57.0	38.0	-19.0
11/5/83	91.0	93.0	85.0	-8.0	57.0	53.0	38.0	-20.0
11/6/83	91.0	93.0	82.0	-11.0	45.0	45.0	30.0	-15.0
11/7/83	91.0	92.0	81.0	-11.0	35.0	36.0	27.0	-9.0
11/8/83	87.0	91.0	72.0	-19.0	42.0	44.0	1.0	-43.0
11/9/83	90.0	93.0	46.0	-47.0	33.0	35.0	5.0	-30.0
11/10/83	89.0	92.0	45.0	-47.0	29.0	30.0	11.0	-19.0
11/11/83	85.0	89.0	61.0	-28.0	29.0	27.0	8.0	-19.0
11/12/83	86.0	90.0	57.0	-33.0	28.0	28.0	21.0	-7.0
11/13/83	84.0	86.0	83.0	-3.0	45.0	43.0	38.0	-5.0
11/14/83	90.0	93.0	80.0	-13.0	37.0	35.0	25.0	-10.0
11/15/83	91.0	93.0	72.0	-21.0	17.0	21.0	3.0	-18.0
11/16/83	77.0	85.0	64.0	-21.0	27.0	25.0	11.0	-14.0
11/17/83	86.0	90.0	58.0	-32.0	22.0	24.0	19.0	-5.0
11/18/83	73.0	79.0	74.0	-5.0	43.0	46.0	5.0	-41.0
11/19/83	83.0	92.0	39.0	-53.0	13.0	17.0	2.0	-15.0
11/20/83	65.0	76.0	92.0	16.0	17.0	19.0	19.0	0.0
11/21/83	93.0	94.0	92.0	-2.0	30.0	34.0	41.0	7.0
11/22/83	95.0	95.0	94.0	-1.0	50.0	56.0	25.0	-31.0
11/23/83	94.0	94.0	88.0	-6.0	34.0	34.0	20.0	-14.0

Table H-7 continued.

Date	Maximum relative humidity			Relative humidity difference (Palo Verde-Marana), %	Minimum relative humidity			Relative humidity difference (Palo Verde-Marana), %
	Marana Desert Site	Marana Field Site	Palo Verde Field Site		Marana Desert Site	Marana Field Site	Palo Verde Field Site	
11/24/83	91.0	94.0	89.0	-5.0	33.0	31.0	22.0	-9.0
11/25/83	92.0	93.0	90.0	-3.0	53.0	61.0	33.0	-28.0
11/26/83	94.0	95.0	68.0	-27.0	45.0	44.0	25.0	-19.0
11/27/83	93.0	95.0	76.0	-19.0	46.0	41.0	16.0	-25.0
11/28/83	92.0	94.0	82.0	-12.0	33.0	32.0	23.0	-9.0
11/29/83	92.0	94.0	86.0	-8.0	30.0	32.0	26.0	-6.0
11/30/83	-	-	82.0	-	-	-	28.0	-
12/1/83	-	-	92.0	-	-	-	52.0	-
12/2/83	-	-	92.0	-	-	-	67.0	-
12/3/83	-	-	94.0	-	-	-	82.0	-
12/4/83	-	-	89.0	-	-	-	34.0	-

Table H-8. PRECIPITATION DURING THE 1983 GROWING SEASON RECORDED AT THE MARANA FIELD SITE AND THE PALO VERDE FIELD SITE.

Date	Marana Field Site: Daily precipitation mm	Marana Field Site: Daily precipitation inches	Marana Field Site: Precipitation accumulated since 6/27/83 mm	Marana Field Site: Precipitation accumulated since 6/27/83 inches	Palo Verde Field Site: Daily precipitation mm	Palo Verde Field Site: Daily precipitation inches	Palo Verde Field Site: Precipitation accumulated since 6/27/83 mm	Palo Verde Field Site: Precipitation accumulated since 6/27/83 inches
7/7/83	1	0.03	1	0.03	0	0	0	0
7/8/83	3	0.13	4	0.16	0	0	0	0
7/9/83	1	0.02	5	0.18	0	0	0	0
7/10/83	2	0.06	6	0.24	0	0	0	0
7/20/83	4	0.15	10	0.39	<1	0.01	<1	0.01
7/21/83	<1	0.01	10	0.40	2	0.09	3	0.10
7/22/83	4	0.14	14	0.54	0	0	3	0.10
7/23/83	1	0.02	14	0.56	0	0	3	0.10
7/24/83	0	0	14	0.56	5	0.21	8	0.31
7/25/83	0	0	14	0.56	1	0.02	8	0.33
7/26/83	<1	0.01	15	0.57	0	0	8	0.33
7/27/83	<1	0.01	15	0.58	0	0	8	0.33
7/29/83	1	0.02	15	0.60	0	0	8	0.33
7/30/83	1	0.02	16	0.62	0	0	8	0.33
7/31/83	<1	0.01	16	0.63	0	0	8	0.33
8/1/83	4	0.14	20	0.77	9	0.37	18	0.70
8/3/83	0	0	20	0.77	3	0.13	21	0.83
8/5/83	2	0.07	21	0.84	0	0	21	0.83
8/8/83	<1	0.01	22	0.85	<1	0.01	21	0.84
8/9/83	5	0.21	27	1.06	3	0.12	24	0.96
8/10/83	1	0.03	28	1.09	2	0.06	26	1.02
8/13/83	1	0.02	28	1.11	0	0	26	1.02
8/14/83	7	0.29	36	1.40	16	0.61	41	1.63
8/15/83	3	0.13	39	1.53	0	0	41	1.63
8/16/83	10	0.40	49	1.93	1	0.02	42	1.65
8/17/83	2	0.07	51	2.00	10	0.38	52	2.03
8/26/83	9	0.37	60	2.37	0	0	52	2.03
8/28/83	1	0.03	61	2.40	0	0	52	2.03

Table H-8 continued.

Date	Marana Field Site: Daily precipitation		Marana Field Site: Precipitation accumulated since 6/27/83		Palo Verde Field Site: Daily precipitation		Palo Verde Field Site: Precipitation accumulated since 6/27/83	
	mm	inches	mm	inches	mm	inches	mm	inches
8/29/83	0	0	61	2.40	<1	0.01	52	2.04
9/1/83	0	0	61	2.40	1	0.05	53	2.09
9/6/83	21	0.82	82	3.22	2	0.09	55	2.18
9/7/83	<1	0.01	82	3.23	1	0.02	56	2.20
9/19/83	5	0.21	87	3.44	<1	0.01	56	2.21
9/22/83	7	0.29	95	3.73	0	0	56	2.21
9/23/83	4	0.17	99	3.90	11	0.44	67	2.65
9/24/83	0	0	99	3.90	<1	0.01	68	2.66
9/29/83	0	0	99	3.90	11	0.45	79	3.11
9/30/83	80	3.15	179	7.05	<1	0.01	79	3.12
10/1/83	40	1.57	219	8.62	7	0.26	86	3.38
10/2/83	19	0.75	238	9.37	0	0	86	3.38
10/3/83	1	0.03	239	9.40	1	0.04	87	3.42
10/4/83	<1	0.01	239	9.41	0	0	87	3.42
10/5/83	0	0	239	9.41	4	0.16	91	3.58
10/7/83	0	0	239	9.41	1	0.05	92	3.63
10/18/83	1	0.03	240	9.44	0	0	92	3.63
10/19/83	10	0.41	250	9.85	0	0	92	3.63
10/21/83	<1	0.01	250	9.86	0	0	92	3.63
10/24/83	1	0.02	251	9.88	0	0	92	3.63
11/3/83	7	0.29	258	10.17	0	0	92	3.63
11/4/83	4	0.17	263	10.34	0	0	92	3.63
11/20/83	0	0	263	10.34	5	0.20	97	3.83
11/21/83	3	0.13	266	10.47	0	0	97	3.83
11/25/83	3	0.11	269	10.58	1	0.04	98	3.87
12/1/83	0	0	269	10.58	5	0.21	104	4.08
12/2/83	0	0	269	10.58	2	0.08	106	4.16

SECTION I

HARVEST DATA: GREENHOUSE AND FIELD

Table I-1. HARVEST DATA: CANTALOUPE, MARANA FIELD SITE. Each value represents the mean of 8 plot samples harvested (8 replications x 1 plot sample per replication) for any given variable at a particular treatment level on a given date. See next page for leaf wash data.

Variable (units)	Nominal treatment (lbs/a·yr)	Date: 8/19	8/29	9/9	10/11	Total for Season
Fresh weight of harvested melons (lbs/200 ft^2)	No treatment	20.38	31.51	6.81	4.16	62.85
	0	21.41	47.08	7.91	4.54	80.93
	10	22.31	38.31	7.06	5.64	73.33
	100	27.50	29.37	4.78	6.01	67.66
	500	18.91	40.56	4.63	6.93	71.02
Number of harvested melons	No treatment	13.63	14.50	5.38	2.25	35.75
	0	11.63	19.50	4.88	2.00	38.00
	10	12.38	16.88	5.88	2.75	37.88
	100	19.38	14.38	4.38	3.00	41.13
	500	14.00	17.88	2.75	3.25	37.88
Number of melons left unharvested on 10/11 (last harvest)	No treatment	N/A	N/A	N/A	N/A	39.38
	0	N/A	N/A	N/A	N/A	35.50
	10	N/A	N/A	N/A	N/A	36.88
	100	N/A	N/A	N/A	N/A	35.13
	500	N/A	N/A	N/A	N/A	39.13
Total number of melons, harvested and unharvested, entire season	No treatment	N/A	N/A	N/A	N/A	75.13
	0	N/A	N/A	N/A	N/A	73.50
	10	N/A	N/A	N/A	N/A	74.75
	100	N/A	N/A	N/A	N/A	76.25
	500	N/A	N/A	N/A	N/A	77.00

Table I-1 continued: Cantaloupe Leaf Wash Data.

Variable (units)	Nominal treatment (lbs/a·yr)	Sampling Date 7/18	Sampling Date 9/22	Average for Season
Leaf surface salts, on a leaf area basis (mg salts/cm^2 leaf area)	No treatment	0.0134	0.0148	0.0141
	0	0.0177	0.0119	0.0148
	10	0.0135	0.0124	0.0130
	100	0.0192	0.0130	0.0161
	500	0.0274	0.0253	0.0263
Leaf surface salts, on a dry weight basis (mg salts/g dry weight)	No treatment	2.36	2.54	2.44
	0	2.80	1.87	2.36
	10	2.35	1.98	2.17
	100	3.05	1.92	2.49
	500	4.94	3.77	4.35

Tables I-2, I-3. HARVEST DATA: COTTON FIBER ANALYSIS, MARANA FIELD SITE.

EXPLANATION OF THE FIBER ANALYSIS VARIABLES USED IN EVALUATING THE QUALITY OF THE FIELD COTTON HARVEST (High Volume Instrument Classification System). This summary was excerpted from Cotton Classification Memorandum Form 1 (HVI). USDA, Agriculture Marketing Service, Cotton Division, May, 1983. The HVI Classification System currently consists of instrument measurements for fiber length, strength, length uniformity, fiber fineness, and color. An instrument for measuring trash content is under development and is expected to be added to the system in the near future. In the meantime, trash content is visually assayed. In addition, a classer is assigned to each HVI system to provide the traditional classer's 'grade'. Except for the color code, all of these variables are derived from a linear scale and mean values are reported in the table that follows (Table I-2).

Color code determination are made on a Nickerson-Hunter Cotton Colorimeter. The code is a two-part numerical value which describes a particular region found on the USDA cotton color diagram. The diagram attempts to describe cotton color as a function of both percent reflectance and degree of yellowness. Color analysis results and the USDA cotton color diagram are presented in Table I-3 and Figure I-1.

FIBER FINENESS- Fiber fineness is measured in micronaires by the Fibronaire airflow instrument. The mike readings reported from this instrument are the same as those that have been used for many years in cotton classification.

LENGTH- Length of fiber, measured in 100th of an inch.

LENGTH UNIFORMITY- Length uniformity is a measure of the degree of uniformity of fibers in a sample.

STRENGTH- The fiber strength measurement is made with a 1/8 inch gauge spacing between the clamp jaws. Results are reported in terms of grams per tex. A tex unit is equal to the weight in grams of 1,000 meters of fiber. Therefore, the strength reported is the force in grams required to break a bundle of fibers one tex unit in size.

GRADE- The assigned grade is determined by the classer, in the traditional manner, based on official grade standards of American Upland cotton.

TRASH- The trash grade is an estimate of waste content. The measurement is made by a visual comparison of the sample with the seven White grade standards, grade 11 through 71, and are numbered 1 through 7 with each showing increasing trash levels. Grade 8 is used to identify samples having more trash than grade 71.

COLOR- The basic color measurements are in terms of grayness and yellowness scales specially designed for cotton. Grayness (% reflectance) indicates how light or dark the sample is and yellowness indicates how much yellow color is in the sample. The Nickerson-Hunter cotton colorimeter color diagram (Figure I-1) is based on current official standards for American Upland Cotton and shows how these measurements are coded and how they relate to the color of the grade standards. Each grade is subdivided to denote color differences within a grade. Data is presented in Table I-3.

Figure I-1. COLOR CODE DIAGRAM.

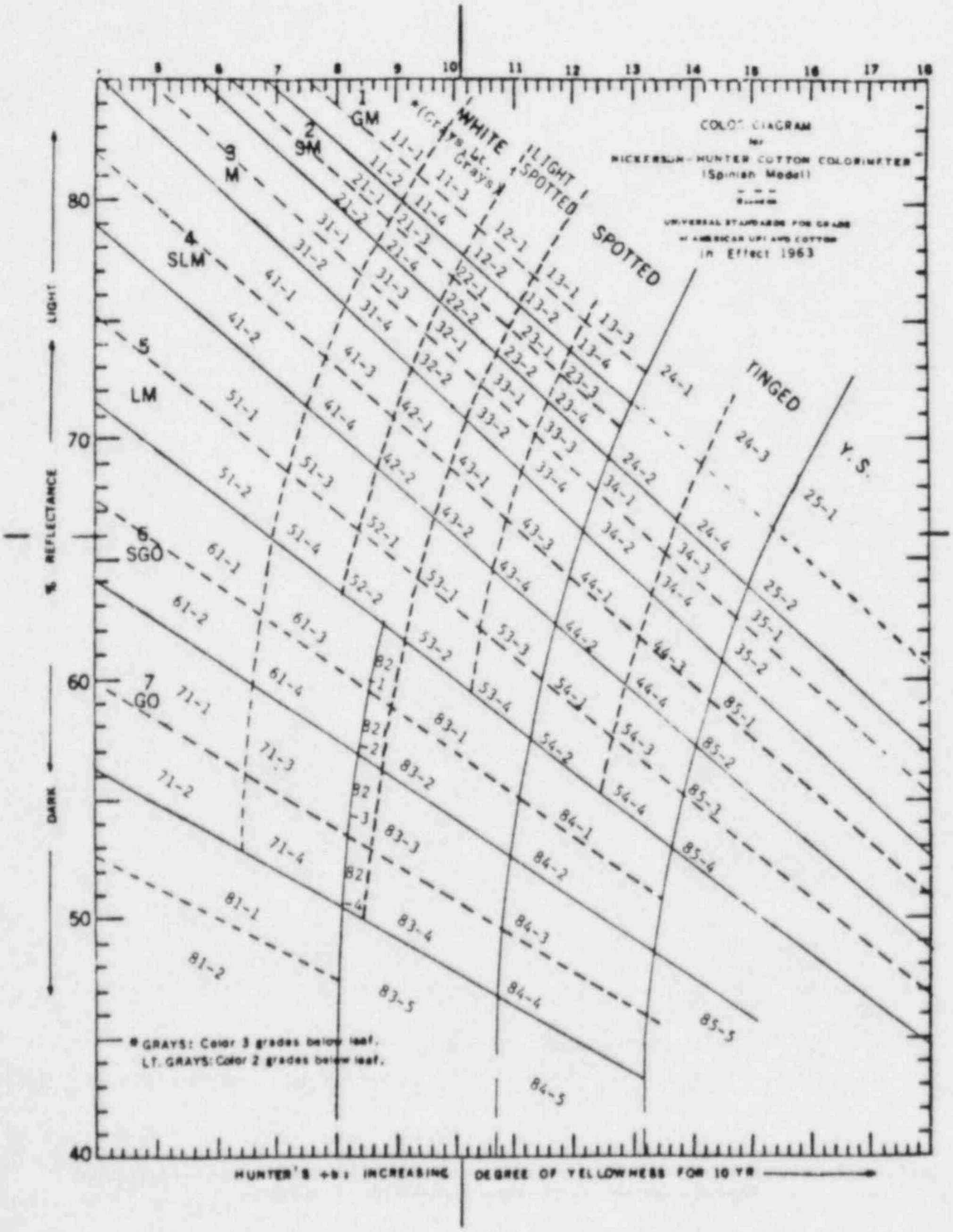


Table I-2 continued. Values represent the means of 8 plot samples (8 replications x 1 plot per replication) for any given variable at a particular treatment level.

	Fiber Analysis Data					
Nominal Treatment (lbs/a/yr)	Fiber Fineness (micronaire)	Length (100ths of an inch)	Length Uniformity (percentage)	Strength (grams per tex)	Grade (scale 1-100)	Trash (scale 1-8)
No treatment	40.25	115.25	80.25	27.00	74.13	6.13
0	39.63	114.88	79.88	27.38	70.50	6.25
10	39.13	112.75	79.75	26.50	76.75	6.63
100	39.25	115.38	79.75	26.63	72.00	6.38
500	37.50	112.38	80.00	26.38	75.63	6.50

Table I-3. HARVEST DATA: COTTON FIBER ANALYSIS, COLOR CODE RESULTS, MARANA FIELD SITE. Values represent color code results for each plot sample analyzed.

Nominal Treatment (lbs/a/yr)	COLOR CODE (see explanation in table I-2)							
	First Replication	Second Replication	Third Replication	Fourth Replication	Fifth Replication	Sixth Replication	Seventh Replication	Eighth Replication
No treatment	51-3	41-4	42-2	52-2	52-2	52-1	52-1	52-1
0	41-1	51-3	52-1	52-1	61-3	52-1	52-1	52-2
10	51-3	51-3	51-3	42-2	52-1	52-1	52-2	52-1
100	51-3	51-3	52-1	71-3	52-2	42-2	52-1	52-1
500	51-3	51-3	52-1	52-1	53-1	52-1	53-2	53-1

Table I-4. HARVEST DATA: COTTON, MARANA FIELD SITE. Values represent the means of 8 plot samples harvested (8 replications x 1 plot per replication) for any given variable at a particular treatment level.

Nominal Treatment (lbs/a/yr)	Mechanical Harvest Data: Seed Cotton[a] Per Acre (lbs/acre) First Pick	Second Pick	Total Seed Cotton (lbs/acre)	Bales per Acre: First Pick	Second Pick	Total Bales Per Acre[b]
No treatment	1903.8	528.0	2269.6[c]	1.35	0.39	1.62[c]
0	2034.3	560.1	2594.4	1.44	0.42	1.86
10	1802.7	513.5	2316.2	1.28	0.38	1.66
100	1695.4	504.9	2238.8[c]	1.20	0.37	1.60[c]
500	1651.4	473.0	2124.4	1.17	0.35	1.52

a/Seed cotton is defined as the cotton that is harvested by the mechanical cotton picker, with seed and trash included.

b/Total bales per acre = [seed cotton per acre (first pick) x turnout (first pick)]/480 lbs per bale + [seed cotton per acre (second pick) x turnout (second pick)]/480 lbs per bale. Turnout is the fraction of lint found in the seed cotton following ginning. Turnout (first pick) = 0.3397 and turnout (second pick) = 0.3563 (a mean of all treatments was used because there was no significant difference in turnout between treatments).

c/Total value is not the sum of the first and second pick because of missing data for either the first or the second pick. Value is based on only seven replications.

Table I-5. **HARVEST DATA: ALFALFA, MARANA FIELD SITE.** Values represent the means of 8 plots measured (8 replications x 1 plots per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable	Nominal Treatment (lbs/a/yr)	First Harvest 7/25	Second Harvest 9/1	Third Harvest 11/3	Average (Entire Season)
Fresh weight (tons per acre)	No treatment	6.97	5.13	2.61	4.91
	0	6.55	5.36	2.71	4.87
	10	5.30	5.36	2.50	4.39
	100	6.32	5.28	2.50	4.70
	500	6.97	5.12	2.49	4.86
	1000	5.92	4.98	2.42	4.44
Dry weight (tons per acre)	No treatment	5.46	4.00	-	4.73
	0	5.11	4.12	-	4.62
	10	4.17	4.15	-	4.16
	100	4.95	4.13	-	4.54
	500	5.40	3.97	-	4.69
	1000	4.59	3.90	-	4.25
Percent moisture per plot sample	No treatment	78.18	77.90	-	78.04
	0	73.38	76.86	-	77.62
	10	78.36	77.26	-	77.81
	100	78.37	78.19	-	78.28
	500	77.46	77.61	-	77.54
	1000	77.68	78.23	-	77.96
Leaf surface salt per leaf area (mg/cm2)	No treatment	-	-0.0013	0.0157	0.0014
	0	-	-0.0009	0.0038	0.0015
	10	-	-0.0014	0.0058	0.0027
	100	-	0.0019	0.0155	0.0087
	500	-	0.0018	0.0216	0.0103
	1000	-	0.0044	0.0451	0.0248
Leaf surface salt per plant dry weight (mg/g)	No treatment	-	-0.1415	0.4573	0.1779
	0	-	-0.1141	0.4291	0.1575
	10	-	-0.1568	0.6652	0.2858
	100	-	0.0625	1.7354	0.8990
	500	-	0.2062	2.5547	1.2127
	1000	-	0.6418	5.0687	2.8552

Table I-6. HARVEST DATA: COTTON FIBER ANALYSIS, NORTH AND SOUTH GREENHOUSES. The ginned cotton from all replications of each treatment was combined into one sample for fiber analysis purposes. The following values represent the results of fiber analysis on each treatment sample. For an explanation of the analysis methods and variables, refer to Table I-2 and Figure I-1.

	Fiber Analysis Data						
Nominal treatment (lbs/a/yr)	Fiber Fineness (micronaires)	Length (100ths of an inch)	Length Uniformity (percentage)	Strength (grams per tex)	Grade (scale 1-100)	Trash (scale 1-8)	Color Code (see Figure I-1)
	North Greenhouse						
0	48	120	89	26	32	3	41-3
10	47	123	89	27	32	3	21-2
100	42	119	87	29	32	3	31-3
500	46	115	87	28	32	3	41-3
	South Greenhouse						
0	53	114	91	27	32	3	41-1
1000	43	115	86	29	32	3	31-2

Table I-7. HARVEST DATA: COTTON, NORTH AND SOUTH GREENHOUSES. Each value given for the north greenhouse represents the mean of 12 plants harvested (4 replications x 3 plants per observation) for any given variable at a particular treatment level on a given date. Each value given for the south greenhouse represents the mean of 12 plants harvested (3 replications x 4 plants per replication) for given variable at a particular treatment level on a given date. Asterisks denote treatments not assigned.

Variable (units)	Nominal Treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Fresh weight leaves per plant (g)	0	239.98	170.91
	10	217.89	*
	100	214.00	*
	500	268.13	*
	1000	*	170.60
Fresh weight stems per plant (g)	0	206.80	152.60
	10	186.30	*
	100	177.20	*
	500	203.54	*
	1000	*	131.47
Fresh weight green bolls per plant (g)	0	160.39	106.32
	10	57.33	*
	100	84.54	*
	500	31.09	*
	1000	*	85.37
Fresh weight bracts per plant (g)	0	21.58	29.44
	10	29.76	*
	100	28.73	*
	500	31.36	*
	1000	*	28.57
Total fresh weight per plant (g)	0	628.75	459.26
	10	491.28	*
	100	504.47	*
	500	539.12	*
	1000	*	416.02

Table I-7 continued.

Variable (units)	Nominal Treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Dry weight leaves per plant (g)	0	50.86	32.84
	10	42.20	*
	100	43.82	*
	500	52.04	*
	1000	*	30.07
Dry weight stems per plant (g)	0	55.67	38.96
	10	44.42	*
	100	47.22	*
	500	53.04	*
	1000	*	34.11
Dry weight green bolls per plant (g)	0	35.16	30.33
	10	16.66	*
	100	20.48	*
	500	7.01	*
	1000	*	25.32
Dry weight bracts per plant (g)	0	18.91	26.40
	10	25.92	*
	100	25.62	*
	500	34.89	*
	1000	*	24.60
Total dry weight per plant (g)	0	160.59	128.53
	10	129.19	*
	100	137.13	*
	500	146.97	*
	1000	*	115.29
Seed Cotton Weight per plant (g)	0	63.90	90.57
	10	83.31	*
	100	81.56	*
	500	88.94	*
	1000	*	83.76

Table I-7 continued.

Variable (units)	Nominal Treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Lint weight per plant (g)	0	24.92	35.32
	10	32.49	*
	100	30.81	*
	500	34.69	*
	1000	*	32.67
Leaf area per plant (cm^2)	0	8644.11	4136.89
	10	8748.94	*
	100	13036.35	*
	500	10899.53	*
	1000	*	5279.18
Surface salt per plant-leaf wash (mg)	0	486.68	728.98
	10	384.33	*
	100	439.39	*
	500	457.34	*
	1000	*	811.53
Surface salt per plant-stem and boll wash (mg)	0	48.76	44.63
	10	35.91	*
	100	39.50	*
	500	38.39	*
	1000	*	63.40
Surface salt (leaf wash) per leaf area (mg/cm^2)	0	0.045	0.13
	10	0.059	*
	100	0.048	*
	500	0.047	*
	1000	*	0.13
Surface salt (stem and boll wash) per dry weight of stems and bolls (mg salt/g)	0	0.565	0.684
	10	0.615	*
	100	0.588	*
	500	0.665	*
	1000	*	1.156

Table I-7 continued.

Variable (units)	Nominal Treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Surface salt (leaf wash) per plant dry weight (mg salt/g)	0	3.12	5.69
	10	2.92	*
	100	3.14	*
	500	3.15	*
	1000	*	7.18
Surface salt (leaf wash) per dry weight of leaves (mg salt/g)	0	10.19	22.28
	10	9.41	*
	100	10.58	*
	500	9.22	*
	1000	*	29.18

Table I-8. HARVEST DATA: BARLEY, NORTH AND SOUTH GREENHOUSES. Each north greenhouse value represents the mean of 12 plants harvested (4 replications × 3 plants per replication) for any given variable at a particular treatment level. Each south greenhouse value represents the mean of 18 plants harvested (2 replications × 9 plants per replication) for any given variable at a particular treatment level. Asterisks denote treatments not assigned.

Variable (units)	Nominal treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Dry weight of straw per plant (g)	0	35.92	16.18
	10	34.78	*
	100	33.90	*
	500	33.60	*
	1000	*	17.84
Dry weight of spikes per plant (g)	0	14.89	8.43
	10	12.13	*
	100	12.29	*
	500	14.82	*
	1000	*	8.79
Total dry weight per plant (g)	0	50.81	24.60
	10	46.91	*
	100	46.19	*
	500	48.42	*
	1000	*	26.63
Number of spikes per plant	0	20.50	13.50
	10	16.33	*
	100	18.42	*
	500	18.33	*
	1000	*	15.72
Number of spikelets per plant	0	962.58	537.61
	10	719.42	*
	100	823.67	*
	500	846.08	*
	1000	*	604.17

Table I-8 continued.

Variable (units)	Nominal treatment (lbs/a/yr)	North Greenhouse	South Greenhouse
Number of seeds per plant	0	263.00	99.33
	10	198.67	*
	100	203.08	*
	500	296.67	*
	1000	*	69.28
Seed weight (g)	0	9.10	4.58
	10	7.05	*
	100	6.46	*
	500	9.07	*
	1000	*	3.17
Weight per 100 seeds (g)	0	3.41	4.79
	10	3.42	*
	100	3.20	*
	500	3.07	*
	1000	*	4.24
Spikelets per spike	0	47.10	39.62
	10	43.52	*
	100	43.29	*
	500	46.38	*
	1000	*	38.77
Seed set (percent)	0	28.85	18.91
	10	29.13	*
	100	26.89	*
	500	35.44	*
	1000	*	12.39
Weight of grain/ weight of straw (g/g)	0	0.26	0.38
	10	0.21	*
	100	0.19	*
	500	0.27	*
	1000	*	0.26

Table I-8 continued.

Variable (units)	Nominal treatment (lbs/a.yr)	North Greenhouse	South Greenhouse
Leaf surface salt per plant dry weight (mg salt/g)	0	3.82	5.31
	10	3.76	*
	100	3.93	*
	500	6.22	*
	1000	*	11.66

Table I-9. HARVEST DATA: ALFALFA SEEDLINGS, NORTH GREENHOUSE. Each value given represents the mean of 12 plants harvested (4 replications x 3 plants per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable (units)	Nominal Treatment (lbs/a/yr)	First Harvest 8/12	Second Harvest 9/12	Third Harvest 9/30	Fourth Harvest 10/25	Average (Entire Season)
Fresh weight per plant (g)	0	28.55	80.86	89.59	118.74	68.05
	10	23.88	82.83	94.40	131.08	72.85
	100	29.42	85.16	96.78	138.77	71.26
	500	29.34	79.19	93.42	127.55	71.77
Dry weight per plant (g)	0	6.15	16.26	13.12	17.56	11.73
	10	5.09	17.07	14.72	19.59	12.31
	100	6.84	17.99	14.79	20.85	12.98
	500	6.35	16.66	14.84	20.23	12.88
Leaf area per plant (cm2)	0	903.31	2275.24	2406.51	-	1622.09
	10	814.05	2314.86	2423.59	-	1591.64
	100	1045.24	2181.18	2985.80	-	1736.27
	500	885.48	2285.94	2846.77	-	1725.92
Leaf surface salt per plant (mg)	0	7.3117	23.3859	10.1855	18.7499	13.35
	10	8.6783	28.7187	11.3534	23.6978	16.01
	100	12.8363	35.9496	14.8250	23.3189	20.05
	500	26.1323	56.7262	38.8176	41.5931	37.88
Leaf surface salt per leaf area (mg salt/cm2)	0	0.0093	0.0094	0.0056	-	0.0084
	10	0.0088	0.0139	0.0047	-	0.0090
	100	0.0093	0.0110	0.0069	-	0.0093
	500	0.0336	0.0205	0.0188	-	0.0266
Leaf surface salt per dry weight (mg salt/g)	0	1.2833	1.4757	0.8013	1.0612	0.7643
	10	1.8204	1.7269	0.7768	1.2181	0.9287
	100	1.8225	1.9930	1.0389	1.1235	1.2242
	500	4.3314	3.3525	2.6085	1.0688	2.7100

Table I-10. **HARVEST DATA: ALFALFA TRANSPLANTS, NORTH GREENHOUSE.** Each value given represents the mean of 12 plants harvested (4 replications x 3 plants per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable (units)	Nominal Treatment (lbs/a/yr)	First Harvest 6/24	Second Harvest 7/11	Third Harvest 8/1	Fourth Harvest 8/24	Fifth Harvest 9/12	Sixth Harvest 9/28	Seventh Harvest 10/25	Average (Entire Season)
Fresh weight per plant (g)	0	26.03	25.62	40.33	37.63	59.82	56.11	89.71	46.64
	10	27.22	25.46	44.34	31.03	56.89	59.68	88.70	47.62
	100	26.22	24.68	42.74	37.81	59.30	58.48	88.94	46.36
	500	30.70	27.81	47.32	40.56	65.33	59.69	89.19	51.51
Dry weight per plant (g)	0	6.02	5.17	7.08	8.17	11.65	7.94	14.27	8.49
	10	6.33	4.86	7.47	7.35	10.63	8.30	13.63	8.37
	100	6.11	4.91	7.45	8.63	10.92	8.00	13.66	8.35
	500	7.06	5.67	8.51	9.24	12.08	8.17	14.02	9.25
Leaf area per plant (cm^2)	0	601.69	547.49	951.76	1014.81	1727.86	1304.98	-	1024.76
	10	708.23	563.57	1148.91	999.06	1527.31	1382.99	-	1055.01
	100	656.03	694.85	1075.90	1041.90	1803.66	1532.49	-	1116.82
	500	742.94	765.72	1304.10	1171.36	1809.64	1632.76	-	1237.75
Leaf surface salt per plant (mg)	0	5.2552	4.5865	4.6864	5.0517	9.3286	2.8100	4.0400	2.8830
	10	5.4878	4.6658	7.2404	5.3583	11.4565	6.9919	12.0671	7.6097
	100	9.1489	6.3839	8.0043	10.1930	13.1773	8.2695	14.7192	9.8691
	500	23.8828	14.3668	24.0863	29.2911	26.5156	23.0634	24.4977	8.5939
Leaf surface salt per leaf area (mg salt/cm^2)	0	0.0081	0.0109	0.0063	0.0054	0.0058	0.0051	-	0.0070
	10	0.0072	0.0084	0.0080	0.0059	0.0072	0.0053	-	0.0070
	100	0.0172	0.0089	0.0097	0.0102	0.0060	0.0060	-	0.0098
	500	0.0350	0.0230	0.0224	0.0266	0.0136	0.0140	-	0.0224
Leaf surface salt per dry weight (mg salt/g)	0	0.8453	0.9287	0.6752	0.6157	0.8112	0.7906	0.6634	0.7643
	10	0.8604	0.9850	1.0226	0.7501	1.1223	0.8657	0.8948	0.9287
	100	1.5058	1.3186	1.1061	1.1953	1.2207	1.0581	1.0894	1.2242
	500	3.3858	2.4720	2.7848	3.2034	2.1632	2.8411	2.0998	2.7100

Table I-11. HARVEST DATA: ALFALFA SEEDLINGS, SOUTH GREENHOUSE. Each value given represents the mean of 12 plants harvested (3 replications x 4 plants per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable (units)	Nominal treatment (lbs/a/yr)	First Harvest 8/10	Second Harvest 9/6	Third Harvest 9/27	Fourth Harvest 10/24	Average (Entire Season)
Fresh weight per plant (g)	0	36.63	60.87	96.13	144.94	84.64
	1000	40.41	72.81	108.91	162.45	96.15
Dry weight per plant (g)	0	7.31	11.77	14.57	21.90	13.89
	1000	7.68	14.31	17.16	24.20	15.84
Leaf area per plant (cm^2)	0	1233.54	1538.02	3350.47	-	2040.68
	1000	950.63	1536.70	3404.92	-	1964.08
Leaf surface salt per plant (mg)	0	7.9118	16.6031	10.2168	14.8426	14.9569
	1000	44.2973	52.5920	49.9196	63.9653	70.0880
Leaf surface salt per leaf area (mg salt/cm^2)	0	0.0065	0.0084	0.0033	-	0.0061
	1000	0.0404	0.0353	0.0279	-	0.0346
Leaf surface salt per plant dry weight (mg salt/g)	0	0.8177	1.2418	0.8031	1.3305	1.0483
	1000	6.1299	4.4559	4.3108	3.9410	4.7179

Table I-12. **HARVEST DATA: ALFALFA TRANSPLANTS, SOUTH GREENHOUSE.** Each value given represents the mean of 12 plants harvested (3 replications x 4 plants per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable (units)	Nominal Treatment (lbs/a/yr)	First Harvest 8/10	Second Harvest 9/6	Third Harvest 9/27	Fourth Harvest 10/24	Average (Entire Season)
Fresh weight per plant (g)	0	38.96	69.79	85.12	111.80	76.42
	1000	37.38	79.21	90.18	105.99	77.60
Dry weight per plant (g)	0	9.23	14.26	13.93	17.76	13.79
	1000	8.43	14.16	14.24	16.83	13.41
Leaf area per plant (cm^2)	0	1009.66	1326.80	2906.80	-	1747.79
	1000	897.78	1655.57	2430.88	-	1661.41
Leaf surface salt per plant (mg)	0	7.9118	16.6031	10.2168	14.8426	12.3936
	1000	44.2973	52.5920	41.9196	63.9653	52.4537
Leaf surface salt per dry weight (mg salt/g)	0	0.8851	1.2419	0.7334	0.8487	0.9273
	1000	5.4150	3.7645	3.5420	3.7884	4.1347
Leaf surface salt per leaf area (mg salt/cm^2)	0	0.0088	0.0118	0.0047	-	0.0084
	1000	0.0465	0.0369	0.0261	-	0.0365

Table I-13. HARVEST DATA: ALFALFA FEED QUALITY ANALYSIS, MARANA FIELD SITE.[3] Each value represents the mean of 4 measurements (4 replications per treatment).

	FEED QUALITY DATA								
Nominal Treatment (lb/a/yr)	Crude Protein %	Digestible Protein %	Crude Fat %	Crude Fiber %	Ash %	Total Digestible Nutrients %	Net Energy for Lactation (Mcal/lb)	Net Energy for Wt. Gain (Mcal/lb)	Net Energy for Wt. Maint. (Mcal/lb)
No Tmt.	20.87	15.38	1.73	26.68	9.95	62.90	.64	.34	.61
10	20.47	15.00	2.20	27.73	9.73	61.49	.62	.31	.59
500	19.78	14.33	1.83	28.28	9.95	60.76	.61	.30	.59
1000	20.81	15.34	1.65	27.28	9.98	62.10	.63	.33	.60

[3]/Feed quality analysis was conducted by A & L Agricultural Laboratories Inc., Memphis, TN.

SECTION J

VISUAL EVALUATIONS OF PLANTS: GREENHOUSE AND FIELD

Table J-1. VISUAL EVALUATIONS OF CANTALOUPE, MARANA FIELD SITE. Each value given represents the mean of 24 plants evaluated (8 replications x 3 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/26	9/2	9/9	9/15	9/27
Height (cm) per plant	No tmt	6.1	9.7	15.5	20.0	31.3	28.6	24.5	22.5	22.1	19.2	19.3
	500	5.7	10.3	15.8	19.0	29.4	27.3	24.3	22.0	21.8	19.0	17.9
Turgidity[a]	No tmt	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
No. cantaloupe flowers per plant	No tmt	0	0.04	4.71	11.21	4.38	1.29	1.25	2.67	3.17	5.29	2.04
	500	0	0	5.25	9.08	4.88	0.96	1.29	2.21	2.63	4.33	2.42
No. cantaloupe fruit per plant[b]	No tmt	0	0	0	1.13	2.83	1.79	0.88	0.88	0.50	0.96	1.13
	500	0	0	0	1.88	2.79	1.83	0.83	0.54	0.63	0.88	1.00
Tip necrosis[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Margin necrosis[a]	No tmt	0	0	0.08	0.83	0.29	0.88	0.88	0.88	0.38	0.46	0.54
	500	0	0	0.21	0.75	0.38	0.92	0.92	0.67	0.33	0.42	0.46
Necrotic spots[a]	No tmt	0	0	0.92	1.00	1.00	1.00	0.96	0.92	0.92	0.88	0.92
	500	0	0	0.88	0.92	1.00	1.00	0.92	0.96	0.92	0.96	0.79

a/In each observation, condition was noted as '1', present, or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

b/Vertical lines indicate the occurrence of a harvest.

Table J-1 continued.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/26	9/2	9/9	9/15	9/27
Few lesions[a]	No tmt	0	0	0.58	0.79	0.83	0.92	1.00	1.00	0.63	0.92	0.88
	500	0	0	0.46	0.67	0.96	0.83	0.93	0.83	0.67	0.88	0.83
Many lesions[a]	No tmt	0	0	0	0	0	0	0	0	0.42	0.21	0.08
	500	0	0	0	0	0	0	0	0	0.33	0.17	0.08
Necrosis- % leaves per plant	No tmt	0	0	16.46	25.42	40.63	63.75	57.29	33.54	52.08	49.58	50.00
	500	0	0	15.21	21.25	46.25	55.83	60.00	34.17	57.71	55.00	45.83
Necrosis- % area per affected leaves	No tmt	0	0	9.58	6.46	5.00	6.04	10.83	17.29	21.25	20.83	17.92
	500	0	0	10.21	6.04	5.00	6.88	11.46	28.54	19.58	18.33	13.54
Chlorosis- Tip pale green[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin pale green[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as "1", present, or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-1 continued.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/26	9/2	9/9	9/15	9/27
Chlorosis- Spots pale green[a]	No tmt	0	0	0	0.38	0	0	0	0	0	0	0
	500	0	0	0	0.46	0	0	0	0	0	0	0
Chlorosis- Spots yellow[a]	No tmt	0.58	0.79	0	0	0.04	0	0	0.04	0	0.17	0.25
	500	0.42	0.96	0	0	0.04	0	0	0.04	0	0.21	0.25
Chlorosis- Spots white[a]	No tmt	0	0	0	0	0.08	0.08	0	0	0	0	0
	500	0	0	0	0	0	0.13	0	0	0	0	0
Chlorosis- General pale green[a]	No tmt	0	0.42	0	0	0.25	0.17	0.08	0.17	0.04	0.04	0.04
	500	0	0.17	0	0	0.29	0.21	0.08	0.13	0	0.04	0.08
Chlorosis- General yellow[a]	No tmt	0	0	0	0	0.50	0.75	0.79	0.75	0.88	0.83	0.79
	500	0	0	0	0	0.33	0.71	0.63	0.75	0.96	0.88	0.50
Chlorosis- General white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0.04	0	0	0	0	0	0
Chlorosis- % leaves per plant	No tmt	13.33	41.67	0	2.71	6.46	8.13	6.46	13.54	19.79	19.38	18.54
	500	12.92	50.00	0	2.50	4.58	11.25	7.29	18.33	12.29	15.42	12.29
Chlorosis- % area per affected leaves	No tmt	7.08	15.00	0	1.88	71.88	71.88	64.58	57.92	47.50	63.75	44.17
	500	5.00	16.25	0	2.29	64.17	66.67	55.83	53.54	59.58	69.17	32.71

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-1 continued.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/26	9/2	9/9	9/15	9/27
Deformity-Tip curling[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin curling[a]	No tmt	0	0.04	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity- Whole leaf curling[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity-Tip wrinkling[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin wrinkling[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0.08	0	0	0	0	0	0
Deformity- Whole leaf wrinkling[a]	No tmt	0.04	0.17	0	0.04	0.04	0	0	0	0	0	0
	500	0.17	0.17	0	0	0	0	0	0	0	0	0
Deformity-Tip texture[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin texture[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0
Deformity- Whole leaf texture[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as "1", present, or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-2. VISUAL EVALUATIONS OF COTTON, MARANA FIELD SITE. Each value given represents the mean of 24 plants evaluated (8 replications x 3 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	Date 6/17	6/23	7/5	7/13	7/26	8/3	8/25	9/2	9/12	9/15	9/27	10/13
Height (cm) per plant	No tmt	17.2	21.0	38.0	55.0	70.7	90.9	121.6	135.2	137.8	140.4	136.2	137.8
	500	17.3	21.4	38.5	53.1	72.5	92.9	128.3	138.0	142.9	151.6	146.0	148.5
Turgidity[a]	No tmt	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88
	500	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92
Epinasty[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Tip necrosis[a]	No tmt	0	0	0	0	0	0.04	0	0	0	0	0	0.38
	500	0	0	0	0	0	0	0.17	0.04	0	0	0	0.42
Margin necrosis[a]	No tmt	0	0	0	0.29	0	0.04	0	0.21	0	0.13	0.21	0.50
	500	0	0	0	0.13	0	0.08	0.08	0.08	0.08	0	0.08	0.58
Necrotic spots[a]	No tmt	1.00	0.96	0.67	0.54	0.88	0.96	0.96	0.88	1.00	1.00	1.00	1.00
	500	1.00	0.96	0.67	0.58	0.88	0.88	0.88	0.75	0.96	1.00	1.00	1.00
Few lesions[a]	No tmt	0.83	0.67	1.00	0.83	0.75	0.54	1.00	1.00	0.96	1.00	1.00	0.08
	500	0.83	0.83	0.96	0.88	0.63	0.54	1.00	1.00	1.00	1.00	1.00	0.13
Many lesions[a]	No tmt	0.13	0.13	0	0.08	0	0	0	0	0.04	0.08	0	0.83
	500	0.17	0.04	0	0.08	0	0	0	0	0	0.04	0	0.88

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-2 continued.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/25	9/2	9/12	9/15	9/27	10/13
		Date											
Necrosis- % leaves per plant	No tmt	50.42	43.75	26.25	34.58	28.13	26.25	32.92	38.54	72.50	70.83	87.92	97.08
	500	50.83	63.54	28.75	25.63	28.96	22.92	32.50	24.58	71.25	67.50	89.58	95.00
Necrosis- % area per affected leaves	No tmt	18.75	17.08	12.29	8.96	5.42	5.00	6.25	7.50	6.67	11.88	21.04	54.17
	500	22.92	23.75	15.42	9.38	5.21	4.58	6.04	7.29	5.83	10.00	16.67	44.17
Chlorosis- Tip pale green[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0.04	0	0	0	0
Chlorosis- Tip white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin pale green[a]	No tmt	0	0	0	0	0	0	0.04	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	No tmt	0	0	0	0	0	0	0.08	0	0	0	0	0
	500	0	0	0	0	0.04	0	0.08	0.13	0	0	0	0
Chlorosis- Margin white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Spots pale green[a]	No tmt	0	0	0	0.42	0	0	0	0	0	0	0	0
	500	0	0	0	0.33	0	0	0	0	0	0	0	0
Chlorosis- Spots yellow[a]	No tmt	0	0	0.08	0.58	0.83	0.33	0.04	0.50	0	0	0	0
	500	0	0	0	0.58	0.58	0.13	0.17	0.50	0	0	0.04	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-2, continued.

Variable	Nominal treatment (lbs/a.yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/25	9/2	9/12	9/15	9/27	10/13
		Date											
Chlorosis- Spots white[a]	No tmt	0	0	0	0	0.17	0.04	0	0	0	0	0	0
	500	0	0	0	0	0.33	0	0	0	0	0	0	0
Chlorosis- General pale green[a]	No tmt	0	0	0	0	0.04	0	0	0.25	0	0	0.13	0.71
	500	0	0	0	0	0.08	0	0	0.08	0	0	0.17	0.67
Chlorosis- General yellow[a]	No tmt	0	0	0	0	0	0	0.21	0.46	0.50	0.54	0.42	0.17
	500	0	0	0	0.04	0	0	0.33	0.29	0.25	0.54	0.25	0.08
Chlorosis- General white[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- % leaves plant[a]	No tmt	0	0	1.67	19.79	23.33	11.04	2.92	44.38	5.00	5.83	5.00	35.00
	500	0	0	0	15.63	23.13	3.33	3.13	35.63	1.67	5.63	3.13	30.00
Chlorosis- % area per affected leaves	No tmt	0	0	0.83	5.21	7.29	1.88	13.33	17.08	34.58	46.67	45.83	70.00
	500	0	0	0	8.75	8.54	0.63	12.92	6.46	15.42	39.58	37.50	62.92
Deformity- Tip curling[a]	No tmt	0	0.25	0	0	0	0	0	0	0	0	0	0
	500	0	0.21	0	0	0	0	0.04	0	0	0	0	0
Deformity- Margin curling[a]	No tmt	0	0	0	0.21	0	0	0	0	0	0	0	0
	500	0	0	0	0.21	0	0	0.08	0	0	0	0	0
Deformity- Whole leaf curling[a]	No tmt	1.00	0	0	0	0	0	0	0	0	0	0	0
	500	1.00	0	0	0.04	0	0	0	0	0	0	0	0
Deformity- Tip wrinkling[a]	No tmt	0	0.33	0	0	0	0.46	0	0	0	0	0	0
	500	0	0.63	0	0	0	0.25	0	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-2 continued.

Variable	Nominal treatment (lbs/a·yr)	6/17	6/23	7/5	7/13	7/26	8/3	8/25	9/2	9/12	9/15	9/27	10/13
Deformity- Margin wrinkling[a]	No tmt	0	0	0.04	0.04	0.13	0	0	0.04	0	0	0	0
	500	0	0	0.13	0.04	0.13	0	0	0	0	0	0	0.08
Deformity- Whole leaf wrinkling[a]	No tmt	0.38	0	0	0	0	0	0	0	0	0	0	0
	500	0.63	0	0	0	0	0	0	0	0	0	0	0
Deformity- Tip texture[a]	No tmt	0	0.08	0	0	0	0	0	0	0	0	0	0
	500	0	0.04	0	0	0	0	0	0	0	0	0	0
Deformity- Margin texture[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Whole leaf texture[a]	No tmt	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '.', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-3. VISUAL EVALUATIONS OF ALFALFA, MARANA FIELD SITE. Each value given represents the mean of 24 plants evaluated (8 replications x 3 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a•yr)	First Harvest 7/26	Second Harvest 8/3	Second Harvest 8/25	Second Harvest 9/2	Second Harvest 9/9	Third Harvest 9/15	Third Harvest 9/27	Third Harvest 10/13	Third Harvest 10/24	Third Harvest 11/3
Height (cm)	No tmt	75.4	18.5	69.0	74.5	77.8	10.6	28.8	42.0	42.0	43.0
	1000	75.3	18.1	68.6	74.5	72.3	9.8	27.5	38.0	44.0	43.2
Turgidity[a]	No tmt	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Tip necrosis[a]	No tmt	0	0	0	0.13	0.17	0	0	0	0	0.04
	1000	0	0	0	0.58	0.88	0	0	0	0.29	0.25
Margin necrosis[a]	No tmt	0	0.04	0.08	0.17	0.08	0	0	0.13	0	0.25
	1000	0.04	0	0.17	0.46	0.88	0.13	0.17	0.13	0.29	0.54
Necrotic spots[a]	No tmt	0.21	0	0.88	0.83	1.00	0.54	0.04	0.79	0.63	0.92
	1000	0.04	0	0.96	0.96	0.83	0.33	0.13	0.96	0.63	0.63
Few lesions[a]	No tmt	0.29	0.13	0.67	0.54	0.42	0.38	0.83	0.46	0.67	0.58
	1000	0.17	0.13	0.63	0.42	0.33	0.42	0.75	0.42	0.67	0.46
Many lesions[a]	No tmt	0	0	0	0	0	0	0	0	0.25	0.13
	1000	0	0	0	0	0	0	0	0.04	0.08	0.17

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-3 continued.

Variable	Nominal treatment (lbs/a·yr)	First Harvest 7/26	Second Harvest 8/3	8/25	9/2	9/9	Third Harvest 9/15	9/27	10/13	10/24	11/3
Necrosis- % leaves per plant	No tmt	3.75	1.04	6.88	16.88	28.96	21.67	13.54	18.13	47.92	43.54
	1000	1.88	2.08	6.88	15.21	34.58	21.67	8.75	16.88	46.25	31.25
Necrosis- % area per affected leaves	No tmt	3.54	0.83	8.75	7.29	9.79	5.83	8.33	7.71	24.17	14.58
	1000	1.25	0.83	6.88	9.38	12.92	8.13	7.50	8.13	16.25	15.63
Chlorosis- Tip pale green[a]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	No tmt	0	0.04	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0.04	0	0
Chlorosis- Tip white[a]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0.17	0.04
Chlorosis- Margin pale green[a]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	No tmt	0	0	0	0.08	0	0	0	0	0	0
	1000	0	0	0	0.08	0	0	0	0	0.04	0
Chlorosis- Margin white[a]	No tmt	0	0	0	0	0	0	0	0	0	0.17
	1000	0.04	0	0	0	0	0	0	0	0.33	0.42

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-3 continued.

Variable	Nominal treatment (lbs/a·yr)	First Harvest 7/26	Second Harvest 8/3	8/25	9/2	9/9	Third Harvest 9/15	9/27	10/13	10/24	11/3
Chlorosis- Spots pale green[a]	No tmt	0.04	0	0	0	0	0	0	0.04	0	0
	1000	0	0	0	0	0	0	0.04	0.04	0	0
Chlorosis- Spots yellow[a]	No tmt	0.04	0.29	0.13	0.17	0.29	0	0.33	0.04	0.04	0.17
	1000	0.08	0.25	0.08	0.38	0.38	0	0.29	0	0.13	0.04
Chlorosis- Spots white[a]	No tmt	0.13	0.04	0.08	0.04	0.13	0	0.04	0.13	0	0.08
	1000	0.08	0.13	0.08	0	0.04	0	0.04	0.21	0.08	0.13
Chlorosis- General pale green[a]	No tmt	0.04	0.29	0	0	0.04	0	0	0.04	0	0.08
	1000	0	0.29	0	0.04	0.17	0.08	0	0.04	0.04	0.08
Chlorosis- General yellow[a]	No tmt	0	0	0.29	0.33	0.63	0	0.04	0.08	0	0.29
	1000	0.04	0	0.38	0.67	0.42	0	0.04	0.04	0.04	0.29
Chlorosis- General white[a]	No tmt	0	0	0.04	0.04	0	0	0.04	0	0	0
	1000	0	0	0.04	0.04	0	0	0	0	0	0
Chlorosis- % leaves per plant	No tmt	1.88	11.46	2.29	5.42	18.75	0	4.79	7.92	1.25	15.63
	1000	1.67	9.79	3.13	14.58	21.04	4.17	2.71	4.79	15.83	17.29
Chlorosis- % area per affected leaves	No tmt	5.21	7.50	7.71	17.29	30.21	0	4.38	5.00	0.21	26.46
	1000	1.25	6.25	6.46	14.79	25.42	8.33	2.71	5.21	9.79	34.58

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-3 continued.

Variable	Nominal treatment (lbs/a·yr)	First Harvest 7/26	Second Harvest 8/3	8/25	9/2	9/9	Third Harvest 9/15	9/27	10/13	10/24	11/3
Deformity- Tip curling[3]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Deformity- Margin curling[3]	No tmt	0	0	0.08	0	0.04	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Deformity- Whole leaf curling[3]	No tmt	0	0	0.04	0	0	0	0	0.04	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Deformity- Tip wrinkling[3]	No tmt	0	0.42	0	0	0	0	0	0	0	0
	1000	0	0.58	0	0	0	0	0	0	0	0
Deformity- Margin wrinkling[3]	No tmt	0.04	0	0.04	0	0	0	0.13	0.08	0	0
	1000	0	0	0.04	0	0	0	0.33	0.04	0	0
Deformity- Whole leaf wrinkling[3]	No tmt	0	0	0.25	0.17	0.17	0	0.13	0.08	0.67	0.08
	1000	0.08	0	0.33	0.17	0.08	0	0.13	0.08	0.54	0.04
Deformity- Tip texture[3]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Deformity- Margin texture[3]	No tmt	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0
Deformity- Whole leaf texture[3]	No tmt	0	0	0	0	0.04	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0

[3]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4. VISUAL EVALUATIONS OF COTTON, NORTH GREENHOUSE. Each value given represents the mean of 12 plants evaluated (4 replications x 3 measurements per observation) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	Date 6/14	6/22	6/27	7/6	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
Height per plant (cm)	0	15.0	21.2	26.2	38.3	45.3	56.3	73.8	86.5	90.8	95.3	98.4	103.9	106.6	108.3	115.8	128.1
	500	16.6	23.8	25.9	37.5	52.5	65.1	81.3	92.2	94.7	96.8	96.3	97.3	100.0	101.8	105.9	112.6
Turgidity[a]	0	1.00	1.00	1.00	0.83	1.00	0.75	1.00	1.00	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	0.92	1.00	1.00	0.50	1.00	1.00	0	1.00	1.00	1.00	1.00	1.00	1.00	0.92
Epinasty[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of nodes per plant	0	2.00	3.92	4.25	5.42	6.42	8.08	10.58	10.33	10.42	11.33	13.08	14.08	14.58	15.50	18.75	22.50
	500	2.00	4.67	4.25	5.17	7.83	8.33	11.17	10.75	11.92	12.33	12.42	13.50	13.33	13.75	16.58	19.33
Number of stems per plant	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Number of squares per plant	0	0	0	0	1.42	3.17	8.50	11.00	9.08	7.25	4.25	3.58	4.67	2.50	2.58	13.33	15.08
	500	0	0	0.42	1.42	7.00	13.00	14.75	9.58	5.92	3.00	0.83	1.17	0.17	0.92	12.67	11.25
Number of blossoms per plant	0	0	0	0	0	0	0	1.75	2.42	1.50	1.83	0.67	0.25	1.00	0.58	0.33	0.58
	500	0	0	0.08	0	0	1.08	3.42	3.17	1.75	1.08	0.25	0	0.08	0.08	0	0.17
Number of bolls per plant	0	0	0	0	0	0	0	0.17	4.42	7.83	10.00	13.83	14.58	13.58	15.42	13.33	9.58
	500	0	0	0	0	0	0	0.33	7.33	13.25	15.08	18.25	17.08	16.83	16.83	10.42	6.75

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4 continued.

Variable	Nominal treatment (lbs/a·yr)	6/14	6/22	6/27	7/6	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
Tip necrosis[a]	0	0	0	0	0.58	0.75	1.00	1.00	0	0	0.25	0.83	0.83	0.67	0.25	0.50	0.33
	500	0	0	0	0.67	0.92	0.92	1.00	0	0	0	0.92	0.83	0.75	0.25	0.67	0.50
Tip necrosis- % leaves per plant	0	0	0	0	45.00	30.00	63.33	89.17	0	0	1.25	12.92	7.08	3.33	1.25	5.42	3.33
	500	0	0	0	55.83	29.17	59.17	87.50	0	0	0	8.75	10.00	6.25	1.67	11.67	7.08
Tip necrosis- % area per affected leaves	0	0	0	0	0.58	0.75	1.33	5.00	0	0	1.25	4.17	4.17	3.33	1.25	2.92	2.08
	500	0	0	0	0.67	0.92	0.92	4.67	0	0	0	4.58	4.17	3.75	1.67	7.92	5.83
Margin necrosis[a]	0	0	0	0	0.25	0.17	0	0	0	0	0	0	0	0	0	0.08	0.42
	500	0	0	0	0.17	0.08	0.08	0.17	0	0	0	0	0.08	0.08	0.25	0.08	0.67
Margin necrosis- % leaves per plant	0	0	0	0	10.00	0.92	0	0	0	0	0	0	0	0	0	1.67	7.50
	500	0	0	0	8.33	2.50	4.17	15.00	0	0	0	0	0.42	0.83	2.92	1.67	6.25
Margin necrosis- % area per affected leaves	0	0	0	0	0.25	0.17	0	0	0	0	0	0	0	0	0	0.83	7.92
	500	0	0	0	0.17	0.08	0.08	0.83	0	0	0	0	0.42	0.42	3.75	1.67	8.33
Spot necrosis[a]	0	0	1.17	0	0	0.08	0.25	0.08	0.08	0	0.17	0.17	0.08	0.08	0.17	0.42	0.33
	500	0	1.17	0	0	0	0.08	0	0	0	0	0.17	0.08	0.50	0.17	0.67	0.25
Spot necrosis- % leaves per plant	0	0	46.67	0	0	0.83	6.67	7.50	0.42	0	0.83	0.83	0.83	0.83	0.83	3.75	1.67
	500	0	53.33	0	0	0	0.83	0	0	0	0	1.25	0.83	4.58	2.50	12.08	2.50
Spot necrosis- % area per affected leaves	0	0	17.92	0	0	0.83	0.08	0.42	0.42	0	0.83	2.08	0.42	0.42	1.25	4.58	5.00
	500	0	15.00	0	0	0	0.42	0	0	0	0	0.83	0.42	2.50	3.33	9.17	1.67

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 6/14	6/22	6/27	7/6	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
Tip chlorosis- % leaves per plant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tip chlorosis- % area per affected leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip pale green[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip white[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Margin chlorosis- % leaves per plant	0	0	0	0	0	0	8.33	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	2.08	0	0.83	0	0	0	0	0	0	0	0	0	0
Margin chlorosis- % area per affected leaves	0	0	0	0	0	0	6.67	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	3.33	0	6.67	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0.08	0	0.08	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin white[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4 continued.

Variable	Nominal treatment (lbs/a-yr)	Date 6/14	6/22	6/27	7/6	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
Spot chlorosis- % leaves per plant	0	0	0	0	12.50	29.17	45.00	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	3.33	7.50	15.83	0	0	0	0	0	0	0	0	0	0
Spot chlorosis- % area per affected leaves	0	0	0	0	10.00	37.50	23.33	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	4.17	6.67	14.17	0	0	0	0	0	0	0	0	0	0
Chlorosis- Spots pale green[a]	0	0	0	0	0.17	0	0.25	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Spots yellow[a]	0	0	0	0	0	0.83	0.33	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0.08	0.42	0.25	0	0	0	0	0	0	0	0	0	0
Chlorosis- Spots white[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
General chlorosis- % leaves per plant	0	0	0	0	70.00	63.33	40.00	19.17	100.00	100.00	56.67	29.17	18.33	38.33	45.83	48.33	36.67
	500	0	0	0	30.83	32.50	48.33	16.67	100.00	100.00	66.67	29.17	23.33	51.67	52.50	55.83	44.17
General chlorosis- % area per affected leaves	0	0	0	0	54.58	47.50	32.50	49.17	100.00	100.00	100.00	45.83	73.33	75.00	55.00	58.33	55.83
	500	0	0	0	36.67	22.50	35.83	52.50	100.00	100.00	100.00	45.00	75.00	70.00	62.50	56.67	44.17
Chlorosis- General pale green[a]	0	0	0	0	0.75	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0	1.00	0.92
	500	0	0	0	0.75	0.83	0.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0	1.00	0.92
Chlorosis- General yellow[a]	0	0	0	0	0.08	0	0.33	0.25	0.75	1.00	1.00	1.00	1.00	0.92	1.00	0.83	0.83
	500	0	0	0	0	0	0.58	0.17	0.83	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.83
Chlorosis- General white[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4 continued.

Variable	Nominal treatment (lbs/a·yr)	6/14	6/22	6/27	7/5	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
		Date															
Deformity-Tip curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0
Deformity-Margin curl[a]	0	0	0.08	0	0	0	0	0	0	1.00	1.00	0	0.58	1.00	0.92	0.58	0.42
	500	0	0	0	0	0	0	0	0	0.92	1.00	0	0.92	1.00	1.00	1.00	0.58
Deformity-Surface curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Tip wrinkling[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin wrinkling[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Surface wrinkling[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Tip texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Surface texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-4 continued.

Variable	Nominal treatment (lbs/a-yr)	6/14	6/22	6/27	7/6	7/11	7/18	7/27	8/4	8/9	8/15	8/23	8/30	9/8	9/13	9/29	10/5
		Date															
Leaf shed[b]	0	0	0	0	0	0	0	0.33	0.42	2.00	5.58	7.17	8.00	9.75	0	0.83	0.08
	500	0	0	0	0	0	0	0.17	0.92	2.08	5.83	8.50	9.42	10.92	0	1.00	0.50
Square shed[b]	0	0	0	0	0	0	0	0	0	0	0.58	0.75	0.50	0.83	0	0	0
	500	0	0	0	0	0	0	0	0	0.33	1.42	1.42	1.92	1.25	0	0	0
Boll shed[b]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0

b/Each value represents the mean number of leaves, squares, or bolls shed for 12 plants evaluated.

Table J-5. VISUAL EVALUATIONS OF COTTON, SOUTH GREENHOUSE. Each value represents the mean of 12 plants evaluated (3 replications x 4 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	Date 7/8	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Height per plant (cm)	0	26.1	51.2	128.4	132.1	132.5	133.4	135.8	138.6
	1000	24.7	48.4	107.0	107.9	115.0	115.9	118.4	121.3
Turgidity[a]	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Number of nodes per plant	0	2.33	6.17	13.67	15.18	15.42	15.75	17.08	19.08
	1000	2.00	6.18	13.17	14.92	15.25	15.67	17.00	18.50
Number of stems per plant	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Number of squares per plant	0	0	4.00	11.17	0.58	0	0.33	1.75	4.92
	1000	0	3.91	7.58	0.42	0.75	0.42	1.58	3.67
Number of blossoms per plant	0	0.25	0	1.75	0.42	0	0	0.08	0
	1000	0	0	1.17	0.25	0	0	0.17	0
Number of bolls per plant	0	0.08	0	14.67	23.42	21.50	18.67	16.00	14.58
	1000	0	0	16.25	21.58	19.67	17.33	14.00	12.08

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-5 continued.

Variable	Nominal treatment (lbs/a·yr)	7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Tip necrosis[a]	0	0	0	0	0	0.33	1.00	1.00	0.83
	1000	0	0.33	1.00	1.00	1.00	1.00	1.00	1.00
Tip necrosis-	0	0	0	0	0	1.67	17.50	12.92	8.75
% leaves per plant	1000	0	1.67	19.58	35.42	30.00	36.67	37.50	34.17
Tip necrosis-	0	0	0	0	0	2.08	38.33	60.00	10.42
% area per affected leaves	1000	0	1.67	8.33	10.42	10.00	17.50	23.33	13.75
Margin necrosis[a]	0	0	0	0	0.08	0.08	1.00	0.92	0.75
	1000	0	0.08	0	0	0.50	1.00	1.00	1.00
Margin necrosis-	0	0	0	0	0.83	0.42	17.50	11.25	7.92
% leaves per plant	1000	0	0.42	0	0	19.17	36.67	37.50	34.17
Margin necrosis-	0	0	0	0	0.42	0.83	38.33	59.17	9.58
% area per affected leaves	1000	0	0.42	0	0	5.00	17.50	23.33	13.75
Spot necrosis[a]	0	0	0	0	0.33	0.08	1.00	1.00	0.67
	1000	0	0.25	0.58	0.67	0.42	0.83	1.00	1.00
Spot necrosis-	0	0	0	0	2.50	0	0	1.67	1.25
% leaves per plant	1000	0	1.25	13.33	25.83	4.16	0	0	0
Spot necrosis-	0	0	0	0	4.58	0	0	0.83	1.25
% area per affected leaves	1000	0	1.25	5.42	7.50	1.67	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-5 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Tip chlorosis- % leaves per plant	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Tip chlorosis- % area per affected leaves	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Tip pale green[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Tip white[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Margin chlorosis- % leaves per plant	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Margin chlorosis- % area per affected leaves	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Margin white[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-5 continued.

Variable	Nominal treatment (lbs/a·yr)	Date: 7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Spot chlorosis- % leaves per plant	0	37.08	0	0	0	0	0	0	0
	1000	41.67	0	0	0	0	0	0.83	0
Spot chlorosis- % area per affected leaves	0	5.42	0	0	0	0	0	0	0
	1000	6.25	0	0	0	0	0	0.83	0
Chlorosis- Spots pale green[a]	0	0.83	0	0	0	0	0	0	0
	1000	0.83	0	0	0	0	0	0	0
Chlorosis- Spots yellow[a]	0	0.08	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Chlorosis- Spots white[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0.08	0
General chlorosis- % leaves per plant	0	6.67	100.00	23.33	20.83	24.17	24.17	18.33	15.42
	1000	0	91.67	11.67	15.00	19.17	25.00	12.50	12.08
General chlorosis- % area per affected leaves	0	2.92	100.00	44.17	46.67	60.83	65.83	69.17	61.67
	1000	0	91.67	66.67	65.83	65.00	59.17	47.50	50.00
Chlorosis- General pale green[a]	0	0	1.00	1.00	1.00	1.00	0.75	0.92	1.00
	1000	0	0.92	1.00	1.00	1.00	1.00	0.83	0.83
Chlorosis- General yellow[a]	0	0.33	0	0.25	1.00	1.00	0.58	0.50	0
	1000	0	0	0.83	0.67	1.00	0.83	0.33	0.17
Chlorosis- General white[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-5 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Deformity- Tip curl[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Margin curl[a]	0	0	0	1.00	0.75	0.67	0.08	1.00	1.00
	1000	0	0	1.00	0.92	0.58	0.25	0.75	0.83
Deformity- Surface curl[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Tip wrinkling[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Margin wrinkling[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Surface wrinkling[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Tip texture[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Margin texture[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0
Deformity- Surface texture[a]	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-5 continued.

Variable	Nominal treatment (lbs/a·yr)	Date: 7/18	8/1	9/9	9/28	10/10	10/19	10/26	11/1
Leaf shed[b]	0	0	0	2.92	3.50	1.58	6.00	3.58	4.25
	1000	0	0	2.67	2.00	0.67	6.92	2.08	2.08
Square shed[b]	0	0	0	0	1.33	0.17	0	0	0
	1000	0	0	0.08	1.25	0.08	0	0	0
Boll shed[b]	0	0	0	0	0	0.83	0.25	0	0.08
	1000	0	0	0	0	0.17	0.25	0.08	0

[b]/Each value represents the mean number of leaves, squares, or bolls shed for 12 plants evaluated.

Table J-6. VISUAL EVALUATIONS OF BARLEY, NORTH GREENHOUSE. Each value represents the mean of 12 plants evaluated (4 replications × 3 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	8/17	8/24	9/1	9/8	9/14	9/29	10/7	10/12
		Date							
Height per plant (cm)	0	42.8	46.1	54.3	58.9	62.2	68.3	69.1	67.6
	500	39.8	40.5	52.2	57.8	59.8	69.4	68.0	69.1
Number of tillers per plant	0	3.42	6.33	8.75	11.83	12.58	19.83	19.50	19.33
	500	2.50	4.33	8.75	10.92	13.67	17.75	17.58	15.83
Number of collars per plant	0	2.67	3.08	3.75	4.33	4.25	5.08	4.50	4.67
	500	2.17	3.00	3.58	3.92	4.17	5.00	5.08	4.75
Number of spikes per plant	0	0	0.08	0.75	1.50	3.42	9.08	12.67	13.67
	500	0	0.25	0.75	1.67	2.08	8.67	12.33	11.83
Turgidity[a]	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Tip necrosis[a]	0	1.00	0.92	0.92	0.82	0.92	0.75	0.83	0.67
	500	1.00	0.92	1.00	1.00	0.83	0.83	0.92	0.92
Tip necrosis- % leaves per plant	0	83.33	25.00	37.50	23.33	11.58	16.67	21.67	15.83
	500	91.67	12.08	29.58	18.33	7.41	24.58	31.25	25.83
Tip necrosis- % area per affected leaves	0	1.00	4.33	4.00	3.08	2.83	3.75	4.17	1.67
	500	1.00	2.33	2.42	2.42	1.17	7.92	4.58	1.92

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-6 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 8/17	8/24	9/1	9/8	9/14	9/29	10/7	10/12
Margin necrosis[a]	0	0.08	0	0	0	0.08	0.25	0.08	0
	500	0	0	0.08	0	0	0.25	0.17	0
Margin necrosis- % leaves per plant	0	6.67	0	0	0	2.50	5.00	2.50	0
	500	0	0	0.83	0	0	5.42	6.67	0
Margin necrosis- % area per affected leaves	0	0.08	0	0	0	0.42	1.25	0.42	0
	500	0	0	0.08	0	0	5.00	0.83	0
Spot necrosis[a]	0	0.17	0.33	0.33	0.18	0.25	0.08	0.17	0.17
	500	0.25	0.33	0.42	0.42	0.17	0	0.33	0
Spot necrosis- % leaves per plant	0	10.00	7.50	10.00	5.00	2.08	0.83	0.83	4.17
	500	22.50	4.58	10.42	9.17	1.75	0	6.25	0
Spot necrosis- % area per affected leaves	0	0.92	3.75	3.42	2.50	2.08	0.42	0.42	0.83
	500	0.25	1.75	1.83	1.83	0.92	0	1.25	0
Tip chlorosis- % leaves per plant	0	0.42	0.42	0	4.17	1.67	0	0	0
	500	8.33	1.67	0	0	0	2.50	0	0
Tip chlorosis- % area per affected leaves	0	0.42	0.83	0	11.67	0.08	0	0	0
	500	0.42	1.67	0	0	0	4.17	0	0

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-6 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 8/17	8/24	9/1	9/8	9/14	9/29	10/7	10/12
Chlorosis- Tip pale green[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	0	0.08	0	0	0.18	0	0	0	0
	500	0.08	0	0	0	0	0.08	0	0
Chlorosis- Tip white[a]	0	0	0.08	0	0.18	0.08	0	0	0
	500	0	0.08	0	0	0	0.08	0	0
Margin chlorosis- % leaves per plant	0	1.67	0.42	0	2.50	0	0	0	0
	500	6.25	5.00	0	1.67	0	0	0	0
Margin chlorosis- % area per affected leaves	0	4.17	0.83	0	5.83	0	0	0	0
	500	7.92	4.17	0	2.50	0	0	0	0
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	0	0.25	0.08	0	0.09	0	0	0	0
	500	0.33	0.08	0	0.08	0	0	0	0
Chlorosis- Margin white[a]	0	0	0	0	0.09	0	0	0	0
	500	0	0.08	0	0	0	0	0	0

[a]/In each observation, condition was noted as '0', present or '1', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-6 continued.

Variable	Nominal treatment (lbs/a·yr)	8/17	8/24	9/1	9/8	9/14	9/29	10/7	10/12
Spot chlorosis- % leaves per plant	0	8.33	10.83	0	0	1.67	0	0	0
	500	27.08	22.50	0	1.67	0	0	0	0
Spot chlorosis- % area per affected leaves	0	4.17	10.00	0	0	6.67	0	0	0
	500	22.92	20.42	0	2.50	0	0	0	0
Chlorosis- Spots pale green[a]	0	0	0	0	0	0	0	0	0
	500	0	0.08	0	0	0	0	0	0
Chlorosis- Spots yellow[a]	0	0.33	0.50	0	0	0	0	0	0
	500	0.75	0.75	0	0.08	0	0	0	0
Chlorosis- Spots white[a]	0	0.08	0.25	0	0	0.08	0	0	0
	500	0	0.33	0	0	0	0	0	0
General chlorosis- % leaves per plant	0	7.50	3.33	25.83	19.17	26.67	38.33	43.33	75.00
	500	46.25	3.33	23.33	20.83	28.33	40.00	41.67	70.83
General chlorosis- % area per affected leaves	0	8.33	12.08	60.83	57.50	61.67	68.33	63.33	84.17
	500	55.83	7.50	66.67	65.00	61.67	65.00	63.33	85.00
Chlorosis- General pale green[a]	0	0.08	0	0.92	0	0	0	0	0
	500	0.67	0	1.00	0	0	0	0	0
Chlorosis- General yellow[a]	0	0	0.25	1.00	1.00	0.92	1.00	1.00	0
	500	0.08	0.08	1.00	0.92	1.00	1.00	1.00	0
Chlorosis- General white[a]	0	0	0.08	0.92	1.00	1.00	1.00	1.00	1.00
	500	0.08	0.17	1.00	0.92	1.00	1.00	1.00	1.00

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-6 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 8/17	8/24	9/1	9/8	9/14	9/29	10/7	10/12
Deformity- Tip curl[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Margin curl[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Surface curl[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Tip wrinkling[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Margin wrinkling[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Surface wrinkling[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Tip texture[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Margin texture[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0
Deformity- Surface texture[a]	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-7. VISUAL EVALUATIONS OF BARLEY, SOUTH GREENHOUSE. Each value given represents the mean of 18 plants evaluated (2 replications x 9 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a·yr)	Date 7/19	8/8	9/14	9/23
Height per plant (cm)	0	24.8	45.3	60.8	61.4
	1000	21.5	43.9	65.2	67.2
Number of tillers per plant	0	1.22	6.17	14.06	15.11
	1000	1.11	6.83	12.11	17.22
Number of collars per plant	0	2.06	3.22	4.50	4.56
	1000	2.11	3.11	5.28	5.11
Number of spikes per plant	0	0	0.39	7.67	11.67
	1000	0	0.17	9.78	13.50
Turgidity[a]	0	1.00	1.00	1.00	1.00
	1000	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0
	1000	0	0	0	0
Tip necrosis[a]	0	0.50	0.11	0.72	0
	1000	0.44	0.11	0.83	0.06
Tip necrosis- % leaves per plant	0	11.11	0.56	17.22	0
	1000	12.22	0.56	16.67	1.67
Tip necrosis- % area per affected leaves	0	2.50	0.56	7.56	0
	1000	2.22	0.56	8.28	1.67

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-7 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 7/19	8/8	9/14	9/23
Margin necrosis[a]	0	0	0.06	0.28	0
	1000	0.06	0	0.44	0
Margin necrosis- % leaves per plant	0	0	0.28	3.89	0
	1000	1.11	0	7.78	0
Margin necrosis- % area per affected leaves	0	0	0.28	3.89	0
	1000	0.28	0	2.56	0
Spot necrosis[a]	0	0.22	0.56	0.50	0.28
	1000	0.06	0.33	0.50	0.39
Spot necrosis- % leaves per plant	0	3.89	2.78	16.39	5.56
	1000	1.11	1.67	15.00	7.22
Spot necrosis- % area per affected leaves	0	1.39	2.78	6.67	4.44
	1000	0.28	1.67	9.44	6.11
Tip chlorosis- % leaves per plant	0	10.56	13.33	0	0
	1000	13.89	12.78	0	0
Tip chlorosis- % area per affected leaves	0	0.61	7.78	0	0
	1000	1.50	8.61	0	0

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-7 continued.

Variable	Nominal treatment (lbs/a•yr)	7/19	8/8	9/14	9/23
		Date			
Chlorosis- Tip pale green[a]	0	0	0	0	0
	1000	0	0	0	0
Chlorosis- Tip yellow[a]	0	0	0.28	0	0
	1000	0.17	0.39	0	0
Chlorosis- Tip white[a]	0	0.39	0.39	0	0
	1000	0.22	0.33	0	0
Margin chlorosis % leaves per plant	0	0	12.78	0	0
	1000	3.89	10.56	0	0
Margin chlorosis- % area per affected leaves	0	0	15.56	0	0
	1000	0.56	11.67	0	0
Chlorosis- Margin pale green[a]	0	0	0	0	0
	1000	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0.72	0	0
	1000	0.06	0.67	0	0
Chlorosis- Margin white[a]	0	0	0.17	0	0
	1000	0.11	0.06	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-7 continued.

Variable	Nominal treatment (lbs/a•yr)	Date 7/19	8/8	9/14	9/23
Spot chlorosis- % leaves per plant	0	0	13.33	0	0
	1000	0	3.33	0	0
Spot chlorosis- % area per affected leaves	0	0	11.11	0	0
	1000	0	2.78	0	0
Chlorosis- Spots pale green[3]	0	0	0	0	0
	1000	0	0	0	0
Chlorosis- Spots yellow[3]	0	0	0.44	0	0
	1000	0	0.17	0	0
Chlorosis- Spots white[3]	0	0	0	0	0
	1000	0	0.06	0	0
General chlorosis- % leaves per plant	0	8.89	2.78	42.78	43.33
	1000	16.11	4.44	46.67	45.56
General chlorosis- % area per affected leaves	0	4.44	1.67	80.55	69.44
	1000	2.89	8.33	71.67	70.56
Chlorosis- General pale green[3]	0	0.28	0	0	0
	1000	0.11	0.06	0	0
Chlorosis- General yellow[3]	0	0	0.22	1.00	1.00
	1000	0.06	0.28	1.00	1.00
Chlorosis- General white[3]	0	0	0	1.00	1.00
	1000	0.22	0.17	1.00	1.00

[3]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-7 continued.

Variable	Nominal treatment (lbs/a·yr)	Date 7/19	8/8	9/14	9/23
Deformity-	0	0	0	0	0
Tip curl[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Margin curl[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Surface curl[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Tip wrinkling[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Margin wrinkling[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Surface wrinkling[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Tip texture[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Margin texture[a]	1000	0	0	0	0
Deformity-	0	0	0	0	0
Surface texture[a]	1000	0	0	0	0

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-8. VISUAL EVALUATIONS OF ALFALFA SEEDLINGS, NORTH GREENHOUSE. Each value given represents the mean of 12 plants evaluated (4 replications × 3 observations per replication) for any given variable at a particular treatment level on a given date. Dashes indicate missing values.

Variable	Nominal treatment (lbs/a·yr)	Date: First Harvest 7/14	First Harvest 7/20	First Harvest 7/27	First Harvest 8/4	Second Harvest 8/24	Second Harvest 9/1	Second Harvest 9/8	Third Harvest 9/22	Fourth Harvest 10/7	Fourth Harvest 10/12	Fourth Harvest 10/21	Fifth Harvest 11/2
Height per plant (cm)	0	11.5	21.0	36.9	45.4	34.0	52.3	63.6	36.8	13.9	29.1	43.3	24.7
	500	12.0	20.0	35.0	46.5	34.5	49.4	57.7	38.8	14.4	33.6	46.1	26.6
Turgidity[a]	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	1.00	1.00	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Diameter (cm) north-south	0	11.0	13.2	26.3	32.9	25.3	32.0	30.7	24.3	14.4	23.4	42.2	27.6
	500	11.3	13.5	25.8	31.6	25.0	31.3	33.3	25.3	15.7	26.7	46.3	30.2
Diameter (cm) east-west	0	10.2	13.1	25.4	24.3	24.9	29.8	28.6	24.3	14.4	21.9	36.7	27.8
	500	9.8	15.2	21.0	23.0	23.8	31.5	32.2	24.9	15.6	28.0	39.0	28.3
Number of stems per plant	0	-	10.42	13.00	14.75	18.58	27.00	27.92	41.08	9.17	35.25	52.36	30.83
	500	-	13.83	13.42	16.08	26.17	30.17	32.83	46.08	6.75	47.33	58.33	33.75
Percent bloom	0	0	0	0	1.67	0	0.83	13.75	0	0	0	0	0
	500	0	0	0	2.08	0	0	12.08	0	0	0	0	0.08
Abscission[b]	0	0	0	0.17	1.00	0	0.83	1.09	0.83	1.00	0.92	0.91	1.00
	500	0	0	0.33	0.50	0	0.92	1.42	1.00	1.17	1.00	1.00	1.00

a/ In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

b/ In each observation, condition was noted as "0", no leaves abscised, "1", few leaves abscised, or "2", many leaves abscised. The resultant mean represents an index of the severity of the condition throughout the population.

Table J-8 continued.

Variable	Nominal treatment (lbs/a·yr)	First Harvest 7/14	First Harvest 7/20	First Harvest 7/27	First Harvest 8/4	Second Harvest 8/24	Second Harvest 9/1	Second Harvest 9/8	Third Harvest 9/22	Fourth Harvest 10/7	Fourth Harvest 10/12	Fourth Harvest 10/21	Fifth Harvest 11/2
Tip necrosis[a]	0	0	0.08	0	0	0	0	0	0	0.17	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0.08	0
Tip necrosis- % leaves per plant	0	0	0	0	0	0	0	0	0	4.58	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0.83	0
Tip necrosis- % area per affected leaves	0	0	0	0	0	0	0	0	0	16.67	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0.83	0
Margin necrosis[a]	0	0.08	0	0	0	0	0	0	0	0.33	0.17	0	0.25
	500	0	0	0	0	0	0	0	0	0	0	0	0.17
Margin necrosis- % leaves per plant	0	0.42	0	0	0	0	0	0	0	5.83	7.50	0	2.08
	500	0	0	0	0	0	0	0	0	0	0	0	0.83
Margin necrosis- % area per affected leaves	0	0.42	0	0	0	0	0	0	0	26.67	2.50	0	2.50
	500	0	0	0	0	0	0	0	0	0	0	0	1.67

a/In each observation, condition was noted as '0', present or '1', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-8 continued.

Variable	Nominal treatment (lbs/a·yr)	First Harvest 7/14	7/20	7/27	8/4	Second Harvest 8/24	9/1	9/8	Third Harvest 9/22	Fourth Harvest 10/7	10/12	10/21	Fifth Harvest 11/2
Spot necrosis[a]	0	0	0.08	0.25	0	0	0	0	0	0	0	0	0
	500	0	0	0.08	0	0	0	0	0	0.08	0.08	0	0.08
Spot necrosis- % leaves per plant	0	0	0.45	0.58	0	0	0	0	0	0	0	0	0
	500	0	0	0.83	0	0	0	0	0	0.42	0.42	0	0.83
Spot necrosis- % area per affected leaves	0	0	0.45	1.00	0	0	0	0	0	0	0	0	0
	500	0	0	0.83	0	0	0	0	0	2.50	3.33	0	5.83
Tip chlorosis- % leaves per plant	0	0	0.91	1.67	0	0	0	0	0	0	0	0	0
	500	0	0.83	2.50	5.83	0	0	0	0	0	0	0	0
Tip chlorosis- % area per affected leaves	0	0	4.55	1.67	0	0	0	0	0	0	0	0	0
	500	0	2.50	1.67	5.00	0	0	0	0	0	0	0	0
Chlorosis- Tip pale green[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0.17	0	0	0	0	0	0	0	0
Chlorosis- Tip white[a]	0	0	0.09	0.17	0	0	0	0	0	0	0	0	0
	500	0	0.08	0.08	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-8 continued.

Variable	Nominal treatment (lbs/a·yr)	Date: First Harvest 7/14	First Harvest 7/20	First Harvest 7/27	First Harvest 8/4	Second Harvest 8/24	Second Harvest 9/1	Second Harvest 9/8	Third Harvest 9/22	Fourth Harvest 10/7	Fourth Harvest 10/12	Fourth Harvest 10/21	Fifth Harvest 11/2
Margin chlorosis- % leaves per plant	0	0	0.91	5.83	0	0.83	5.00	6.36	4.17	0.42	1.25	25.45	4.17
	500	0	0.83	9.17	0	0.83	2.50	0	2.50	0	0	45.83	0
Margin chlorosis- % area per affected leaves	0	0	4.55	7.50	0	0.83	4.17	5.45	0.42	0.42	0.83	3.64	0.83
	500	0	2.50	6.67	0	0.83	6.67	0	0.42	0	0	6.67	0
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0	0.18	0.08	0	0	0	0
	500	0	0	0	0	0	0	0	0.08	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0	0	0	0.09	0	0.27	0	0	0.17	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin white[a]	0	0	0.09	0.33	0	0.09	0.17	0.27	0.08	0.08	0	0.36	0.08
	500	0	0.08	0.42	0	0.17	0.08	0	0.08	0	0	0.67	0
Spot chlorosis- % leaves per plant	0	0.42	5.45	10.00	2.50	2.08	18.33	25.45	19.58	2.50	25.00	60.00	33.33
	500	3.33	2.50	10.00	10.83	2.08	24.17	28.33	27.50	7.92	17.92	71.67	21.67
Spot chlorosis- % area per affected leaves	0	0.42	10.91	8.33	5.00	2.50	14.17	22.73	4.58	4.58	7.92	13.64	19.58
	500	3.33	2.08	7.50	12.50	1.67	11.67	19.17	5.00	5.83	5.00	10.00	7.92

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-8 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest 7/14	First Harvest 7/20	First Harvest 7/27	First Harvest 8/4	Second Harvest 8/24	Second Harvest 9/1	Second Harvest 9/8	Third Harvest 9/22	Fourth Harvest 10/7	Fourth Harvest 10/12	Fourth Harvest 10/21	Fifth Harvest 11/2
Chlorosis- Spots pale green[a]	0	0	0	0	0	0	0	0.82	0.92	0	0	0	0
	500	0	0	0	0	0	0	0.92	0.92	0	0	0	0
Chlorosis- Spots yellow[a]	0	0	0.09	0.17	0	0.09	0.25	0.91	0.50	0	0.58	0.55	0.17
	500	0	0	0.08	0	0	0.33	0.92	0.58	0.25	0.42	0.50	0.08
Chlorosis- Spots white[a]	0	0.08	0.36	0.33	0.33	0.18	0.75	0.82	0.08	0.17	0.75	0.82	0.75
	500	0.33	0.33	0.50	0.17	0.33	0.92	0.83	0.50	0.42	0.67	1.00	0.75
General chlorosis- % leaves per plant	0	1.67	31.82	14.17	57.50	32.50	20.00	20.91	0.83	79.17	8.33	0	40.83
	500	1.67	39.17	16.67	59.17	40.00	22.50	30.83	0	100.00	0.83	6.67	51.67
General chlorosis- % area per affected leaves	0	15.00	19.09	14.17	79.17	22.50	20.00	18.18	2.50	41.67	5.83	0	35.42
	500	8.75	30.00	11.67	75.00	26.67	22.50	20.83	0	46.67	3.33	0.83	50.00
Chlorosis- General pale green[a]	0	0	0.73	0.92	1.00	0.91	0.75	0.82	0	0.75	0.08	0	0.92
	500	0	0.75	1.00	1.00	0.92	0.75	1.00	0	1.00	0	0	1.00
Chlorosis- General yellow[a]	0	0	0.27	0.58	1.00	0	0.33	0.82	0	0	0.08	0	0
	500	0	0.50	0.75	0.92	0	0.25	1.00	0	0	0.08	0.08	0
Chlorosis- General white[a]	0	0.17	0	0.08	0	0.09	0	0.82	0.08	0.08	0.08	0	0
	500	0.25	0	0	0	0	0	0.92	0	0	0	0	0

[a]/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-8 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest 7/14	7/20	7/27	8/4	Second Harvest 8/24	9/1	9/8	Third Harvest 9/22	Fourth Harvest 10/7	10/12	10/21	Fifth Harvest 11/2
Deformity-Tip curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin curl[a]	0	0	0	0	0	0	0	0	0	0	0.25	0	0
	500	0	0	0	0	0	0.08	0	0	0	0	0	0
Deformity-Surface curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Tip wrinkling[a]	0	0	0.09	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin wrinkling[a]	0	0	0.09	0.42	0.58	0.73	0.75	0.91	1.00	0.17	0.67	0.91	0.42
	500	0	0.08	0.33	0.42	0.75	0.92	0.92	1.00	0.17	0.58	0.92	0.50
Deformity-Surface wrinkling[a]	0	0	0	0	0	0	0	0	0.08	0.25	0	0	0.17
	500	0	0	0	0	0	0	0	0.08	0.33	0.50	0.08	0.25
Deformity-Tip texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0
Deformity-Surface texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

TABLE J-9. VISUAL EVALUATIONS OF ALFALFA TRANSPLANTS, NORTH GREENHOUSE. Each value represents the mean of 12 plants evaluated (4 replications x 3 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a-yr)	Date: First Harvest 6/10	First Harvest 6/20	Second Harvest 6/29	Second Harvest 7/6	Third Harvest 7/20	Third Harvest 7/27	Fourth Harvest 8/9	Fourth Harvest 8/15	Fifth Harvest 9/1	Fifth Harvest 9/8	Sixth Harvest 9/22	Seventh Harvest 10/7	Seventh Harvest 10/12	Seventh Harvest 10/20	Eighth Harvest 11/1
Height per plant (cm)	0	30.8	51.8	18.0	35.8	25.5	53.6	26.2	47.3	31.5	56.9	39.1	13.6	32.0	52.2	21.8
	500	29.3	52.2	15.8	34.3	28.8	54.8	28.4	47.1	35.2	57.4	36.3	13.4	32.8	46.4	22.4
Turgidity[a]	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diameter (cm) north-south	0	18.4	27.1	10.7	21.8	14.9	26.3	17.0	23.6	24.8	32.7	20.3	12.9	20.6	44.7	21.2
	500	16.8	26.6	10.9	25.1	17.3	29.8	19.5	28.8	27.3	33.7	22.0	12.7	20.9	39.8	26.2
Diameter (cm) east-west	0	15.2	27.3	11.3	21.4	14.3	25.0	16.0	22.5	20.8	25.6	19.8	11.9	20.2	32.8	20.2
	500	16.3	29.5	9.1	21.2	16.1	27.8	18.0	27.5	21.8	27.5	20.4	10.8	21.8	35.0	23.8
Number of stems per plant	0	5.45	7.33	3.83	4.83	8.83	13.25	13.08	13.83	20.33	22.08	25.00	7.00	21.91	30.11	20.09
	500	5.75	9.08	3.83	4.75	9.83	16.17	12.08	14.92	20.42	25.08	30.33	6.50	27.58	32.50	18.83
Percent bloom	0	0	3.75	0	3.00	0.83	6.25	0	0.83	0	0.42	0	0	0	0	0
	500	0	5.42	0	0.83	0	9.58	0	3.33	0	2.08	0	0	0	0	0
Abscission[b]	0	0	0.17	0	0.08	0	0.08	0	0	0.58	0.75	0.75	0.64	0.64	0.33	1.18
	500	0	0.33	0	0.33	0	0.17	0	0	0.75	0.75	1.00	0.83	0.67	1.00	1.08

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

b/In each observation, condition was noted as "0", no leaves abscised, "1", few leaves abscised, or "2", many leaves abscised. The resultant mean represents an index of the severity of the condition throughout the population.

Table J-9 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest		Second Harvest		Third Harvest		Fourth Harvest		Fifth Harvest		Sixth Harvest	---Seventh Harvest---			Eighth Harvest
		6/10	6/20	6/29	7/6	7/20	7/27	8/9	8/15	9/1	9/8	9/22	10/7	10/12	10/20	11/1
Tip necrosis[a]	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0.08	0
Tip necrosis- % leaves per plant	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0.42	0	0	0	0.83	0
Tip necrosis- % area per affected leaves	0	0	0	0	0	0	0	0	0	0	0	0.83	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0.42	0	0	0	1.67	0
Margin necrosis[a]	0	0	0	0	0	0	0	0	0	0	0	0.08	0.36	0.18	0.22	0.18
	500	0	0	0	0	0	0	0	0	0	0	0.08	0.08	0.08	0.08	0.50
Margin necrosis- % leaves per plant	0	0	0	0	0	0	0	0	0	0	0	0.08	8.64	11.82	1.11	0.91
	500	0	0	0	0	0	0	0	0	0	0	0.42	0.42	0.42	0.83	4.17
Margin necrosis- % area per affected leaves	0	0	0	0	0	0	0	0	0	0	0	0.83	3.18	4.55	2.22	1.82
	500	0	0	0	0	0	0	0	0	0	0	0.83	0.42	0.42	1.67	6.67

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-9 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest 6/10	First Harvest 6/20	Second Harvest 6/29	Second Harvest 7/6	Third Harvest 7/20	Third Harvest 7/27	Fourth Harvest 8/9	Fourth Harvest 8/15	Fifth Harvest 9/1	Fifth Harvest 9/8	Sixth Harvest 9/22	Seventh Harvest 10/7	Seventh Harvest 10/12	Seventh Harvest 10/20	Eighth Harvest 11/1
Spot necrosis[a]	0	0	0	0	0	0	0.08	0	0	0	0	0	0.09	0	0	0
	500	0	0	0	0	0	0.08	0	0	0	0.83	0.08	0	0	0	0
Spot necrosis- % leaves per plant	0	0	0	0	0	0	0.83	0	0	0	0	0	5.45	0	0	0
	500	0	0	0	0	0	2.50	0	0	0	0.83	0.42	0	0	0	0
Spot necrosis- % area per affected leaves	0	0	0	0	0	0	1.67	0	0	0	0	0	0.91	0	0	0
	500	0	0	0	0	0	1.67	0	0	0	0.83	0.83	0	0	0	0
Tip chlorosis- % leaves per plant	0	0	1.67	0	0	0	0	0	0	0	2.50	0	0	0	0	0
	500	0	0	0	0	0.83	0	0	0	0	0	0	0	0	0	0
Tip chlorosis- % area per affected leaves	0	0	5.00	0	0	0	0	0	0	0	0.42	0	0	0	0	0
	500	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip pale green[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip yellow[a]	0	0	0.08	0	0	0	0	0	0	0	0.08	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Tip white[a]	0	0	0.08	0	0	0	0	0	0	0	0.08	0	0	0	0	0
	500	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-9 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest 6/10	First Harvest 6/20	Second Harvest 6/29	Second Harvest 7/6	Third Harvest 7/20	Third Harvest 7/27	Fourth Harvest 8/9	Fourth Harvest 8/15	Fifth Harvest 9/1	Fifth Harvest 9/8	Sixth Harvest 9/22	Seventh Harvest 10/7	Seventh Harvest 10/12	Seventh Harvest 10/20	Eighth Harvest 11/1
Margin chlorosis- % leaves per plant	0	0	1.67	0	0	0	0.08	0.42	2.92	0	0	4.17	0	0	8.89	19.55
	500	0	2.92	0	0	0.83	2.08	2.08	5.83	0	16.67	8.33	0	3.33	22.50	1.67
Margin chlorosis- % area per affected leaves	0	0	3.33	0	0	0	0.42	0.42	2.92	0	0	0.83	0	0	1.11	3.18
	500	0	6.67	0	0	0.08	1.25	2.08	4.58	0	4.58	2.08	0	0.83	2.92	0.83
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0.17	0	0	0	0.08	0	0.25	0	0	0	0	0	0	0.09
	500	0	0.25	0	0	0	0.17	0.08	0.17	0	0.50	0.08	0	0	0	0
Chlorosis- Margin white[a]	0	0	0	0	0	0	0	0.08	0	0	0	0.08	0	0	0.11	0.27
	500	0	0.08	0	0	0.08	0	0.08	0	0	0.50	0.25	0	0.17	0.33	0.08
Spot chlorosis- % leaves per plant	0	0.17	7.50	4.17	1.67	0.42	0.92	1.25	4.58	3.33	15.83	27.50	9.09	15.45	51.11	27.27
	500	0.42	3.83	0	0	0.42	1.25	0.42	1.25	0.42	23.33	28.33	7.08	17.92	57.50	29.58
Spot chlorosis- % area per affected leaves	0	0.17	16.67	2.50	1.67	0.42	0.83	1.25	5.00	3.33	8.33	5.83	2.73	4.09	5.56	9.55
	500	0.42	2.17	0	0	0.42	1.67	0.42	1.25	0.42	9.17	6.67	3.75	4.58	13.75	8.75

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-9 continued.

Variable	Nominal treatment (lbs/a-yr)	First Harvest 6/10	First Harvest 6/20	Second Harvest 6/29	Second Harvest 7/6	Third Harvest 7/20	Third Harvest 7/27	Fourth Harvest 8/9	Fourth Harvest 8/15	Fifth Harvest 9/1	Fifth Harvest 9/8	Sixth Harvest 9/22	Seventh Harvest 10/7	Seventh Harvest 10/12	Seventh Harvest 10/20	Eighth Harvest 11/1
Chlorosis-Spots pale green[a]	0	0	0	0.08	0	0	0	0	0	0	0.17	0.92	0	0	0	0
	500	0	0	0	0	0.08	0	0	0	0	0	0.83	0	0	0	0
Chlorosis-Spots yellow[a]	0	0	0	0	0.08	0.08	0.17	0.17	0.33	0.08	0.58	0.58	0	0.55	0.11	0.36
	500	0	0.08	0	0	0	0.17	0	0.17	0.08	0.92	0.50	0	0.33	0.25	0.50
Chlorosis-Spots white[a]	0	0.17	0.42	0	0.08	0	0	0	0.17	0.08	0.83	0.33	0.55	0.55	0.67	0.55
	500	0.42	0.25	0	0	0.08	0	0.08	0.08	0	1.00	0.58	0.50	0.83	0.92	0.92
General chlorosis-% leaves per plant	0	90.00	18.33	45.83	27.50	2.08	10.42	15.83	36.25	15.00	2.50	0	100.00	0	0	47.27
	500	90.00	13.33	50.00	20.83	11.67	11.33	17.50	50.00	15.00	0	0	93.33	1.67	10.83	15.00
General chlorosis-% area per affected leaves	0	50.00	25.83	27.50	18.33	6.67	14.58	12.50	31.25	21.67	2.50	0	54.55	0	0	31.82
	500	50.00	26.67	27.50	13.33	10.00	18.33	15.00	48.33	16.67	0	0	46.25	0.42	1.25	8.33
Chlorosis-General pale green[a]	0	1.00	0.25	0.92	0.58	0.17	0.83	0.58	0.83	0.75	0.08	0	1.00	0	0	0.64
	500	1.00	0.50	1.00	0.50	0.33	0.67	0.75	0.92	0.83	0	0	1.00	0	0.08	0.17
Chlorosis-General yellow[a]	0	0.33	0.58	0.08	0.17	0.08	0.08	0	0.25	0.08	0.17	0	0.09	0	0	0
	500	0	0.08	0	0	0	0.33	0	0.25	0	0	0	0	0.08	0.08	0
Chlorosis-General white[a]	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0
	500	0	0.08	0	0	0	0	0	0	0	0	0	0	0.08	0.08	0

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-9 continued.

Variable	Nominal treatment (lbs/a-yr)	Date: First Harvest 6/10	First Harvest 6/20	Second Harvest 6/29	Second Harvest 7/6	Third Harvest 7/20	Third Harvest 7/27	Fourth Harvest 8/9	Fourth Harvest 8/15	Fifth Harvest 9/1	Fifth Harvest 9/8	Sixth Harvest 9/22	Seventh Harvest 10/7	Seventh Harvest 10/12	Seventh Harvest 10/20	Eighth Harvest 11/1
Deformity- Tip curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Margin curl[a]	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Surface curl[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Tip wrinkling[a]	0	0	0.58	0.25	0.08	0	0	0	0	0	0	0	0	0	0	0
	500	0	0.75	0.25	0.17	0	0	0	0	0	0	0	0	0	0	0
Deformity- Margin wrinkling[a]	0	0	0	0.08	0.08	0.17	0.17	0.08	0.17	0.75	1.00	1.00	0.36	0.82	0.67	0.45
	500	0	0	0	0	0.17	0.08	0.33	0.58	0.58	1.00	1.00	0.42	1.00	1.00	0.17
Deformity- Surface wrinkling[a]	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0	0.18
	500	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0.08
Deformity- Tip texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Margin texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deformity- Surface texture[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-10. VISUAL EVALUATIONS OF ALFALFA SEEDLINGS AND TRANSPLANTS, SOUTH GREENHOUSE. Each value given represents the mean of 12 plants evaluated (3 replications x 4 observations per replication) for any given variable at a particular treatment level.

Variable	Nominal treatment (lbs/a-yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest[c] 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest[d] 10/10	SEEDLINGS Fourth Harvest[d] 10/19	SEEDLINGS Fifth Harvest 11/2
Height per plant (cm)	0	44.3	46.9	62.2	45.0	53.8	27.0	25.1	46.4	42.7	47.6	29.3
	1000	43.4	43.2	63.8	44.6	56.3	27.3	24.3	45.8	44.5	50.8	29.6
Turgidity[a]	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epinasty[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Diameter (cm) north-south	0	21.8	25.7	20.7	28.4	40.7	25.9	17.8	21.8	34.2	43.8	30.2
	1000	18.8	22.8	21.7	29.9	38.5	25.8	14.9	20.8	34.4	38.9	31.3
Diameter (cm) east-west	0	19.8	22.6	21.4	28.9	32.0	23.8	16.6	20.3	31.4	34.7	27.5
	1000	20.2	23.5	22.2	29.8	35.1	26.1	15.3	22.8	32.0	35.5	27.4
Number of stems per plant	0	7.17	13.08	25.08	21.67	25.33	14.25	15.50	11.33	37.83	43.67	22.25
	1000	8.75	13.75	26.67	23.33	27.33	15.42	14.33	11.75	43.08	49.67	25.75
Percent bloom	0	10.00	5.83	2.50	0	0	0	0	0.83	0	0	0
	1000	5.83	2.50	0.83	0	0	0	0	0	0	0	0
Abscission[b]	0	0.17	0.08	0.58	0.58	0.67	0.83	0	0.42	0.33	0.67	0.83
	1000	0.25	0.08	1.00	1.00	1.08	1.00	0	0.50	0.67	1.00	1.00

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

b/In each observation, condition was noted as "0", no leaves abscised, "1", few leaves abscised, or "2", many leaves abscised. The resultant mean represents an index of the severity of the condition throughout the population.

c/Second harvest not evaluated.

d/Second and third harvests not evaluated.

Table J-10 continued.

Variable	Nominal treatment (lbs/a-yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest 10/10	SEEDLINGS Fourth Harvest 10/19	SEEDLINGS Fifth Harvest 11/2
Tip necrosis[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0.08
Tip necrosis- % leaves per plant	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0.42
Tip necrosis- % area per affected leaves	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0.83
Margin necrosis[a]	0	0	0	0	0	0	0.17	0	0	0	0	0
	1000	0	0	0	0	0	0.08	0	0	0	0	0.08
Margin necrosis- % leaves per plant	0	0	0	0	0	0	0.83	0	0	0	0	0
	1000	0	0	0	0	0	0.42	0	0	0	0	0.42
Margin necrosis- % area per affected leaves	0	0	0	0	0	0	1.67	0	0	0	0	0
	1000	0	0	0	0	0	0.83	0	0	0	0	0.42

a/In each observation, condition was noted as '1', present or '0', absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-10 continued.

Variable	Nominal treatment (lbs/a·yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest 10/10	SEEDLINGS Fourth Harvest 10/19	SEEDLINGS Fifth Harvest 11/2
Spot necrosis[a]	0	0.08	0.08	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Spot necrosis-% leaves per plant	0	0.83	0.42	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Spot necrosis-% area per affected leaves	0	2.50	0.42	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Tip chlorosis-% leaves per plant	0	2.50	0.42	0	0	0	0	10.83	0	0	0	0
	1000	0	6.25	0	0	0	0	9.17	0	0	0	0
Tip chlorosis-% area per affected leaves	0	2.50	0.83	0	0	0	0	7.83	0	0	0	0
	1000	0	3.33	0	0	0	0	5.83	0	0	0	0
Chlorosis-Tip pale green[a]	0	0.08	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Chlorosis-Tip yellow[a]	0	0.08	0	0	0	0	0	0.08	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Chlorosis-Tip white[a]	0	0.08	0.08	0	0	0	0	0.50	0	0	0	0
	1000	0	0.42	0	0	0	0	0.25	0	0	0	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-10 continued.

Variable	Nominal treatment (lbs/a·yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest[c] 10/10	SEEDLINGS Fourth Harvest[c] 10/19	SEEDLINGS Fifth Harvest 11/2
Margin chlorosis- % leaves per plant	0	0	5.42	0	0	6.67	0	0	0	0	0	0
	1000	0	2.92	0.42	0.42	6.67	0	0	0	0	0	0
Margin chlorosis- % area per affected leaves	0	0	5.83	0	0	1.25	0	0	0	0	0	0
	1000	0	2.08	0.83	0.42	1.25	0	0	0	0	0	0
Chlorosis- Margin pale green[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Chlorosis- Margin yellow[a]	0	0	0.17	0	0	0.25	0	0	0	0	0	0
	1000	0	0.17	0	0	0	0	0	0	0	0	0
Chlorosis- Margin white[a]	0	0	0.17	0	0	0	0	0	0	0	0	0
	1000	0	0.08	0.08	0.08	0.17	0	0	0	0	0	0
Spot chlorosis- % leaves per plant	0	10.00	7.50	8.33	7.08	19.17	8.75	1.67	6.67	14.58	14.58	7.08
	1000	11.67	7.92	11.67	22.50	25.42	11.25	17.58	0	10.00	19.58	11.25
Spot chlorosis- % area per affected leaves	0	6.67	7.08	5.42	7.08	4.17	7.08	2.50	8.33	5.42	5.42	7.92
	1000	15.00	4.17	5.83	14.58	9.17	8.75	10.67	0	5.42	5.83	7.08

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population

Table J-10 continued.

Variable	Nominal treatment (lbs/a-yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest 10/10	SEEDLINGS Fourth Harvest 10/19	SEEDLINGS Fifth Harvest 11/2
Chlorosis-	0	0.17	0.08	0	0	0	0	0	0	0	0	0
Spots pale green[a]	1000	0.17	0	0	0	0	0	0	0	0	0	0
Chlorosis-	0	0.25	0	0.67	0.83	0.17	0.92	0	0	0.92	0.50	0.75
Spots yellow[a]	1000	0.33	0.17	0.50	0.67	0.75	0.58	0.08	0	0.92	0.67	0.75
Chlorosis-	0	0.08	0.33	0.58	0.75	0.67	0	0.17	0.08	0.42	0.50	0.08
Spots white[a]	1000	0.42	0.33	0.58	0.50	0.42	0.08	0.67	0	0.33	0.50	0.08
General chlorosis-	0	8.33	0	4.17	0	0	55.00	90.00	62.50	0	0	46.67
% leaves per plant	1000	16.67	4.17	6.67	0	0	30.83	68.33	50.00	0	0	38.33
General chlorosis-	0	10.83	0	10.00	0	0	36.67	50.00	100.00	0	0	36.67
% area per affected leaves	1000	15.83	8.33	13.33	0	0	27.50	37.58	100.00	0	0	30.00
Chlorosis-	0	0.17	0	0	0	0	1.00	1.00	1.00	0	0	1.00
General pale green[a]	1000	0.25	0.08	0	0	0	0.83	1.00	0.92	0	0	1.00
Chlorosis-	0	0.25	0.08	0.33	0	0	0	0	1.00	0	0	0
General yellow[a]	1000	0.17	0	0.58	0	0	0	0	1.00	0	0	0
Chlorosis-	0	0	0	0.08	0	0	0	0	0	0	0	0
General white[a]	1000	0	0	0.33	0	0	0	0	0.17	0	0	0

[a]/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

Table J-10 continued.

Variable	Nominal treatment (lbs/a-yr)	TRANSPLANTS First Harvest 7/20	TRANSPLANTS First Harvest 8/2	TRANSPLANTS Third Harvest 9/26	TRANSPLANTS Fourth Harvest 10/10	TRANSPLANTS Fourth Harvest 10/19	TRANSPLANTS Fifth Harvest 11/2	SEEDLINGS First Harvest 7/20	SEEDLINGS First Harvest 8/2	SEEDLINGS Fourth Harvest 10/10	SEEDLINGS Fourth Harvest 10/19	SEEDLINGS Fifth Harvest 11/2
Deformity-Tip curl[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin curl[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Deformity-Surface curl[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Deformity-Tip wrinkling[a]	0	0	0	0.42	0	0	0	0	0	0	0	0
	1000	0	0	0.58	0	0	0	0.25	0	0	0	0
Deformity-Margin wrinkling[a]	0	0	0.17	0	0.92	1.00	0.67	0	0.33	0.92	1.00	0
	1000	0	0.25	0	0.75	0.83	0.42	0	0.17	1.00	0.75	0.08
Deformity-Surface wrinkling[a]	0	0	0	0	0	0	0	0	0	0.17	0	0.08
	1000	0	0	0	0.50	0.08	0.17	0	0	0.25	0.25	0.25
Deformity-Tip texture[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Deformity-Margin texture[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0
Deformity-Surface texture[a]	0	0	0	0	0	0	0	0	0	0	0	0
	1000	0	0	0	0	0	0	0	0	0	0	0

a/In each observation, condition was noted as "1", present or "0", absent. The resultant mean represents the fraction of the population affected with the condition.

SECTION K

POROMETER MEASUREMENTS: GREENHOUSE AND FIELD

Table K-1. **POROMETER READINGS FROM CANTALOUPE, MARANA FIELD SITE.** Each value represents the mean of 16 readings (8 replications x 2 plants per replication x 1 reading per plant) for any given variable at a particular treatment level.

Variable (units)	Nominal treatment (lbs/a•yr)	Date					
		7/11	7/18	7/29	8/19	9/1	9/8
Temperature differential (celcius degrees)	No treatment	2.48	6.94	1.75	0.05	1.01	1.24
	0	2.37	7.21	2.16	0.33	1.13	1.01
	10	2.38	8.00	2.51	0.16	1.78	1.15
	100	2.89	6.77	1.83	-0.07	0.42	0.89
	500	2.39	7.04	1.54	-0.14	0.95	1.04
Leaf temperature (celcius degrees)	No treatment	31.79	31.57	30.48	31.06	36.79	38.64
	0	31.63	31.34	29.84	30.92	37.27	38.99
	10	31.69	30.66	29.64	31.42	35.96	38.59
	100	31.59	31.62	30.29	30.93	37.43	39.19
	500	31.89	31.64	30.87	31.16	37.08	39.08
Diffusive resistance (seconds/cm)	No treatment	0.66	0.70	0.92	0.77	2.45	1.17
	0	0.68	0.64	0.91	0.68	2.46	1.41
	10	0.72	0.59	0.86	0.80	1.22	1.25
	100	0.68	0.61	0.97	0.73	2.07	1.43
	500	0.71	0.63	1.00	0.71	2.60	1.43
Transpiration (micrograms/ cm^2•second)	No treatment	23.33	28.85	18.26	16.77	16.40	24.81
	0	22.73	29.96	17.61	17.15	16.08	22.12
	10	22.34	30.77	18.67	16.79	21.76	23.36
	100	23.27	30.71	16.64	16.52	20.16	21.92
	500	22.72	30.32	17.42	17.78	18.04	23.19

Table K-2. POROMETER READINGS FROM COTTON, MARANA FIELD SITE. Each value represents the mean of 16 readings (8 replications x 2 plants per replication x 1 reading per plant) for any given variable at a particular treatment level.

Variable (units)	Nominal treatment (lbs/a-yr)	Date											
		6/17	6/23	7/7	7/15	7/26	8/1	8/5	8/25	9/8	9/13	9/26	10/13
Temperature differential (celcius degrees)	No treatment	4.90	5.01	1.26	3.98	3.32	2.04	2.57	3.73	0.48	0.90	0.56	0.36
	0	5.15	5.11	1.97	3.41	3.31	1.95	2.88	3.91	0.49	1.20	0.90	0.34
	10	4.20	4.49	1.50	3.97	3.23	1.80	2.72	3.71	0.52	0.96	0.26	0.35
	100	4.74	4.66	1.43	3.94	3.56	1.99	2.81	3.79	0.42	0.96	0.24	0.36
	500	4.78	4.66	1.81	3.65	3.24	2.31	2.97	4.06	0.36	1.03	1.79	0.44
Leaf temperature (celcius degrees)	No treatment	33.55	30.39	34.12	32.78	32.31	33.84	32.16	32.23	38.09	36.09	35.64	31.71
	0	33.29	30.21	33.21	33.35	32.19	33.93	31.74	31.77	38.11	35.79	35.13	31.68
	10	34.02	31.32	34.31	33.04	32.62	34.09	31.97	32.18	38.64	36.34	34.91	32.23
	100	33.49	30.84	34.13	32.97	32.29	33.68	31.93	32.13	37.83	36.20	35.43	31.94
	500	33.93	30.26	33.06	32.78	32.18	33.41	31.61	31.79	37.39	35.62	34.83	31.34
Diffusive resistance (seconds/cm)	No treatment	1.05	1.01	0.69	0.75	0.55	0.55	0.48	0.69	0.78	0.75	0.91	1.54
	0	0.99	1.01	0.64	0.88	0.55	0.57	0.43	0.65	0.78	0.73	0.85	1.59
	10	1.10	1.07	0.71	0.82	0.57	0.56	0.43	0.73	0.80	0.71	0.90	1.45
	100	1.11	0.97	0.71	0.78	0.55	0.57	0.42	0.75	0.77	0.72	0.86	1.43
	500	1.17	1.08	0.62	0.79	0.54	0.52	0.42	0.75	0.77	0.70	0.74	1.67
Transpiration (micrograms/ cm²-second)	No treatment	22.63	20.05	27.19	29.54	30.05	32.27	29.50	25.24	29.59	35.91	30.17	15.53
	0	23.48	19.94	26.70	27.18	30.22	30.47	31.01	25.60	29.43	36.68	30.36	14.57
	10	22.89	19.94	27.14	29.85	29.14	31.65	30.54	24.13	30.84	37.31	28.17	16.53
	100	21.89	21.42	26.76	29.29	29.54	31.40	31.29	23.90	30.58	37.11	30.58	16.74
	500	21.77	18.92	26.60	27.95	30.81	32.52	30.78	25.79	27.33	36.75	33.97	14.34

Table K-3. POROMETER READINGS FROM ALFALFA, MARANA FIELD SITE. Each value represents the mean of 16 readings (8 replications x 2 plants per replication x 1 reading per plant) for any given variable at a particular treatment level.

Variable (units)	Nominal treatment (lbs/a·yr)	Date		
		7/20	8/12	10/13
Temperature differential (celcius degrees)	No treatment	3.53	2.08	-0.39
	0	3.46	2.01	0.07
	10	3.42	1.67	-0.39
	100	3.56	3.15	-0.65
	500	3.59	2.86	-0.16
	1000	3.73	2.56	-0.55
Leaf temperature (celcius degrees)	No treatment	28.78	31.68	27.26
	0	28.82	31.51	26.32
	10	28.86	31.77	26.75
	100	28.68	30.58	27.53
	500	28.54	30.84	27.02
	1000	28.52	31.41	27.64
Diffusive resistance (seconds/cm)	No treatment	0.29	0.25	0.83
	0	0.30	0.26	0.77
	10	0.29	0.23	0.82
	100	0.30	0.22	0.83
	500	0.30	0.21	0.77
	1000	0.28	0.26	0.82
Transpiration (micrograms/ cm^2·second)	No treatment	40.65	58.04	19.96
	0	40.24	55.69	20.82
	10	41.29	60.55	21.03
	100	40.09	57.32	20.13
	500	39.64	60.61	20.95
	1000	41.54	55.62	20.33

GREENHOUSE POROMETER DATA

The following eight tables report the porometer readings from the north and south greenhouses.

The number of readings used to calculate the mean values reported in the tables are as follows:

For all of the north greenhouse crops, each value reported represents the mean of four porometer readings (4 replications × 1 plant × 1 reading per plant).

For all of the south greenhouse crops except barley, each reported value represents the mean of 3 porometer readings (3 replications × 1 plant × 1 reading per plant).

For the south greenhouse barley, each reported value represents the mean of 2 porometer readings (2 replications × 1 plant × 1 reading per plant).

Table K-4. DIFFUSIVE RESISTANCE MEASUREMENTS FROM POROMETER, MORNING, NORTH AND SOUTH GREENHOUSES.

Crop	Nominal treatment (lbs/a·yr)	Date														
		6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27
		Seconds/cm^2														
Cotton- North Greenhouse	0	1.60	3.17	0.59	0.49	1.31	0.65	0.65	0.73	0.09	0.89	0.61	0.60	0.87	0.63	0.94
	10	2.62	3.15	0.61	0.39	0.97	0.62	0.70	0.68	0.10	0.98	0.57	0.60	0.74	0.53	0.83
	100	4.83	3.52	0.68	0.45	0.76	0.75	0.64	0.70	0.06	1.04	0.57	0.60	0.80	0.66	1.03
	500	4.26	3.24	0.68	0.48	0.85	0.71	0.60	0.85	0.08	0.99	0.59	0.60	1.01	0.64	0.75
Cotton- South Greenhouse	0	-	-	-	-	-	0.67	0.96	0.68	0.09	0.80	0.56	0.67	1.18	0.49	0.91
	1000	-	-	-	-	-	0.72	1.09	0.77	0.11	1.14	0.70	0.71	1.10	0.49	1.48
Barley- North Greenhouse	0	-	-	-	-	-	-	-	0.77	4.22	0.81	4.17	0.87	1.00	0.81	4.13
	10	-	-	-	-	-	-	-	0.80	4.74	0.79	2.48	0.87	1.18	0.81	3.88
	100	-	-	-	-	-	-	-	0.73	4.08	0.87	6.42	0.92	0.95	0.90	4.15
	500	-	-	-	-	-	-	-	0.75	6.20	1.08	6.93	1.07	1.13	1.65	4.60
Barley- South Greenhouse	0	-	-	-	-	-	0.84	0.45	0.45	0.84	0.74	1.21	0.79	0.89	0.96	3.38
	1000	-	-	-	-	-	0.62	0.81	0.71	0.85	0.80	0.96	0.81	1.06	1.20	4.07
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	0.40	-	0.61	0.53	-	-	1.04	0.72	-	0.61	-
	10	-	-	-	-	0.37	-	0.60	0.59	-	-	0.92	0.84	-	0.57	-
	100	-	-	-	-	0.34	-	0.61	0.67	-	-	0.86	0.80	-	0.73	-
	500	-	-	-	-	0.30	-	0.71	0.50	-	-	0.95	0.77	-	0.53	-
Alfalfa Transplants[a]- North Greenhouse	0	0.42	-	0.40	0.12	-	1.08	-	-	0.83	2.07	-	-	-	-	0.74
	10	0.44	-	0.41	0.19	-	0.47	-	-	0.83	2.10	-	-	-	-	0.66
	100	0.61	-	0.38	0.12	-	0.59	-	-	0.78	1.42	-	-	-	-	0.68
	500	0.45	-	0.40	0.09	-	0.55	-	-	1.04	3.05	-	-	-	-	0.66
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	0.48	-	2.18	-	-	0.81		0.45	-
	1000	-	-	-	-	-	-	2.44	-	1.02	-	-	0.83		0.57	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-		0.60	-	2.98	-	2.20	0.63	-	-	-	0.53
	1000	-	-	-	-	-	0.51	-	3.24	-	2.10	1.11	-	-	-	0.54

[a]/Vertical lines denote the occurrence of a harvest.

Table K-5. DIFFUSIVE RESISTANCE MEASUREMENTS FROM POROMETER, AFTERNOON, NORTH AND SOUTH GREENHOUSES.

Crop	Nominal treatment (lbs/a·yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23
		Seconds/cm[2]									
Cotton-North Greenhouse	0	4.84	12.19	0.25	8.60	0.88	1.17	0.71	0.87	0.44	0.98
	10	1.80	5.54	0.11	4.58	0.69	0.74	0.69	0.67	0.43	1.22
	100	2.95	9.49	0.10	4.22	0.48	0.75	0.81	1.21	0.48	1.36
	500	6.67	11.83	0.17	7.66	0.78	0.69	0.74	2.54	0.41	2.02
Cotton South Greenhouse	0	-	-	-	-	-	2.54	1.26	5.07	0.63	1.17
	1000	-	-	-	-	-	4.33	1.10	5.82	0.89	2.01
Barley-North Greenhouse	0	-	-	-	-	-	-	-	0.64	16.18	0.69
	10	-	-	-	-	-	-	-	0.68	3.93	0.77
	100	-	-	-	-	-	-	-	0.65	4.68	1.02
	500	-	-	-	-	-	-	-	0.68	0.99	1.48
Barley- South Greenhouse	0	-	-	-	-	-	0.91	0.89	0.51	-	1.20
	1000	-	-	-	-	-	0.63	0.56	0.63	-	1.25
Alfalfa Seedlings[a]-North Greenhouse	0	-	-	-	-	0.31	-	2.11	0.48	-	-
	10	-	-	-	-	0.37	-	0.73	0.56	-	-
	100	-	-	-	-	0.37	-	2.25	0.66	-	-
	500	-	-	-	-	0.36	-	0.91	0.47	-	-
Alfalfa Transplants[a]-North Greenhouse	0	-	-	0.57	0.88	-	0.69	-	-	0.63	4.10
	10	-	-	0.61	0.44	-	0.50	-	-	0.62	4.08
	100	-	-	0.30	0.50	-	0.59	-	-	0.67	2.45
	500	-	-	0.32	0.68	-	0.58	-	-	0.47	5.06
Alfalfa Seedlings[a]-South Greenhouse	0	-	-	-	-	-	-	0.89	-	2.06	-
	1000	-	-	-	-	-	-	3.21	-	0.78	-
Alfalfa Transplants[a]-South Greenhouse	0	-	-	-	-	-	0.53	-	2.89	-	5.78
	1000	-	-	-	-	-	0.54	-	8.14	-	4.18

[a]/Vertical lines denote the occurrence of a harvest.

Table K-6. LEAF TEMPERATURE MEASUREMENTS FROM POROMETER, MORNING, NORTH AND SOUTH GREENHOUSES.

Crop	Nominal treatment (lbs/a-yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27
		Celcius														
Cotton-North Greenhouse	0	24.25	21.65	23.88	25.28	23.43	24.35	25.38	23.95	26.80	22.75	27.63	29.28	32.95	29.98	28.63
	10	23.30	21.53	24.10	24.98	22.93	24.50	25.45	23.90	26.85	22.98	27.65	29.45	33.83	29.03	28.45
	100	23.85	21.75	23.90	25.28	22.98	24.83	25.38	24.08	26.80	22.45	27.53	29.38	33.30	29.33	28.53
	500	24.65	21.18	24.15	25.18	23.20	24.48	25.40	24.23	26.85	22.63	27.83	29.50	34.08	29.68	28.58
Cotton- South Greenhouse	0	-	-	-	-	-	28.33	30.33	31.23	26.70	22.33	27.33	29.87	34.17	27.63	28.33
	1000	-	-	-	-	-	28.37	30.27	31.07	27.17	22.67	27.77	30.17	33.83	29.10	28.33
Barley-North Greenhouse	0	-	-	-	-	-	-	-	25.18	25.43	25.93	29.33	29.20	31.18	29.28	28.68
	10	-	-	-	-	-	-	-	25.35	25.63	26.15	28.48	29.28	31.18	28.53	29.18
	100	-	-	-	-	-	-	-	25.30	25.85	26.40	29.05	29.43	31.18	30.50	28.53
	500	-	-	-	-	-	-	-	25.13	25.28	26.80	30.25	29.38	31.53	32.10	29.35
Barley- South Greenhouse	0	-	-	-	-	-	26.25	31.10	26.40	26.25	23.20	28.05	29.90	29.60	28.10	25.95
	1000	-	-	-	-	-	25.75	32.95	28.85	25.80	24.25	27.95	30.00	30.15	28.70	26.30
Alfalfa Seedlings[a]-North Greenhouse	0	-	-	-	-	23.73	-	25.23	25.65	-	-	28.35	29.40	-	28.08	-
	10	-	-	-	-	23.18	-	25.08	25.70	-	-	27.93	29.48	-	26.88	-
	100	-	-	-	-	23.58	-	24.93	26.03	-	-	28.28	29.58	-	27.45	-
	500	-	-	-	-	23.83	-	25.33	26.28	-	-	28.50	29.83	-	27.35	-
Alfalfa Transplants[a]-North Greenhouse	0	23.30	-	25.63	24.73	-	25.23	-	-	25.25	24.75	-	-	-	-	27.03
	10	22.85	-	25.23	25.05	-	24.63	-	-	25.13	25.95	-	-	-	-	26.63
	100	23.10	-	25.75	24.20	-	25.10	-	-	25.13	25.43	-	-	-	-	26.97
	500	24.00	-	25.58	24.23	-	25.00	-	-	25.58	26.60	-	-	-	-	26.68
Alfalfa Seedlings[a]-South Greenhouse	0	-	-	-	-	-	-	30.97	-	26.47	-	-	30.97	-	28.63	-
	1000	-	-	-	-	-	-	32.13	-	26.30	-	-	30.77	-	28.93	-
Alfalfa Transplants[a]-South Greenhouse	0	-	-	-	-	-	26.30	-	28.80	-	24.90	28.10	-	-	-	24.13
	1000	-	-	-	-	-	24.93	-	26.60	-	24.60	28.13	-	-	-	23.80

a/Vertical lines denote the occurrence of a harvest.

Table K-7. **LEAF TEMPERATURE MEASUREMENTS FROM POROMETER, AFTERNOON, NORTH AND SOUTH GREENHOUSES.**

Crop	Nominal treatment (lbs/a·yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23
		Date									
		Celcius									
Cotton- North Greenhouse	0	26.70	25.43	28.50	28.63	26.40	25.20	31.50	27.65	30.63	27.85
	10	25.30	25.55	28.13	27.70	25.70	24.70	31.30	27.10	30.38	27.75
	100	25.45	26.30	28.58	28.08	25.23	24.65	31.88	28.73	31.15	27.85
	500	25.80	26.15	28.10	28.05	26.10	24.72	32.15	27.98	30.70	28.05
Cotton- South Greenhouse	0	-	-	-	-	-	25.83	35.37	30.27	29.27	27.93
	1000	-	-	-	-	-	25.77	35.57	31.07	29.77	28.37
Barley- North Greenhouse	0	-	-	-	-	-	-	-	25.68	29.25	26.78
	10	-	-	-	-	-	-	-	26.50	29.48	27.08
	100	-	-	-	-	-	-	-	25.95	29.28	27.53
	500	-	-	-	-	-	-	-	26.20	28.53	27.45
Barley- South Greenhouse	0	-	-	-	-	-	24.20	24.35	25.25	-	26.95
	1000	-	-	-	-	-	23.80	24.05	25.70	-	28.35
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	27.60	-	25.75	25.60	-	-
	10	-	-	-	-	27.60	-	25.05	26.13	-	-
	100	-	-	-	-	28.48	-	25.63	26.40	-	-
	500	-	-	-	-	27.63	-	25.38	25.93	-	-
Alfalfa Transplants[a]- North Greenhouse	0	-	-	29.65	28.18	-	23.53	-	-	28.88	27.55
	10	-	-	29.35	27.03	-	23.38	-	-	28.65	27.48
	100	-	-	29.53	27.85	-	23.55	-	-	28.75	27.18
	500	-	-	29.30	27.80	-	23.50	-	-	28.48	29.20
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	25.37	-	30.20	-
	1000	-	-	-	-	-	-	25.50	-	28.50	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-	-	23.83	-	27.53	-	32.83
	1000	-	-	-	-	-	23.77	-	28.77	-	30.70

a/Vertical lines denote the occurrence of a harvest.

Table K-8. TEMPERATURE DIFFERENTIAL MEASUREMENTS FROM POROMETER, MORNING, NORTH AND SOUTH GREENHOUSES.

Crop	Nominal treatment (lbs/a-yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27
		Celcius														
Cotton- North Greenhouse	0	1.15	0.10	0.03	0.73	1.15	2.15	0.88	1.15	0.60	0.30	1.83	0.23	1.10	2.63	0.33
	10	1.00	0.03	0.05	1.03	1.73	1.90	0.85	1.35	0.50	0.18	1.90	0.15	0.58	3.73	0.45
	100	0.55	-0.25	0.05	0.78	1.63	1.88	0.93	1.13	0.60	0.50	1.98	0.13	1.00	3.33	0.33
	500	0.35	-0.03	0.20	0.93	1.40	1.78	0.85	1.08	0.65	0.58	1.78	0.20	0.53	2.93	0.23
Cotton- South Greenhouse	0	-	-	-	-	-	2.00	1.07	0.10	0.43	1.13	1.60	0.27	0.57	5.50	0.20
	1000	-	-	-	-	-	1.77	0.80	0.53	0.10	0.73	1.37	0.17	0.97	4.03	0.13
Barley- North Greenhouse	0	-	-	-	-	-	-	-	2.18	0.58	1.58	0.23	0.80	1.78	4.98	-0.28
	10	-	-	-	-	-	-	-	1.95	0.13	1.70	1.18	0.73	1.88	5.83	-0.43
	100	-	-	-	-	-	-	-	2.15	0.10	1.20	0.68	0.63	1.83	3.95	-0.08
	500	-	-	-	-	-	-	-	2.23	0.43	1.10	-0.65	0.63	1.53	2.60	-0.80
Barley- South Greenhouse	0	-	-	-	-	-	0.95	3.30	2.90	0.45	1.90	1.15	0.30	2.30	3.40	0.50
	1000	-	-	-	-	-	1.45	1.85	0.75	0.80	0.85	1.35	0.40	1.55	2.80	-0.40
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	2.28	-	1.93	2.35	-	-	1.15	0.50	-	3.43	-
	10	-	-	-	-	2.88	-	2.13	2.20	-	-	1.73	0.63	-	4.48	-
	100	-	-	-	-	2.33	-	2.23	1.88	-	-	1.33	0.48	-	4.00	-
	500	-	-	-	-	2.38	-	2.03	1.68	-	-	1.40	0.58	-	3.85	-
Alfalfa Transplants[a]- North Greenhouse	0	3.10	-	1.08	2.08	-	1.73	-	-	1.35	1.05	-	-	-	-	0.83
	10	4.35	-	1.23	1.90	-	2.28	-	-	1.48	-0.05	-	-	-	-	0.93
	100	2.70	-	1.05	2.65	-	1.70	-	-	1.53	0.53	-	-	-	-	0.57
	500	4.40	-	0.98	2.83	-	1.95	-	-	1.13	-0.60	-	-	-	-	0.73
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	2.63	-	0.53	-	-	0.63	-	2.83	-
	1000	-	-	-	-	-	-	1.60	-	0.63	-	-	0.70	-	2.60	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-	-	1.37	-	-0.13	-	0.10	1.30	-	-	-	1.20
	1000	-	-	-	-	-	2.73	-	1.07	-	0.40	1.27	-	-	-	1.60

a/Vertical lines denote the occurrence of a harvest.

Table K-9. **TEMPERATURE DIFFERENTIAL MEASUREMENTS FROM POROMETER, AFTERNOON, NORTH AND SOUTH GREENHOUSES.**

Crop	Nominal treatment (lbs/a·yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23
		Celcius									
Cotton- North Greenhouse	0	1.10	0.48	0.25	0.33	1.30	1.45	1.10	2.25	3.73	1.60
	10	1.00	0.35	0.68	1.20	2.05	1.95	1.10	2.50	3.78	1.65
	100	1.15	-0.20	0.18	0.93	2.48	2.05	0.73	1.33	3.30	1.55
	500	0.20	0.05	0.85	0.80	1.75	1.98	0.45	1.53	3.55	1.40
Cotton- South Greenhouse	0	-	-	-	-	-	0.17	0.77	0.60	1.60	0.20
	1000	-	-	-	-	-	0.23	1.03	0.07	1.10	-0.37
Barley- North Greenhouse	0	-	-	-	-	-	-	-	2.28	0.95	2.28
	10	-	-	-	-	-	-	-	1.55	0.88	2.03
	100	-	-	-	-	-	-	-	2.10	0.93	1.63
	500	-	-	-	-	-	-	-	1.90	1.78	1.75
Barley- South Greenhouse	0	-	-	-	-	-	1.20	1.15	2.15	-	1.75
	1000	-	-	-	-	-	1.60	1.65	1.90	-	0.75
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	3.40	-	1.15	2.80	-	-
	10	-	-	-	-	3.25	-	1.85	2.33	-	-
	100	-	-	-	-	2.63	-	1.38	2.00	-	-
	500	-	-	-	-	3.33	-	1.58	2.63	-	-
Alfalfa Transplants[a]- North Greenhouse	0	-	-	1.60	2.53	-	1.88	-	-	1.73	0.20
	10	-	-	1.80	3.33	-	2.08	-	-	2.10	0.28
	100	-	-	1.88	3.05	-	1.90	-	-	1.90	0.68
	500	-	-	2.00	2.50	-	2.00	-	-	2.43	-1.05
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	1.50	-	0.20	-
	1000	-	-	-	-	-	-	1.30	-	1.70	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-	-	1.90	-	0.60	-	0.83
	1000	-	-	-	-	-	1.90	-	-0.83	-	1.70

a/Vertical line denote the occurrence of a harvest.

Table K-10. TRANSPIRATION MEASUREMENTS FROM POROMETER, MORNING, NORTH AND SOUTH GREENHOUSES.

Crop	Nominal treatment (lbs/a·yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23	8/30	9/6	9/13	9/20	9/27
		Micrograms/cm²·second														
Cotton- North Greenhouse	0	7.55	2.50	18.74	23.28	11.17	16.11	16.60	12.15	28.56	8.35	18.49	23.16	27.34	28.86	12.47
	10	5.23	2.36	18.24	25.02	15.04	16.60	15.55	12.13	28.20	8.16	18.96	23.24	31.53	29.18	13.35
	100	4.26	2.29	17.08	23.59	15.53	16.08	16.54	13.03	31.71	7.05	19.04	23.36	28.93	26.24	12.33
	500	3.48	2.33	17.44	23.01	15.52	15.10	16.71	10.96	29.62	7.95	18.79	23.73	27.54	27.04	14.51
Cotton- South Greenhouse	0	-	-	-	-	-	20.89	17.69	23.81	29.9[illegible]	9.44	18.28	22.03	24.06	28.83	13.11
	1000	-	-	-	-	-	19.93	15.40	22.13	29.45	6.97	16.39	21.60	25.82	31.76	9.99
Barley- North Greenhouse	0	-	-	-	-	-	-	-	20.29	3.40	12.37	5.71	16.65	25.29	27.87	5.14
	10	-	-	-	-	-	-	-	20.09	2.38	12.71	8.12	16.78	25.37	26.64	6.23
	100	-	-	-	-	-	-	-	21.61	2.50	12.17	5.07	16.32	26.47	27.65	7.37
	500	-	-	-	-	-	-	-	20.76	3.91	10.86	2.47	15.19	24.94	18.94	4.35
Barley- South Greenhouse	0	-	-	-	-	-	20.33	43.08	32.06	8.01	14.67	9.02	19.33	25.98	22.62	7.50
	1000	-	-	-	-	-	25.44	34.73	27.24	7.23	15.35	10.09	18.97	23.26	19.02	5.08
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	34.81	-	24.33	27.71	-	-	9.70	20.03	-	32.24	-
	10	-	-	-	-	34.20	-	24.83	25.70	-	-	9.99	17.66	-	31.91	-
	100	-	-	-	-	37.57	-	24.26	24.58	-	-	11.09	18.76	-	28.96	-
	500	-	-	-	-	41.46	-	22.61	31.34	-	-	10.50	19.41	-	34.66	-
Alfalfa Transplants[a]- North Greenhouse	0	25.69	-	29.86	59.70	-	23.62	-	-	9.87	13.11	-	-	-	-	19.29
	10	23.83	-	29.22	50.18	-	29.37	-	-	7.69	12.20	-	-	-	-	20.50
	100	19.00	-	30.63	57.35	-	25.44	-	-	9.83	13.50	-	-	-	-	20.73
	500	24.04	-	30.92	63.81	-	27.16	-	-	6.53	6.00	-	-	-	-	20.82
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	40.42	-	3.35	-	-	19.71	-	42.11	-
	1000	-	-	-	-	-	-	32.56	-	5.18	-	-	19.19	-	35.[illegible]2	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-	-	27.18	-	21.14	-	9.10	9.90	-	-	-	26.82
	1000	-	-	-	-	-	28.14	-	16.97	-	9.44	8.95	-	-	-	25.62

[a]/Vertical lines denote the occurrence of a harvest.

Table K-11. **TRANSPIRATION MEASUREMENTS FROM POROMETER, AFTERNOON, NORTH AND SOUTH GREENHOUSES.**

Crop	Nominal treatment (lbs/a.yr)	6/21	6/29	7/5	7/12	7/19	7/27	8/2	8/9	8/16	8/23
		Micrograms/cm2.second									
Cotton- North Greenhouse	0	3.02	1.42	52.95	2.43	17.30	11.77	24.44	15.28	27.97	13.52
	10	7.66	2.26	66.76	3.47	21.08	13.78	24.41	17.76	28.08	12.56
	100	4.90	1.82	70.43	4.01	23.89	13.66	22.40	12.35	27.96	12.33
	500	3.27	1.42	58.84	2.71	18.29	14.77	23.70	9.79	30.91	11.13
Cotton- South Greenhouse	0	-	-	-	-	-	5.05	25.41	7.16	19.80	12.27
	1000	-	-	-	-	-	3.03	23.68	8.53	16.63	9.42
Barley- North Greenhouse	0	-	-	-	-	-	-	-	23.45	8.82	18.87
	10	-	-	-	-	-	-	-	23.34	6.70	16.83
	100	-	-	-	-	-	-	-	23.68	6.27	14.72
	500	-	-	-	-	-	-	-	22.77	11.40	12.43
Barley- South Greenhouse	0	-	-	-	-	-	16.43	17.25	26.45	-	12.80
	1000	-	-	-	-	-	22.00	23.22	23.61	-	13.71
Alfalfa Seedlings[a]- North Greenhouse	0	-	-	-	-	50.17	-	12.45	28.80	-	-
	10	-	-	-	-	43.87	-	22.01	26.52	-	-
	100	-	-	-	-	50.73	-	14.74	24.74	-	-
	500	-	-	-	-	45.81	-	19.13	29.52	-	-
Alfalfa Transplants[a]- North Greenhouse	0	-	-	36.81	28.05	-	21.44	-	-	22.87	8.90
	10	-	-	42.43	33.73	-	25.38	-	-	25.62	10.29
	100	-	-	53.00	31.83	-	22.46	-	-	22.72	9.64
	500	-	-	51.34	28.72	-	23.01	-	-	27.59	3.98
Alfalfa Seedlings[a]- South Greenhouse	0	-	-	-	-	-	-	19.26	-	5.47	-
	1000	-	-	-	-	-	-	11.95	-	10.19	-
Alfalfa Transplants[a]- South Greenhouse	0	-	-	-	-	-	24.88	-	14.01	-	8.07
	1000	-	-	-	-	-	24.36	-	2.79	-	11.61

a/Vertical lines denote the occurrence of a harvest.

SECTION L

WATER POTENTIAL MEASUREMENTS: GREENHOUSE AND FIELD

Table L-1. WATER POTENTIAL DATA, FIELD AND GREENHOUSE. Psychrometer readings were recorded at 15 minute intervals. Each value given for greenhouse cotton and barley in the following table represents the mean of 96 readings which were made from 6 to 12 hours following leaf sample harvest (24 readings per replication x 4 replications). Each value given for field cotton represents the mean of 336 readings which were made from 6 to 18 hours following leaf sample harvest (48 readings per replication x 7 replications).

Crop	Nominal treatment (lbs/a·yr)	Water potential (bars)
North Greenhouse Cotton (Data collected on 9/20/83)	0 lbs/acre	-10.25
	500 lbs/acre	-11.76
North Greenhouse Barley (Data Collected on 9/20/83)	0 lbs/acre	-5.81
	500 lbs/acre	-5.26
Field Cotton (Data collected on 10/13/83)	0 lbs/acre	-0.11
	500 lbs/acre	-0.34

SECTION M

GREENHOUSE AND FIELD TISSUE ANALYSIS DATA

TABLE M-1. TISSUE ANALYSIS DATA: CANTALOUPE, MARANA FIELD SITE. Each mean value given represents the mean of 8 plot samples analyzed (i.e. 8 replications per treatment) for any given variable at a particular treatment level. Sampling was performed on October 11, 1983.

Element	Nominal Treatment (lbs/a·yr) 0 Mean (ppm)	500 Mean (ppm)	Standard Error
Na	13.99	14.29	0.89
K	42562.00	40012.00	2120.26
Fe	36.18	36.81	9.12
Mn	1.87	2.03	0.31
Cu	5.93	4.53	0.68
Zn	32.54	30.39	5.31
Kjeldahl N	15419.38	13473.50	469.98 *
PO_4	1664.13	1417.45	98.07
Ca	795.39	931.68	98.98
Mg	839.95	913.41	45.98
SO_4	1878.13	1820.13	120.79
B	29.52	31.40	1.51
Cl	5804.13	4934.75	751.94
Mo	4.84	5.86	0.64

* Significant difference between treatments.

TABLE M-1 continued.

Element	Nominal Treatment (lbs/a•yr) 0 Mean (ppm)	500 Mean (ppm)	Standard Error
As	4.72	4.58	0.41
Ba	20.27	20.09	2.61
Cd	0.74	0.58	0.20
Cr	4.69	5.10	1.28
Pb	0.75	1.06	0.10
Hg	2.93	2.95	0.43
Sr	20.45	8.36	7.01
Se	21.86	23.39	1.84

* Significant difference between treatments.

TABLE M-2. TISSUE ANALYSIS DATA: COTTON, MARANA FIELD SITE. Each mean value given represents the mean of 8 plot samples analyzed (i.e. 8 replications per treatment) for any given variable at a particular treatment level. Sampling was performed on September 16, 1983.

Element	Nominal Treatment (lbs/a•yr) 0 Mean (ppm)	500 Mean (ppm)	Standard Error
Na	1005.94	4651.86	121.68 *
K	16343.00	13571.00	1241.14
Fe	123.53	176.83	36.18
Mn	146.61	137.56	10.94
Cu	14.21	22.39	2.98
Zn	28.84	71.53	17.53
Kjeldahl N	38549.86	41664.14	936.59
PO_4	3523.14	3689.86	33.58
Ca	35314.00	31329.00	828.85 *
Mg	4275.14	3320.29	111.00 *
SO_4	35420.86	31904.29	1376.25
B	48.36	40.64	1.78 *
Cl	18046.29	22500.29	515.02 *
Mo	12.77	5.63	3.54

* Significant difference between treatments.

TABLE M-3. TISSUE ANALYSIS DATA: ALFALFA, MARANA FIELD SITE. Each mean value given represents the mean of 8 plot samples analyzed (i.e. 8 replications per treatment) for any given variable at a particular treatment level. Sampling was performed on November 3, 1983.

Element	Nominal Treatment (lbs/a•yr) 0 Mean (ppm)	1000 Mean (ppm)	Standard Error
Na	911.00	3653.00	152.26 *
K	20237.00	18150.00	902.64
Fe	168.43	118.10	36.84
Mn	33.88	29.86	2.11
Cu	18.36	10.59	2.55
Zn	39.39	73.99	28.67
Kjeldahl N	37715.38	39811.00	748.00
PO_4	1943.63	2309.00	304.08
Ca	16238.00	15037.00	385.68
Mg	1999.75	1785.63	98.07
SO_4	4833.88	5738.38	445.36
B a	-	-	-
Cl	9801.25	14848.63	764.92 *
Mo	3.56	3.14	0.91

a/ No boron data for this crop.

* Significant difference between treatments.

TABLE M-4. TISSUE ANALYSIS DATA: COTTON, NORTH GREENHOUSE. Each mean value given represents the mean of 12 plants analyzed (4 replications x 3 plants per replication) for any given variable at a particular treatment level. Sampling was performed on October 17, 1983.

Element	Nominal Treatment (lbs/a·yr) 0 Mean (ppm)	500 Mean (ppm)	Standard Error
Na	662.43	4186.92	419.37 *
K	26425.00	24325.00	1587.24
Fe	241.72	195.25	12.08
Mn	48.53	56.01	2.12
Cu	5.20	6.23	1.34
Zn	34.78	36.98	2.28
Kjeldahl N	36500.75	36627.08	2001.09
PO_4	4323.67	5815.00	416.10
Ca	29392.00	27692.00	1169.51
Mg	4719.42	4984.50	213.46
SO_4	17928.58	19118.42	1540.61
B	8.86	20.52	2.61
Cl	5301.00	9900.92	302.80 *
Mo	16.19	14.02	2.44

* Significant difference between treatments.

TABLE M-5. **TISSUE ANALYSIS DATA: BARLEY, NORTH GREENHOUSE.** Each mean value given represents the mean of 12 plants analyzed (4 replications x 3 plants per replication) for any given variable at a particular treatment level. Sampling was performed on October 20, 1983.

Element	Nominal Treatment (lbs/a·yr) 0	500	
	Mean (ppm)	Mean (ppm)	Standard Error
Na	1882.67	2872.67	82.39 *
K	25000.00	24850.00	1111.83
Fe	75.33	123.88	42.01
Mn	72.80	59.18	1.98 *
Cu	13.48	13.72	2.11
Zn	20.62	24.37	1.22
Kjeldahl N	8499.50	6941.08	1412.97
PO_4	4027.42	4677.50	153.42
Ca	3611.17	3661.08	114.95
Mg	2547.17	2475.58	92.36
SO_4	5223.00	4949.92	552.09
B	2.88	2.41	.49
Cl	6439.92	7824.33	431.12
Mo	23.90	25.05	1.28

* Significant difference between treatments.

TABLE M-6. TISSUE ANALYSIS DATA: ALFALFA TRANSPLANTS, NORTH GREENHOUSE. Each mean value represents the mean of 12 plants analyzed (4 replications x 3 plants per replication) for any given variable at a particular treatment level on a given date.

Element	Nominal Treatment (lbs/a•yr)	First Harvest 6/24 Mean (ppm)	First Harvest 6/24 Standard Error	Second Harvest 7/11 Mean (ppm)	Second Harvest 7/11 Standard Error	Third Harvest 8/01 Mean (ppm)	Third Harvest 8/01 Standard Error	Fourth Harvest 8/24 Mean (ppm)	Fourth Harvest 8/24 Standard Error	Fifth Harvest 9/12 Mean (ppm)	Fifth Harvest 9/12 Standard Error	Sixth Harvest 9/28 Mean (ppm)	Sixth Harvest 9/28 Standard Error	Seasonal Average Mean (ppm)	Seasonal Average Standard Error
Na	0	302.68	85.61	302.89	47.75	295.31	17.85	344.00	74.47	404.18	62.17	419.45	93.57	344.75	48.28*
	500	773.67		548.05		664.27		787.43		955.20		1271.30		833.32	
K	0	24450.00	927.54	29058.00	1076.07	33450.00	577.21	29283.00	1537.18	36058.00	1480.96	53792.00	5278.35	34349.00	1143.68
	500	24983.00		29575.00		32058.00		27642.00		33425.00		45142.00		32138.00	
Fe	0	75.58	29.01	111.13	36.82	98.90	31.73	3379.88	2336.40	90.02	14.90	93.57	18.55	641.51	388.46
	500	115.09		61.39		82.77		119.94		64.70		148.13		98.67	
Mn	0	45.93	1.83	42.50	.88	28.60	.82	51.79	12.58	11.23	2.22	16.95	3.63	32.83	1.77
	500	56.98		45.21		28.85		52.70		13.91		25.01		37.11	
Cu	0	24.57	19.45	17.63	2.63	10.99	2.37	145.12	97.82	3.95	.17	2.66	1.69	34.15	16.84
	500	42.74		11.20		14.97		9.56		4.37		6.86		14.95	
Zn	0	25.98	1.94	31.64	4.26	31.39	9.01	34.53	11.96	33.51	5.57	25.88	8.79	30.49	3.51
	500	28.37		26.06		35.11		31.16		37.69		40.82		33.20	
Kjeldahl N	0	34959.06	993.00	31603.66	1017.41	32965.29	1015.87	33481.95	677.67	36364.32	1033.60	37154.24	1083.28	34421.42	1505.30
	500	34597.76		33232.58		34883.36		34981.78		37542.11		44530.50		36628.01	
PO_4	0	2887.14	143.55	3428.38	66.32	3832.50	105.49	3312.90	52.85	4231.56	106.74	3653.00	105.82	3557.58	144.83
	500	2891.48		3302.21		3592.03		3320.73		4221.43		4646.28		3662.36	
Ca	0	13737.42	428.42	10498.08	509.99	10408.50	447.23	9330.17	507.35	9190.25	326.06	8631.08	297.15	10299.25	454.68
	500	13437.58		10105.42		10391.33		9728.33		8895.00		10210.42		10461.35	
Mg	0	2990.33	133.01	2544.92	153.71	2600.25	88.65	1901.33	78.26	2207.25	103.32	1926.50	53.59	2361.76	29.14
	500	2882.17		2626.08		2338.58		2021.00		2099.67		2228.42		2365.99	
SO_4	0	3516.41	718.93	3799.45	483.67	4810.21	553.45	4316.38	384.25	4348.29	366.99	4168.16	432.92	4159.82	399.50
	500	4215.16		4095.43		4944.08		4379.74		4622.08		5682.37		4656.48	
B	0	18.09	.81	13.20	1.84	21.03	.63	14.84	1.39	16.24	.72	13.98	1.85	16.23	1.13
	500	17.70		13.77		19.75		13.33		16.60		21.29		17.07	
Cl	0	5218.60	298.86	6378.31	135.87	6787.56	216.47	6171.46	188.85	7139.17	320.94	6320.07	180.47	6335.86	112.89*
	500	6282.61		7129.08		7247.72		6976.44		8014.77		9398.54		7508.19	
Mo	0	3.04	3.11	17.20	1.21	15.55	1.46	9.02	3.26	20.92	4.41	19.11	5.45	14.14	4.35
	500	6.21		17.21		15.93		9.63		22.95		29.28		16.87	

* Significant difference between treatments.