VALIDATION OF A COUPLED HERBICIDE
FATE AND TARGET PLANT
SPECIES EFFECTS MODEL

DISSERTATION

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A series of experiments provided data to parameterize and validate a coupled herbicide fate and target plant species effects model. This simulation model is currently designed to predict responses of water hyacinth populations to treatments of the dimethylamine formulation of 2,4-dichloro-phenoxy acetic acid (2,4-D - DMA). Experiments investigated 1) the response of water hyacinth to varying exposures of 2,4-D (DMA); 2) the role of water hyacinth density and herbicide interception in treatment effectiveness using 2,4-D (DMA); and 3) the importance of root exposure to obtain control of water hyacinth using 2,4-D (DMA). Results demonstrated the importance of leaf or canopy interception of 2,4-D (DMA) sprays in obtaining control of water hyacinth populations. The critical threshold plant tissue concentration of 2,4-D (DMA) required to elicit maximum mortality (98%) was estimated to be approximately 12 mg 2,4-D per kg water hyacinth tissue (wet weight). Root uptake apparently plays little or no role in the effectiveness of this herbicide for controlling water
hyacinth growth. Validation trials illustrated the efficacy of the current model. The model was validated with data from a field operation. This research has provided considerable insight into optimal use of this auxin-type herbicide for control of water hyacinth, a monocotyledon.
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CHAPTER 1

INTRODUCTION

Surface waters in the United States are valuable resources for domestic water supplies, recreation, wildlife habitat, industry, navigation and agriculture. Vascular aquatic plants (macrophytes) comprise an important part of aquatic ecosystems, but dense growths may compromise the utility of water resources. Although many macrophyte species are indigenous to the United States, macrophytes that frequently cause the most serious water resource management problems are exotic species from Europe, Asia, Africa and South America. *Eichhornia crassipes* (Mart.) Solms, water hyacinth, is an exotic macrophyte that is currently causing water management problems in this country. One common control practice for dense growths of water hyacinths is use of herbicides.

*Eichhornia crassipes* (water hyacinth)

*Eichhornia crassipes* (Mart.) Solms (family Pontederiaceae) is commonly called water hyacinth because its flowers resemble those of the hyacinth (family: Liliaceae, genus *Hyacinthus*). This monocotyledon was
originally classified as *Pontederia crassipes* by von Martius in 1924 and was later re-classified into the genus *Eichhornia* by Solms (Count Hermann Maximilian Carl Ludwig Friedrich Solms-Laubach, 1842-1915, professor of botany, Strassburg).

Penfound and Earle (1948) described mature specimens of *Eichhornia crassipes* as consisting of roots, rhizomes, stolons, leaves, inflorescences and fruit clusters. The rhizomes (vegetative stems) consist of an axis with short internodes which produce the other parts of the plant. The stolons are similar in diameter to the rhizome and function in vegetative production of daughter rosettes (ramets) (Bock, 1969). In uncrowded conditions (e.g. during the early part of the growth season), the leaves of water hyacinths produce hollow, swollen portions which assist the plants in floating on the water surface. The inflorescence of the water hyacinth is a lavender colored spike subtended by two bracts attached to an elongate stalk (peduncle). Mature stands of water hyacinths frequently achieve densities of as much as 340 metric tons/hectare (Penfound and Earle, 1948). The mean dry weight percentage of the plant is approximately 7% (Bock, 1969).

Originally from the Amazon River basin in South America, water hyacinth was collected and distributed virtually world wide during the mid- to late-nineteenth
century because of its ornamental attractiveness. Since that time, water hyacinth has become established throughout the southeastern United States where it dominates many water systems. Most states (Texas included) with suitable habitat for this species have established control programs designed to limit the plant's growth and restore some of the utility of the water resource.

Several techniques are available to control the growth of water hyacinth populations. These control practices include mechanical (such as harvesting), biological (such as the Neochetina weevil and Ctenopharyngodon idella (Chinese grass carp)), and chemical (such as 2,4-D) (Gopal, 1987). This research focused on use of the dimethylamine formulation of 2,4-dichloro-phenoxy acetic acid (2,4-D - DMA) for control of water hyacinth since this is one of the most common control methods used in the United States (Audus, 1976b).

2,4-Dichlorophenoxy Acetic Acid

This herbicide (Figure 1) is usually applied to dicotyledons and acts as a hormone that regulates plant growth, uncouples phosphorylation associated with pyruvate oxidation, stimulates respiration, and lowers the photosynthesis / respiration ratio, ultimately resulting in the death of the plant (Audus 1976b). Since E. crassipes is
Figure 1. Structure of 2,4-D (DMA).
a monocotyledon, 2,4-D may not function solely as a hormone. Audus (1976a) indicated that monocotyledonous shoots are generally resistant to auxin-type herbicides. When susceptibility does occur, the responses of monocotyledons are similar to those of dicotyledons. Ashton and Crafts (1981) reported that chlorophenoxy compounds cause cessation of apical meristematic cell division, and termination of length increase in elongating cells with continued radial expansion. In mature plant tissues parenchyma cells swell and begin to divide, producing callus tissue. Root elongation stops and root tips swell. Young leaves stop expanding and develop excessive vascular tissue and very compact mesophyll, low in chlorophyll. Roots lose their ability to absorb water and salts, photosynthesis is inhibited, and the phloem becomes plugged.

There is no doubt that 2,4-D is effective for control of water hyacinth since it is widely used for this purpose, but no clear understanding of the mode of action of the herbicide on this species currently exists. A more complete understanding of the use of 2,4-D for controlling water hyacinth may lead to more effective application, use, and ultimately less expensive control of this common water resource problem.
Control of *Eichhornia crassipes* with 2,4-D

An area of primary concern in management of waters that are plagued with excessive growths of aquatic vegetation is efficient use of the relatively few herbicides that are registered for use in these aquatic systems. In the past few years, managers of lakes, reservoirs, canals, rivers, and streams have been faced with the problems of a shrinking list of available herbicides and concerned and cautious citizens. Extensive and expensive testing is required before a herbicide can be registered and marketed under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA). Consequently, few new herbicides are developed or marketed and managers are faced with fewer chemical tools for solving immediate and pressing problems. The most efficacious strategy at the present time is to maximize the efficient use of currently available herbicides.

The response of water hyacinths to 2,4-D should be related to the amount of herbicide incorporated into plant tissues by processes such as sorption, and active transport. This herbicide is usually applied to water hyacinths in actual field situations by aerial spraying. It is unclear whether 2,4-D (DMA) is taken up primarily through the upper leaf surfaces from direct spray contact or via roots from the water after excess herbicide has dripped from the leaves into the water. Hildebrand (1946) and Hitchcock et al.
(1949) reported that the degree of control of *E. crassipes* by 2,4-D is greatly reduced by rainfall or wave action during the first three hours following spraying. Since these conditions would tend to wash 2,4-D from the leaf surfaces into the water, this suggests that the herbicide may function through leaf contact rather than via root uptake. Penfound and Minyard (1947) and Hitchcock *et al.* (1949) reported that 2,4-D is efficiently translocated from the leaves to other organs within a single individual plant of *E. crassipes*, but "very little" is transported through the connecting stolons to daughter rosettes with fairly well-developed roots. Ashton and Crafts (1981) indicate that chlorophenoxy herbicides display optimum concentration responses. Concentrations below the optimum provide too little toxicant to be effective at a distance from the treated foliage, while too much, produces excessive contact injury to the foliage resulting in little translocation. Although Sculthorpe (1967) reported that roots of *E. crassipes* may account for 20 to 50% of the plant's biomass depending on habitat and season, no mention was found of translocation of 2,4-D from roots to leaves of water hyacinth or the role of roots in uptake of 2,4-D from water.

Sculthorpe (1967) indicated that the angle of the leaves of *E. crassipes* relative to the water's surface is from 15° to 45° at the periphery and 75° to 90° in the center
of the rosette and is characteristic of the plant as a whole in crowded conditions. This steep inclination of the leaves would suggest that runoff of herbicide from the leaves into the water may be an important factor in control of water hyacinth with 2,4-D. Density of water hyacinth plants should affect the amount of herbicide interception from an aerial spray application and concurrently concentrations of 2,4-D in water and mass of herbicide on plant leaves. Therefore, plant population density may affect response (control) depending on whether aqueous or contact herbicide exposure is the most important source of chemical uptake. An understanding of the most effective route of exposure could lead to more efficient application techniques (e.g. aqueous application rather than aerial) and / or herbicide formulations (addition of adjuvants to retain the herbicide on water hyacinth leaves). Once these relationships have been defined, it should be possible to predict the response of water hyacinth populations to application "doses" (treatment concentrations) of 2,4-D under actual field situations by modeling the exposure route of water hyacinth to the herbicide and the environmental fate of the herbicide.
Computer Simulation Modeling

Methodologies are needed that will allow operational aquatic plant management personnel to optimally utilize available control techniques. A variety of site-specific and interacting environmental factors may strongly influence successful application of a control technique. Computer simulation models have proven useful in similar complex situations as decision support systems (Reinert and Rodgers 1987; Reinert et al. 1987).

Chemical control techniques, including herbicides such as 2,4-D, are used in a variety of aquatic environments. The physical, chemical and biological characteristics of these systems influence the herbicide's persistence and consequently the effectiveness of the herbicide as a control technique. The initial concentration of a herbicide introduced to an aquatic system is limited or regulated by its FIFRA registration label. Concentrations of herbicides in aquatic environments are not constant through time since they are affected by a number of processes. These processes are relatively well known and can be modeled by mass balance and kinetic approaches (Donigian 1982; Lassiter 1982). In particular, the fate processes controlling environmental concentrations of 2,4-D (DMA) are sorption to solids, $K_p = 0.13$ to $0.25$, and biodegradation, $3.9$ to $11$ day half-life (Reinert and Rodgers, 1987). Other fate processes such as
volatilization, photolysis and hydrolysis are apparently insignificant transformation processes for this compound.

The responses of target aquatic plant populations to time-varying concentrations of herbicides are perhaps less well understood. Since the concentrations of herbicides in water are not constant through time and concentrations through time will vary under different environmental conditions, a descriptor of "exposure" other than initial concentration alone may be more useful as a predictor of population response. For the purposes of this research, "exposure" was defined as a function of concentration and time and was calculated as the area under the curve of plant tissue concentration of herbicide vs. time.

A computer simulation model was developed to allow an investigator to enter site specific characteristics pertaining to the environment to be simulated. The model generates estimates of target plant population (water hyacinth) response to an application of a herbicide [2,4-D (DMA)]. Using this simulation, herbicide application rates can be adjusted so optimal control can be obtained with the minimum amount of chemical and as an additional benefit, effects on non-target species may be minimized for the desired level of control. In development of the initial prototype model, water hyacinth and 2,4-D were selected since data are available on this aquatic weed species and
chemical (Gopal 1987). Although herbicide fate and target plant population response models are not currently available for aquatic systems, some parallel situations have been modeled for terrestrial systems (Brown et al. 1982).

One promising strategy that can lead to more efficient use of herbicides and concomitant cost savings is development of predictive models that can be used as a framework to guide operational activities. Using the computer simulation model as an investigative tool also allows examination of such strategies as treatment timing and repeated treatments. One of the purposes of this research was to obtain model calibration and validation data relating to herbicide fate and persistence, response of the target population (E. crassipes), importance of tissue concentration of 2,4-D, and regrowth of the population since appropriate data were not located in literature sources.

Research Objectives

In general, the objectives of this research were to enhance understanding of the concentrations of 2,4-D (DMA) required to achieve control of E. crassipes. The factors examined were the relationship between concentrations of 2,4-D in plant tissues, versus plant response (mortality) and the influence of route of plant exposure to 2,4-D. Since water hyacinth is an emergent species and the whole plant is
not in contact with the water, the route of herbicide exposure (roots vs. leaves) may play an important part in determining tissue concentration of 2,4-D and consequently, mortality. Degree of 2,4-D spray interception relative to plant density was investigated for the purpose of determining the relative amounts of 2,4-D available to plants from direct contact and aqueous sources. Finally, these data were used to calibrate and validate Modules I and II of the computer simulation model (developed during this research) estimating the fate and persistence of 2,4-D (DMA) in aquatic environments (Module I), response of water hyacinth to this exposure to 2,4-D (Module II), and subsequent water hyacinth population recovery (growth) following treatment (Module III).

Hypotheses

1) There is no relationship between concentration of 2,4-D (DMA) in tissues of *E. crassipes* and plant response (mortality).

Corollaries:

1) there is no lower bound (threshold, 0% response) to this relationship.

2) there is no upper bound (response saturation, 100% mortality) to this relationship.
2) There is no relationship between 2,4-D (DMA) concentration in water and concentration of 2,4-D (DMA) in tissues of *E. crassipes*.

3) There is no relationship between contact time of 2,4-D (DMA) applied to the leaves of *E. crassipes* (contact via dipping in a 2 ppm solution for various durations) and concentration of the herbicide in plant tissues.

4) There is no relationship between concentration of 2,4-D (DMA) applied via aqueous exposure (root contact) to *E. crassipes* and concentration of the herbicide in plant tissues.

5) There is no relationship between density of *E. crassipes* and degree of aerial spray interception.

6) Computer simulation model predictions for these relationships are not significantly different from experimental observations.
CHAPTER II

MATERIALS AND METHODS

Microcosm Experimental Design

The herbicide formulation that was be used for these experiments was Weed-Rhap A-4D (Vertac). The maximum label application rate of this formulation is 5.25 liters/hectare and at 46.7% active ingredient, this approximates 2.45 liters/hectare of 2,4-D (DMA). The culture vessels used for these experiments are 1750 liter, cement tanks located at the UNT Water Research Field Station. Since the average depth of each tank is one meter and the surface area is 1.8 m², the label rate of application approximates 0.25 mg/l in containers of this volume. The overall experimental design is illustrated in Figure 2.

In the first experiment, water hyacinths were exposed to a 2 mg/l solution of 2,4-D (DMA) by dipping the above-water portions of the plants in the herbicide solution for varying contact times. The purpose of this experiment was to determine if leaf contact alone of water hyacinth to 2,4-D is sufficient to elicit mortality. Concentrations of 2,4-D were monitored in plant tissues periodically during the experiment. These data were used to establish the
Figure 2. Experimental Design.
relationship between tissue concentration of 2,4-D obtained via leaf contact and mortality. The contact times were 1, 10 and 100 seconds. A contact solution concentration of 2 mg/l was selected because it provided sufficient 2,4-D in solution so that depletion of 2,4-D from the dipping solution via plant tissue uptake was not an important factor. The 2 mg/l solution approximates eight times label application rates for the formulation used also, 2 mg/l was selected as sufficiently in excess of the label application rate so that 1, 10 and 100 second contact times should describe the inflection points of the mortality response relationship (0%, partial, and 100% response).

In the second experiment, herbicide application was made via aqueous introduction to minimize contact of water hyacinth leaves with the herbicide. The purpose of this experiment was to determine if water hyacinth roots are capable of sufficient 2,4-D uptake to produce the tissue concentrations required to elicit a mortality response. The experiment was conducted at 0.05 mg/l, 0.1 mg/l, and 0.25 mg/l (maximum label application rate) to approximate concentrations expected to elicit a 0% mortality response, a partial mortality response, and full label application rates (100% mortality response) if roots are capable of 2,4-D uptake in sufficient quantities to elicit any response.
across a range of environmentally realistic 2,4-D concentrations.

The third set of experiments was conducted to parameterize the relationships between water hyacinth tissue concentration of 2,4-D and mortality for different aerial spray "doses" and varying degrees of interception (plant population densities). Since population density affects the amount of herbicide that contacts the plants' leaves and the amount that enters the water and becomes available to the plants' roots, this experiment was conducted with several densities of water hyacinth and several concentrations of 2,4-D (DMA) applied via aerial spray. This experiment consisted of four "dose levels" of 2,4-D approximating 0.04, 0.2, 1.0, and 2.0 times label application rates (0.10 liters / hectare, 0.49 liters / hectare, 2.45 liters / hectare, and 4.90 liters / hectare) and three densities of water hyacinth at each concentration. The densities of water hyacinth that were used in this experiment were 8, 17, and 28 plants / m² (approximating 28, 56, and 108 metric tons / hectare). Herbicide (2,4-D) was applied with a spray applicator and water hyacinth biomass was determined through time by periodically removing and weighing three representative plants from each container and multiplying the mean weight by the number of plants in the container to estimate total biomass. Subjective estimates of mortality were also made by
visual comparison of treatments to controls (Langland, et al., 1983). Herbicide (2,4-D) concentrations in water, plant tissue, and sediments were determined through time using procedures described in Appendix A. The analytical method for 2,4-D (DMA) involves derivatization of the 2,4-D to the methyl-ester using a procedure adapted from Knapp (1979). The derivative was extracted with hexane and analyzed using gas-liquid chromatography and an electron-capture detector (Moses 1985). The product of this experiment is a translation step of the information gathered in the first two sets of experiments to actual field situations.

Since water hyacinth tissue concentrations of 2,4-D based on exposure concentration and route of exposure were demonstrated in the first and second sets of experiments and the third set of experiments parameterized the relationship between plant density and exposure concentrations via water and leaf contact with aerial herbicide application, actual field situations can be modeled.

These data were used to calibrate the coupled herbicide fate and target plant population effects computer simulation model developed in 1988 (Clifford and Rodgers, 1989).

Field Validation Study

Model validation was performed by comparing model predictions with experimental observations obtained from a
field operation conducted at Wallisville, Texas. The field operation consisted of treating a 0.37 hectare plot of water hyacinths with the maximum label application rate of Weedar 64 (Union Carbide). This application rate is 4.26 kg active ingredient per hectare (9.35 liters per hectare of formulation).

Water and plant samples were collected periodically during the study from randomly selected locations within the treatment area. Nine, one-liter water samples were collected on each sampling date, preserved with H2SO4, and stored for later analysis. Each plant sample was obtained by removing all of the plant matter from 0.25 m² area. The plants were rinsed to remove water soluble 2,4-D from the surface. The total volume of the rinsate was measured and one liter was preserved in the same manner as the water samples. The total weight of plants in each sample was determined and the plants were sub-divided into leaves, stems (rhizomes and stolons), and roots. The weights of each sub-sample were recorded and the samples were frozen for later analyses. The purpose of this plant sample sub-division was to monitor translocation of 2,4-D within the plants through time.

These experiments were performed by the U. S. Army Corps of Engineers (Waterways Experiment Station) personnel and the plant and water samples were sent to UNT for 2,4-D residue analysis. Similar sampling regimes were established
for both the experiments conducted at the UNT Water Research Field Station and those conducted at Wallisville, Texas. Since the sampling regimes were coordinated and 2,4-D residue analyses were performed in the same laboratory, the data obtained were sufficiently complementary to provide a complete calibration and validation of the computer simulation model.

The Computer Simulation Model

The model was written in Quick-BASIC™ 3.00 (copyright Microsoft Corporation, 1987) for use with most IBM and IBM-compatible computers. The hardware requirements are: dual floppy disk drives or hard disk drive, color monitor, and optional 80 column dot-matrix printer. The model consists of a series of essentially stand-alone sub-routines which are linked together by common variables and data.
CHAPTER III

RESULTS AND DISCUSSION

Microcosm Studies

No water hyacinth mortality was observed in experiments in which plants were dipped in a 2 ppm solution of 2,4-D for varying contact times of 1, 10, and 100 seconds. Analysis of the contact solution verified that the concentration was approximately 2 ppm. The maximum observed 2,4-D concentrations in plant tissues occurred on day seven at a concentration of 0.19 mg/kg plant wet weight. These data are presented in Figure 3. Water concentrations of 2,4-D were below detection limit (approximately 25 ppb) except on day seven when a concentration of 0.05 ppm was observed. Sediment concentrations of 2,4-D were below detection limit except on day zero at a maximum concentration of 0.08 mg/kg sediment wet weight. The results from this study suggest that leaf-contact of 2,4-D even at concentrations approximating eight times label application rate (estimated water concentration with no interception) is insufficient to produce tissue concentrations sufficient to elicit mortality. In actual field situations, at tank-mix dilutions of 1:130 (formulation:water, label recommendation) the concentrations of 2,4-D contacting leaf surfaces
Figure 3. 2,4-D Concentrations Observed in Plant Tissues During the Leaf-Contact Experiment.
approximates 3,600 mg/l. This suggests that plants that are not directly contacted by a concentrated herbicide spray will probably not receive sufficient 2,4-D through the leaves from water which has been contacted by the spray to elicit mortality.

The second experiment was designed to determine if water hyacinth is capable of uptake of sufficient quantities of 2,4-D through roots from water which has been contacted by herbicide spray to elicit mortality. The maximum water hyacinth tissue concentration of 2,4-D observed in this experiment occurred on day seven. This concentration was 0.3 mg/kg wet weight (Figure 4). No mortality was observed in this experiment. Actual aqueous concentrations are presented in Figure 5. Measured water concentrations in this experiment were lower than the targeted concentrations. This was probably due to incomplete mixing of the herbicide with water prior to addition of plants. Maximum sediment concentrations of 2,4-D were observed on day zero in the highest exposure concentration (0.25 ppm target) at 0.24 mg/kg sediment wet weight and no 2,4-D was observed in subsequent sediment samples. The results of this experiment suggest that water hyacinths are not capable of uptake of sufficient quantities of 2,4-D through the roots from water even at maximum label application rates to elicit a mortality response.
Figure 4. 2,4-D Concentrations in Plant Tissues (water hyacinth) During the Aqueous Exposure Experiment.
Figure 5. 2,4-D Concentrations in Water During the Aqueous Exposure Experiment.
Experiments one and two suggest that the primary route of 2,4-D uptake by water hyacinths is via contact of concentrated spray with the emergent portions of the plants. It appears that 2,4-D uptake by water hyacinth from water via contact with roots or emergent portions of the plants even at maximum label application rates plays an insignificant role in the effectiveness of 2,4-D as a control agent for water hyacinths.

Experiment three was designed to parameterize the exposure-response relationship of water hyacinth to 2,4-D and to determine the effects of density on interception of 2,4-D by plants when herbicide application is made via aerial spray. The concentrations of 2,4-D in water hyacinth tissues and in water during this experiment are presented in Figures 6 and 7. Figure 8 illustrates change in mean plant biomass through time in these experiments. Biomass was not observed to be a good predictor of mortality. This is probably because a large fraction of the plant's biomass is present in the roots and the decay of roots and submerged portions of the dead leaves proceeded very slowly. The results from visual estimates of mortality are presented in Figures 9 and 10. This exposure-mortality relationship indicates that the critical tissue concentration of 2,4-D in tissues of water hyacinth required to elicit a maximum mortality response occurs at approximately 12 mg 2,4-D per
Figure 6. 2,4-D Concentrations in Plant Tissues (water hyacinth) During the Spray Exposure Experiments.
Figure 7. 2,4-D Concentrations in Water During the Spray Exposure Experiments.
Figure 9. Visually Estimated Mortality Observed During the Spray Exposure Experiments.
Figure 10. Percent Mortality vs. Exposure (mg/kg-days).
kg plant tissue wet weight. This and the overall shape of this curve are some of the factors required for calibration of the computer simulation model. One-hundred percent mortality was not observed during this experiment even at double label application rates of 2,4-D. This appears to have been due to 2,4-D interception by mature plants thereby protecting daughter ramets from sufficient spray exposure to elicit a mortality response. This upper mortality bound of approximately 98% is another factor required for computer simulation model calibration.

The half-life of 2,4-D estimated across all of these experiments was approximately 2.5 days. This value is probably somewhat inflated due to the fact that water samples were collected from the plant root zone (2-5 cm below the water surface) and mixing of the 2,4-D with the water in the tanks immediately following spray application was probably not complete at this time.

The relationship between plant density and degree of 2,4-D spray interception is essentially linear ($r^2 = 0.998$) and follows the equation:

\[ \% \text{ interception} = (0.191 \times \text{mass}) + 0.417 \]

where mass is weight of plants in metric tons per hectare. This relationship was determined by estimating the plant biomass present in each tank (mean measured weight per plant times number of plants in each tank), extrapolating the mass
of 2,4-D present in plant tissues (2,4-D concentration times mass of plants), and calculating the percent of 2,4-D present in plant tissues relative to the mass that was applied. Water concentrations of 2,4-D were not used for these calculations because incomplete mixing of this compartment would tend to bias estimates. Only data for day one and label application rate were used in this calculation.

Percent dry weight of plant tissue and sediments were determined by drying for 24 hours at 104 °C. Plant tissue dry weight percent was determined to be 7.84% ± 4.96 (mean and standard deviation, N = 41). Sediment dry weight percent was determined to be 75.82% ± 3.27 (N = 77). These values are also required for model simulation and were used in the comparisons of model simulations with experimental observation.

Table 1 lists the data used for comparison of computer model simulations with experimental observations. Figures 11 - 13 illustrate these comparisons. Although the computer simulation produced results comparable with observations for plant tissue and water compartments, sediment concentrations of 2,4-D were over predicted. This may have been due to incomplete mixing of the water compartment.
Table I. Data used for microcosm simulations. The values listed here are those used in the simulations illustrated in Figures 11 - 13. The symbol '*' in indicates that process is insignificant for the compound.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</tr>
</thead>
<tbody>
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<td>Average Depth of area to be Treated (meters)</td>
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<td>Water Flow Rate From Treated Area (meters/min.)</td>
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<td>This study</td>
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<td>Total Suspended Solids in Water (mg/l)</td>
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</tr>
<tr>
<td>Herbicide Hydrolysis Halflife in Sediment (days)</td>
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<td>Herbicide Biotransformation Halflife in Sediment (days)</td>
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<td>Herbicide Photolysis Halflife in Water (days)</td>
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</tr>
<tr>
<td>Herbicide Volatilization Halflife in Water (days)</td>
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<td>Percent Dry Weight of Plant Tissue</td>
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Figure 11. Comparison of Computer Simulation Model Predictions with Microcosm Study Observations for 2,4-D in Tissues of Water Hyacinth. Simulations Were Conducted for Maximum Label Application Rate of 2,4-D and 108.4 Metric Tons of Water Hyacinth Per Hectare.
Figure 12. Comparison of Computer Simulation Model Predictions with Microcosm study Observations for 2,4-D in Water. Simulations Were Conducted for Maximum Label Application Rate of 2,4-D and 108.4 Metric Tons of Water Hyacinth Per Hectare.
Figure 13. Comparison of Computer Simulation Model Predictions with Microcosm Study Observations for 2,4-D in Sediments. Simulations Were Conducted for Maximum Label Application Rate of 2,4-D and 108.4 Metric Tons of Water Hyacinth Per Hectare.
Field Validation Study

Translocation of 2,4-D into stems (rhizomes and stolons) of water hyacinth was observed in the Wallisville field validation study. The mean measured 2,4-D concentration in water hyacinth stems on day one was 0.30 mg 2,4-D per kg plant tissue wet weight. This value increased to a mean maximum of 0.64 mg/kg on day seven and declined during the rest of the study (Figure 14). These observations support Penfound and Minyard (1947) and Hitchcock et al. (1949) who report that 2,4-D is efficiently translocated from the leaves to other organs within a single individual plant of water hyacinth, but very little is transported through the connecting stolons. Concentrations of 2,4-D in roots of water hyacinth were relatively constant through time. These data are presented in Figure 15.

Figure 16 illustrates the mass of 2,4-D which was removed from plants by rinsing with water. The maximum mass of 2,4-D which was removed was 0.17 mg 2,4-D per kg plant tissue wet weight (day 1). Since this mass is only a fraction of plant tissue concentrations at the same sampling time (7.17 mg / kg) it appears that the majority of the 2,4-D had either penetrated plant tissues or been converted to the relatively water insoluble acid form.

As observed in the microcosm studies, biomass measurements in the field validation study were poor
Figure 14. 2,4-D Concentrations in Water Hyacinth Stems (Stolons and Rhizomes) During the Field Validation Study.
Figure 15. 2,4-D Concentrations in Water Hyacinth Roots During the Field Validation Study.
Figure 16. 2,4-D Removed From Water Hyacinths by Rinsing with Water (Field Validation Study).
predictors of mortality (Figure 17). For this reason, visual mortality estimates were used for model parameterization and validation.

Table 2 lists the data used for comparison of computer simulation model predictions with experimental observations for the field validation study. These comparisons are illustrated in Figures 18 and 19. Computer simulation model predictions were consistent with predictions of 2,4-D concentrations observed in plant tissues. Initial water concentrations were over predicted by the model possibly, as suggested with the microcosm study, this was due to mixing effects. Model validation was performed by regressing model predictions against observations. This relationship is illustrated in Figure 20. The $r^2$ for this regression is 0.884 indicating that the model accounted for 88% of the observed variability. The slope of predictions vs observations was not significantly different from 1.0 (0.929, p=0.373) and the intercept was not significantly different from 0.0 (0.136, p=0.274). The model predicted accurately what was actually observed in the Wallisville study and should be considered validated. The next level of model validation and modification must come from feedback from actual field operations (Reinert et al. 1986).
Figure 17. Change in Plant Biomass Measured During the Field Validation Study.
Table II. Data used for field study simulations. The values listed here are those used in the simulations illustrated in Figures 18 and 19. The symbol '*' in indicates that process is insignificant for the compound.

<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
<td>Average Depth of area to be Treated (meters)</td>
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<td>This study</td>
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<td>Water Flow Rate From Treated Area (meters/min.)</td>
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<td>This study</td>
</tr>
<tr>
<td>Total Suspended Solids in Water (mg/l)</td>
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<td>Clifford, et al. 1988</td>
</tr>
<tr>
<td>Depth of Active Sediment Layer (cm)</td>
<td>0.00</td>
<td>Clifford, et al. 1988</td>
</tr>
<tr>
<td>Sediment Water Content (%)</td>
<td>0.00</td>
<td>Clifford, et al. 1988</td>
</tr>
<tr>
<td>Sediment/Herbicide Diffusion Exchange Rate (cm/day)</td>
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<td>Reinert and Rodgers,1986</td>
</tr>
<tr>
<td>Sedimentation Rate (cm/Year)</td>
<td>0.00</td>
<td>Clifford, et al. 1988</td>
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<tr>
<td>Sediment Resuspension Rate (cm/Year)</td>
<td>0.00</td>
<td>Clifford, et al. 1988</td>
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<td>Herbicide label</td>
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<tr>
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<td>Herbicide label</td>
</tr>
<tr>
<td>Loss of Herbicide Due to Drift (%)</td>
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<td>--</td>
</tr>
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<td>Herbicide Sediment Layer Partition Coefficient (Kp)</td>
<td>0.0</td>
<td>Reinert and Rodgers,1987</td>
</tr>
<tr>
<td>Herbicide Hydrolysis Halflife in Water (days)</td>
<td>*</td>
<td>Reinert and Rodgers,1987</td>
</tr>
<tr>
<td>Herbicide Hydrolysis Halflife in Sediment (days)</td>
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<tr>
<td>Herbicide Oxidation Halflife in Water (days)</td>
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<td>Reinert and Rodgers,1987</td>
</tr>
<tr>
<td>Herbicide Oxidation Halflife in Sediment (days)</td>
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<td>Reinert and Rodgers,1987</td>
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<td>Herbicide Biotransformation Halflife in Sediment (days)</td>
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<tr>
<td>Herbicide Photolysis Halflife in Water (days)</td>
<td>*</td>
<td>Reinert and Rodgers,1987</td>
</tr>
<tr>
<td>Herbicide Volatilization Halflife in Water (days)</td>
<td>*</td>
<td>Reinert and Rodgers,1987</td>
</tr>
<tr>
<td>Percent Interception at This Plant Density</td>
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<td>Plant Biomass to be Treated (metric tons/hectare)</td>
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</tr>
<tr>
<td>Percent Dry Weight of Plant Tissue</td>
<td>7.84</td>
<td>This study</td>
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</table>
Figure 18. Comparison of Computer Simulation Model Predictions with Field Validation Study Observations for 2,4-D in Tissues of Water Hyacinth. Sediment Parameters Were Assigned Values of Zero Since No Sediment Samples Were Obtained During The Study.
Figure 19. Comparison of Computer Simulation Model Predictions with Field Validation Study Observations for 2,4-D in Water. Sediment Parameters Were Assigned Values of Zero Since No Sediment Samples Were Obtained During The Study.
Figure 20. Computer Simulation Model Validation by Comparison of Predictions with Observations. The 45° Degree Line is the Line of Perfect Prediction.
The Computer Simulation Model

A flowchart for the model is illustrated in Figure 21 and the BASIC source code is listed in Appendix B. This computer simulation model is a valuable tool for predicting the effects of herbicides on target aquatic plant populations and supporting decisions made by trained management personnel. The model is not however, designed to make decisions regarding the use of herbicides for aquatic plant control, only to support them. Mathematical models are subject to predictive errors due either to design flaws (elements not considered by the programmer) or a failure to accurately reflect the complex nature of the system(s) being modeled. Although the data entered by the user may be the most accurate available, the model may incorrectly predict what actually occurs in the real world because of the complex nature of natural situations. Users are strongly cautioned to be aware that this model is only a decision support tool and should not be used to make decisions, only to support them. This model is not intended to be a substitute for common sense and professional training but, if used in combination with these, it can be a useful investigative tool.

One of the primary results of this modeling effort was identification of gaps in understanding of the processes affecting the effective use of herbicides for control of
Figure 21. Generalized Flow Chart of The Coupled Herbicide Fate and Target Plant Population Response Model.
aquatic plants, specifically 2,4-D and water hyacinth. Model development forced close examination of available information and experimentation to derive relationships not described in the literature on the subject. Although the model itself is a valuable product as it can be a powerful predictive tool if used properly, the modeling effort generated some of the information needed to close the identified information gaps. Further modeling efforts to expand the current model to other herbicides and target plant populations can be expected to identify other information gaps and promote the research necessary to close these gaps. If for no reason other than this, this modeling effort was a success.

Model Structure

The computer simulation model is organized into three modules. The functions of Module I are: 1) selection of herbicide, 2) selection of target plant species, 3) data management, and 4) estimation of the fate and persistence of herbicides in aquatic environments. The function of Module II is estimation of the effect of herbicides on target plant species (in terms of percent control). The function of Module III is estimation of population response of target plant population following herbicide application.

Critical factors that were considered in the herbicide fate portion of the model (Module I) are transfer and
transformation of 2,4-D in the various media through which the herbicide may pass in reaching the target plants. In this case, transfer through both air and water were considered. The model is driven by the assumption that the target plant population must receive a certain "dose" or exposure (tissue concentration X time) in order to elicit the desired population response.

Efficiencies for each transfer (and sorption) and rate coefficients for transformations (biotransformation, photolysis, hydrolysis, etc.) are included in the calculations and the dose received by the macrophytes is calculated using a "mass balance" approach. This approach allows considerations such as "back calculation" to estimate minimum required initial concentrations as well as estimation of consequences of a particular concentration in a site specific situation.

The effects of herbicide treatment on the target plant population (Module II) are estimated by mathematical relationships which were developed from the data obtained in microcosm experiments (Figures 9 and 10). This Module estimates the percent reduction in the plant population and this estimate is passed along Module III (population response).

The target species response portion of the model (Module III) includes seasonal growth dynamics of water
Module I - Fate of Herbicides

Once a herbicide has been introduced into an aquatic system, the herbicide becomes distributed among various compartments of the system such as water, sediments and plants. The amount of herbicide to which a target plant population is exposed may be directly influenced by this compartmentalization. For instance, removal of herbicide from the water by processes resulting in sorption of the herbicide to sediments is one way that herbicide may be removed from direct contact with the target plant population. In addition to compartmentalization, target plant population exposure to a herbicide is not constant over time even if the herbicide is a conservative (usually inorganic) compound such as some of the copper complexes. Various processes affect the conversion of herbicides from the original parent compound to any of a number of intermediate compounds or degradation products, ultimately resulting in degradation of the compound to inert materials.
Some of the chemical and biochemical processes which drive transformations are: hydrolysis, oxidation, photolysis, volatilization, and biotransformation. Physical processes also affect the exposure of target plant species to herbicides. Some of these are: retention time, loss due to drift prior to herbicide interception by plants or introduction to the water, and rate of release of active ingredients from the herbicide formulation to the water. For this reason, exposure of target plant species to a herbicide in this model has been defined as the area under the curve of herbicide concentration vs. time and, to estimate this, an understanding of the fate and persistence of the herbicide is required. This exposure estimate is passed from Module I to Module II (effects) and consists of the total exposure of target plant species to the herbicide in terms of herbicide concentration vs. time or, mg 2,4-D per kg plant tissue wet weight times days (mg/kg-days).

The mass-balance and conservation of matter approach has been applied to herbicide compartmentalization and persistence in this model. The first step in the mass-balance calculation is determination of the masses of each component of the system. For the purposes of these calculations, a one hectare "window" is assumed. The mass of the water compartment is calculated from water depth and area. The mass of the plant (water hyacinth) component is a
user entered value. The mass of total suspended solids is calculated as mg/1 of suspended solids times system volume. The masses of sediments and sediment interstitial water are calculated from volume of sediments and depth of "active" sediment layer. The mass of sediments is estimated from this based on a relationship between sediment volume and mass developed from data on reservoir sediments (Rodgers and Clifford, 1985). The relationship is:

\[
\text{sediment density (grams dry weight/cubic centimeter)} = -1.441 \times \left(\frac{\% \text{water}}{100}\right) + 2.188 \tag{1}\n\]

\(N = 125, r\text{-square} = 0.83, p < 0.001\)

The mass of interstitial water is calculated by subtraction of volume of sediment solids from sediment volume.

Mass of herbicide applied is calculated from application rate and active ingredient fraction less the amount lost to spray drift. Once the masses of all components of the system have been calculated, the next step is accounting for relative partition concentrations. The "effective mass" of each compartment is estimated by multiplying compartment mass and partition coefficient for each compartment, where the partition coefficient is defined as the concentration in a given compartment relative to the concentration of the herbicide in water. Therefore, the partition coefficient for water is, by definition, always equal to one. The reasoning behind the calculation of "effective masses" is that
mathematically, one unit of mass with a partition coefficient of two (for example) is equivalent to two units of mass with a partition coefficient of one. Once the "effective mass" has been calculated, each compartment has a "relative" partition coefficient of 1.0 and the compartments are now mathematically comparable. The sum of the effective masses of all compartments is the "effective mass" of the system. Division of the effective mass of a compartment by the effective mass of the system yields a fractional value which, when multiplied by the mass of herbicide in the system at that particular time, yields the mass of herbicide which would be present in that compartment at any time (assuming that the compartments are all in instantaneous equilibrium). In the case of water hyacinth, the plant compartment is uncoupled from the rest of the system and mass of herbicide in plants is calculated from percent interception. The concentration of herbicide in a given compartment is then readily calculated as mass of herbicide in the compartment divided by actual compartment mass.

Once equilibrium calculations have been performed for a given time interval, the mass of herbicide in the system is decremented by various fate processes rates through time. The mass of herbicide in each compartment is then calculated as described above.
The removal of herbicide from contact with the target plant population by the physical factors of herbicide transfer between the suspended solids and sediment compartments (by sedimentation and resuspension) and, water flow from the treated area, is then calculated. The calculations for sedimentation and resuspension modify the effective mass of the sediment compartment so that when the equilibrium calculations are performed for the next time interval, herbicide mass is shifted into or out of the sediment compartment. Suspended solids are considered to remain constant throughout the period even if net sedimentation is not zero. Water flow from the area is calculated by assuming that the area (a one hectare window) is square and the water is flowing from one side to the other. The amount of herbicide lost due to flow is calculated from the concentration in water times the amount of water lost per unit time, where the amount of water lost per unit time is the water flow rate (distance) divided by the time interval.

The final step in the herbicide fate calculations is estimation of exposure of the target plant species to herbicide. The area under the curve of herbicide concentration through time is calculated by mathematically determining the sum of the areas of each time increment under the plant tissue concentration curve.
This value (mg/kg-days) is then passed to Module II (effects).

Module II - Effects (Response) on Target Plant Species

The output from Module I (exposure, mg/kg-days) is passed to Module II as well as information regarding the display units selected, species selected, and other parameters required for the operation of the module. The function of this module is estimation of the degree of control of the target plant species obtained based upon exposure to the herbicide. This degree of control is estimated mathematically from the relationship illustrated in Figure 10. The maximum percent control currently allowed by the model is 98.0%. This allows sufficient remaining biomass to drive simulation of the regrowth of the population after herbicide treatment.

The output from this module is a plot of exposure (mg/kg-days) vs. percent control (mortality). The control achieved is indicated graphically and its numerical value is reported. The percent control achieved, initial plant density, mathematical units and other variables required for the operation of Module III are then passed to that module.
Module III - Population Response

Currently, the version of Module III available is for water hyacinth (*Eichhornia crassipes*). This module was adapted from the program written by Howell *et al.* (1987). The portions of this program that were adapted for use in Module III were those that deal with the growth of water hyacinth. Several routines that were added are: 1) multi-year operation and date entry, 2) cursor-driven weather data set selection, 3) graphic output of plant response, 4) printer or screen numerical output selection, 5) error trap routines, and 6) conversion of plant mass from kg/m² dry weight to tons/acre or metric tons/hectare wet weight. Further documentation on the operation and validation of this module can be obtained from the documentation report by Howell *et al.* (1987).

Conclusions

1) The primary route of exposure of water hyacinth to 2,4-D appears to be via contact of the emergent portions of the plants with concentrated sprays (hypotheses 1,2,3,4).

2) The concentration of 2,4-D in tissues of water hyacinth required to elicit a maximum mortality response is approximately 12 mg/kg plant wet weight (hypothesis 1).

3) The maximum observed plant mortality in both microcosm and field experiments was approximately 98% (hypothesis 1).
4) The observed half-life of 2,4-D in water was approximately 2.5 days in microcosm experiments and 6 days in the Wallisville field study.

5) Degree of interception of 2,4-D by water hyacinths as a function of plant density does play a role in achieved control of water hyacinth with 2,4-D (hypothesis 5).

6) The current version of the computer simulation model was validated using data from the microcosm and Wallisville, Texas field studies (hypothesis 6).

7) Plant tissue percent dry weight was determined to be 7.84% ± 4.96 (mean and standard deviation, N=41) and sediment percent dry weight was determined to be 75.82 ± 3.27 (N=77) in these experiments.

8) Computer simulation modeling is a valuable technique both for management decision support and identification of information gaps.
APPENDIX A

2,4-D ANALYTICAL PROTOCOL
Introduction:

This protocol was adapted from Rocchio (1988), Knapp (1979), and Moses (1985). The analytical method for 2,4-D (DMA) is based on the aqueous derivatization of 2,4-D using methanol and HCl. The methyl ester of 2,4-D (2,4-D-Me) is then analyzed on a gas-liquid chromatograph (Tracor 560) using an ECD. The column currently in use is a fused silica capillary column (SPB-5 packing material, 0.53 mm id, 15 meter length, Supelco # 2-5304). The carrier gas is nitrogen at a flow rate of 15.0 ml/min. The injection temperature is 225 °C, oven temperature is 158 °C, and the detector temperature is 300 °C. The syringe is pre-rinsed with pesticide-grade n-hexane. Injection volumes are 2.0 microliters.

Required Materials:

The materials listed below are for single samples.

Water Samples:

1) 4 ml sample.
2) Tissue culture tube.
3) 5 ml reagent-grade methanol.
4) 1.25 ml conc. HCl.
5) 60 °C waterbath.
6) 2 ml pesticide-grade n-hexane.
7) Vortexer.

Plant and Sediment Samples:

1) 30 g sample (5 for % dry weight, 25 for 2,4-D analysis).
2) Soxhlet extraction apparatus, soxhlet thimble.
3) 175 ml 0.5 N NaOH (pH > 12), boiling stones.
4) 250 ml separatory funnel.
5) 25 ml pesticide-grade pentane.
6) 50 ml reagent-grade Methanol.
7) 10 ml reagent-grade conc. HCl.
8) 6 ml pesticide-grade n-hexane.
9) 250 ml prescription bottle.

Gas Chromatograph:
1) Tracor 560 gas/liquid chromatograph or equivalent.
2) Column: Supelco # 2-5304 (fused silica capillary column, 0.53 mm id, 15 meter length, SPB-5 packing material).

Glassware Preparation:
All glassware should be rinsed with DI water with sufficient agitation to remove any particulate matter, rinsed with 10% HCl, rinsed again with DI water, rinsed with acetone, again with DI water and finally with pesticide-grade hexane. These steps are necessary to remove all contaminating organics which might otherwise be carried through the digestion/extraction process.

Sample Preparation:

Water Sample Preparation:
1) Water samples should be collected in acid-washed containers and placed on ice or stored frozen prior to analysis.
2) Place 4 ml of sample in a tissue culture tube.
3) Add 5 ml reagent-grade methanol and 1.25 ml reagent-grade conc. HCl (addition order must be observed). Incubate in waterbath at 60 °C for 18-24 hours. Be sure to exclude light.
4) Add 2 ml pesticide-grade n-hexane.
5) Immediately prior to GC analysis, vortex sample for 5 minutes.
6) Analyze the hexane layer with GC.

Plant and Sediment Sample Preparation:
1) Plant and sediment samples may be frozen prior to analysis.
2) For sediment samples, a cellulose fiber soxhlet thimble **MUST** be used because the sediment may plug the glass frits on the bottom of glass thimbles and the apparatus may fail to cycle. A bed (0.5 cm) of boiling chips under the tube will ensure that the tube does not block the siphon outlet as it swells during the extraction process. For plant samples, a glass soxhlet thimble lined with glass wool is recommended.

3) Place 25 g wet sediment (or plant material ground in a mortar and pestle) into the thimble. Retain another 5 g sediment (or plants) for determination of percent dry weight (by drying at 104 °C for 24 hours).

4) For sediment samples, Place 175 ml 0.5 N NaOH (pH > 12) (0.25 N for plants) and boiling chips into the bottom of the digestion flask and place the thimble containing the sample into the cycling tube. Seat the cycling tube and condenser into place with sufficient stop-cock grease to prevent "freezing" of the glass elements.

5) Turn on the water supply to the condenser and ensure free flow. Turn on heating mantle and monitor temperature until a smooth boil is attained. Refluxing requires approximately 5 hours. The refluxing time is determined by a minimum of three "cycles". A "cycle" begins when the condenser begins to drip and terminates when the self-priming syphon on the cycling tube draws the extract back into the digestion flask.

6) The extract may be stored at 4 °C in the dark at this point.

7) Transfer the extract to a 250 ml separatory funnel and add 25 ml pesticide-grade pentane. Shake once for 5 minutes. Allow sample to stand for 20 minutes so that the emulsion layer will dissipate. Place the aqueous layer in a 250 ml prescription bottle and discard the pentane in an appropriate waste container. This step is essentially a "clean-up" step.

8) Add 50 ml reagent-grade Methanol to the extract. Acidify the sample (pH approx. 2) with 10 ml reagent-grade conc. HCl. **NOTE:** order of reagent addition must be observed.

9) Seal container and incubate in a 60 °C waterbath in the dark for 18-24 hours.
10) Transfer the derivatized extract to a 250 ml separatory funnel and add 2 ml pesticide-grade n-hexane. Shake gently for 5 minutes. Formation of emulsion layer is not as likely at this step as it is with the pentane clean-up step but excessive agitation is unnecessary.

11) Drain aqueous layer into the 250 ml prescription bottle.

12) Collect the hexane layer in a sample vial.

13) Return prescription bottle contents to the separatory funnel and repeat steps 9-11 (2 ml hexane, shake, save hexane) twice more (this makes a total of 3 extractions at 2 ml each for a final hexane/2,4-D-me volume of 6 ml).

14) Analyze hexane extract with GC.
APPENDIX B

BASIC Source Code Listing of The Computer Simulation Model
Subroutine INSTALL

START:
  DIM A$(24,2)
  DIM A(24,1)
  DIM F$(60)
  DIM B(25)
  DIM MENU$(10)
  DIM RESULT$(10)
  DIM FILEINS$(60)
  COMMON DSKID$, A$(1), A$(2), F$(1), B$(1), TYPES$(1), DIRECT$(1), UNITS$(1)
  COMMON PMMDAYS, INITBIOM, DIR$, SPECNAMES$(1), PERD$(1)
  COMMON CHEMNAME$, PRNTPLACE$, LINK$, PPATH$, DPATH$(1)
  COMMON MENU$(1), MAXITEM, RESULT$(1), TITLES$(1), COUNT, CURBICM
  LINKS$ = "INSTALL"
  ON ERROR GOTO TRAP
  SCREEN 0,1,0,0
  OPEN "A:\DSKID.CHR" FOR INPUT AS #1
  INPUT #1, DSKID$
  CLOSE #1
  IF DSKID$ = "BOOT" OR DSKID$ = "HD" THEN GOTO BEGIN
  CLS
  LOCATE 12,15,0
  PRINT "Please Place Boot Disk in Drive A:"
  LOCATE 14,15,0
  PRINT "and Press Any Key to Continue"

  CHKCHOOSE:
    SEL$=INKEY$
    IF SEL$="" THEN GOTO CHKCHOOSE
    GOTO START

BEGIN:
  OPEN "A:\CONFIG.HRF" FOR INPUT AS #1
  INPUT #1, PPATH$, DPATH$
  CLOSE
  COLOR 14,1
  CLS
  LOCATE 4,21,0
  PRINT "Current Program Configuration is:"
  LOCATE 6,12,0
  PRINT "Program Disks are to be Run From Disk Drive "; PPATH$
  LOCATE 7,18,0
  PRINT "Data is to be Stored on Disk Drive "; DPATH$
  LOCATE 12,5,0
  PRINT "Would You Like to Install This Program on Hard Disk?"
  LOCATE 15,5,0
  PRINT "Yes  No"
  LOCATE 22,15,0
  PRINT "MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
  LOCATE 23,22,0
  PRINT "(USE ARROW KEYS "; CHR$(24); CHR$(26); CHR$(25); CHR$(27);"
PRINT "J TO MOVE CURSOR"
LOCATE 15,21,0
COLOR 19
PRINT CHR$(178)
CHOICES$="T"
DEF SEG=0:ROKE 1050,PEEK(1052)

CHOOSE:
CURSOR$=INKEY$
IF CURSOR$="" THEN GOTO CHOOSE
CURSOR$=RIGHT$(CURSOR$,1)
IF CURSOR$=CHR$(13) THEN GOTO CH0SEN2
IF CURSOR$=CHR$(77) THEN GOTO N02
IF CURSOR$=CHR$(75) THEN GOTO YES2
GOTO CHOOSE

YES2:
LOCATE 15,46,0
PRINT" 
LOCATE 15,21,0
PRINT CHR$(178)
CHOICE$="Y"
GOTO CHOOSE

N02:
LOCATE 15,21,0
PRINT" 
LOCATE 15,46,0
PRINT CHR$(178)
CHOICE$="N"
GOTO CHOOSE

CH0SEN2:
IF CHOICE$="N" THEN GOTO EXITINSTAL
IF CHOICE$ <> "Y" THEN GOTO BEGIN

BEGININSTAL:
COLOR 14,1
CLS
LOCATE 12,10,0
PRINT "Please Type the Letter of Your Hard Drive. Select"
LOCATE 13,10,0
PRINT "Carefully, an Invalid Drive Letter Will Not Damage the"
LOCATE 14,10,0
PRINT "Program but, Proper Installation Will Fail."
LOCATE 16,20,0
PRINT "=>";

CHOOSEHD:
SELS$ = INKEY$
IF SELS$ = "" THEN GOTO CHOOSEHD
IF ASC(SELS$) < 64 THEN INPUT "USE LETTERS ONLY, PRESS <ENTER>";X$
IF ASCII(SEL$) < 64 THEN GOTO BEGININSTAL
IF ASCII(SEL$) > 71 AND ASCII(SEL$) < 97 THEN INPUT "INVALID, PRESS <ENTER>";X$
IF ASCII(SEL$) > 71 AND ASCII(SEL$) < 97 THEN GOTO BEGININSTAL
IF ASCII(SEL$) > 102 THEN INPUT "INVALID, PRESS <ENTER>";X$
IF ASCII(SEL$) > 102 THEN GOTO BEGININSTAL
PPATH$ = SEL$ + ":\"
PRINT SEL$
FOR I = 1 TO 500: NEXT I

CHOOSEDIRECT:
CLS
LOCATE 10,15,0
PRINT "Enter Name of Directory (up to eight letters)"
LOCATE 11,15,0
PRINT "in Which to install HERBICIDE Program"

CHOOSEHD2:
LOCATE 12,15,0
INPUT"====";DIRECT$
FOR K = 1 TO LEN(DIRECT$)
  IF K = 9 THEN DIRECT$ = LEFT$(DIRECT$,8):GOTO ENDK
  IF MID$(DIRECT$,K,1) = "." THEN DIRECT$ = LEFT$(DIRECT$,K-1): GOTO ENDK
ENDK:
NEXT K
TEMPFILE$ = ""
FOR K = 1 TO LEN(DIRECT$)
  TEMPCHAR = ASCII(MID$(DIRECT$,K,1))
  IF TEMPCHAR < 48 THEN GOTO ANOTHERK
  IF TEMPCHAR > 57 AND TEMPCHAR < 64 THEN GOTO ANOTHERK
  IF TEMPCHAR > 90 AND TEMPCHAR < 97 THEN GOTO ANOTHERK
  IF TEMPCHAR > 122 THEN GOTO ANOTHERK
  TEMPFILE$ = TEMPFILE$ + CHR$(TEMPCHAR)
ANOTHERK:
NEXT K
DIRECT$ = TEMPFILE$
IF DIRECT$ = "" THEN GOTO CHOOSEDIRECT
LOCATE 13,15,0
PRINT "SELECTION IS: ";PPATH$ + DIRECT$
LOCATE 14,10,0
INPUT "If this is Correct, Press <ENTER>, if not, Type: N";X$
IF X$ = "N" OR X$ = "n" THEN GOTO BEGININSTAL
CLS
LOCATE 1,1,0
PRINT "MAKING DIRECTORIES"
SHELL "MD \HYACINTH"
SHELL "MD \HYacinTH\24DDMA"
SHELL "MD \HYAcINTH\24DDMA DEFAULT"
LOCATE 1,1,0
PRINT "COPYING FILES"
SHELL "COPY A:HERBICID.EXE \PPATH$ + DIRECT$"
SHELL "COPY A:INITIAL. PIC \PPATH$ + DIRECT$"
SHELL "COPY A:HDPROG.BAT" + PPATH$ + DIRECT$ + "\H.BAT"

DISK1:

CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk I in Drive A:"
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"
OPEN "A:DSKID.CHK" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = "PROG1" THEN GOTO CONTINSTAL

CHK:
SEL$=INKEY$
IF SEL$="" THEN GOTO CHK
GOTO DISK1

CONTINSTAL:

CLS
LOCATE 1,1,0
PRINT "COPYING FILES"
SHELL "COPY A:*.*" + PPATH$ + DIRECT$

DISK2:

CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk for Hyacinth in Drive A:"
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"
OPEN "A:DSKID.CHK" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = "HYACINTH" THEN GOTO CONTINSTAL2

CHK2:
SEL$=INKEY$
IF SEL$="" THEN GOTO CHK2
GOTO DISK2

CONTINSTAL2:

CLS
LOCATE 1,1,0
PRINT "COPYING FILES"
SHELL "COPY A:*.*" + PPATH$ + DIRECT$

DATADISK:

CLS
LOCATE 12,15,0
PRINT "Please Place Data Disk for Hyacinth and 2,4-D in Drive A:"
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"
OPEN "A:DSKID.CHK" FOR INPUT AS #1
INPUT #1,D$KID$
CLOSE #1
IF D$KID$ = "DATA" THEN GOTO CONTINSTAL3

CHK3:
   SEL$=INKEY$
   IF SEL$="" THEN GOTO CHK3
   GOTO DATADISK

CONTINSTAL3:
   CLS
   LOCATE 1,1,0
   PRINT "COPYING FILES"
   COMM1$ = "A:\HYACINTH\*."
   COMM2$ = PPATH$ + DIRECT$ + "\HYACINTH"
   SHELL "COPY " + COMM1$ + " " + COMM2$
   CLS
   LOCATE 1,1,0
   PRINT "COPYING FILES"
   COMM1$ = "A:\HYACINTH\24DMA\*."
   COMM2$ = PPATH$ + DIRECT$ + "\HYACINTH\24DMA"
   SHELL "COPY " + COMM1$ + " " + COMM2$
   CLS
   LOCATE 1,1,0
   PRINT "COPYING FILES"
   COMM1$ = "A:\HYACINTH\24DMA\DEFAULT\*."
   COMM2$ = PPATH$ + DIRECT$ + "\HYACINTH\24DMA\DEFAULT"
   SHELL "COPY " + COMM1$ + " " + COMM2$
   OPEN PPATH$ + DIRECT$ + "\DSKID.CHK" FOR OUTPUT AS #1
   WRITE #1,"HD"
   CLOSE
   OPEN PPATH$ + DIRECT$ + "\CONFIG.HKB" FOR OUTPUT AS #1
   WRITE #1,PPATH$ + DIRECT$ + ""
   WRITE #1,PPATH$ + DIRECT$ + ""
   CLOSE
   CLS
   LOCATE 10,1,0
   PRINT "Installation Complete, Press <ENTER> to Exit Install Program"
   PRINT
   PRINT "To Run Herbicide, Type: CD ";DIRECT$;
   PRINT "From the ";PPATH$;" Prompt Then Type: H "
   PRINT
   INPUT " =>";X$
   COLOR 7,0
   CLS
   SHELL PPATH$
   SYSTEM

EXITINSTAL:
   COLOR 14,1
   CLS
   LOCATE 10,1,0
Installation Aborted. Press <ENTER> to Exit Install Program

INPUT " ==>","X$
COLOR 7,0
CLS
SYSTEM

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT " ";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "
"
DEF SEG=0:POKE 1050,PEEK(1052)
KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:";
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
   IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
   IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
   IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
   IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
   IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
   IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER",ERR," OCCURRED IN SUB-Routine: ";LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN

PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN
CLS
RESUME START

Subroutine HERBICID

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENUS(10)
DIM RESULT$(10)
COMMON DSKID$, A$(,), A(), F$(,), B(), TYPE$, DIRECT$, UNITS$
COMMON PPMDAYS, INITBIOM, DIR$, SPECNAME$, PERDNY
COMMON CHEMNAME$, PRNTPLACES$, LINK$, PPPATH$, DPATH$
COMMON MENUS$(,), MAXITEM, RESULT$(,), TITLES, COUNT, CURBIOM
LINK$ = "HERBICID"
ON ERROR GOTO TRAP

INIT:
SCREEN 1
COLOR 7,1,0
OPEN "CONFIG.HRE" FOR INPUT AS #1
INPUT #1, PPPATH$, DPATH$
CLOSE
DEF SEG=HB400
BLOAD PPPATH$ + "INITIAL.PIC", 0

MENU:
MAXITEM = 4
MENUS$1) = "1. Instructions & Help"
MENUS$2) = "2. Issue a DOS Command"
MENUS$3) = "3. Begin HERBICIDE Program"
MENUS$4) = "4. Exit HERBICIDE Program"
RESULT$(1) = "HELP1"
RESULT$(2) = "DOSCOM"
RESULT$(3) = "SELECT"
RESULT$(4) = "QUIT"
CHOOSE:
   SEL$=INKEY$
   IF SEL$="" THEN GOTO CHOOSE
   CLOSE

DISK1:
   SCREEN 2
   SCREEN 0,1,0,0
   COLOR 14,1
   CLS
   OPEN "DSKID.CHK" FOR INPUT AS #1
   INPUT #1,DSKID$
   CLOSE #1
   IF DSKID$ = "PROG1" OR DSKID$ = "HD" THEN CHAIN PPATH$ + "MENU"
   LOCATE 12,15,0
   PRINT "Please Place Program Disk I in Drive A:"
   LOCATE 14,15,0
   PRINT "and Press Any Key to Continue"

   CHK:
      SEL$=INKEY$
      IF SEL$="" THEN GOTO CHK
      GOTO DISK1

TRAP:
   SCREEN 2
   SCREEN 0,1,0,0
   COLOR 7,1
   CLS
   PRINT "";TAB(30);"ERROR INFORMATION"
   COLOR 14,1
   PRINT "
   DBF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
   IF ERR < 24 THEN GOTO UNKNOWN
   IF ERR = 26 THEN GOTO UNKNOWN
   IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
   IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
   IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
   IF ERR = 69 THEN GOTO UNKNOWN
   IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
   IF ERR > 76 THEN GOTO UNKNOWN
   LOCATE 8,10,0
   PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
   LOCATE 10,5,0
   IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
      IF ERR = 24 THEN PRINT "OR PLUGGED IN"
   IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
   IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
  IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
  IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
  IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
  IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
  IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE

UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER";ERR;" OCCURRED IN SUB-Routine: ";LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN

PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN
CLS
RESUME START

Subroutine MENU1

START:
  DIM A$(24,2)
  DIM A(24,1)
  DIM F$(60)
  DIM B(25)
  DIM MENU$(10)
  DIM RESULT$(10)
  COMMON DSK1D$;A$(,A(),F$(,)B(),TYPE$;DIRECT$,UNIT$(
  COMMON PMDCAYS;INIT$;DIR$;SPEC$NAME$;PER$D$;
  COMMON CHE$;PATH$;LINK$;PATH$;DEATH$
  COMMON MENU$();MAX$(RESULT$());TITLE$;COUNT;CURBOM
  LINK$ = "MENU1"
  KEY(1) ON
ON KEY(1) GOSUB HELP
ON ERROR GOTO TRAP
SCREEN 0,1,0,0
COLOR 4,1,6
IF DSKID$ = "HD" THEN GOTO ALLOCATE
OPEN PPATH$ + "DSKID.CHK?" FOR INPUT AS #1
INPUT #1, DSKID$
CLOSE #1
IF DSKID$ = "PROG1" OR DSKID$ = "HD" THEN GOTO ALLOCATE
CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive "; PPATH$
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"

CHKCHOOSE:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO CHKCHOOSE
GOTO START

ALLOCATE:
'****************************** # MENU ITEMS AND ******************************
'****************************** HIGHLIGHT ALLOCATION ******************************
MENU$(1) = "1. Waterhyacinth and 2,4-D (DMA)"
MENU$(2) = "2. Help and Instructions"
MENU$(3) = "3. Exit HERBICIDE Program"
RESULT$(1) = "INPUT"
RESULT$(2) = "HELP1"
RESULT$(3) = "QUIT"
MAXITEM = 3
TITLE$ = " Select Target Plant Species and Herbicide"
MINITEM = 1
MINHIGH = 5
MAXHIGH = MINHIGH + (2 * MAXITEM) - 2
COUNT = MINITEM
HIGHPOS = MINHIGH
GOTO SETUP

DONE:
IF COUNT <> 1 THEN GOTO CHOICE TWO
DIRECT$ = "HYACINTH"
DIR$ = "\24DDMA"
SPECNAME$ = "Waterhyacinth"
CHEMNAME$ = "2,4-D (DMA)"
TYPE$ = "FLOATING"

CHOICE TWO:
IF COUNT <> 2 THEN GOTO CHOICETHREE
DIRECT$ = "MILFOIL"
DIR$ = "ENOTHAL"
SPECNAME$ = "Milfoil"
CHEMNAME$ = "Endothall"
TYPE$ = "SUBMERGED"
CHOICETHREE:

CHAIN EPATH$ + RESULT$(COUNT)

SETUP:
COLOR 10,1,6
CLS
COLOR 4,7,6
LOCATE 1,1,0
PRINT "":"TAB(80) " "
LOCATE 2,1,0
PRINT "":"TAB(80) " "
LOCATE 3,1,0
PRINT "":"TAB(80) " "
LOCATE 1,1,0
PRINT TITLE$
LOCATE 2,18,0
PRINT"use arrow keys [";CHR$(24);
PRINT CHR$(25);"] to highlight selection"
LOCATE 3,24,0
PRINT"press <ENTER> to make selection"
COLOR 4,2,6
LOCATE 25,1,0
PRINT "":"TAB(80) " "
LOCATE 25,25,0
PRINT "PRESS <F1> FOR HELP AT ANY TIME";
COLOR 1,10,6
LOCATE 5,20,0
PRINT MENU$(1)
COLOR 10,1,6
FOR I = 2 TO MAXITEM
  LOCATE 3+(I*2),20,0
  PRINT MENU$(I)
NEXT I
GOTO COUNTCHECK

COUNTCHECK:
DEF SDG=0:POKE 1050,PEEK(1052)
IF COUNT < MINITEM THEN COUNT = MINITEM
IF COUNT > MAXITEM THEN COUNT = MAXITEM
IF HIGHPOS < MINHIGH THEN HIGHPOS = MINHIGH
IF HIGHPOS > MAXHIGH THEN HIGHPOS = MAXHIGH
GOTO REPEAT

REPEAT:
HIGHLITE$ = INKEY$
IF HIGHLITE$ = "" THEN GOTO REPEAT
HIGHLITE$ = RIGHT$(HIGHLITE$,1)
IF HIGHLITE$ = CHR$(13) THEN GOTO DONE
IF HIGHLITE$ = "P" THEN GOTO DOWN
IF HIGHLITE$ = "P" THEN GOTO UP
GOTO REPEAT
DOWN:
    IF COUNT = MAXITEM THEN GOTO TOPAGAIN
    COUNT = (HIGHPOS-3)/2
    GOTO DOWNONE

DOWNONE:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = HIGHPOS + 2
    COLOR 1,10,6
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT+1)
    COLOR 10,1,6
    COUNT = COUNT+1
    GOTO COUNTCHECK

TOPAGAIN:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = MINHIGH - 2
    COUNT = MINITEM + 1
    GOTO UPONE

UP:
    IF COUNT = MINITEM THEN GOTO BOTTOMAGAIN
    COUNT = (HIGHPOS-3)/2
    GOTO UPONE

UPONE:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = HIGHPOS - 2
    COLOR 1,10,6
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT-1)
    COLOR 10,1,6
    COUNT = COUNT-1
    GOTO COUNTCHECK

BOTTOMAGAIN:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = MAXHIGH - 2
    COUNT = MAXITEM - 1
    GOTO DOWNONE

HELP:
    CHAIN PPATH$ + "HELP1"

TRAP:
    SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT """:TAB(30):""ERROR INFORMATION"
COLOR 14,1
PRINT """:TAB(10):""PRINT """:TAB(30):""ERROR INFORMATION"
PRINT """:TAB(10):""DEF SEG=0:POKE 1050,PEEK(1052)
KNOW:
  IF ERR < 24 THEN GOTO UNKNOWN
  IF ERR = 26 THEN GOTO UNKNOWN
  IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
  IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
  IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
  IF ERR = 69 THEN GOTO UNKNOWN
  IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
  IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:";
LOCATE 10,5,0
  IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
  IF ERR = 24 THEN PRINT "OR PLUGGED IN";
  IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
  IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
  IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE"
  IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
  IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
    IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
    IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
  IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
  IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
  IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER":ERR," OCCURRED IN SUB-Routine: ";LINKS
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN:
  SEL$ = INKEY$
  IF SEL$ = "" THEN GOTO SCAN
  CLS
  RESUME START

START:
  DIM A$(24,2)
  DIM A(24,1)
  DIM F$(60)
  DIM B(25)
  DIM MENUS$(10)
  DIM RESULTS$(10)
  COMMON DSKID$,A$(,),A(,),F$(,),B(,),TYPE$(,),DIRECT$(,),UNIT$(,)
  COMMON PPMDAYS,INITBICM,DIR$(,),SPECNAME$(,),PENDRY
  COMMON CHEMNAMES$(,),PRETPLACE$(,),LINK$(,),PATH$(,),PATH$(,)
  COMMON MENUS$(,),MAXITEM,RESULTS$(,),TITLES$(,),COUNT,$CURBICM
  LINK$( = "MENU"
  KEY(1) ON
  ON KEY(1) GOSUB HELP
  ON ERROR GOTO TRAP
  SCREEN 0,1,0,0
  COLOR 4,1,6
  IF DSKID$ = "HD" THEN GOTO ALLOCATE
  OPEN PPATH$ + "DSKID.CHF?" FOR INPUT AS #1
  INPUT #1,DSKID$
  CLOSE #1
  IF DSKID$ = "PROG1" OR DSKID$ = "HD" THEN GOTO ALLOCATE
  CLS
  LOCATE 12,15,0
  PRINT"Please Place Program Disk 1 in Drive "; PPATH$
  LOCATE 14,15,0
  PRINT"and Press Any Key to Continue"

CHRCHOOSE:
  SEL$ = INKEY$
  IF SEL$ = "" THEN GOTO CHRCHOOSE
  GOTO START

ALLOCATE:
  '******************************************************************************* # MENU ITEMS AND *******************************************************************************
  '******************************************************************************* HIGHLIGHT ALLOCATION *******************************************************************************
  MINITEM = 1
  MINHIGH = 5
  MAXHIGH = MINHIGH + (2 * MAXITEM) - 2
  COUNT = MINITEM
  HIGHPOS = MINHIGH
  GOTO SETUP
DONE:
    CHAIN PPA$ + RESULT$ (COUNT)

SETUP:
    COLOR 10,1,6
    CLS
    COLOR 4,7,6
    LOCATE 1,1,0
    PRINT " ";TAB(80) " "
    LOCATE 2,1,0
    PRINT " ";TAB(80) " "
    LOCATE 3,1,0
    PRINT " ";TAB(80) " "
    LOCATE 1,1,0
    PRINT TITLE$
    LOCATE 2,18,0
    PRINT "use arrow keys [";CHR$(24);CHR$(25);"] to highlight selection"
    LOCATE 3,24,0
    PRINT "press <ENTER> to make selection"
    COLOR 4,2,6
    LOCATE 25,1,0
    PRINT " ";TAB(80) " "
    LOCATE 25,25,0
    PRINT "PRESS <F1> FOR HELP AT ANY TIME";
    COLOR 1,10,6
    LOCATE 5,20,0
    PRINT MENU$(1)
    COLOR 10,1,6
    FOR I = 2 TO MAXITEM
        LOCATE 3+(I*2),20,0
        PRINT MENU$(I)
    NEXT I
    GOTO COUNTCHECK

COUNTCHECK:
    DEF SEG=0:POKE 1050,PEEK(1052)
    IF COUNT < MINITEM THEN COUNT = MINITEM
    IF COUNT > MAXITEM THEN COUNT = MAXITEM
    IF HIGHPOS < MINHIGH THEN HIGHPOS = MINHIGH
    IF HIGHPOS > MAXHIGH THEN HIGHPOS = MAXHIGH
    GOTO REPEAT

REPEAT:
    HIGHLITE$ = INKEY$
    IF HIGHLITE$ = "" THEN GOTO REPEAT
    HIGHLITE$ = RIGHT$(HIGHLITE$,1)
    IF HIGHLITE$ = CHR$(13) THEN GOTO DONE
    IF HIGHLITE$ = "F" THEN GOTO DOWN
    IF HIGHLITE$ = "H" THEN GOTO UP
    GOTO REPEAT
DOWN:
    IF COUNT = MAXITEM THEN GOTO TOPAGAIN
    COUNT = (HIGHPOS-3)/2
    GOTO DOWNONE

DOWNONE:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = HIGHPOS + 2
    COLOR 1,10,6
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT+1)
    COLOR 10,1,6
    COUNT = COUNT+1
    GOTO COUNTCHECK

TOPAGAIN:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = MINHIGH + 2
    COUNT = MINITEM + 1
    GOTO UPONE

UP:
    IF COUNT = MINITEM THEN GOTO BOTTOMAGAIN
    COUNT = (HIGHPOS-3)/2
    GOTO UPONE

UPONE:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = HIGHPOS - 2
    COLOR 1,10,6
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT-1)
    COLOR 10,1,6
    COUNT = COUNT-1
    GOTO COUNTCHECK

BOTTOMAGAIN:
    LOCATE HIGHPOS,20,0
    PRINT MENU$(COUNT)
    HIGHPOS = MAXHIGH - 2
    COUNT = MAXITEM - 1
    GOTO DOWNONE

HELP:
    CHAIN PPATH$ + "HELP1"

TRAP:
    SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT "";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "="*100
PRINT "="*100
DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
    IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
    IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
    IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
    IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER";ERR;" OCCURRED IN SUB-Routine: ";LINKS
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:
    SEL$ = INKEY$
    IF SEL$ = "" THEN GOTO SCAN
   .cls
    RESUME START

Subroutine DOSCOM

START:
    DIM A$(24,2)
    DIM A(24,1)
    DIM F$(60)
    DIM B(25)
    DIM MENUS$(10)
    DIM RESULTS$(10)
    COMMON DSKIDS$,A$(,),A(,),F$(,),B(,),TYPES,DIRECTS,UNITBS$
    COMMON PPRMAYS,INITBOM,DIRS SPECNAME$,PERDRO$
    COMMON CHEMNAMES$,PRINTPLACES$,LINKS$,PPATHS$,DEPATHS$
    COMMON MENGUS$(,),MAXITEM,RESULT$(,),TITLES,COUNT,CURBIOM$
    LINKS = "DOSCOM"
    ON ERROR GOTO TRAP
    SCREEN 0,1,0,0
    COLOR 4,1,5
    IF DSKIDS$ = "HD" THEN GOTO DOSCOM
    OPEN PPATH$ + "DSKID.CHK" FOR INPUT AS #1
    INPUT #1,DSKIDS$
    CLOSE #1
    IF DSKIDS$ = "PROG1" OR DSKIDS$ = "HD" THEN GOTO DOSCOM
   .cls
    LOCATE 12,15,0
    PRINT "Please Place Program Disk 1 in Drive ";PPATH$
    LOCATE 14,15,0
    PRINT "and Press Any Key to Continue"

CHOOSE:
    SEL$ = INKEY$
    IF SEL$ = "" THEN GOTO CHOOSE
    GOTO START

DOSCOM:
    COLOR 14,1
    cls
    LOCATE 12,18,0
    PRINT "Type DOS Command Below and Press <ENTER>"
    LOCATE 14,18,0
    PRINT "or Press <ENTER> to Return to the Menu"
    LOCATE 16,10,0
    INPUT "";DOSCOM$
    IF DOSCOM$ = "" THEN CHAIN PPATH$ + "MENU"
COLOR 0,0,0
CLS
SHELL DOSCOMM$COLOR 20
LOCATE 25,28,0
PRINT "<Press Any Key to Continue>";
CHOOSE:
    SEL$ = INKEY$:IF SEL$ = "" THEN GOTO CHOOSE
COLOR 10,1,6
CLS
CHAIN PPATH$ + "MENU"

TRAP:
    SCREEN 2
    SCREEN 0,1,0,0
    COLOR 7,1
    CHOOSE:
    PRINT "",TAB(30);"ERROR INFORMATION"
    COLOR 14,1
    PRINT "="
    PRINT "="
    DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
    IF ERR < 24 THEN GOTO UNKNOWN
    IF ERR = 26 THEN GOTO UNKNOWN
    IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
    IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
    IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
    IF ERR = 69 THEN GOTO UNKNOWN
    IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
    IF ERR > 76 THEN GOTO UNKNOWN
    LOCATE 8,10,0
    PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THE PROGRAM:"
    LOCATE 10,5,0
    IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
        IF ERR = 24 THEN PRINT "OR PLUGGED IN"
    IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
    IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
    IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
    IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL!"
    IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
        IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
        IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
        IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
    IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
    IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
        IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
    IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
    GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER";ERR:" OCCURRED IN SUB-ROUTINE: "';LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN
CLS
RESUME START
GOTO SCAN

Subroutine HELP1

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM T$(60)
DIM B(25)
DIM MENU$(10)
DIM RESULT$(10)
COMMON DSKID$,A$(),A(),F$(),B(),TYPE$,DIRECT$,UNITS$
COMMON PM $,INITB IM,DIR$,SPECNAME$,PERD RY
COMMON CHWNAME$,PRINTPLACES$,LINK$,P $,PATH$,DPATH$
COMMON MENU$(),MAXITEM,RESULT$(),T TLES$,COUNT,CURBIOM
KEY 1,"Z":KEY OFF
ON ERROR GOTO TRAP
SCREEN 0,1,0,0
COLOR 4,1,6

DSKID:
IF DSKID$ = "HD" THEN GOTO SETUP
OPEN PATH$ + "dskid.chk" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE
IF DSKID$ = "PROG1" OR DSKID$ = "HD" THEN GOTO SETUP
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive "';PATH$
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"
CHOOSE:
  SEL$=INKEY$
  IF SEL$="" THEN GOTO CHOOSE
  GOTO START

SETUP:
  OPEN PPATH$ + "help.txt" AS #1 LEN=79
  FIELD #1,78 AS TEXTIN$

TOP:
  COLOR 10,1,1
  CLS
  LOCATE 5,5,0
  PRINT"This is the BEGINNING of the HELP facility"
  LOCATE 7,5,0
  PRINT"To use this facility:"
  LOCATE 9,5,0
  PRINT"The"
  COLOR 4
  LOCATE 9,9,0
  PRINT"page-down"
  COLOR 10
  LOCATE 9,19,0
  PRINT"(pgdn) and"
  COLOR 4
  LOCATE 9,30,0
  PRINT"page-up"
  COLOR 10
  LOCATE 9,38,0
  PRINT"(pgup) keys move you"
  LOCATE 11,5,0
  PRINT"Up and Down through the text."
  LOCATE 13,5,0
  PRINT"The"
  COLOR 4
  LOCATE 13,9,0
  PRINT"ESCAPE"
  COLOR 10
  LOCATE 13,16,0
  PRINT"key returns you to the main menu"
  LOCATE 15,5,0
  COLOR 4
  PRINT"F1"
  COLOR 10
  LOCATE 15,8,0
  PRINT"invokes the HELP INDEX"

CHOOSE1:
  SEL$=INKEY$
  IF SEL$="" THEN GOTO CHOOSE1
  IF SEL$="2" THEN GOTO INDEX
SEL$=RIGHT$(SEL$,1)
IF SEL$="Q" OR SEL$ = "F" THEN GOTO BEGINSET
IF SEL$=CHR$(27) THEN GOTO QUIT
GOTO CHOOSE1

BEGINSET:
TXTSTART=1:TXTSTOP=23

BEGIN:
CLS
LOCATE 25,1,0
COLOR 2,3
PRINT "";TAB(80);""
COLOR 4
LOCATE 25,10,0
PRINT "PRESS <F1> FOR HELP INDEX OR <ESC> TO RETURN TO PROGRAM";
LOCATE 1,1,0
COLOR 10,1
FOR TXT = TXTSTART TO TXTSTOP
IF TXT < 1 THEN GOTO TOP
GET #1,TXT
IF ASC(LEFT$(TEXTIN$,1)) = 0 THEN GOTO BOTTOM
PRINT TEXTIN$;
NEXT TXT
DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE2:
SEL$=INKEY$:IF SEL$="" THEN GOTO CHOOSE2
IF SEL$="2" THEN GOTO INDEX
SEL$=RIGHT$(SEL$,1)
IF SEL$="P" OR SEL$ = "Q" THEN TXTSTART=TXTSTART+23:TXTSTOP=TXTSTOP+23:GOTO BEGIN
IF SEL$="I" OR SEL$ = "F" THEN TXTSTART=TXTSTART-23:TXTSTOP=TXTSTOP-23:GOTO BEGIN
IF SEL$=CHR$(27) THEN GOTO QUIT
GOTO CHOOSE2

BOTTOM:
COLOR 10,1,1
CLS
LOCATE 5,5,0
PRINT"This is the END of the HELP facility"
LOCATE 7,5,0
PRINT"To continue using this facility:";
LOCATE 9,5,0
PRINT"The"
COLOR 4
LOCATE 9,9,0
PRINT"page-down"
COLOR 10
LOCATE 9,19,0
PRINT"(pgdn) and"
COLOR 4
LOCATE 9,30,0
PRINT"page-up"
COLOR 10
LOCATE 9,38,0
PRINT"(pgup) keys move you"
LOCATE 11,5,0
PRINT"Up and Down through the text."
LOCATE 13,5,0
PRINT"The"
COLOR 4
LOCATE 13,9,0
PRINT"ESCAPE"
COLOR 10
LOCATE 13,16,0
PRINT"key returns you to the main menu"
LOCATE 15,5,0
COLOR 4
PRINT"F1"
COLOR 10
LOCATE 15,8,0
PRINT"invokes the HELP INDEX"

CHOOSE3:

SEL$=INKEY$
IF SEL$="" THEN GOTO CHOOSE3
IF SEL$="Z" THEN GOTO INDEX
SEL$=RIGHT$(SEL$,1)
IF SEL$ <> "H" AND SEL$ <> "I" THEN GOTO CHOOSE3
TXTSTART=TXTSTART-23
TXTSTOP=TXTSTOP-23
GOTO BEGIN
IF SEL$=CHR$(27) THEN GOTO QUIT
GOTO CHOOSE3

QUIT:
CLOSE #1
CHAIN PPATH$ + LINK$

INDEX:

J=34
T$(1)="HELP FACILITY INSTRUCTIONS"
T$(2)="HERBICIDE GENERAL INSTRUCTIONS"
T$(3)="BACKUP COPIES"
T$(4)="CHANGING DATA"
T$(5)="CURSOR"
T$(6)="DATA"
T$(7)="DATA DISKS"
T$(8)="DATA FILES"
T$(9)="DEFAULTS"
T$(10)="DISKS"
T$(11)="FATE"
INDEXSET:
FOR I=CUR TO FIN
Prtolin=Prtolin+1
IF I>J THEN GOTO INDEXMOVE
LOCATE Prtolin, Prtocol, 0
PRINT I;" "; T$(I)
NEXT I
IF I<J THEN Prtocol=Prtocol+40
Cur=Cur+20
Fin=Fin+20
Prtolin=1
GOTO INDEXSET

INDEXMOVE:
ROW=2
COL=4
LOCATE ROW, COL, 0
COLOR 7
PRINT "=>"
DEF SBC=0: PEEK 1050, PEEK(1052)
```
CHOOSE4:
  CURSOR$=INKEY$
  IF CURSOR$='"' THEN GOTO CHOOSE4
  IF CURSOR$=CHR$(13) THEN GOTO DONE
  CURSOR$=RIGHT$(CURSOR$,1)
  IF CURSOR$=CHR$(75) THEN GOTO LEFTARROW
  IF CURSOR$=CHR$(72) THEN GOTO UPARROW
  IF CURSOR$=CHR$(77) THEN GOTO RIGHTARROW
  IF CURSQR$=CHR$(80) THEN GOTO DOWNARROW
  LOCATE ROW+1, COL, 0: PRINT " "'LOCATE, ROW, COL, 0: PRINT"=>""

LEFTARROW:
  COL=COL-40: IF COL<4 THEN COL=4: GOTO CHOOSE4
  LOCATE ROW, COL+40, 0: PRINT " "'LOCATE, ROW, COL, 0: PRINT"=>"
  GOTO CHOOSE4

UPARROW:
  ROW=ROW-1: IF ROW<2 THEN ROW=2: GOTO CHOOSE4
  LOCATE ROW+1, COL, 0: PRINT " "'LOCATE, ROW, COL, 0: PRINT"=>"
  GOTO CHOOSE4

RIGHTARROW:
  COL=COL+40: IF COL>44 THEN COL=44: GOTO CHOOSE4
  LOCATE ROW, COL-40, 0: PRINT " "'LOCATE, ROW, COL, 0: PRINT"=>"
  GOTO CHOOSE4

DOWNARROW:
  ROW=ROW+1: IF ROW>21 THEN ROW=21: GOTO CHOOSE4
  LOCATE ROW-1, COL, 0: PRINT " "'LOCATE, ROW, COL, 0: PRINT"=>"
  GOTO CHOOSE4

DONE:
  IF COL=4 THEN COL=0
  IF COL=44 THEN COL=20
  TOPIC=(ROW-1)+COL
  IF TOPIC > J THEN GOTO CHOOSE4
  TOPIC$=T$(TOPIC)
  IF TOPIC=1 THEN GOTO TOP
  TXTSTART=(23*TOPIC)-45
  TXTSTOR=TXTSTART+22
  CLS
  COLOR 10,1,1
  GOTO BEGIN

TRAP:
  SCREEN 2
  SCREEN 0,1,0,0
  COLOR 7,1
  CLS
  PRINT " "'TAB(30);"ERROR INFORMATION"
  COLOR 14,1
```
PRINT "================================================================";
PRINT "================================================================";
DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:";
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
   IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
   IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
   IF ERR = 68 THEN PRINT "SOFTWARE MUST BE RE-"
   IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
   IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
   IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE

UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR";
LOCATE 12,5,0
PRINT "NUMBER:";ERR;" OCCURRED IN SUB-Routine: HELP"
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN

PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:
SEL$ = INKEY$
IF SEL$ = "$" THEN GOTO SCAN
CLS
RESUME START

Subroutine QUIT

START:
    DIM A$(24,2)
    DIM A(24,1)
    DIM F$(60)
    DIM B(25)
    DIM MENU$(10)
    DIM RESULT$(10)
    COMMON DSKID$,A$(,),A$(,),F$(,),B$(,),TYPES$,DIRECT$,UNITS$
    COMMON PPMAYS,INITBICM,DIR$,SPECNAMES$,PERDLY
    COMMON CHENNAMES$,PRMTPLACES$,LINK$,PASS$,DEATH$
    COMMON MENU$(,),MAXITEM,RESULTS$(,),TITLE$,COUNT,CURBICM
    ON ERROR GOTO TRAP

BEGIN:
    COLOR 14,1
   CLS
    LOCATE 12,5,0
    PRINT" Are You Sure You Want To QUIT HERBICIDE?"
    LOCATE 15,5,0
    PRINT" No Yes"
    LOCATE 21,5,0
    PRINT" IF YOU DO NOT LOAD A DISK FILE, THE DEFAULT DATA SET*
    PRINT" WILL BE LOADED."
    LOCATE 22,15,0
    PRINT" MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
    LOCATE 23,22,0
    PRINT" USE ARROW KEYS [";CHR$(24);CHR$(26);CHR$(25);CHR$(27)
    PRINT"] TO MOVE CURSOR"
    LOCATE 15,21,0
    COLOR 19
    PRINT CHR$(178)
    CHOICE$="N"
    DEF SEG=0:P0KE 1050,PEEK(1052)

CHOOSE1:
    CURSOR$=INKEY$
    IF CURSOR$="" THEN GOTO CHOOSE1
    CURSOR$=RIGHT$(CURSOR$,1)
    IF CURSOR$=CHR$(13) THEN GOTO CHOOSE1
    IF CURSOR$=CHR$(77) THEN GOTO YES
    IF CURSOR$=CHR$(75) THEN GOTO NO
    GOTO CHOOSE1

NO:
    LOCATE 15,46,0
    PRINT" 

LOCATE 15,21,0
PRINT CHR$(178)
CHOICE$="N"
GOTO CHOOSE1

YES:
LOCATE 15,21,0
PRINT " "
LOCATE 15,46,0
PRINT CHR$(178)
CHOICE$="Y"
GOTO CHOOSE1

CHOOSE1:
IF CHOICE$ = "N" THEN GOTO CHKDSK
IF CHOICE$ <> "Y" THEN GOTO BEGIN
COLOR 7,0
CLS
SHELL "CD\"
SYSTEM

CHKDSK:
IF DSKID$ = "HD" THEN GOTO GOBACK
OPEN PPATH$ + "DSKID.CHR" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = DIRECT$ OR DSKID$ = "HD" THEN GOTO GOBACK
CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive ";PPATH$
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"

CHKCHOOSE:
SEL$=INKEY$
IF SEL$="" THEN GOTO CHKCHOOSE
GOTO CHKDSK

GOBACK:
CHAIN PPATH$ + LINK$

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT " ",TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT 30
PRINT PEEL(1052)
DEF SEG=0:POKE 1050,PEEK(1052)
KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOOD UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
  IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID, RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK, THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
  IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
  IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT, SOFTWARE MUST BE RE-
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
  IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
  IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD, USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER: ; ERR; " OCCURRED IN SUB-Routine: "; LINKS
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN:
SELECT INKEYS
IF SELS = "" THEN GOTO SCAN
CLS
RESUME START
Subroutine SELECT

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENS$(10)
DIM RESULT$(10)
COMMON DSKID$,A$0,A0,F$(),B(),TYPES,DIRECT$,UNIT$(
COMMON PMNDAYS,INITBIOM,DIR$,SPECNAME$,PERDAY
COMMON CHEMNAMES,PRINTPLACES,LINK$,PFATH$,DFATH$
COMMON MENDS$(),MAXITEM,RESULT$(),ITLE$,COUNT,CURBIOM
LINK$ = "SELECT"
ON ERROR GOTO TRAP
SCREEN 0,1,0,0
COLOR 4,1,6
IF DSKID$ = "HD" THEN GOTO BEGIN
OPEN PPATH$ + "DSKED.CHK" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = "PROG1" THEN GOTO BEGIN
CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive ";FEATH$
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"
WAITING:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO WAITING
GOTO START
BEGIN:
COLOR 14,1
CLS
LOCATE 12,5,0
PRINT "Would You Like to use Metric or U.S. Customary Units?"
LOCATE 15,5,0
PRINT "Metric U.S. Customary"
LOCATE 22,15,0
PRINT "Move Cursor to desired selection and press <ENTER>"
LOCATE 23,22,0
PRINT "([use arrow keys [";CHR$(24);CHR$(26);CHR$(25);CHR$(27);"
PRINT "]) to move cursor"
LOCATE 15,21,0
COLOR 19
PRINT CHR$(178)
UNIT$="m"
DEF SEG=0:POKE 1050,PEEK(1052)
CHOOSE:
CURSOR$=INKEY$
IF CURSOR$="" THEN GOTO CHOOSE
CURSOR$=RIGHT$(CURSOR$,1)
IF CURSOR$=CHR$(13) THEN GOTO CHosen1
IF CURSOR$=CHR$(77) THEN GOTO STANDARD
IF CURSOR$=CHR$(75) THEN GOTO METRIC
GOTO CHOOSE

METRIC:
LOCATE 15,46,0
PRINT" "
LOCATE 15,21,0
PRINT Chr$(178)
UNITS$="M"
GOTO CHOOSE

STANDARD:
LOCATE 15,21,0
PRINT" "
LOCATE 15,46,0
PRINT Chr$(178)
UNITS$="S"
GOTO CHOOSE

CHOSEN1:
COLOR 2,8,1
DEF SEG=0:POKE 1050,PEEK(1052)
CHAIN PFATH$ + "MENU1"

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT" "";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT"="
PRINT"="
DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT"AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
LOCATE 10,5,0
IF ERR = 24 THEN PRINT"DISK DRIVE OR PRINTER IS NOT TURNED ON";
IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
IF ERR = 71 THEN PRINT "NEITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER":ERR;" OCCURRED IN SUB-Routine: ";LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN
CLS
RESUME START

Subroutine INPUT

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENU$(10)
DIM RESULT$(10)
DIM FILES$(60)
COMMON DSKID$,A$( ),A$( ),F$( ),B$( ),TYPE$,DIRECT$,UNIT$(
COMMON THMADAYS,INTYBCM,DIR$,SPECNAME$,PERDRY
COMMON CHEMNAME$, PRINTPLACES$, LINK$, FPATH$, DPATH$

COMMON MENS(), MAXITEM, RESULTS(), TITLE, COUNT, CURBIGN

LINK$ = "INPUT"

ON ERROR GOTO TRAP
SCREEN 0,1,0,0
IF DSKID$ = "HD" THEN GOTO CHKDATA
OPEN FPATH$ + "DSKID.CHR" FOR INPUT AS #1
INPUT #1, DSKID$
CLOSE #1
IF DSKID$ = "PROG1" THEN GOTO CHKDATA
CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive "; FEAXH$
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"

CHKCHOOSE:
   SEL$=INKEY$
   IF SEL$="" THEN GOTO CHKCHOOSE
   GOTO START

CHKDATA:
   IF DSKID$ = "HD" THEN GOTO BEGIN
   CLS
   LOCATE 12,15,0
   PRINT "Please Place the Data Disk for "; SPECNAME$;" and ";
   LOCATE 14,20,0
   PRINT CHEMNAME$;" in Drive "; DPATH$
   LOCATE 16,20,0
   PRINT "and Press Any Key to Continue"

SIT:
   SEL$=INKEY$
   IF SEL$="" THEN GOTO SIT
   OPEN DPATH$ + "DSKID.CHR" FOR INPUT AS #1
   INPUT #1, DSKID$
   CLOSE #1
   IF DSKID$ = "DATA" THEN GOTO BEGIN
   GOTO CHKDATA

'------------------------ LOAD A DISK FILE? ------------------------'

BEGIN:
COLOR 14,1
CLS
LOCATE 12,5,0
PRINT "Would You Like to Load a Disk File?"'
LOCATE 15,5,0
PRINT "Yes"
LOCATE 21,5,0
PRINT "No"
PRINT "If you do not load a disk file, the default data set";
PRINT " WILL BE LOADED."
LOCATE 22,15,0
PRINT "MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
LOCATE 23,22,0
PRINT "(USE ARROW KEYS [";CHR$(24);CHR$(26);CHR$(25);CHR$(27);"
PRINT "] TO MOVE CURSOR)"
LOCATE 15,21,0
COLOR 19
PRINT CHR$(178)
CHOICE$='Y''
DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE1:
CURSOR$=INKEY$
IF CURSOR$="" THEN GOTO CHOOSE1
CURSOR$=RIGHT$(CURSOR$,1)
IF CURSOR$=CHR$(13) THEN GOTO CHOOSE1
IF CURSOR$=CHR$(77) THEN GOTO NO
IF CURSOR$=CHR$(75) THEN GOTO YES
GOTO CH00SE1

YES:
LOCATE 15,46,0
PRINT" 
LOCATE 15,21,0
PRINT CHR$(178)
CHOICE$="Y"
GOTO CHOOSE1

NO:
LOCATE 15,21,0
PRINT"
LOCATE 15,46,0
PRINT CHR$(178)
CHOICE$="N"
GOTO CHOOSE1

CHOSEN1:
IF CHOICE$ = "N" THEN GOTO LOADDEF
IF CHOICE$ <> "Y" THEN GOTO BEGIN

'---------------------------------- DISK FILE DIRECTORY ----------------------------------'

DIR:
SHELL "DIR " + DEATHS + DIRECT$ + DIR$ + "\*.* >" + DEATH$ + "FILES.DAT"
OPEN DPATH$ + "FILES.DAT" FOR INPUT AS #1
READLOOP:
FOR I = 1 TO 59
    INPUT #1,TEXTIN$
    IF EOF(1) THEN GOTO KILLFILE
    IF I < 5 THEN GOTO READEND
    IF MID$(TEXTIN$,14,1) = "<" THEN I = I - 1:GOTO READEND

FILE$IN$(I - 4) = LEFT$(TEXT$IN$, 13)
READEND:
    NEXT I
CLOSE

KILLFILE:
    SHELL "ERASE " + DPATH$ + "FILES.DAT"
    IF I > 59 THEN GOTO OVERFLOW1

PRINTOUT:
    CLOSE
    FILE$IN$(I - 4) = "<ESCAPE>"
    COLOR 14, 1
    CLS
    ROW = 2
    COL = 5
    PR$TLIN = 1
    PR$TCOL = 5
    LOCATE 24, 1, 0
    COLOR 14, 4
    PRINT "<"; DIRECT$; DIR$; "">; TAB(30);";
    PRINT "MOVE CURSOR TO DESIRED FILE AND PRESS <ENTER>"; TAB(80); ""
    LOCATE 25, 1, 0
    PRINT "OR CHOOSE <ESCAPE> AND PRESS <ENTER>";
    PRINT "IF YOU DO NOT WISH TO LOAD A FILE"; TAB(80); ""
    ELEMENT = 0
    COLOR 14, 1

PRINTLOOP:
    COLOR 14, 1
    FOR K = 1 TO 21
        IF ELEMENT = 1 THEN GOTO PR$TCURSOR
        PR$TLIN = PR$TLIN + 1
        IF K < 21 THEN ELEMENT = ELEMENT + 1; GOTO SKIP
        PR$TCOL = PR$TCOL + 22
        PR$TLIN = 1
        GOTO PRINTLOOP
    SKIP:
        IF ELEMENT = 1 THEN COLOR 4
        LOCATE PR$TLIN, PR$TCOL, 0
        PRINT FILE$IN$(ELEMENT)
        COLOR 14, 1
        GOTO NEXTK

NEXTK:
    NEXT K

PR$TCURSOR:
    COLOR 14, 1
    IF ELEMENT = 0 THEN FILE$IN$(1) = "<ESCAPE>"
    IF ELEMENT = 0 THEN ELEMENT = 1
    LOCATE 23, 1, 0
    PRINT "TOTAL NUMBER OF ITEMS LISTED IS: "; ELEMENT - 1; TAB(80); ""
    LOCATE ROW, COL, 0
COLOR 0,11
PRINT FILESIN$(1)
DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE2:
  CURSOR$ = INKEY$
  IF CURSOR$ = "" THEN GOTO CHOOSE2
  IF CURSOR$ = CHR$(13) THEN GOTO CHOOSE2
  IF CURSOR$ = RIGHT$(CURSOR$,1)
       CURSOR$ = CHR$(75) THEN GOTO BACKARROW
  IF CURSOR$ = CHR$(72) THEN GOTO UPARROW
  IF CURSOR$ = CHR$(77) THEN GOTO FOREARROW
  IF CURSOR$ = CHR$(80) THEN GOTO DOWNARROW
  GOTO CHOOSE2

GETELEMENT:
  IF COL = 5 THEN COLN = 0
  IF COL = 27 THEN COLN = 20
  IF COL = 49 THEN COLN = 40
  FILENUM = (ROW - 1) + COLN
  RETURN

UPARROW:
  CHOICE$ = "UP"
  ROW = ROW - 1
  IF ROW < 2 THEN ROW = 2:GOTO CHOOSE2
  GOSUB GETELEMENT
  IF FILENUM > ELEMENT THEN GOTO STOPHERE
  LOCATE ROW + 1,COL,0
  IF FILESIN$(FILENUM + 1) = "<ESCAPE>" THEN COLOR 4,1 ELSE COLOR 14,1
  PRINT FILESIN$(FILENUM + 1)
  COLOR 0,11
  LOCATE ROW,COL,0
  PRINT FILESIN$(FILENUM)
  GOTO CHOOSE2

DOWNARROW:
  CHOICE$ = "DOWN"
  ROW = ROW + 1
  IF ROW > 21 THEN ROW = 21:GOTO CHOOSE2
  GOSUB GETELEMENT
  IF FILENUM > ELEMENT THEN GOTO STOPHERE
  LOCATE ROW - 1,COL,0
  IF FILESIN$(FILENUM - 1) = "<ESCAPE>" THEN COLOR 4,1 ELSE COLOR 14,1
  PRINT FILESIN$(FILENUM - 1)
  COLOR 0,11
  LOCATE ROW,COL,0
  PRINT FILESIN$(FILENUM)
  GOTO CHOOSE2

FOREARROW:
  CHOICE$ = "RIGHT"
COL = COL + 22
IF COL > 49 THEN COL = 49: GOTO CHOOSE2
GOSUB GETELEMENT
IF FILENUM > ELEMENT THEN GOTO STOFHERE
LOCATE ROW, COL + 22, 0
IF FILESIN$(FILENUM - 20) = "<ESCAPE>" THEN COLOR 4, 1 ELSE COLOR 14, 1
PRINT FILESIN$(FILENUM - 20)
COLOR 0, 11
LOCATE ROW, COL, 0
PRINT FILESIN$(FILENUM)
GOTO CHOOSE2

BACKARROW:
CHOOSE$ = "LEF"T
COL = COL - 22
IF COL < 5 THEN COL = 5: GOTO CHOOSE2
GOSUB GETELEMENT
IF FILENUM > ELEMENT THEN GOTO STOFHERE
LOCATE ROW, COL + 22, 0
IF FILESIN$(FILENUM + 20) = "<ESCAPE>" THEN COLOR 4, 1 ELSE COLOR 14, 1
PRINT FILESIN$(FILENUM + 20)
COLOR 0, 11
LOCATE ROW, COL, 0
PRINT FILESIN$(FILENUM)
GOTO CHOOSE2

STOFHERE:
COLOR 14, 1
IF CHOOSE$ = "UP" THEN LOCATE ROW + 1, COL, 0: COL = 5: ROW = 2
IF CHOOSE$ = "UP" THEN PRINT FILESIN$(FILENUM + 1): GOTO PUTCURSOR
IF CHOOSE$ = "DOWN" THEN COLOR 4, 1
IF CHOOSE$ = "DOWN" THEN LOCATE ROW - 1, COL, 0: COL = 5: ROW = 2
IF CHOOSE$ = "DOWN" THEN PRINT FILESIN$(FILENUM - 1): GOTO PUTCURSOR
IF CHOOSE$ = "RIGHT" AND FILESIN$(FILENUM - 20) = "<ESCAPE>" THEN COLOR 4, 1
IF CHOOSE$ = "RIGHT" THEN LOCATE ROW, COL + 22, 0: COL = 5: ROW = 2
IF CHOOSE$ = "RIGHT" THEN PRINT FILESIN$(FILENUM - 20): GOTO PUTCURSOR
IF CHOOSE$ = "LEFT" THEN LOCATE ROW, COL + 22, 0: COL = 5: ROW = 2
IF CHOOSE$ = "LEFT" THEN PRINT FILESIN$(FILENUM + 20): GOTO PUTCURSOR

CHOOSEMADE:
GOSUB GETELEMENT
IF FILESIN$(1) = "<ESCAPE>" THEN GOTO BEGIN
IF FILENUM > ELEMENT THEN GOTO CHOOSE2
FILES = FILESIN$(FILENUM)
IF FILES = "<ESCAPE>" THEN GOTO BEGIN
GOTO CHOSEN

OVERFLOW1:
COLOR 2, 8, 1
CLS
PRINT "THESE ARE TOO MANY FILES FOR THIS ROUTINE."
PRINT "TO SELECT YOUR FILE, YOU MUST ENTER THE NAME"
PRINT "OF THE FILE BELOW (INCLUDING EXTENSION):" 
PRINT:PRINT:INPUT "ENTER FILE NAME—> ";FILE$

CHosen:
COLOR 14,1
CLS
LOCATE 12,1,0
PRINT " ";TAB(80);" ";
LOCATE 12,1,0
FILE$ = LEFT$(FILE$,8) + ".DAT"
PRINT " FILE SELECTED IS: ";FILE$;TAB(80);" ";
PRINT " IF THIS IS CORRECT, PRESS <ENTER>.";
PRINT " OTHERWISE, ENTER A SLASH ( / )";TAB(80);" ";
PRINT " AND THEN PRESS <ENTER>.";TAB(80);" ";
DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE3:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO CHOOSE3
SEL = ASC(SEL$)
IF SEL = 47 GOTO PRINTOUT
OPEN DPATH$ + DIRECT$ + DIR$ + "\";FILE$ FOR INPUT AS #1
INPUT #1,CHECK$,CHECK2$
CLOSE
IF CHECK2$=UNITS$ THEN GOTO LOADFILE ELSE BEEP
IF UNITS$="M" THEN UNICHK$="Metric" ELSE UNICHK$="U.S. Customary"
CLS
LOCATE 10,1,0
PRINT "The file does not contain the correct type of data for input."
PRINT "Check the directory to make sure you";
PRINT "are requesting the proper data file";
PRINT "for input in ";UNICHK$;" units."
DEF SEG=0:POKE 1050,PEEK(1052)
PRINT
INPUT"PRESS <ENTER> TO CONTINUE";X$
CLOSE #1
GOTO BEGIN

LOADFILE:
OPEN DPATH$ + DIRECT$ + DIR$ + "\";FILE$ FOR INPUT AS #1
FOR I=0 TO 24
INPUT #1,A(I,0),A(I,1)
NEXT I
CLOSE #1
CLS
LOCATE 12,3,0
PRINT
PRINT " FILE ";FILE$;" HAS BEEN LOADED. PRESS ANY KEY TO CONTINUE"
DEF SEG=0:POKE 1050,PEEK(1052)

WAITING2:
SEL$=INKEY$
IF SEL$="" THEN GOTO WAITING2

TITLE$ = " Change / Save / Review Menu"

MENU$(1) = "1. Continue Program (Fate Calculations)"
MENU$(2) = "2. Save Data to Disk"
MENU$(3) = "3. Change / Review Data"
MENU$(4) = "4. Help and Instructions"
MENU$(5) = "5. Exit HERBICIDE Program"

RESULT$(1) = "CALC"
RESULT$(2) = "SAVE"
RESULT$(3) = "ENTER"
RESULT$(4) = "HELP1"
RESULT$(5) = "QUIT"

MAXITEM = 5
CHAIN PPATH$ + "MENU"

LOADDEF:

DEFAULT$ = DPATH$ + DIRECT$ + DIR$ + "\DEFAULT\" + UNITS$ + ".DEF"
OPEN DEFAULT$ FOR INPUT AS #1
FOR I=0 TO 24
  INPUT #1,A(I,0),A(I,1)
NEXT I
CLOSE #1
CHAIN PPATH$ + "ENTER"

TRAP:

SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT " ";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "-" * (10 * MAXITEM)
PRINT "-" * (10 * MAXITEM)
DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:

IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
  IF ERR = 24 THEN PRINT "OR PLUGGED IN";
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
    IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
    IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
    IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
    IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
    IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
    IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
    IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD, USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
    LOCATE 10,5,0
    PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
    LOCATE 11,5,0
    PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
    LOCATE 12,5,0
    PRINT "NUMBER";ERR;" OCCURRED IN SUB-Routine: ";LINK$
    LOCATE 20,28,0
    COLOR 20
    PRINT "PRESS ANY KEY TO CONTINUE"
    COLOR 14,1
    GOTO SCAN
PAUSE:
    LOCATE 20,15,0
    COLOR 20
    PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
    COLOR 14,1
    CLOSE
SCAN:
    SEL$ = INKEY$
    IF SEL$ = "" THEN GOTO SCAN
    CLS
    RESUME START

Subroutine ENTER
BEGIN:
    DIM A$(24,2)
    DIM A(24,1)
    DIM F$(60)
    DIM B(25)
    DIM MENUS$(10)
    DIM RESULT$(10)
    DIM HOLD(24,1)
    COMMON DXKIDS,A$(,),A(),F$(,),B(),TYPES,DIRECT$,UNITS$
    COMMON PMDAYS,INITI0M,DIR$,SPECNAME$,PERDRY
    COMMON CHEMNAME$,PRNTPLACE$,LINK$,PATH$,PATH$
    COMMON MENUS(,MAXITEM,RESULT$(,),TITLES,COUNT,CURBIOM
    MAXITEMS = 24
    KEY(1) ON
    ON KEY(1) GOSUB QUIT
LINE$ = "ENTER"
ON ERROR GOTO TRAP
SCREEN 0,1,0,0
IF DSKID$ = "HD" THEN GOTO START
OPEN PPATH$ + "DSKID.CHR" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = "PROG1" THEN GOTO START
CLS
LOCATE 12,15,0
PRINT"Please Place Program Disk 1 in Drive ";PATH$
LOCATE 14,15,0
PRINT"and Press Any Key to Continue"

CHKCHOOSE:
SEL$=INKEY$
IF SEL$="" THEN GOTO CHKCHOOSE
GOTO START

START:
FOR I = 0 TO MAXITEMS
   HOLD(I,0) = A(I,0)
   HOLD(I,1) = A(I,1)
NEXT I
IF UNITS$ = "S" THEN GOTO STANDARD

METRIC:
A$(1,0)="Average Depth of area to be Treated (meters)"
A$(1,1)="(Used to calculate water volume)"
A$(1,2)="(This may have any positive value)"
A$(2,0)="Water Flow Rate From Treated Area (meters/min.)"
A$(2,1)="(Used to calculate herbicide dispersal so, if a very large"
A$(2,2)="fraction of the lake is treated, dispersal is unimportant, enter 0)"
A$(3,0)="Total Suspended Solids in Water (mg/l)"
A$(3,1)="(used to determine loss of herbicide due to sorption)"
A$(3,2)="(a clear system may be 1 mg/l and a muddy one 20-50 mg/l)"
A$(4,0)="Depth of Active Sediment Layer (cm)"
A$(4,1)="(the portion of the sediment which is ‘well mixed’)"
A$(4,2)="(This value is used to determine loss of herbicide to sediments)"
A$(5,0)="Sediment Water Content (%)"
A$(5,1)="(water content of the ‘active’ sediment layer)"
A$(5,2)="(used to calculate actual mass of solids in the sediments)"
A$(6,0)="Sediment Diffusion Exchange Rate (cm/day)"
A$(6,1)="(rate at which interstitial water moves in sediment. Used to"
A$(6,2)="determine the rate at which dissolved herbicide enters sediments)"
A$(7,0)="Sedimentation Rate (cm/Year)"
A$(7,1)="(used to calculate loss of herbicide due to sorption and"
A$(7,2)="addition of herbicide to sediments)"
A$(8,0)="Sediment Resuspension Rate (cm/Year)"
A$(8,1)="(for calculating rate of herbicide return to suspended"
A$(8,2)="solids in water from sediments)"
A$(9,0)="Herbicide Formulation Release Halflife (days)"
A$(9,1)="(the time it takes 1/2 to dissolve in water)"
A$(9,2)="(this is zero for liquid formulations)"
A$(10,0)="/Active Ingredient Fraction of Herbicide (kg/liter)"
A$(10,1)="/this can be obtained from the herbicide label"
A$(10,2)="/NOTE: this value is for the PURE COMPOUND not the formulation"
A$(11,0)="/Application Rate of Formulation (liters/hectare)"
A$(11,1)="/weight of herbicide FORMULATION applied per hectare"
A$(11,2)="/this can be obtained from the herbicide label"
A$(12,0)="/Loses of Herbicide Due to Drift (%)"
A$(12,1)="/due to wind drift from area, etc.)"
A$(12,2)="/"
A$(13,0)="/Herbicide Sediment Layer Partition Coefficient"
A$(13,1)="/the ratio of sed. conc./water conc. at equilibrium"
A$(13,2)="/this determines how much is lost due to sorption"
A$(14,0)="/Herbicide Hydrolysis Halflife in Water (days)"
A$(14,1)="/the time it takes 1/2 to hydrolyze in water"
A$(14,2)="/if this is not an important fate process, use a value of 1000"
A$(15,0)="/Herbicide Hydrolysis Halflife in Sediment (days)"
A$(15,1)="/the time it takes 1/2 to hydrolyze in sediment"
A$(15,2)="/if this is not an important fate process, use a value of 1000"
A$(16,0)="/Herbicide Oxidation Halflife in Water (days)"
A$(16,1)="/the time it takes 1/2 to Oxidize in water"
A$(16,2)="/if this is not an important fate process, use a value of 1000"
A$(17,0)="/Herbicide Oxidation Halflife in Sediment (days)"
A$(17,1)="/the time it takes 1/2 to Oxidize in sediment"
A$(17,2)="/if this is not an important fate process, use a value of 1000"
A$(18,0)="/Herbicide Biotransformation Halflife in Water (days)"
A$(18,1)="/the time it takes 1/2 to biotransform in water"
A$(18,2)="/if this is not an important fate process, use a value of 1000"
A$(19,0)="/Herbicide Biotransformation Halflife in Sediment (days)"
A$(19,1)="/the time it takes 1/2 to biotransform in sediment"
A$(19,2)="/if this is not an important fate process, use a value of 1000"
A$(20,0)="/Herbicide Photolysis Halflife in Water (days)"
A$(20,1)="/the time it takes 1/2 to photolyze in water"
A$(20,2)="/if this is not an important fate process, use a value of 1000"
A$(21,0)="/Herbicide Volatilization Halflife in Water (days)"
A$(21,1)="/the time it takes 1/2 to volatilize in water"
A$(21,2)="/if this is not an important fate process, use a value of 1000"
IF TYPE$ <> "FLOATING" THEN GOTO NOTFLOAT1
A$(22,0)="/Bioconcentration Factor of Herbicide for this Plant Species"
A$(22,1)="/the ratio of plant tissue conc./water conc. at equilibrium"
A$(22,2)="/this value may range from just above 0 to several hundred"
GOTO CONTVALS1

NOTFLOAT1:
A$(22,0)="/Bioconcentration Factor of Herbicide for this Plant Species"
A$(22,1)="/the ratio of plant tissue conc./water conc. at equilibrium"
A$(22,2)="/this value may range from just above 0 to several hundred"
GOTO CONTVALS1

CONTVALS1:
A$(23,0)="/Plant Biomass to be Treated (metric tons/hectare)"
A$(23,1)="/the amount (wet weight) of plants to be treated per hectare"
A$(23,2)="(this should be an average of the biomass in all areas)"
A$(24,0)="Percent Dry Weight of Plant Tissue (%)"
A$(24,1)="(the percentage of plant tissue which is not water)"
A$(24,2)=""
IF A(22,1) = 1 THEN GOTO SETUP
GOSUB CALCINTERCEPT
GOTO SETUP

STANDARD:
A$(1,0)="Average Depth of area to be Treated (feet)"
A$(1,1)="(Used to calculate water volume)"
A$(1,2)="(This may have any positive value up to 5,000)"
A$(2,0)="Water Flow Rate From Treated Area (feet/min.)"
A$(2,1)="(Used to calculate herbicide dispersal so, if a very large"
A$(2,2)="fraction of the lake is treated, dispersal is unimportant, enter 0)"
A$(3,0)="Total Suspended Solids in Water (parts per million)"
A$(3,1)="(used to determine loss of herbicide due to sorption)"
A$(3,2)="(a clear system may be 1 ppm and a muddy one 20-50 ppm)"
A$(4,0)="Depth of Active Sediment Layer (inches)"
A$(4,1)="(the portion of the sediment which is 'well mixed')"
A$(4,2)="(This value is used to determine loss of herbicide to sediments)"
A$(5,0)="Sediment Water Content (%)"
A$(5,1)="(water content of the ‘active’ sediment layer)"
A$(5,2)="(used to calculate actual mass of solids in the sediments)"
A$(6,0)="Sediment Diffusion Exchange Rate (inches/day)"
A$(6,1)="(rate at which interstitial water moves in sediment. Used to"
A$(6,2)="determine the rate at which dissolved herbicide enters sediments)"
A$(7,0)="Sedimentation Rate (inches/Year)"
A$(7,1)="(used to calculate loss of herbicide due to sorption and"
A$(7,2)="addition of herbicide to sediments)"
A$(8,0)="Sediment Resuspension Rate (inches/Year)"
A$(8,1)="(for calculating rate of herbicide return to suspended"
A$(8,2)="solids in water from sediments)"
A$(9,0)="Herbicide Formulation Release Halflife (days)"
A$(9,1)="(the time it takes 1/2 to dissolve in water)"
A$(9,2)="(this is zero for liquid formulations)"
A$(10,0)="Active Ingredient Fraction of Herbicide (lbs/gallon)"
A$(10,1)="(this can be obtained from the herbicide label)"
A$(10,2)="(NOTE: this value is for the PURE COMPOUND not the formulation"
A$(11,0)="Application Rate of Formulation (gallons/acre)"
A$(11,1)="(weight of herbicide FORMULATION applied per acre)"
A$(11,2)="(this can be obtained from the herbicide label)"
A$(12,0)="Loss of Herbicide Due to Drift (%)"
A$(12,1)="(due to wind drift from area, etc.)"
A$(12,2)=""
A$(13,0)="Herbicide Sediment Layer Partition Coefficient [KP]"
A$(13,1)="(the ratio of sed. conc./water conc. at equilibrium)"
A$(13,2)="(this determines how much is lost due to sorption)"
A$(14,0)="Herbicide Hydrolysis Halflife in Water (days)"
A$(14,1)="(the time it takes 1/2 to hydrolyze in water)"
A$(14,2)="(if this is not an important fate process, use a value of 1000)"
A$(15,0)="Herbicide Hydrolysis Halflife in Sediment (days)"
A$$(15,1)="(the time it takes 1/2 to hydrolyze in sediment)"
A$$(15,2)="(if this is not an important fate process, use a value of 1000)"
A$$(16,0)="Herbicide Oxidation Half-life in Water (days)"
A$$(16,1)="(the time it takes 1/2 to Oxidize in water)"
A$$(16,2)="(if this is not an important fate process, use a value of 1000)"
A$$(17,0)="Herbicide Oxidation Half-life in Sediment (days)"
A$$(17,1)="(the time it takes 1/2 to Oxidize in sediment)"
A$$(17,2)="(if this is not an important fate process, use a value of 1000)"
A$$(18,0)="Herbicide Biotransformation Half-life in Water (days)"
A$$(18,1)="(the time it takes 1/2 to biotransform in water)"
A$$(18,2)="(if this is not an important fate process, use a value of 1000)"
A$$(19,0)="Herbicide Biotransformation Half-life in Sediment (days)"
A$$(19,1)="(the time it takes 1/2 to biotransform in sediment)"
A$$(19,2)="(if this is not an important fate process, use a value of 1000)"
A$$(20,0)="Herbicide Photolysis Half-life in Water (days)"
A$$(20,1)="(the time it takes 1/2 to photolyze in water)"
A$$(20,2)="(if this is not an important fate process, use a value of 1000)"
A$$(21,0)="Herbicide Volatilization Half-life in Water (days)"
A$$(21,1)="(the time it takes 1/2 to volatilize in water)"
A$$(21,2)="(if this is not an important fate process, use a value of 1000)"
IF TYPE$ <> "FLOATING" THEN RETURN
A$$(22,0)="Percent Herbicide Interception at this Plant Density"
A$$(22,1)="(the amount of the spray that remains on the plant leaves)"
A$$(22,2)="(this value is calculated by the program but may be changed)"
GOTO CONTVALS2

CONTVALS2:
A$$(23,0)="Plant Biomass to be Treated (tons/acre)"
A$$(23,1)="(the amount (wet weight) of plants to be treated per acre)"
A$$(23,2)="(this should be an average of the biomass in all areas)"
A$$(24,0)="Percent Dry Weight of Plant Tissue (%)"
A$$(24,1)="(the percentage of plant tissue which is not water)"
A$$(24,2)=""
IF A(22,1) = 1 THEN GOTO SETUP
GOSUB CALCINTERCEP
GOTO SETUP

CALCINTERCEP:
IF TYPE$ <> "FLOATING" THEN RETURN
IF A(23,0) <= 0 THEN A(23,0) = 0.00001
BIOMASS = A(23,0)
IF UNITS$ = "S" THEN GOTO CUSTREG
INTERCEPT = (BIOMASS * 0.1908) + 0.4166
GOTO TRIM

CUSTREG:
INTERCEPT = (BIOMASS * 0.4279) + 0.4167
TRIM:
IF INTERCEPT > 100.000 THEN INTERCEPT = 100.000
IF INTERCEPT < 0.000 THEN INTERCEPT = 0.000
INTERCEPT = INTERCEPT * 1000
INTERCEPT = INT (INTERCEPT)
INTERCEPT = INTERCEPT / 1000
A(22,0) = INTERCEPT
A(22,1) = 0
HOLD(22,0) = INTERCEPT
HOLD(22,1) = 0
RETURN

SETUP:
FIRSTLINE = 1
CURLINE = 2
CURCOL = 1
WORKPAGE = 1
DISPAGE = 0
COLOR 14,1
SCREEN 0,1,DISPAGE,DISPAGE
CLS
LOCATE 12,25,0
PRINT "INITIALIZING, PLEASE WAIT"
GOSUB INITSCREEN
GOTO CHOOSE

INITSCREEN:
CHARLINE = 1
SCREEN 0,1,WORKPAGE,DISPAGE
COLOR 14,1
CLS
FOR I = FIRSTLINE TO FIRSTLINE + 5
COLOR 14,1
LOCATE CHARLINE,12,0
PRINT A$(I,0);TAB(80);"";
LOCATE CHARLINE+1,12,0
PRINT A$(I,1);TAB(80);"";
LOCATE CHARLINE+2,12,0
PRINT A$(I,2);TAB(80);"";
LOCATE CHARLINE+3,12,0
PRINT "";TAB(80);"";
COLOR 4,3
LOCATE CHARLINE,1,0
PRINT "VALUE: "
COLOR 0,3
LOCATE CHARLINE+1,1,0
PRINT USING "####.####";A(I,0);
PRINT "";
COLOR 4,3
LOCATE CHARLINE+2,1,0
IF A(I,1) = 0 THEN PRINT "<default>"
IF A(I,1) = 1 THEN PRINT "<user>"
CHARLINE = CHARLINE + 4
NEXT I
COLOR 14, 4
LOCATE 24, 1, 0
PRINT " ENTER VALUE, PRESS <ESC> TO RESTORE OLD VALUE OR PRESS";
PRINT " <F1> TO EXIT"; TAB(80); " ";
LOCATE 25, 1, 0
PRINT " USE ARROW KEYS, PgUp, PgDn. THERE ARE";
PRINT " MORE VALUES THAN SHOWN ON THIS SCREEN"; TAB(80); " ";
LOCATE CURLINE, CURCOL, 0
COLOR 30, 3
PRINT CHR$(95)
SWAPSCKN:
   IF DISPAGE = 1 THEN DISPAGE = 0: GOTO NEXTPAGE
   DISPAGE = 1
NEXTPAGE:
   IF DISPAGE = 1 THEN WORKPAGE = 0: GOTO UPDATE
   WORKPAGE = 1
UPDATE:
   SCREEN 0, 1, WORKPAGE, DISPAGE
RETURN

CHOICE:
   DEF SEG = 0: POKE 1050, PEAK(1052)
SCAN:
   SEL$ = INKEY$
PASS:
   IF SEL$ = "" THEN GOTO SCAN
   TEMP!O = A(23, 0)
   IF SEL$ = "H" OR SEL$ = "I" OR SEL$ = "K" THEN GOTO SCAN
   IF SEL$ = "M" OR SEL$ = "N" OR SEL$ = "Q" THEN GOTO SCAN
   SEL = ASC(RIGHT$(SEL$, 1))
   IF SEL = 80 OR SEL = 13 THEN GOTO DOWN
   IF SEL = 81 THEN GOTO PAGEDOWN
   IF SEL = 72 THEN GOTO UP
   IF SEL = 73 THEN GOTO PAGEUP
   IF SEL = 75 OR SEL = 77 OR SEL = 8 OR SEL = 32 THEN GOTO EDITVALUE
   IF SEL = 27 OR SEL = 46 OR (SEL > 47 AND SEL < 58) THEN GOTO EDITVALUE
   GOTO SCAN

----------------------- DOWN -----------------------

DOWN:
   CURCOL = 1
   SCREEN 0, 1, DISPAGE, DISPAGE
   COLOR 14, 4
   LOCATE 25, 1, 0
   PRINT TAB(26); " PROCESSING, PLEASE WAIT"; TAB(80); " ";
   GOSUB NEWNUMBER
   DEF SEG = 0: POKE 1050, PEAK(1052)
   IF CURLINE = 22 THEN GOTO PAGEDOWN
   GOTO REFRESHDOWN
REFRESHDOWN:
  COLOR 4,3
  LOCATE CURLINE,CURCOL,0
  PRINT CHR$(32)
  CURLINE = CURLINE + 4
  LOCATE CURLINE,CURCOL,0
  COLOR 30,3
  PRINT CHR$(95)
  LOCATE 24,1,0
  COLOR 14,4
  PRINT "ENTER VALUE, PRESS <ESC> TO RESTORE OLD VALUE OR PRESS";
  PRINT "<F1> TO EXIT";TAB(80);"";
  LOCATE 25,1,0
  PRINT "USE ARROW KEYS, PgUp, PgDn. THERE ARE";
  PRINT "MORE VALUES THAN SHOWN ON THIS SCREEN";TAB(80);"";
  CURCOL = 1
  GOTO SCAN

PAGEDOWN:
  SCREEN 0,1,DISPAGE,DISPAGE
  GOSUB MOVEMESSAGE
  GOSUB NEWNUMBER
  IF FIRSTLINE = MAXITEMS - 5 THEN GOSUB BOTTOM:GOTO SCAN
  FIRSTLINE = FIRSTLINE + 6
  IF FIRSTLINE > MAXITEMS - 5 THEN FIRSTLINE = MAXITEMS - 5
  CURLINE = 2
  CURCOL = 1
  GOSUB INITSCREEN
  GOTO CHOOSE

BOTTOM:
  SCREEN 0,1,DISPAGE,DISPAGE
  COLOR 14,4
  LOCATE 25,1,0
  PRINT TAB(30);"BOTTOM OF INPUT FACILITY";TAB(80);""
  COLOR 4,3
  LOCATE CURLINE,CURCOL,0
  PRINT CHR$(32)
  CURLINE = 22
  LOCATE CURLINE,CURCOL,0
  COLOR 30,3
  PRINT CHR$(95)
  DEF SEG = 0:POKE 1050,PEEK(1052)
  RETURN

UP:
  CURCOL = 1
  SCREEN 0,1,DISPAGE,DISPAGE
  COLOR 14,4
  LOCATE 25,1,0
PRINT TAB(26);"PROCESSING, PLEASE WAIT";TAB(80);" ";
GOSUB NEWNUMBER
DEF SEG = 0:POKE 1050,PEEK(1052)
IF CURLINE = 2 THEN GOTO PAGEUP
GOTO REFRESHUP

REFRESHUP:
COLOR 4,3
LOCATE CURLINE,CURCOL,0
PRINT CHR$(32)
CURLINE = CURLINE - 4
LOCATE CURLINE,CURCOL,0
COLOR 30,3
PRINT CHR$(95)
LOCATE 24,1,0
COLOR 14,4
PRINT ", ENTER VALUE, PRESS <ESC> TO RESTORE OLD VALUE OR PRESS";
PRINT " <F1> TO EXIT";TAB(80);" ";
LOCATE 25,1,0
PRINT " USE ARROW KEYS, PgUp, PgDn. THERE ARE";
PRINT " MORE VALUES THAN SHOWN ON THIS SCREEN";TAB(80);" ";
CURCOL = 1
GOTO SCAN

PAGEUP:
SCREEN 0,1,DISPAGE,DISPAGE
GOSUB MOVEMESSAGE
GOSUB NEWNUMBER
IF FIRSTLINE = 1 THEN GOSUB TOP:GOTO SCAN
FIRSTLINE = FIRSTLINE - 6
IF FIRSTLINE < 1 THEN FIRSTLINE = 1
CURLINE = 22
CURCOL = 1
GOSUB INITSCREEN
GOTO CHOOSE

TOP:
SCREEN 0,1,DISPAGE,DISPAGE
COLOR 14,4
LOCATE 25,1,0
PRINT TAB(30);"TOP OF INPUT FACILITY";TAB(80);" ";
COLOR 4,3
LOCATE CURLINE,CURCOL,0
PRINT CHR$(32)
CURLINE = 2
LOCATE CURLINE,CURCOL,0
COLOR 30,3
PRINT CHR$(95)
DEF SEG = 0:POKE 1050,PEEK(1052)
RETURN

MOVEMESSAGE:
COLOR 14, 4
LOCATE 25, 1, 0
PRINT TAB(30); "MOVING, PLEASE WAIT"; TAB(80); "";
DEF SEG = 0: POKE 1050, PEERK(1052)
RETURN

NEWNUMBER:
B$ = ""
C$ = ""
SUBSCRPT = FIRSTLINE + ((CURZLINE-2)/4)
FOR J = 1 TO 10
    TEMP$ = CHR$(SCREEN(CURLINE, J))
    IF TEMP$ = " " THEN TEMP$ = " "
    B$ = B$ + TEMP$
NEXT J
FOR K = 1 TO LEN(B$)
    IF ASC(MID$(B$, K, 1)) <> 32 THEN GOTO NOTBLANK
NEXT K
GOTO BLANK

NOTBLANK:
FOR I = K TO LEN(B$)
    IF ASC(MID$(B$, I, 1)) <> 32 THEN C$ = C$ + MID$(B$, I, 1) ELSE GOTO CLEAN
NEXT I
CLEAN:
B = VAL(C$)
IF B > 9999.99 THEN GOTO OVERFLOW
IF TYPE$ = "FLOATING" AND SUBSCRPT = 22 AND B > 100 THEN B = 100
IF B <> A(SUBSCRPT, 0) THEN A(SUBSCRPT, 1) = 1
A(SUBSCRPT, 0) = B
BLANK:
COLOR 4, 3
LOCATE CURLINE-1, 1, 0
PRINT " VALUE: "
COLOR 0, 3
LOCATE CURLINE, 1, 0
PRINT USING "#####.###"; A(SUBSCRPT, 0);
PRINT " ";
IF SUBSCRPT <> 23 OR TYPE$ <> "FLOATING" THEN GOTO SKIPINTERCEP
IF A(23, 0) = TEMP$IO AND SEL <> 27 THEN GOTO SKIPINTERCEP
GOSUB CALCINTERCEP
LOCATE CURLINE-4, 1, 0
PRINT USING "#####.###"; A(22, 0)
PRINT " ";
COLOR 4, 3
LOCATE CURLINE-3, 1, 0
PRINT "<default> "
SKIPINTERCEP:
COLOR 4, 3
LOCATE CURLINE+1, 1, 0
IF A(SUBSCRPT, 1) = 0 THEN PRINT "<default> "
IF A(SUBSCRIPT,1) = 1 THEN PRINT " <user> " RETURN

EDITVALUE:
SCREEN 0,1,DISPAGE,DISPAGE
COLOR 4,3
SUBSCRIPT = FIRSTLINE + ((CURLINE-2)/4)
LOCATE CURLINE-1,1,0
PRINT USING "#####.###";A(SUBSCRIPT,0);
LOCATE CURLINE,1,0
PRINT " "
LOCATE 24,1,0
COLOR 14,4
PRINT " ENTER VALUE, PRESS <ESC> TO RESTORE OLD VALUE OR PRESS";
PRINT " <F1> TO EXIT";TAB(80);" "
LOCATE 25,1,0
PRINT " USE ARROW KEYS, PgUp, PgDn. THERE ARE";
PRINT " MORE VALUES THAN SHOWN ON THIS SCREEN";TAB(80);" ";
GOTO SCAN2

CHOOSE2:
DEF SEG = 0:POKE 1050,PEEK(1052)
SELECT2:
SEL$ = INKEY$
SCAN2:
IF SEL$ = "" THEN GOTO SELECT2
IF SEL$ = "H" OR SEL$ = "I" OR SEL$ = "K" THEN GOTO CHOOSE2
IF SEL$ = "M" OR SEL$ = "P" OR SEL$ = "Q" THEN GOTO CHOOSE2
SEL = ASC(RIGHT$(SEL$,1))
IF SEL = 72 THEN GOTO UP
IF SEL = 73 THEN GOTO PAGEUP
IF SEL = 27 THEN GOTO REPDEF
IF SEL = 80 OR SEL = 13 GOTO DOWN
IF SEL = 81 THEN GOTO PAGEDOWN
IF SEL = 75 OR SEL = 8 THEN GOTO CURLEFT
IF SEL = 77 OR SEL = 32 THEN GOTO CURRIGHT
IF SEL <> 46 AND (SEL < 47 OR SEL > 58) THEN GOTO CHOOSE2
GOTO CURRIGHT

REPDEF:
COLOR 0,3
SUBSCRIPT = FIRSTLINE + ((CURLINE-2)/4)
A(SUBSCRIPT,0) = HOLD(SUBSCRIPT,0)
A(SUBSCRIPT,1) = HOLD(SUBSCRIPT,1)
IF SUBSCRIPT = 22 THEN A(SUBSCRIPT,1) = 0:GOSUB CALCINTERCEP
GOSUB BLANK
LOCATE CURLINE,1,0
COLOR 30,3
PRINT CHR$(95)
GOTO SCAN
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CURR_RIGHT:
COLOR 0,3
THISOOL = SCREEN (CURLINE, CUROOL)
IF THISOOL = 95 THEN THISOOL = 32
LOCATE CURLINE, CUROOL, 0
IF SEL = 77 THEN PRINT CHRS (THISOOL)
IF SEL <> 77 THEN PRINT CHRS (SEL)
CUROOL = CUROOL + 1
IF CUROOL > 10 THEN CUROOL = 10
GOTO FLASH

CURR_LEFT:
COLOR 0,3
THISOOL = SCREEN (CURLINE, CUROOL)
IF THISOOL = 95 THEN THISOOL = 32
LOCATE CURLINE, CUROOL, 0
IF SEL = 75 THEN PRINT CHRS (THISOOL)
IF SEL = 8 THEN SEL = 32
IF SEL <> 75 THEN PRINT CHRS (SEL)
CUROOL = CUROOL - 1
IF CUROOL < 1 THEN CUROOL = 1
GOTO FLASH

FLASH:
COLOR 30,3
LOCATE CURLINE, CUROOL, 0
FLASHCHAR = SCREEN (CURLINE, CUROOL)
IF FLASHCHAR = 32 OR FLASHCHAR = 8 THEN FLASHCHAR = 95
PRINT CHRS (FLASHCHAR)
GOTO SELECT2

OVERFLOW:
SCREEN 0,1, DISPAGE, DISPAGE
COLOR 14,4
LOCATE 25, 1, 0
PRINT TAB (16); "NUMBER TOO LARGE OR INVALID, PLEASE RE-ENTER"; TAB (80); " ";

PAUSE:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO PAUSE
LOCATE 24, 1, 0
COLOR 14,4
PRINT " ENTER VALUE, PRESS <ESC> TO RESTORE OLD VALUE OR PRESS";
PRINT " <F1> TO EXIT"; TAB (80); " ";
LOCATE 25, 1, 0
PRINT " USE ARROW KEYS, PGUP, PGDN. THERE ARE";
PRINT " MORE VALUES THAN SHOWN ON THIS SCREEN"; TAB (80); " ";
GOTO PASS

QUIT:
TITLE$ = "" Change / Save / Review Menu"
**MENU$(i) = "i. continue Program (Fate Calculations)"

**MENU$(2) = "2. Save Data to Disk"

**MENU$(3) = "3. Change / Review Data"

**MENU$(4) = "4. Load a Data File or Restore Defaults"

**MENU$(5) = "5. Restart Program From Beginning"

**MENU$(6) = "6. Help and Instructions"

**MENU$(7) = "7. Exit HERBICIDE Program"

**RESULT$(1) = "CALC"

**RESULT$(2) = "SAVE"

**RESULT$(3) = "ENTER"

**RESULT$(4) = "INPUT"

**RESULT$(5) = "SELECT"

**RESULT$(6) = "HELP1"

**RESULT$(7) = "QUIT"

**MAXITEM = 7

**CHAIN PPATH$ + "MENU"

**TRAP:

SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT "  " :TAB(30) ; "ERROR INFORMATION"
COLOR 14,1
PRINT "----------------------------------------------------------"
PRINT "----------------------------------------------------------"
DEF SEG=0:POKE 1050,PEEK(1052)

**KNOWN:

IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE1
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER"; ERR; " OCCURRED IN SUB-Routine: "; LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN1
PAUSE1:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN1:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN1
CLS
RESUME BEGIN

Subroutine SAVE

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENU$ (10)
DIM RESULT$(10)
DIM FILESIN$(60)
DIM FILEIN$(60)
COMMON DSKID$, A$(1), A$(1), F$(1), B$(1), TYPES, DIRECT$, UNITS$
COMMON PPAI$, INITBIOM, DIRS, SPECNAMES$, PERDry
COMMON CHEMNAME$, PPAI$, LINKS, PPATH$, DPATH$
COMMON MENU$(1), MAXITEM, RESULT$(10), TITLES$, COUNT, CURBIOM
LINK$ = "SAVE"
ON ERROR GOTO TRAP
SCREEN 0,1,0,0
IF DSKID$ = "HD" THEN GOTO BEGIN
OPEN PPAI$, "DSKED.CHK" FOR INPUT AS #1
INPUT #1, DSKID$
CLOSE #1
IF DSKID$ = "PROG1" OR DSKID$ = "HD" THEN GOTO CHKDATA
CLS
LOCATE 12,15,0
Please Place Program Disk 1 in Drive ";PFATH$"
LOCATE 14,15,0
PRINT"and Press Any Key to Continue"

CHKCHOOSE:
    SEL$=INKEY$
    IF SEL$="""" THEN GOTO CHKCHOOSE
    GOTO START

CHKDATA:
    OPEN DPATH$ + "DSKID.CHR" FOR INPUT AS #1
    INPUT #1,DSKID$
    CLOSE #1
    IF DSKID$ = "DATA" OR DSKID$ = "HD" THEN GOTO BEGIN
    CLS
    LOCATE 12,15,0
    PRINT"Please Place the Data Disk for the Herbicide and Target"
    LOCATE 14,15,0
    PRINT"Plant Species You will be Using in Drive ";DPATH$
    LOCATE 16,20,0
    PRINT"and Press Any Key to Continue"

    SEL$=INKEY$
    IF SEL$="""" THEN GOTO SIT

'----------------------- DISK FILE DIRECTORY -----------------------

BEGIN:
    SHELL "DIR " + DPATH$ + DIRECT$ + DIR$ + "\.* >" + DPATH$ + "FILES.DAT"
    OPEN DPATH$ + "FILES.DAT" FOR INPUT AS #1
    READLOOP:
        FOR I = 1 TO 59
            INPUT #1,TEXTIN$
            IF EOF(1) THEN GOTO KILLFILE
            IF I < 5 THEN GOTO READEND
            IF MID$(TEXTIN$,14,1) = "<" THEN I = I - 1:GOTO READEND
            FILESIN$(I - 4) = LEFT$(TEXTIN$,13)
        READEND:
            NEXT I
            CLOSE

    KILLFILE:
        SHELL "ERASE " + DPATH$ + "FILES.DAT"
        IF I > 59 THEN GOTO OVERFLOW1

    PRINTOUT:
        CLOSE
        COLOR 14,1
        CLS
        ROW = 2
COL = 5
PRINTL1N = 1
PRTOOL = 5
LOCATE 23,1,0
COLOR 14,4
PRINT" <";DIRECT$;DIR$;" > ";
PRINT " FILES CURRENTLY ON THIS DISK ARE LISTED ABOVE. PLEASE PRESS";
PRINT TAB(80);" ";
LOCATE 24,1,0
PRINT " <ENTER> IF YOU DO NOT WISH TO SAVE A FILE.";
PRINT " NOTE: ALL FILES END IN .DAT";
PRINT TAB(80);" ";
ELEMENT = 0
COLOR 14,1
PRINTLOOP:
COLOR 14,1
FOR K = 1 TO 21
   IF ELEMENT = I - 4 THEN GOTO ENTERNAME
   PRINTL1N = PRTOOL + 1
   IF K < 21 THEN ELEMENT = ELEMENT + 1: GOTO SKIP
   PRTOOL = PRTOOL + 22
   PRINTL1N = 1
   GOTO PRINTLOOP
SK1P:
   IF ELEMENT = I - 4 THEN COLOR 4
   LOCATE PRTOOL,PRINTL1N,0
   PRINT FILESIN$ (ELEMENT)
   COLOR 14,1
   GOTO NEXTK
NEXTK:
   NEXT K
OVERFLOW1:
COLOR 2,8,1
CLS
PRINT" THERE ARE TOO MANY FILES FOR THIS ROUTINE."
PRINT" TO SAVE YOUR FILE, YOU MUST ENTER THE NAME"
PRINT" IF THE FILE ABOVE INCLUDES EXTENSION "
PRINT:PRINT:INPUT" ENTER FILE NAME===> ";FILE$
DEF SEG=0:POKE 1050,PEEK(1052)
ENTERNAME:
LOCATE 22,10,0
INPUT " ENTER SAVE FILE NAME===> " ;FILE$
IF FILE$ = " " THEN CHAIN "MENU"
FOR K = 1 TO LEN(FILE$)
   IF K = 9 THEN FILE$ = LEFT$(FILE$,8):GOTO ENDK
   IF MID$(FILE$,K,1) = "." THEN FILE$ = LEFT$(FILE$, K-1):GOTO ENDK
ENDK:
NEXT K
TEMPFILE$ = " ";
FOR K = 1 TO LEN(FILE$)
TEMPCHAR = ASC(MID$(FILE$,K,1))
IF TEMPCHAR < 48 THEN GOTO ANOTHERK
IF TEMPCHAR > 57 AND TEMPCHAR < 64 THEN GOTO ANOTHERK
IF TEMPCHAR > 90 AND TEMPCHAR < 97 THEN GOTO ANOTHERK
IF TEMPCHAR > 122 THEN GOTO ANOTHERK
TEMFFILE$ = TEMPFILE$ + CHR$(TEMPCHAR)
ANOTHERK:
NEXT K
FILE$ = TEMFFILE$
FILE$ = FILE$ + ".DAT"
CAP$=""
FOR L = 1 TO LEN(FILE$)
CHR$=MID$(FILE$,L,1)
IF ASC(CHR$)<123 AND ASC(CHR$)>96 THEN CHR$=CHR$(ASC(CHR$)-32)
CAP$=CAP$+CHR$
NEXT L
FILE$=CAP$
FOR J = 1 TO ELEMENT
HOLD$="":HOLD2$=""
FOR K=1 TO 8
HOLD$=MID$(FILESIN$(J),K,1)
IF HOLD$=CHR$(32) THEN GOTO KNEXT ELSE HOLD2$=HOLD2$+HOLD$
NEXT
NEXT K
IF FILE$ = ".DAT" THEN CHAIN PPATH$ + "MENU"
IF FILE$=HOLD2$ + ".DAT" THEN GOTO EXISTS
NEXT J
GOTO SELECTED
EXISTS:
CLS
LOCATE 12,5,0
PRINT "FILE NAME SELECTED ";FILE$;" ALREADY EXISTS."
DEF SEG=0:POKE 1050,PEEK(1052)
INPUT "DO YOU WANT TO REPLACE IT (Y/N)";SEL$
IF SEL$="y" OR SEL$="Y" THEN GOTO SELECTED
IF SEL$="n" OR SEL$="N" THEN GOTO PRINTOUT
GOTO EXISTS
SELECTED:
CLS
LOCATE 12,3,0
PRINT ":TAB(60);" "
LOCATE 12,3,0
PRINT "FILE NAME SELECTED IS: ";FILE$
PRINT "IF THIS IS CORRECT, PRESS <ENTER>.";
PRINT ": OTHERWISE, ENTER A SLASH ( / )";
DEF SEG=0:POKE 1050,PEEK(1052)
CHOOSE:
INPUT SEL$
IF SEL$="m" THEN GOTO SAVEIT
SEL=ASC(SEL$)
IF SEL=47 GOTO PRINTOUT
GOTO CHOOSE

SAVEIT:
OPEN DEPS$ + DIRECT$ + DIR$ + "\" + FILE$ FOR OUTPUT AS #1
WRITE #1,"",UNIT$S
FOR I=1 TO 24
WRITE #1,A(I,0),A(I,1)
NEXT I
CLOSE #1
DEF SEG=0:POKE 1050,PEEK(1052)
CLS
LOCATE 12,5,0
PRINT"DATA HAS BEEN SAVED IN ";TTT,K!•!;" PRESS <ENTER> TO CONTINUE"
INPUT X$
CHAIN PPATH$ + "MENU"

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT "";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "";
DEF SEG=0:POKE 1050,PEEK(1052)
KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF TUTS PROGRAM:\""
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
IF ERR = 71 THEN PRINT " EITHER THE DISK DRIVE DOOR IS OPEN OR THERE";
  IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT " THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
  LOCATE 10,5,0
  PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
  LOCATE 11,5,0
  PRINT " YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
  LOCATE 12,5,0
  PRINT "NUMBER";ERR;" OCCURRED IN SUB-Routine: ";LINK$
  LOCATE 20,28,0
  COLOR 20
  PRINT "PRESS ANY KEY TO CONTINUE"
  COLOR 14,1
  GOTO SCAN
PAUSE:
  LOCATE 20,15,0
  COLOR 20
  PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
  COLOR 14,1
  CLOSE
SCAN:
  SEL$ = INKEY$
  IF SEL$ = "" THEN GOTO SCAN
  CLS
  RESUME START

Subroutine CALC

START:
  DIM A$(24,2)
  DIM A(24,1)
  DIM F$(60)
  DIM B(25)
  DIM MENU$(10)
  DIM RESULT$(10)
  COMMON DSKID$,A$(),A(),F$(),B(),TYPE$,DIRECT$,UNIT$,DOS$,
  COMMON FNAME$,INITBIOM,DIR$,SPECNAME$,PERD$,DIR$,SPECNAME$,
  COMMON CHEMNAMES$,PRNTPLACE$,LINK$,PATH$,PATH$
  COMMON MENU$(10),MAXITEM,RESULT$(10),TITLE$,COUNT,CURBIM
  LINK$ = "CALC"
  ON ERROR GOTO TRAP
  SCREEN 0,1,0,0
  COLOR 4,1,6
  IF DSKID$ = "HD" THEN GOTO BEGIN
  OPEN PPATH$ + "DSKID.CHR" FOR INPUT AS #1
  INPUT #1,DSKID$
  CLOSE #1
  IF DSKID$ = "PROG1" THEN GOTO BEGIN
  CLS
LOCATE 12,15,0
PRINT "Please Place Program Disk 1 in Drive ":PEEK$(
LOCATE 14,15,0
PRINT "and Press Any Key to Continue"

CHOOSE:
  SEL$=INKEY$
  IF SEL$="" THEN GOTO CHOOSE

BEGIN:
  DEF SEG=0:POKE 1050,PEEK(1052)
  COLOR 14,1
  CLS
  LOCATE 8,4,0
  PRINT "This Portion of Module 1 Calculates the Fate"
  PRINT "of Herbicides in Aquatic"
  LOCATE 10,5,0
  PRINT "Environments. These Calculations Will"
  PRINT "be Performed for 14 Days or Until"
  LOCATE 12,7,0
  PRINT "Concentrations of Herbicide in Either Water or Plants"
  PRINT "Have Dropped to"
  LOCATE 14,8,0
  PRINT "Less than 0.1% of Peak Concentrations"
  PRINT "At the Termination of These"
  LOCATE 16,10,0
  PRINT "Calculations You Will be Given the Option of Continuing the"
  LOCATE 18,19,0
  PRINT "Calculations for a Period of Your Choice"
  LOCATE 21,18,0
  INPUT "Press <ENTER> to Begin Fate Calculations":X$

  FOR I = 1 TO 24
    B(I) = 0
  NEXT I
  FOR I = 2 TO 25
    B(I) = A(I-1,0)
  NEXT I

  IF UNITS$ = "M" THEN GOTO CALC1

  B(2) = B(2) * 0.3048   : 'feet => meters
  B(3) = B(3) * 0.3048   : 'feet => meters
  B(5) = B(5) * 2.54     : 'inches => cm
  B(7) = B(7) * 2.54     : 'inches => cm
  B(8) = B(8) * 2.54     : 'inches => cm
  B(9) = B(9) * 2.54     : 'inches => cm
  B(11) = B(11) * 0.1198 : 'lb/gal => kg/l
  B(24) = B(24) * 2.2417 : 'tons/acre => metric tons/ha

CALC1:
**TREATMENT AREA SQ. METERS**

\[
\text{TAREA} = B(1) \times 10000 \\
\text{\textsuperscript{10000} SQ. METERS/HA.}
\]

**WATER VOLUME CU. METERS**

\[
\text{WVOL} = \text{TAREA} \times B(2) \\
\text{\textsuperscript{B(2) IS DEPTH IN METERS}}
\]

**WATER VOLUME LITERS**

\[
\text{WVOL} = \text{WVOL} \times 1000 \\
\text{\textsuperscript{1000 L/CU. METER}}
\]

**SUDDENED SOLIDS MASS (KG)**

\[
\text{TSSMASS} = \frac{(B(4) \times \text{WVOL})}{1000000} \\
\text{\textsuperscript{MG/L \times LITERS DIVIDED BY 1,000,000 MS/KG = MG/CU. METER}}
\]

**VOLUME OF SEDIMENTS CU. METERS**

\[
\text{Volsed} = \text{TAREA} \times \frac{(B(5))}{100} \\
\text{\textsuperscript{AREA SQ. METERS \times DEPTH CM. / 100 CM/M}}
\]

**SEDIMENT INTERSTITIAL WATER (LITERS)**

\[
\text{SIW} = \frac{(B(6))}{100} \times (\text{Volsed} \times 1000) \\
\text{\textsuperscript{PERCENT WATER/100 \times CU. M \times 1000 L/CU. M}}
\]

**SOLID VOLUME OF SEDIMENTS (CUBIC DECIMETERS)**

\[
\text{RVS} = \text{Volsed} \times 1000 - \text{SIW} \\
\text{\textsuperscript{CU. METERS \times 1000 CU. EM. \times L WATER}}
\]

**CALCULATE SEDIMENT DENSITY FOR MASS FROM VOL. CALC**

\[
\text{SEDDENS} = -1.441 \times \left( \frac{(B(6))}{100} \right) + 2.188 \\
\text{\textsuperscript{REGRESSION FROM PAT MAYSE LAKE TEXAS}}
\]

**MASS OF SEDIMENT SOLIDS (KG)**

\[
\text{SEEMASS} = \frac{((\text{RVS} \times 1000) \times \text{SEDDENS})}{1000} \\
\text{\textsuperscript{CU. CM \times 1000 CU. EM / DENSITY}}
\]

**TOTAL MASS OF PLANTS (KG)**

\[
\text{MP} = \frac{(B(24) \times 1000) \times B(1)}{\text{TAREA}} \\
\text{\textsuperscript{MET. TONS \times 1000 KG/MET. TON \times AREA (HA.)}}
\]

**INITIAL VOL PORE CHEMICAL APPLIED**

\[
\text{HMASS} = \left( \frac{(B(1) \times B(11)) \times B(12)}{(1 - (B(13)/100))} \right) \\
\text{\textsuperscript{HA \times 1/HA = 11 \times KG/1 = KG}}
\]

**SEDIMENTATION RATE CU. M/YEAR**

\[
\text{SEDVOL} = \frac{(B(8))}{100} \times \text{TAREA} \\
\text{\textsuperscript{CM/YEAR /100 CM/M \times SQ. METERS}}
\]

**SEDIMENTATION IN CU. CM / DAY**

\[
\text{SEDVOL} = \left( \text{SEDVOL} \times 10000 \right) / 365 \\
\text{\textsuperscript{CU. M/YEAR \times 1,000,000 CU. CM/CU. M \over 365 DAYS/YEAR}}
\]

**RESUSPENSION RATE CU. M/YEAR**

\[
\text{RESVOL} = \left( \frac{(B(9))}{100} \right) \times \text{TAREA} \\
\text{\textsuperscript{AS ABOVE FOR SEDIMENTATION}}
\]

**RESUSPENSION RATE IN CU. CM / DAY**

\[
\text{RESVOL} = \left( \frac{(\text{RESVOL} \times 1000000)}{365} \right) \\
\text{\textsuperscript{AS ABOVE FOR SEDIMENTATION}}
\]

**NET SEDIMENTATION RATE CU. CM/DAY**

\[
\text{NETSED} = \text{SEDVOL} - \text{RESVOL} \\
\text{\textsuperscript{SEDIMENTATION - RESUSPENSION}}
\]

**MASS OF SEDIMENTATION PER DAY**

\[
\text{NETSED} = \left( \frac{(\text{NETSED} \times \text{SEDDENS})}{1000} \right) \\
\text{\textsuperscript{CU. CM \times G/CU. CM OVER 1000 G/KG}}
\]
**MASS OF SED LESS % WATER**

\[ \text{NETSED} = \text{NETSED} \times (1 - (B(6) / 100)) \]

**CU. CM/CAY * DRY WEIGHT FRACTION**

**CROSSSECTIONAL AREA OF SITE (SQ. M)**

\[ \text{XSAREA} = (\sqrt{\text{TAREA}} \times B(2)) \]

**SQUARE ROOT OF AREA (M) X DEPTH (M)**

**FLOW VOLUME FROM AREA L/DAY**

\[ \text{FLOWVOL} = (\text{XSAREA} \times (B(3) \times 1440)) \times 1000 \]

**SQ. METERS X M/MIN. X 1440 MIN./DAY * 1000 L/CU. M**

**CALCULATE FATE AND RELEASE COEFFICIENTS FROM /DAY**

CLS

PEAK = 0

COUNT = 0

STACNT = 0:STPCNT = 14.1

KEY OFF

**PREVENT DIVISION BY ZERO**

FOR G = 1 TO 24

\[ \text{IF } B(G) \leq 0 \text{ THEN } B(G) = 0.00001 \]

NEXT G

**HERBICIDE RELEASE COEFFICIENT FROM /DAY**

\[ \text{HRATE} = 0.6931 / B(10) \]

**SUM OF WATER FATE PROCESSES AND**

**CONVERT FROM /DAY TO COEFFICIENT**

\[ \text{WFATE} = (0.6931/B(15)) + (0.6931 / B(17)) + (0.6931 / B(19)) \]

**SUM OF SED. FATE PROCESSES AND**

**CONVERT FROM /DAY TO COEFFICIENT**

\[ \text{SFATE} = (0.6931 / B(16)) + (0.6931 / B(18)) + (0.6931 / B(20)) \]

**BIOCONCENTRATION FACTOR**

IF TYPE$ = "FLOATING" THEN INTERCEPT = B(23): BCF = B(23)

**SELECT output TYPE**

CLS

LOCATE 12,5,0

PRINT "Would You Like numerical and graphic output or just graphic?"

LOCATE 15,5,0

PRINT "Both"

LOCATE 23,15,0

PRINT "Move cursor to desired selection and press <enter>"

LOCATE 15,21,0

COLOR 19

PRINT CHR$(178)

OUTYPE$ = "GRAPH"

DEF SEG=0: PEEK 1050, PEEK(1052)

CHOOSE1:

CURSORS$ = INKEY$;

IF CURSORS$ = "" THEN GOTO CHOOSE1

CURSORS$ = RIGHT$(CURSORS$,

IF CURSORS$ = CHR$(13) THEN GOTO SELOUT

IF CURSORS$ = CHR$(77) THEN GOTO BOTHOUT

IF CURSORS$ = CHR$(75) THEN GOTO GRAPHDUT

GOTO CHOOSE1
GRATHOUT:
  LOCATE 15,46,0
  PRINT " "
  LOCATE 15,21,0
  PRINT CHR$(178)
  OUTTYPE$ = "GRAPH"
  GOTO CHOOSE1

BOTOUT:
  LOCATE 15,21,0
  PRINT " "
  LOCATE 15,46,0
  PRINT CHR$(178)
  OUTTYPE$ = "BOTH"
  GOTO CHOOSE1

SELOUT:
  IF OUTTYPE$ = "GRAPH" THEN GOTO SETHRATE
  "******** SELECT output device **********************
  COLOR 14,1
  CLS
  LOCATE 12,5,0
  PRINT" Would You Like the output to go to the screen or the printer?"
  LOCATE 15,5,0
  PRINT" Screen          Printer"
  LOCATE 23,15,0
  PRINT"MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
  LOCATE 15,21,0
  COLOR 19
  PRINT CHR$(178)
  PRNTPLACE$ = "SCRN:"
  DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE2:
  CURSOR$ = INKEY$
  IF CURSOR$ = "" THEN GOTO CHOOSE2
  CURSOR$ = RIGHT$(CURSOR$,1)
  IF CURSOR$ = CHR$(13) THEN GOTO STARTOUT
  IF CURSOR$ = CHR$(77) THEN GOTO PRINTER
  IF CURSOR$ = CHR$(75) THEN GOTO CRTOUT
  GOTO CHOOSE2

CRTOUT:
  LOCATE 15,46,0
  PRINT " "
  LOCATE 15,21,0
  PRINT CHR$(178)
  PRNTPLACE$ = "SCRN:"
  GOTO CHOOSE2

PRINTER:
LOCATE 15,21,0
PRINT ""
LOCATE 15,46,0
PRINT CHR$(178)
PRNTPLACE$ = "LPT1:"
GOTO CHOOSE2

STARTOUT:
OPEN PRNTPLACE$ FOR OUTPUT AS #2
CLS

SETHRATE:
IF HRATE > 1 THEN ITER = 0.1:GOTO COUNTP
IF HRATE <= 1 AND HRATE > 0.1 THEN ITER = 0.1:GOTO COUNTP
IF HRATE < 0.1 THEN ITER = 0.5

COUNTP:
FLOWVOL = FLOWVOL * ITER
IF (FLOWVOL / (WVOL * ITER)) = 1 THEN FLOWVOL = WVOL * ITER
COUNTP = 0:OVERIDE = 0
CLS
COLOR 14,1
IF OUTTYPE$ <> "GRAPH" THEN GOTO NOTGRAPH
LOCATE 12,6,0
PRINT "CALCULATIONS IN PROGRESS, PLEASE WAIT. CALCULATING FOR DAY:"

NOTGRAPH:
IF PRNTPLACE$ = "LPT1:" THEN PRNTFIX = 0 ELSE PRNTFIX = 1
WPOO = 1
IMASS = HMASS * (INTERCEPT / 100)
GMASS = HMASS - IMASS

** MAXIMUM POSSIBLE WATER CONCENTRATION PPM **************
IF WVOL = 0 THEN WVOL = 0.000001
WMAXCON = (GMASS * 1000000) / WVOL
WCONEC = 0:PCONEC = 0:SCONC = 0:AMTREL = 0:DMDT = 0:WMASS = 0
SMASS = 0:SEDDEP = 0:TSSONC = 0:SIWCONC = 0
WPEAK = 0:PEAK = 0:PPMDAYS = 0:CHEMMASS = 0

****** release of herbicide to water **************
MASW = WVOL : 'KG WATER
MASSS = SEDMASS : 'KG SEDIMENT
MASSP = MP : 'KG PLANTS
MASSI = TSSMASS : 'KG TOTAL SUSPENDED SOLIDS
KM = B(14) : 'RATIO OF SEDIMENT/WATER CONC
BCF = B(23) : 'RATIO OF PLANT/WATER CONC

TIMELOOP2:
FOR TIME = STACNT TO STPCNT STEP ITER
COUNTP = COUNTP + 1
DMDT = (CMASS * (1 - EXP(-HRATE * TIME))) - AMTREL
AMTREL = AMTREL + DMDT
CHEMMASS = CHEMMASS + DMDT
SEDDEPTH = B(7) * TIME
IF SEDDEPTH <= 0 THEN SEDDEPTH = 0.00001
IF SEDDEPTH > B(5) THEN SEDDEPTH = B(5)
EFFMASS = (MASSW * WPOO) + (MASSS * KP)
EFFMASS = EFFMASS + (MASST * KP) + (MASSI * WPOO)
IF TYPE$ <> "FLOATING" THEN EFFMASS = EFFMASS + (MASSP * BCF)
MASS = SEDMASS * (SEDDEPTH / B(5))
MASS = MASS + (NETSED * ITER)
SRATIO = ((MASSS * KP) / EFFMASS)
IF TYPE$ <> "FLOATING" THEN PRATIO = ((MASSP * BCF) / EFFMASS)
WRATIO = ((MASSW * WPOO) / EFFMASS)
TRATIO = ((MASST * KP) / EFFMASS)
IRATIO = ((MASSI * WPOO) / EFFMASS)
TOTRATIO = WRATIO + SRATIO + TRATIO + IRATIO
IF TYPE$ <> "FLOATING" THEN TOTRATIO = TOTRATIO + PRATIO
WMASS = WRATIO * CHEMMASS
WMASS = WMASS * EXP(-WFATE * ITER)
IF TYPE$ <> "FLOATING" THEN WMASS = PRATIO * CHEMMASS: GOTO NOTFLOAT2
DPDT = (PMASS * (1 - EXP(-WFATE * ITER)))
AMTQONE = AMTQONE + DPDT
PMASS = PMASS - DPDT
NOTFLOAT2:
SMASS = SRATIO * CHEMMASS
SMASS = SMASS * EXP(-SFATE * ITER)
TMASS = TRATIO * CHEMMASS
TMASS = TMASS * EXP(-SFATE * ITER)
IMASS = IRATIO * CHEMMASS
IMASS = IMASS * EXP(-WFATE * ITER)
WCONC = (WMASS / MASSW) * 1000000
IF WMASS < 0.00001 THEN WCONC = 0.00001
SCONC = (SMASS / MASSS) * 1000000
IF SMASS < 0.00001 THEN SCONC = 0.00001
PCONC = (PMASS / MP) * 1000000
IF PMASS < 0.00001 THEN PCONC = 0.00001
WMASS = WMASS * (1 - (FLOWVOL / WVOL))
IF WCONC < 0 THEN WCONC = 0
CHEMMASS = WMASS + SMASS + TMASS + IMASS
IF TYPE$ <> "FLOATING" THEN CHEMMASS = CHEMMASS + PMASS
IF PCONC < 0 THEN PCONC = 0
IF WCONC > WPEAK THEN WPEAK = WCONC
IF PCONC > PPEAK THEN PPEAK = PCONC
IF SCONC > SPEAK THEN SPEAK = SCONC
IF OUTTYPE$ <> "GRAPH" THEN GOTO CHECKCOUNT
LOCATE 12,65,0
PRINT USING "###.##"; TIME
GOTO CHECKWCONC
CHECKCOUNT:
IF COUNT > 0 THEN GOTO PRINTBLNK1
COLOR 4
PRINT \#2," fate calculations output"
COLOR 14,1
PRINT \#2,"time water plants sediments"
PRINT \#2,"(days) (mg/l) (mg/kg) (mg/kg)"

PRINTBLINK1:
PRINT \#2,"";
PRINT \#2,USING"####.##";TIME;
PRINT \#2,"";
PRINTTEMP = (WMAXCON * (1 - EXP(-HRATB * ITER)))
IF TIME = 0 THEN PRINT \#2,USING "###.####";PRINTTEMP;
IF TIME = 0 THEN GOTO PRINTBLINK2
PRINT \#2,USING "###.####";WCONC;

PRINTBLINK2:
PRINT \#2,"";
PRINT \#2,USING "###.####";POONC;
PRINT \#2,"";
PRINT \#2,USING "###.####";SCONC
COUNT = COUNT + 1
DEF SEG=0:POKE 1050,PEEK(1052)
IF PRINTPLACE$ <> "SCRN:" THEN GOTO CHECKWOQNC
IF COUNT <> 20 THEN GOTO CHECKWOQNC
COUNT = 0
INPUT" Press <ENTER> to Continue";X$
CLS

CHECKWOQNC:
IF WCONC >= (WPEAK / 1000) THEN GOTO NEXTTIME
IF POONC < (PPEAK / 1000) AND OVERIDE = 0 THEN GOTO PRINTPOONC
NEXTTIME:
NEXT TIME

CHECKBELOW:
IF TIME <= STPCNT THEN GOTO PRINTBELOW
TIME = TIME - ITER
PRINT " Time is";
PRINT USING "####.##";TIME;
IF WPEAK = 0 OR PPEAK = 0 THEN CURCONC = 0.00001
PRINT " Herbicide concentration in water or plants is";
IF WPEAK = 0 OR PPEAK = 0 THEN GOTO PRINTCONC
IF (WCONC / WPEAK) <= (POONC / PPEAK) THEN GOTO FIXCONC
CURCONC = (WCONC / WPEAK) * 100
GOTO PRINTPOONC

FIXCONC:
CURCONC = (POONC/PPEAK) * 100

PRINTPOONC:
PRINT USING "###.####";CURCONC;
PRINT " percent of peak concentrations in water or plants."

CONTCALC:
PRINT "If you wish to continue calculations,";
PRINT "please enter the number of"
PRINT "additional days to continue calculation";
PRINT "(press <ENTER> to stop now)."
DEF SEG=0:POKE 1050,PEEK(1052)
INPUT "enter number of days =>";STPADD
IF OUTTYPE$ = "GRAPH" THEN GOTO PRINTWAIT
IF STPADD = 0 THEN GOTO CLOSEFILE
STACNT = TIME + ITER
STPCNT = STACNT + STPADD
COUNT = 0
OVERIDE = 1
CLS
GOTO TIMELOOP2

PRINTWAIT:
IF STPADD = 0 THEN GOTO CLOSEFILE
STACNT = TIME + ITER
STPCNT = STACNT + STPADD
COUNT = 0
OVERIDE = 1
CLS
LOCATE 12,6,0
PRINT "CALCULATIONS IN PROGRESS, PLEASE WAIT. CALCULATING FOR DAY: "
GOTO TIMELOOP2

PRINTBELLOW:
PRINT "herbicide concentrations in plant tissue and water is below"
PRINT "one tenth of one percent of maximum."
GOTO CONTYCALC

CLOSEFILE:
CLOSE
IF WPEAK > PPEAK THEN PEAK = WPEAK ELSE PEAK = PPEAK
IF SPEAK > PEAK THEN PEAK = SPEAK
PEAK = PEAK * 1.2
FOR U = 1 TO 30
   PEAK = PEAK * 10
NEXT U
IF PEAK > 1 THEN GOTO EXITULOOP

EXITULOOP:
PEAK = INT(PEAK)
IF U => 1 THEN PEAK = PEAK + 1
PEAK = (PEAK / (10^U)) * 1.2
IF HRATE = 1000 THEN PEAK = PEAK * 2
CLS
LOCATE 12,5,0
PRINT "When the Following Graph Has Finished Printing";
PRINT "on the Screen, a Hardcopy"
PRINT "May be Obtained by Pressing and Holding the";
PRINT "<SHIFT> Key and Then Pressing"
PRINT "the <Print Screen> or <PrtSc> Key (whichever);"
PRINT "your system has)."
PRINT "This Should be Done";
COLOR 4
PRINT "BEFORE";
COLOR 14,1
PRINT "Pressing <ENTER> as Instructed on the at the"
PRINT "Bottom of the Graph."
PRINT:PRINT
INPUT" Press <ENTER> to Continue";X$ SCREEN 1,0 COLOR 0,0 CLS PRTP0S$ = STR$(DAYS) PRTP0S = LEN(PRTP0S$) PRTP0S = 37 - PRTP0S LOCATE 20,5,0 PRINT "0 TIME (DAYS)" LOCATE 20,PRTP0S,0 PRINT USING "###.#";TIME LOCATE 1,1,0 IF PEAK => 100 THEN PRINT USING "###";PEAK IF PEAK => 10 AND PEAK < 100 THEN PRINT USING "##.#";PEAK IF PEAK => 1 1 AND PEAK < 10 THEN PRINT USING "###";PEAK IF PEAK => 0.001 AND PEAK < 1 THEN PRINT USING "###.";PEAK IF PEAK < 0.001 THEN PRINT USING "####";PEAK LOCATE 10,2,0 PRINT "PPM" LOCATE 10,1,0 PRINT "water plants sediments"
FOR LEG = 45 TO 60 STEP 2 PSET(LEG,165),2 PSET(LEG + 80,165),1 PSET(LEG + 170,165),3 NEXT LEG WMASS = 0:PMASS = 0:CHEMMASS = 0
WMASS = WMASS * (INTERCEPT / 100)
WMASS = WMASS - PMASS
STPCNT = TIME
STACNT = 0
ITER = TIME / 130
WPOO = 1
"******** release of herbicide to water ***************
MASSW = WVCDL: 'KG WATER
MASSS = SEDMASS: 'KG SEDIMENT
MASSP = MP: 'KG PLANTS
MASST = TSMASS: 'KG TOTAL SUSPENDED SOLIDS
MASSI = SIW: 'KG INTERSTITIAL WATER
KP = B(14) : 'RATIO OF SEDIMENT/WATER CONC
BCF = B(23) : 'RATIO OF PLANT/WATER CONC
FOR TIME = STACNT TO STPCNT STEP ITER
COUNTP = COUNTP + 1
DMDT = (OMASS * (1 - EXP(-HRATE * TIME))) - AMTREL
AMTREL = AMTREL + DMDT
CHEMMASS = CHEMMASS + DMDT

NOTFLOAT3:
SEDDPETH = B(7) * TIME
IF SEDDEPETH <= 0 THEN SEDDEPETH = 0.000001
IF SEDDEPETH > B(5) THEN SEDDEPETH = B(5)
EFFMASS = (MASSW * WPOO) + (MASSS * KP)
EFFMASS = EFFMASS + (MASST * KP) + (MASSI * WPOO)
IF TYPE$ <> "FLOATING" THEN EFFMASS = EFFMASS + (MASSP * BCF)
MASSS = SEDMASS * (SEDDPETH / B(5))
MASSS = MASSS + (NETSED * ITER)
SRATI0 = ((MASSS * KP) / EFFMASS)
IF TYPE$ <> "FLOATING" THEN PRATI0 = ((MASSP * BCF) / EFFMASS)
WRATI0 = ((MASSW * WPOO) / EFFMASS)
TRATI0 = ((MASST * KP) / EFFMASS)
IRATI0 = ((MASSI * WPOO) / EFFMASS)
TOTRATI0 = WRATI0 + SRATI0 + TRATI0 + IRATI0
IF TYPE$ <> "FLOATING" THEN TOTRATI0 = TOTRATI0 + PRATI0
WMASS = WRA0TIO * CHEMMASS
WMASS = WMASS * EXP(-WFATE * ITER)
IF TYPE$ <> "FLOATING" THEN IMASS = PRATI0 * CHEMMASS: G0TO NOTFLOAT4
DPDT = (PMASS * (1 - EXP(-WFATE * ITER)))
AMTgone = AMTgone + DPDT
WMASS = WMASS - DPDT

NOTFLOAT4:
SMASS = SRATI0 * CHEMMASS
SMASS = SMASS * EXP(-SFATE * ITER)
TMASS = TRATI0 * CHEMMASS
TMASS = TMASS * EXP(-SFATE * ITER)
IMASS = IRATI0 * CHEMMASS
IMASS = IMASS * EXP(-WFATE * ITER)
WOONC = (WMASS / MASSW) * 1000000
IF WMASS < 0.000001 THEN WOONC = 0.000001
SOONC = (SMASS / MASSS) * 1000000
IF SMASS < 0.000001 THEN SOONC = 0.000001
POONC = (TMASS / MP) * 1000000
IF TMASS < 0.000001 THEN POONC = 0.000001
WMASS = WMASS * (1 - (FDOWVOL / WVOL))
IF WOONC < 0 THEN WOONC = 0
CHEMMASS = WMASS + SMASS + TMASS + IMASS
IF TYPE$ <> "FLOATING" THEN CHEMMASS = CHEMMASS + PMASS
IF POONC < 0 THEN POONC = 0
PPMDAYS = PPMDAYS + (POONC * ITER)
Y = (((260 / STPCNT) * TIME) + 40
X = 150 - ((140 / PEAK) * WOONC)
YW = Y
XW = 150 - ((140 / PEAK) * POQNC)
YS = Y
XS = 150 - ((140 / PERK) * SOONC)
PSET(Y,X),2
PSET(YW,XW),1
PSET(YS,XS),3
NEXT TIME
DEF SEG=0:POKE 1050,PEEK(1052)
LOCATE 23,1,0
INPUT" press <ENTER>";X$:SCREEN 2
SCREEN 0,1,0,0
COLOR 14,1
CLS
DEF SEG=0:POKE 1050,PEEK(1052)
CLOSE
LOCATE 12,1,0
PRINT " output to module 2 (EFFECTS)"
PRINT " plant exposure to herbicide (MG/XG-DAYS)"
PRINT USING"####.###";PPMDAYS
PRINT ""
DEF SEG=0:POKE 1050,PEEK(1052)
INPUT" press <ENTER> to continue";X$
CLS
PERDRY = B(25)
INITBIGH = A(23,0)
TIMESHRU = 1
TITLES$ = " Change / Save / Review Menu"
MENUS$(1) = "1. Continue Program (Module II)"
MENUS$(2) = "2. Change / Review Data"
MENUS$(3) = "3. Save Data to Disk"
MENUS$(4) = "4. Load New Data File or Load Defaults"
MENUS$(5) = "5. Help and Instructions"
MENUS$(6) = "6. Exit HERBICIDE Program"
RESULT$(1) = "EFFECT"
RESULT$(2) = "ENTER"
RESULT$(3) = "SAVE"
RESULT$(4) = "INPUT"
RESULT$(5) = "HELP1"
RESULT$(6) = "QUIT"
MAXITEM = 6
CHAIN PPATH$ + "MEND"

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT "";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "
PRINT ""
DEF SEG=0: POKE 1050, PEEK(1052)

KNOWN:

IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN

LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM."
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
    IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
    IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
    IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
    IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
    IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
    IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
    IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
    IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE

UNKNOWN:

LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THIS ERROR"
LOCATE 12,5,0
PRINT "NUMBER":;ERR;": OCCURRED IN SUB-Routine: ";LINKS
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN

PAUSE:

LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:

SEL$ = INKEY$
IF SEL$ = "": GOTO SCAN
CLS
RESUME START

Subroutine EFFECT

BEGIN:

DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENU$(10)
DIM RESU/T$(10)
DIM H0LD(25,1)
COMMON DSKED$,A$(),A(),F$(),B(),TYPE$,DIRECT$,UNIT8$
COMMON PPM DAYS,INITBIOM,DIR$,SPECNAME$,PERDY
COMMON CHEMNAME$,PRINTPLACE$,LINK$,PATH$,PATH$
COMMON MENU$(),MAXITEM,RESULT$(),TITLE$,COUNT,CURBIOM
MAXITEMS = 24
KEY(1) ON
LINK$ = "EFFECT"
SCREEN 0,1,0,0
IF DSKED$ = "HD" THEN GOTO START
OPEN PPATH$ + "DSKED.CHK" FOR INPUT AS #1
INPUT #1, DSKID$
CLOSE #1
IF DSKID$ = "PR7G1" THEN GOTO START
CLS
LOCATE 12,15,0
PRINT"Please Place Program Disk 1 in Drive "; PPATH$
LOCATE 14,15,0
PRINT"and Press Any Key to Continue"

CHKCHOOSE:

SEL$ = INKEY$
IF SEL$ = "H" THEN GOTO CHKCHOOSE
GOTO START

START:

FILE$ = DPATH$ + DIRECT$ + DIR$ + "\DEFAULT\" + DIR$ + ".BAS"
OPEN FILE$ FOR INPUT AS #1
INPUT #1, RESPOCO, LACOEFF
CLOSE #1
SCREEN 0
COLOR 14,1
CLS
CIRCREC = 0
ITER = 0.1
IF LACOEFF = 0 THEN LACOEFF = 1: GOTO SKIPLAGCO

GETLAGCO:

LAGCO = 1 / LACOEFF
IF TIMESCHK > 0 THEN GOTO SKIPINSTR
SKIPLAGOO:

LOCATE 6,2,0
PRINT "This is Module 2 (Response). The Graph Which Will Follow";
PRINT " is a Graph of"
LOCATE 8,2,0
PRINT "Percent of Plants Killed vs. Exposure";
PRINT " (mg / kg Herbicide Concentration"
LOCATE 10,2,0
PRINT "in Plant Tissues X Exposure Duration (Days)).";
PRINT " From This Graph,"
LOCATE 12,2,0
PRINT "Percentage of Plant Population Killed is Calculated.";
PRINT " It is Assumed for"
LOCATE 14,2,0
PRINT "the Purposes of Module 3 (Population Response)";
PRINT " That the Maximum Obtainable"
LOCATE 16,2,0
PRINT "Kill is 99.0% of Pre-Treatment Densities so That There";
PRINT " Remains Sufficient"
LOCATE 18,2,0
PRINT "Plant Material to Regrow. The Calculations Performed";
PRINT " in This Module";
LOCATE 20,2,0
PRINT "Can be Modified by the User at the End of The Module";
PRINT " and This Module Can"
LOCATE 22,2,0
PRINT "Then be Re-Run With the New Calculation Parameters."
PRINT "
INPUT "Press <ENTER> to Begin";X$
CLS

SKEPINSTR:

CIRCREC = 0
PACTKILL = LAGOO
CLS
LOCATE 12,15,0
PRINT "calculations in progress, please wait"
FOR PMDAYS = 0 TO 100 STEP 0.1
DKILDMD = (RESPPO * PACTKILL * ((99 - PACTKILL) / 99)) * 0.1
PACTKILL = PACTKILL + DKILDMD
IF DIRECT$ = "HYACINTH" THEN STFCNT = 100
IF PACTKILL > 99.0 THEN STFCNT = PMDAYS * 1.1:GOTO PLOTGRAPH
NEXT PMDAYS

PLOTGRAPH:

PACTKILL = LAGOO
DKILDMD = 0

PLOTGRAPH2:

CLS
LOCATE 12,5,0
PRINT "When the Following Graph Has Finished Printing on";
PRINT " the Screen, a Hardcopy";
PRINT " May be Obtained by Pressing and Holding the";
PRINT " <SHIFT> Key and Then Pressing";
PRINT" the <Print Screen> or <PrtSc> Key";
PRINT " (which ever your system has)."
PRINT:"PRINT" This Should be Done";
COLOR 4
PRINT" BEFORE";
COLOR 14,1
PRINT " Pressing <ENTER> as Instructed on the at the"
PRINT " Bottom of the Graph."
PRINT
PRINT
INPUT " Press <ENTER> to Continue" ;X$
CLS
SCREEN 1,0
COLOR 0,0
PRTPOS$ = STR$(DAYS)
PRTPOS = LEN(PRTPOS$)
PRTPOS = 37 - PRTPOS
LOCATE 20,5,0
PRINT " 0 MG/KG-DAYS"
LOCATE 20,PRTPOS,0
PRINT USING "###.#";STPCNT
LOCATE 2,2,0
PRINT "100"
LOCATE 10,2,0
PRINT "%"
LOCATE 11,1,0
PRINT "kill"
UNE (39,10)-(301,151),3,B
CERCLB (100,164),5,2
LOCATE 21,15,0
PRINT "=kill achieved"
ITER = PMDAYS / 260
IF STPCNT = 0 THEN STPCNT = ITER
IF DIRECT$ <> "HYACINTH" THEN GOTO LOGISTIC

HYACINTH:
ITER = 0.1
STPCNT = 50
FOR PMDAYS = 0 TO STPCNT STEP ITER
  DKILDPM = (99 * (1 - EXP(-RESPOO * PMDAYS))) - INCR
  INCR = INCR + DKILDPM
  PRCtkill = PRCtkill + DKILDPM
  PMDAYS = PMDAYS
GOTO PUTPOINT

LOGISTIC:
FOR PMDAYS = 0 TO STPCNT STEP ITER
  DKILDPM = (RESPOO * PRCtkill * ((99 - PRCtkill) / 99)) * ITER
PRCTKILL = PRCTKILL + DKILDMD

PUTPOINT:
Y = ((260 / STFCNT) * PMDAYS) + 40
X = 150 - ((139 / 100) * PRCTKILL)
PSET(Y,X),1
IF PMDAYS < PMDAYS OR CIRCREC = 1 THEN GOTO NEXTPM
CIRCREC = 1
CIRCLE (Y,X),5,2
KILLPCT = PRCTKILL

NEXTPM:
IF DIRECT$ = "HYACINTH" THEN GOTO NEXTPM
NEXT PMDAYS
GOTO ENDDO

NEXTPM:
NEXT PMDAYS

ENDDO:
IF PMDAYS > PMDAYS THEN CIRCLE(Y,X),5,2:KILLPCT = 100
LOCATE 23,10,0
INPUT "press <ENTER>";X$
SCREEN 2
SCREEN 0,1,0,0
COLOR 14,1
CLS
CURBIOM = (1 - (KILLPCT / 100)) * INITBIOM
IF UNITS$ = "M" THEN PRN$ = " Metric Tons/Hectare"
IF UNITS$ = "S" THEN PRN$ = " Tons/Acre"
IF KILLPCT > 99.0 THEN KILLPCT = 99.0
LOCATE 12,1,0
PRINT " percent kill is:";
PRINT USING "###.##";KILLPCT
PRINT " initial biomass was:";
PRINT USING "###.##";INITBIOM;
PRINT PRN$:PRINT ""
PRINT " final biomass is:";
PRINT USING "###.##";CURBIOM;
PRINT PRN$:PRINT:PRINT:PRINT
INPUT " press <ENTER> to continue";X$
CLOSE
IF CURBIOM <= 0 THEN CURBIOM = INITBIOM / 1000
DEF SEG=0:POKE 1050,PEEK(1052)
CLS
LOCATE 12,1,0
PRINT " Would You Like to Repeat This Module or Continue to";
PRINT " Module 3 (Plant Response)?"
LOCATE 15,5,0
PRINT" Repeat Continue"
LOCATE 23,15,0
PRINT "MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
LOCATE 15,21,0
COLOR 19
PRINT CHR$(178)
REPOON$ = "REP"
DEF SEG=0:P0KE 1050,PEEK(1052)

CHOOSE1:
CURSOR$ = INKEY$
IF CURSOR$ = "" THEN GOTO CHOOSE1
CURSOR$ = RIGHT$(CURSOR$,1)
IF CURSOR$ = CHR$(13) THEN GOTO CHOOSE1
IF CURSOR$ = CHR$(77) THEN GOTO CONMOD
IF CURSOR$ = CHR$(75) THEN GOTO REP
GOTO CHOOSE1

REP:
LOCATE 15,46,0
PRINT " "
LOCATE 15,21,0
PRINT CHR$(178)
REPOON$ = "REP"
GOTO CHOOSE1

CONMOD:
LOCATE 15,21,0
PRINT " "
LOCATE 15,46,0
PRINT CHR$(178)
REPOON$ = "CONT"
GOTO CHOOSE1

CHOOSE1:
COLOR 14,1
IF REPOON$ = "CONT" THEN GOTO MENU
TIMESCHK = TIMESCHK + 1
CLS
LOCATE 12,5,0
PRINT " Would You Like to change to model parameters or not?"
LOCATE 15,5,0
PRINT " Change No Change"
LOCATE 23,15,0
PRINT "MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
LOCATE 15,21,0
COLOR 19
PRINT CHR$(178)
FLUSH$ = "CHNG"
DEF SEG=0:P0KE 1050,PEEK(1052)

CHOOSE2:
CURSOR$ = INKEY$
IF CURSOR$ = "" THEN GOTO CHOOSE2
CURSOR$ = RIGHT$(CURSOR$, 1)
IF CURSOR$ = CHR$(13) THEN GOTO CHOSEN2
IF CURSOR$ = CHR$(77) THEN GOTO NCHG
IF CURSOR$ = CHR$(75) THEN GOTO CHNG
GOTO CHOOSE2

CHNG:
    LOCATE 15, 46, 0
    PRINT " 
    LOCATE 15, 21, 0
    PRINT CHR$(178)
    FIXCH$ = "CHNG"
    GOTO CHOOSE2

NCHG:
    LOCATE 15, 21, 0
    PRINT " 
    LOCATE 15, 46, 0
    PRINT CHR$(178)
    FIXCH$ = "NCHG"
    GOTO CHOOSE2

CHOSEN2:
    COLOR 14, 1
    CIRCREC = 0
    IF FIXCH$ = "NCHG" AND DIRECT$ = "HYACINTH" THEN GOTO PLOTGRAF2
    IF FIXCH$ = "NCHG" THEN GOTO SKIPINSTR
    CLS
    LOCATE 3, 25, 0
    IF DIRECT$ = "HYACINTH" THEN GOTO HYACINTH2
    PRINT "The Model is in the Form:"
    PRINT
    COLOR 2
    PRINT " (-response"
    PRINT " coeff. x mg/kg-days)"
    PRINT" percent kill = 99% / (1 + (1/\text{lag coeff.} X e^\text{?})
    PRINT ")
    COLOR 14, 1
    PRINT
    PRINT "The response and lag coefficients can range":
    PRINT " from 0.1 to 1000."
    PRINT
    PRINT "The larger these coefficients, the faster the response":
    PRINT " and the longer the lag."
    PRINT
    PRINT " current response coefficient is:\"; RESPCO
    PRINT
    PRINT " current lag coefficient is:\"; LAGCOEF
    PRINT " 

NEWRESP00:
  PRINT
  INPUT " enter new response coefficient ==>");RESPCO
  IF RESPCCO > 0 AND RESPCCO < 999 THEN GOTO NEWLAGC0
  PRINT " value must be between 0.1 and 1000"
  GOTO NEWRESP00

NEWLAGC0:
  PRINT
  INPUT " enter new lag coefficient ==>");LAGC0
  IF RESPCCO > 0 AND RESPCCO < 999 THEN GOTO KEEPG0IN
  PRINT " value must be between 0.1 and 1000"
  CIRCREC = 0
  GOTO NEWLAGC0

HYACINTH2:
  PRINT "The Model is in the Form:";
  PRINT COLOR 2
  PRINT " (-response";
  PRINT " coeff. X mg/kg-days)";
  PRINT " percent kill = (99% * (1 - e";
  PRINT " )"
  COLOR 14,1
  PRINT PRINT
  PRINT " The response coefficient can range";
  PRINT " from 0.01 to 1000."
  PRINT PRINT
  PRINT " The larger this coefficient, the faster the response";
  PRINT PRINT
  PRINT " current response coefficient is:";RESPCC0
  PRINT PRINT
  PRINT " 
  PRINT " 

NEWRESP002:
  PRINT
  INPUT " enter new response coefficient ==>");RESPCC0
  IF RESPCC0 > 0 AND RESPCC0 < 999 THEN GOTO KEEPG0IN
  PRINT " value must be between 0.01 and 1000"
  GOTO NEWRESP002

KEEPG0IN:
  PRINT
  INPUT " press <ENTER> to continue";X$
  CIRCREC = 0
  GOTO PLOTGRAPH2

MENU:
CLOSE

TITLE$ = "Module II (Effects) Menu"

MENU$(1) = "1. Continue Program (Module III)"

MENU$(2) = "2. Change / Review Data"

MENU$(3) = "3. Save Data to Disk"

MENU$(4) = "4. Load New Data File or Replace Defaults"

MENU$(5) = "5. Restart Program From Beginning"

MENU$(6) = "6. Help and Instructions"

MENU$(7) = "7. Exit HERBICIDE Program"

RESULT$(1) = "MODIII"

RESULT$(2) = "ENTER"

RESULT$(3) = "SAVE"

RESULT$(4) = "INPUT"

RESULT$(5) = "SELECT"

RESULT$(6) = "HELP1"

RESULT$(7) = "QUIT"

MAXITEM = 7

CHAIN FPATH$ + "MENU"

TRAP:

SCREEN 2

SCREEN 0,1,0,0

COLOR 7,1

CLS

PRINT " ";TAB(30);"ERROR INFORMATION"

COLOR 14,1

PRINT "------------------------------------------------------------------"

PRINT "------------------------------------------------------------------"

DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:

IF ERR < 24 THEN GOTO UNKNOWN

IF ERR = 26 THEN GOTO UNKNOWN

IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN

IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN

IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN

IF ERR = 69 THEN GOTO UNKNOWN

IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN

IF ERR > 76 THEN GOTO UNKNOWN

LOCATE 8,10,0

PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:";

LOCATE 10,5,0

IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";

IF ERR = 24 THEN PRINT "OR PLUGGED IN"

IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"

IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"

IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."

IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"

IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"

IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"

IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"

IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"

IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER":ERR;" OCCURRED IN SUB-ROUTINE: ";LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN
PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE
SCAN:
S$ = INKEY$
IF S$ = "" THEN GOTO SCAN
CLS
RESUME BEGIN

Subroutine MODIII

START:
DIM A$(24,2)
DIM A(24,1)
DIM P$(60)
DIM B(25)
DIM MENU$(10)
DIM RESULT$(10)
DIM FILESIN$(60)
COMMON DSKID$,A$(,),A),(,),B,(),TYPE$,DIRECT$,UNIT$(
COMMON FPMODAYS,INITEIOK,DIR$,SPECNAMES,PERDRY
COMMON CHEMMNAMES,PRINTPLACE$,LINK$,PPATH$,DPATH$
COMMON MENU$(,),MAXITEM,RESULT$(,),TITLE$,COUNT,CURBIOM
LINK$ = "MODIII"
CLS
ON ERROR GOTO TRAP
IF DSKID$ = "HD" THEN GOTO BEGIN

PRINTTEXT:
COLOR 14,1
CLS
LOCATE 12,5,0
PRINT "Please Place the ";SPECNAME$;" Model Disk"
LOCATE 14,5,0
PRINT " in Drive ";PPATH$;" and Press any Key to Continue"

CHOOSE:
    SEL$=INKEY$
    IF SEL$="!" THEN GOTO CHOOSE

OPEN PPATH$ + "DSKID.CEH" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = DIRECT$ THEN GOTO BEGIN ELSE GOTO PRTEXT

BEGIN:
    CHAIN PPATH$ + DIRECT$

TRAP:
    SCREEN 2
    SCREEN 0,1,0,0
    COLOR 7,1
    CLS
    PRINT " ";TAB(30);"ERROR INFORMATION"
    COLOR 14,1
    PRINT "--------------------------------------------------------------------------------
    PRINT "--------------------------------------------------------------------------------"
    DEF SEG=0:POKE 1050,PEEK(1052)

KNOWN:
    IF ERR < 24 THEN GOTO UNKNOWN
    IF ERR = 26 THEN GOTO UNKNOWN
    IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
    IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
    IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
    IF ERR = 69 THEN GOTO UNKNOWN
    IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
    IF ERR > 76 THEN GOTO UNKNOWN
    LOCATE 8,10,0
    PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
    LOCATE 10,5,0
    IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
        IF ERR = 24 THEN PRINT "OR PLUGGED IN"
    IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
    IF ERR = 27 THEN PRINT "THEプリンタはインキ";
    IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE"
    IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
    IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
        IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
        IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
    IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
    IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
    IF ERR = 53 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN";
        IF ERR = 53 OR ERR = 76 THEN PRINT " THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
    IF ERR = 71 THEN PRINT " IS NO DISK IN THE DRIVE"
    IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE

UNKNOWN:
    LOCATE 10,5,0
    PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
    LOCATE 11,5,0
    PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
    LOCATE 12,5,0
    PRINT "NUMBER";ERR;" OCCURRED IN SUB-Routine:";LINK$
    LOCATE 20,28,0
    COLOR 20
    PRINT "PRESS ANY KEY TO CONTINUE"
    COLOR 14,1
    GOTO SCAN

PAUSE:
    LOCATE 20,15,0
    COLOR 20
    PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
    COLOR 14,1
    CLOSE

SCAN:
    SEL$ = INKEY$
    IF SEL$ = "" THEN GOTO SCAN
   CLS
    RESUME START

BEGIN:
    DIM BIOM(365)
    DIM PT(365)
    DIM DAYC(14)
    DIM FACTRLF(14)
    DIM ALTNT(14)
    DIM ANLFT(14)
    DIM ANLFTA(14)
    DIM TEM(14)
    DIM FEEDS(365)
    DIM A$(24,2)
    DIM A(24,1)
    DIM F$(60)
    DIM B(25)
    DIM MENU$(10)
    DIM RESULT$(10)
    COMMON DSKID$,A$(,),A$(,),F$(,),B$(,),TYPES$,DIRECT$,UNITSS$
    COMMON PPMDAYS,INIBIOM,DIR$,SPECNAMES$,PERDRY
    COMMON CHEMMANES,PRNTPLACES$,LINKS$,PATHS$,PATHS$
    COMMON MENU$(,),MAXITEM,RESULT$(,),TITLES$,COUNT,CURBIOM
    LINKS = "HYACINTH"
    ON ERROR GOTO TRAP

Subroutine HYACINTH
SCREEN 0,1,0,0
COLOR 14,1
CLS
IF DSKID$ = "HD" THEN GOTO START
OPEN PPATH$ + "DSKID.CHK" FOR INPUT AS #1
INPUT #1,DSKID$
CLOSE #1
IF DSKID$ = DIRECT$ THEN GOTO START
CLS
LOCATE 12,15,0
PRINT"Please Place Program Disk 1 in Drive ";PPATH$
LOCATE 14,15,0
PRINT"and Press Any Key to Continue"

CHOOSE:
  SEL$=INKEY$
  IF SEL$="" THEN GOTO CHOOSE
  CLS
  GOTO START

START:
  IF UNITS$ <> "M" THEN GOTO CUSTOMARY
  CONVERT = 10
  PRNTHEAD$ = "MT. TONS/HA."
  AXIS = 600
  GOTO TITLES

CUSTOMARY:
  CONVERT = 4.4534
  PRNTHEAD$ = "TONS/acre"
  AXIS = 300

TITLES:
  PERWET = 1 / (PERDRY / 100)
  CURBIOH = (CURBIOH / CONVERT) / PERWET
  PRINT
  PRINT
  PRINT
  PRINT
  PRINT" THIS PROGRAM WAS ADAPTED FROM THE ORIGINAL PROGRAM:"
  PRINT
  PRINT" COMPUTER—SIMULATION MODELING OF Neochetina spp. ——" STRATEGIES TO CONTROL WATERHYACINTH"
  PRINT
  PRINT" WRITTEN BY:"
  PRINT
  PRINT" Runter S. Akbay, Ph.D , Jean W. Wooten, Ph.D and"
  PRINT" Fred G. Howell, Ph.D"
  PRINT
  PRINT" at the University of Southern Mississippi"
  PRINT
  PRINT" SIMULATION FOR WEEVIL DAMAGE TO PLANTS HAS BEEN";
  PRINT " OMITTED"
And only the growth portion of the model has; 
been retained."

PRINT
PRINT
PRINT
PRINT
PRINT
INPUT

PRESS <ENTER> TO BEGIN'; X$
LOCATE 15,21,0
PRINT CHR$(178)
OUTTYPES$ = "GRAPH"
GOTO CHOOSE1

NUMOUT:
    LOCATE 15,21,0
    PRINT " "
    LOCATE 15,46,0
    PRINT CHR$(178)
    OUTTYPES$ = "NUM"
    GOTO CHOOSE1

PRICKOUT:
    COLOR 14,1
    IF OUTTYPES$ = "GRAPH" THEN GOSUB PRNTGRAPH
    IF OUTTYPES$ = "GRAPH" THEN GOTO SEASON
    ' **************** SELECT output device ******************
    CLS
    LOCATE 12,5,0
    PRINT " Would You Like the output to go to the screen or the printer?"
    LOCATE 15,5,0
    PRINT " " Screen Printer"
    LOCATE 23,15,0
    PRINT " MOVE CURSOR TO DESIRED SELECTION AND PRESS <ENTER>"
    LOCATE 15,21,0
    COLOR 19
    PRINT CHR$(178)
    PRN$ = "SCRN:"
    DEF SEG=0:POKE 1050,PEEK(1052)

CHOOSE2:
    CURSOR$ = INKEY$)
    IF CURSOR$ = "" THEN GOTO CHOOSE2
    CURSOR$ = RIGHTS$(CURSOR$,1)
    IF CURSOR$ = CHR$(13) THEN GOTO CHOOSE2
    IF CURSOR$ = CHR$(77) THEN GOTO PRINTOUT
    IF CURSOR$ = CHR$(75) THEN GOTO SCREENOUT
    GOTO CHOOSE2

SCREENOUT:
    LOCATE 15,46,0
    PRINT " "
    LOCATE 15,21,0
    PRINT CHR$(178)
    PRN$ = "SCRN:"
    GOTO CHOOSE2

PRINTOUT:
    LOCATE 15,21,0
    PRINT " "
    LOCATE 15,46,0
PRINT CHR$(178)
PRN$ = "LPT1:"
GOTO CHOOSE2

CHOOSE2:
COLOR 14,1
OPEN PRN$ FOR OUTPUT AS #1
CLS
IF PRN$ = "LPT1:" THEN PRNTFIX = 0 ELSE PRNTFIX = 1

SEASON:
"******** SIMULATE FOR THE SEASON ********
IF OUTTYPE$ = "GRAPH" THEN GOTO SETDAY
CLS
PRINT #1, " WEATHER DATA SET SELECTED IS: ";WEATH$(NA)
PRINT #1, " JULIAN BIOMASS"
PRINT #1, "DATE ";PRNTHEADS
PRINT #1, "###"
IF YRCNT <> 0 THEN GOTO YEARNOT
PRINT #1, "###"
PRINT #1, "###";ADD1 + D1;Y1;
PRINT #1, "###
PRINT #1, US"###
YEARNOT:
IF YRCNT <= 0 THEN GOTO SETOAY
PRINT #1, "###
PRINT #1, "###
PRINT #1, "###
PRINT #1, "###.##
SETOAY:
JDF1 = JDFRST + 1
FOR JDAY = JDF1 TO JDLAST
DAY = JDAY
IDAY = JDAY - JDFRST + 1
"*********** READ DAILY WEATHER DATA **********
INPUT #2,JWDAY,SOLR,TMAX,TMIN
ATEMP = (TMAX + TMIN) / 2
ATEMP = (ATEMP * 32) * (5/9)
GOSUB MAXPHOTO
GOSUB MODULUS
GOSUB MAXPHOTO
GOSUB MODULUS
KOUNT = MD
IF OUTTYPE$ = "GRAPH" THEN GOTO CHECKGRAPH
IF KOUNT <> 0 THEN GOTO SETBIO
LOCATE 24,1,0
IF PRN$ <> "LPT1:" THEN PRINT " ";TAB(20);
IF PRN$ <> "LPT1:" THEN INPUT "PRESS <ENTER> TO CONTINUE";X$

CHECKGRAPH:
IF KOUNT <> 0 THEN GOTO SETBIO
IF OUTTYPE$ = "GRAPH" THEN GOTO CHECKNUM
IF PRN$ = "LPT1:" THEN GOTO SETBIO
CLS
PRINT #1," JULIAN BIOMASS"
PRINT #1," DATE ";PRNTHEADS$ 
PRINT #1,

SETBIO:
IF YRCNT > 0 AND JDFRST = 1 AND JDAY = 1 THEN BIOMKG = FINBIO
IF YRCNT > 0 AND JDFRST = 1 AND JDAY = 1 THEN GOTO CHKINCRQDAY
BIOMKG = BIOM(IDAY) / 1000

CHKINCRQDAY:
IF OUTTYPE$ = "GRAPH" THEN GOTO INCQDAY
PRINT #1,";
PRINT #1,USING "###":JDAY;
PRINT #1,USING "###":Y1 + YRCNT;
PRINT #1,"";
PRINT #1,USING "###.##":(BIOMKG * PERWET) * CONVERT

CHECKNUM:
IF OUTTYPE$ = "NUM" THEN GOTO NEXTJDAY

INCQDAY:
QDAY = QDAY + 1
Y = ((260 / DAYS) * QDAY)+40
X = 150 - ((140 / AXIS) * (BIOMKG * PEKWET * CONVERT))
PSET(Y,X),1

NEXTJDAY:
NEXT JDAY
CLOSE #2
FINBIO = BIOM(IDAY) / 1000
LOCATE 24,1,0
IF OUTTYPE$ = "GRAPH" THEN GOTO NEXTYR
IF PRN$ <> "LPT1:" THEN PRINT "";TAB(20); 
IF PRN$ <> "LPT1:" THEN INPUT "PRESS <ENTER> TO CONTINUE";X$

NEXTYR:
NEXT YRCNT
DEF SEG=0:POKE 1050,PEEK(1052)
LOCATE 23,8,0
IF OUTTYPE$ = "GRAPH" THEN INPUT "PRESS <ENTER>";X$
CLOSE #1
QDAY = 0
GOTO SETTIMES

TABLI:
"FUNCTION TABLI "
K = 14
DUMMY = DAY
IF DUMMY < DAYC(K) THEN AMIN1 = DUMMY ELSE AMIN1 = DAYC(K)
IF AMIN1 > DAYC(1) THEN AMAX1 = AMIN1 ELSE AMAX1 = DAYC(1)
DUM = AMAX1
FOR I = 2 TO K
    IF (DUM > DAYC(I)) THEN GOTO NEXTTABLI ELSE GOTO EXITI
NEXTTABLI:
    NEXT I
EXITI:
    J = I - 1
    TABLI = (DUM - DAYC(J)) * (TEM(I) - TEM(J))
    TABLI = TABLI / (DAYC(I) - DAYC(J)) + TEM(J)
RETURN

INITVAR:
'********** INITIALIZE VARIABLES **********
FOR I = 1 TO 365
    PT(I) = 0
    BIOM(I) = 0
NEXT I
FOR I = 1 TO 14
    READ DAYC(I)
NEXT I
DATA 1,15,46,74,105,135,166,196,227,258,288,319,349,365
FOR I = 1 TO 14
    READ PRCTLF(I)
NEXT I
DATA 0.2740,0.2740,0.2173,0.4076,0.6378,0.6569,0.7127
DATA 0.7469,0.7056,0.6972,0.7292,0.7258,0.5944,0.2740
FOR I = 1 TO 14
    READ ATLWT(I)
NEXT I
DATA 1.635,1.635,1.048,1.975,1.948,4.55,11.80,12.66
DATA 12.73,15.97,14.23,9.15,5.41,3.523
FOR I = 1 TO 14
    READ ANLPT(I)
NEXT I
DATA 3.95,4.1,4.21,4.81,4.63,6.2,6.46,6.33,5.81,6.31
DATA 5.08,5.07,4.33,4.02
FOR I = 1 TO 14
    READ ANLPTA(I)
NEXT I
DATA 3.125,2.75,5.6,6,6,6,6,6,6,6,5,3.5,3.125
DAY = 0
SOLR = 0
TMAX = 0
TMN = 0
ATEMP = 0
KODE = 0
IDAY = 0
RM2 = 0.015
RM1 = 0.019
E = 0.75
PON = 1
FP = 1
NODIV = 1
CONVEX = 1
DENSTY = 0
PRCTLV = 0
ATLW = 0
ANLP = 0
ANPLTS = 0
DETLF = 0
REMCRT = 0.001
RIMORT = 0.001
RPMORT = 0.001
RAMORT = 0.001
DUMMY = 0
DAY = 0
AMIN1 = 0
ANAX = 0
DUM = 0
TABLI = 0
RETURN

MODULUS:

'********** MODULUS PROCEDURE **********
MD = IDAY / 20
MD = MD - INT(MD)
RETURN

INITPLANT:

'********** INITIALIZE PLANT MODULE **********
IF YRCNT <> 0 THEN GOTO SKIPNOTE
CLS
LOCATE 12,20,0
PRINT "DATA IS BEING LOADED, PLEASE WAIT"

SKIPNOTE:

IF YRCNT = 0 THEN BIOM(1) = CURBIOM ELSE BIOM(1) = FNBIO
BIOM(1) = BIOM(1) * 1000
DAY = JDFRST
FOR I = 1 TO 14
   TEM(I) = PRCTLF(I)
NEXT I
GOSUB TABLI
PRCTLV = TABLI
FOR I = 1 TO 14
   TEM(I) = ATLWT(I)
NEXT I
GOSUB TABLI
ATLW = TABLI
IF WDATA$ = "W75F.DAT" THEN GOTO SETTEM
FOR I = 1 TO 14
   ANLP(I) = ANLPFA(I)
NEXT I

SETTEM:
  FOR I = 1 TO 14
    TEM(I) = ANLPT(I)
  NEXT I
  GOSUB TABLI
  ANLP = TABLI
  OPEN DEATH$ + DIRECT$ + "\" + WDATA$ FOR INPUT AS #2

GETWEAT:
  INPUT#2,JWDAY,SOLR,TMAX,TMIN
  IF JWDAY < JDFRST THEN GOTO GETWEAT
  RETURN

MAXPHOTO:
  "******** MAXIMUM PHOTOSYNTHESIS **********
  IF SOLR > 100 THEN GOTO SETPMAX
  PMAX = 0.32 * SOLR
  GOTO TEMPLIMIT

SETPMAX:
  PMAX = 22.318 + 0.102 * SOLR

TEMPLIMIT:
  "******** TEMPERATURE LIMITING FUNCTION - PHOTOSYNTHESIS ******
  ATEMP1 = ABS(ATEMP - 29)
  FT = 1 - 0.0037 * ATEMP1^2
  IF FT < 0 THEN FT = 0.028
  "******** DENSITY LIMITING FUNCTION - PHOTOSYNTHESIS **********
  DENSITY = BIOM(IDRY - 1)
  IF DENSITY >= 1000 THEN GOTO SETFDEN
  FDEN = DENSITY / 1000
  GOTO SETGROSS

SETFDEN:
  FDEN = 1

SETGROSS:
  "******** GROSS PHOTOSYNTHESIS **********
  PG = PMAX * FT * FCN * FP * FDEN
  "******** DETRITAL PRODUCTION **********
  FOR I = 1 TO 14
    TEM(I) = FRCTLF(I)
  NEXT I
  GOSUB TABLI
  FRCTLV = TABLI
  FOR I = 1 TO 14
    TEM(I) = ATDWT(I)
  NEXT I
  GOSUB TABLI
  ATUT = TABLI
FOR I = 1 TO 14
    TEM(I) = ANLFT(I)
NEXT I
GOSUB TABLI
ANLP = TABLI
ANLP = (DENSTY * PRCTLV) / ATLW
DRAEL = 1 / 10.2
DETFL = ANLPS * DRAEL
D = DETFL * (ATLW / ANLP)

'******* RESPIRATORY MAINTENANCE BY GEOGRAPHICAL LOCALITY *****
IF NA > 4 THEN GOTO FLORIDA

'******* FOR LOUISIANA ************
RM = RM2 * DENSTY
GOTO EFFICIENT

FLORIDA:

'******* FOR FLORIDA ***************
RM = RM1 * DENSTY

EFFICIENT:

'******* CHOOSE EFFICIENCY BASED ON WHETHER PLANTS ARE FLOWERING
IF NA > 4 THEN GOTO FLORIDA2

'******* FOR LOUISIANA ************
IF JDAY > 150 AND JDAY < 330 THEN E = 0.73 ELSE E = 0.83
GOTO GROWTH

FLORIDA2:

'******* FOR FLORIDA ***************
IF JDAY > 150 AND JDAY < 330 THEN E = 0.65 ELSE E = 0.75

GROWTH:

'******* WATERHYACINTH GROWTH IN DRY WEIGHT PER DAY
'******* BASED ON WHETHER OR NOT DETRITUS IS INCLUDED
IF NA <= 4 THEN DLTBM = ((PS - RM) * E)
IF NA > 4 THEN DLTBM = ((PS - RM * E) - D)
IF ATMP <= 0 THEN DLTBM = -D

'******* CUMULATIVE BIOMASS ************
BIOM(IDAY) = BIOM(IDAY - 1) + DLTBM
RETURN

PRINTGRAPH:
CLS
COLOR 14,1
LOCATE 12,5,0
PRINT "When the Following Graph Has Finished Printing on the";
PRINT " Screen, a Hardcopy"
PRINT " May be Obtained by Pressing and Holding the <SHIFT>";
PRINT " Key and Then Pressing";
PRINT " the <Print Screen> or <PrtSc> Key (whichever"
PRINT " your system has)."
PRINT
PRINT " This Should be Done";
COLOR 4
PRINT "BEFORE";
COLOR 14,1
PRINT "Pressing <ENTER> as Instructed on the at the"
PRINT "Bottom of the Graph."
PRINT
PRINT
INPUT "Press <ENTER> to Continue";X$
CLS
SCREEN 1,0
COLOR 0,0
PRTPOS$ = STR$(DAYS)
PRTPOS = LEN(PRTPOS$)
PRTPOS = 37 - PRTPOS
LOCATE 20,2,0
PRINT USING "###•";M1;D1;Y1;
PRINT "Date ";
PRINT USING "###";M2;D2;Y2
IF UNITS$ <> "S" THEN GOTO METRICOUT
LOCATE 1,2,0
PRINT "300"
LOCATE 10,1,0
PRINT "TONS"
LOCATE 11,1,0
PRINT "PER"
LOCATE 12,1,0
PRINT "ACRE"
GOTO PRINTGRAPH

METRICOUT:
LOCATE 1,2,0
PRINT "600"
LOCATE 9,1,0
PRINT "MET."
LOCATE 10,1,0
PRINT "TONS"
LOCATE 11,1,0
PRINT "PER"
LOCATE 12,1,0
PRINT "HA."
GOTO PRINTGRAPH

PRINTGRAPH:
LINE (39,1)-(301,151),3,B
DEF SEG=0:POKE 1050,PEEK(1052)
CIRCLE (44,150 - ((140 / AXIS) * INITBIGM)),5,2
CIRCLE (88,164),5,2
LOCATE 21,13,0
PRINT "PRE-TREATMENT BIOMASS"
RETURN

SETTIMES:
TIMESTHRU = 1
Would You Like to re-run this module?"
"Yes" "No"
"Move cursor to desired selection and press <enter>"
"Yes"
"No"
"Yes"
"No"
"Yes"
"No"
"Yes"
"No"
"Yes"
CLS
LOCATE 10,19,0
PRINT "Enter Date Of Treatment (MM/DD/YY) \(\Rightarrow\) / /" 
LOCATE 15,7,0
PRINT "Enter Last Day To Observe Plant Response (MM/DD/YY)";
PRINT " \(\Rightarrow\) / /" 
LOCATE 21,2,0
PRINT "Enter Requested Dates in the Form: Month Month / Day Day";
PRINT " / Year Year."
LOCATE 22,2,0
PRINT "Example: June Second 1984 Would be Entered as: 06 / 02 /";
PRINT " 84. Use the Cursor" 
LOCATE 23,2,0
PRINT "Arrows to Move to Appropriate Blanks and When Date is";
PRINT "Correct, Press <ENTER>.",
COLOR 3
LOCATE 10,58,0
PRINT "00"
LOCATE 10,62,0
PRINT "00"
LOCATE 10,66,0
PRINT "00"
LOCATE 15,63,0
PRINT "00"
LOCATE 15,67,0
PRINT "00"
LOCATE 15,71,0
PRINT "00"
COLOR 14,1
ARCOL = 58
ARROW = 9

INITSCREEN:
LOCATE ARROW,ARCOL,0
COLOR 22
PRINT CHR$(25)

CHOOSE4:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO CHOOSE4
DEF SEG=0:POKE 1052,PEEK(1050)
SEL$ = RIGHT$(SEL$,1)
MOVES = ""
LOCATE ARROW,ARCOL,0
PRINT CHR$(32)
IF SEL$ = CHR$(75) OR SEL$ = CHR$(8) THEN MOVES = "LEFT"
IF MOVES = "LEFT" THEN ARCOL = ARCOL - 1
IF SEL$ = CHR$(72) THEN ARROW = ARROW - 5
IF SEL$ = CHR$(77) OR SEL$ = CHR$(32) THEN MOVES = "RIGHT"
IF MOVES = "RIGHT" THEN ARCOL = ARCOL + 1
IF SEL$ = CHR$(80) THEN ARROW = ARROW + 5
IF SEL$ > CHR$(47) AND SEL$ < CHR$(58) THEN GOTO PRINTARROW
IF SEL$ = CHR$(13) THEN GOTO GETSCREEN
IF ARROW < 9 THEN ARROW = 9
IF ARROW > 14 THEN ARROW = 14
IF ARROW = 9 AND SEL$ = CHR$(72) THEN ARCOL = 58
IF ARROW = 14 AND SEL$ = CHR$(80) THEN ARCOL = 63
IF ARROW = 14 AND ARCOL < 63 THEN ARCOL = 63
IF ARROW = 9 AND ARCOL < 58 THEN ARCOL = 58
IF ARROW = 9 AND ARCOL > 59 AND ARCOL < 62 AND MOVE$ = "RIGHT" THEN ARCOL = 62
IF ARROW = 9 AND ARCOL > 59 AND ARCOL < 62 AND MOVE$ = "LEFT" THEN ARCOL = 59
IF ARROW = 14 AND ARCOL > 64 AND ARCOL < 67 AND MOVE$ = "RIGHT" THEN ARCOL = 67
IF ARROW = 14 AND ARCOL > 64 AND ARCOL < 67 AND MOVE$ = "LEFT" THEN ARCOL = 64
IF ARROW = 14 AND ARCOL > 68 AND ARCOL < 71 AND MOVE$ = "RIGHT" THEN ARCOL = 71
IF ARROW = 14 AND ARCOL > 68 AND ARCOL < 71 AND MOVE$ = "LEFT" THEN ARCOL = 68
IF ARROW = 9 AND ARCOL > 67 THEN ARCOL = 67
IF ARROW = 14 AND ARCOL > 67 THEN ARCOL = 67
GOTO INITSCREEN

PRINTARROW:
LOCATE ARROW + 1,ARCOL,0
PRINT CHR$(32)
COLOR 3
LOCATE ARROW + 1,ARCOL,0
PRINT SEL$
COLOR 22
ARCOL = ARCOL + 1
IF ARROW = 9 AND ARCOL < 58 THEN ARCOL = 58
IF ARROW = 9 AND ARCOL > 67 THEN ARROW = 14:ARCOL = 63
IF ARROW = 9 AND ARCOL > 59 AND ARCOL < 62 THEN ARCOL = 62
IF ARROW = 9 AND ARCOL > 63 AND ARCOL < 66 THEN ARCOL = 66
IF ARROW = 14 AND ARCOL > 64 AND ARCOL < 67 THEN ARCOL = 67
IF ARROW = 14 AND ARCOL > 68 AND ARCOL < 71 THEN ARCOL = 71
IF ARROW = 14 AND ARCOL > 63 THEN ARCOL = 63
IF ARROW = 14 AND ARCOL > 72 THEN ARROW = 9:ARCOL = 58
GOTO INITSCREEN

GETSCREEN:
\[ M1 = \text{VAL}(\text{CHR$(\text{SCREEN}(10, 58))) + \text{CHR$(\text{SCREEN}(10, 59)))} \]
\[ D1 = \text{VAL}(\text{CHR$(\text{SCREEN}(10, 62))) + \text{CHR$(\text{SCREEN}(10, 63)))} \]
\[ Y1 = \text{VAL}(\text{CHR$(\text{SCREEN}(10, 66))) + \text{CHR$(\text{SCREEN}(10, 67)))} \]
\[ M2 = \text{VAL}(\text{CHR$(\text{SCREEN}(15, 63))) + \text{CHR$(\text{SCREEN}(15, 64)))} \]
\[ D2 = \text{VAL}(\text{CHR$(\text{SCREEN}(15, 67))) + \text{CHR$(\text{SCREEN}(15, 68)))} \]
\[ Y2 = \text{VAL}(\text{CHR$(\text{SCREEN}(15, 71))) + \text{CHR$(\text{SCREEN}(15, 72)))} \]
COLOR 6
IF M1 >= 1 AND M1 <= 12 THEN GOTO ENDMONTH
LOCATE 18, 3, 0
INPUT "Treatment Month is Invalid, Press <ENTER> to Continue"; X$
LOCATE 18, 3, 0
PRINT "", TAB(80); " ";
ARROW = 9
ARCOL = 58
GOTO INITSCREEN

ENDMONTH:
    IF M2 >= 1 AND M2 <= 12 THEN GOTO CHECKYEAR
    LOCATE 18,3,0
    INPUT "Ending Month is Invalid, Press <ENTER> to Continue";X$
    LOCATE 18,3,0
    PRINT ";"";TAB(80);" ";
    ARROW = 14
    ARCOL = 63
    GOTO INITSCREEN

CHECKYEAR:
    IF Y2 > Y1 THEN GOTO CHECKMONTH
    IF Y2 = Y1 AND M2 > M1 THEN GOTO CHECKMONTH
    IF Y2 >= Y1 THEN GOTO CHECKEND
    LOCATE 18,3,0
    PRINT "Ending Date Must be Greater Than Treatment Date. Press";
    INPUT " <ENTER> to Continue";X$
    LOCATE 18,3,0
    PRINT ";";TAB(80);" ";
    ARROW = 14
    ARCOL = 63
    GOTO INITSCREEN

CHECKEND:
    IF M2 >= M1 THEN GOTO CHECKTREAT
    LOCATE 18,3,0
    PRINT "Ending Date Must be Greater Than Treatment Date. Press";
    INPUT " <ENTER> to Continue";X$
    LOCATE 18,3,0
    PRINT ";";TAB(80);" ";
    ARROW = 14
    ARCOL = 63
    GOTO INITSCREEN

CHECKTREAT:
    IF D2 > D1 THEN GOTO CHECKMONTH
    LOCATE 18,3,0
    PRINT "Ending Date Must be Greater Than Treatment Date. Press";
    INPUT " <ENTER> to Continue";X$
    LOCATE 18,3,0
    PRINT ";";TAB(80);" ";
    ARROW = 14
    ARCOL = 63
    GOTO INITSCREEN

CHECKMONTH:
    IF M1 <> 1 THEN GOTO FEB1
    MONTH$ = "January"
    TODAYS = 31
    ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

FEB1:
    IF M1 <> 2 THEN GOTO MAR1
    MONTHS = "February"
    TOTDAYS = 28
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

MAR1:
    IF M1 <> 3 THEN GOTO APR1
    MONTHS = "March"
    TOTDAYS = 31
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

APR1:
    IF M1 <> 4 THEN GOTO MAY1
    MONTHS = "April"
    TOTDAYS = 30
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

MAY1:
    IF M1 <> 5 THEN GOTO JUN1
    MONTHS = "May"
    TOTDAYS = 31
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

JUN1:
    IF M1 <> 6 THEN GOTO JUL1
    MONTHS = "June"
    TOTDAYS = 30
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

JUL1:
    IF M1 <> 7 THEN GOTO AUG1
    MONTHS = "July"
    TOTDAYS = 31
    ARROW = 9
    ARCOL = 62
    IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

AUG1:
IF M1 <> 8 THEN GOTO SEP1
MONTH$ = "August"
TOTDAYS = 31
ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

SEP1:
IF M1 <> 9 THEN GOTO OCT1
MONTH$ = "September"
TOTDAYS = 30
ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

OCT1:
IF M1 <> 10 THEN GOTO NOV1
MONTH$ = "October"
TOTDAYS = 31
ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

NOV1:
IF M1 <> 11 THEN GOTO DEC1
MONTH$ = "November"
TOTDAYS = 31
ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

DEC1:
MONTH$ = "December"
TOTDAYS = 31
ARROW = 9
ARCOL = 62
IF D1 < 1 OR D1 > TOTDAYS THEN GOTO FLAGDATE

JAN2:
IF M2 <> 1 THEN GOTO FEB2
MONTH$ = "January"
TOTDAYS = 31
ARROW = 14
ARCOL = 67
IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGDATE

FEB2:
IF M2 <> 2 THEN GOTO MAR2
MONTH$ = "February"
TOTDAYS = 28
ARROW = 14
ARCOL = 67
IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

MAR2:
  IF M2 <> 3 THEN GOTO APR2
  MONTH$ = "March"
  TOTDAYS = 31
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

APR2:
  IF M2 <> 4 THEN GOTO MAY2
  MONTH$ = "April"
  TOTDAYS = 30
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

MAY2:
  IF M2 <> 5 THEN GOTO JUN2
  MONTH$ = "May"
  TOTDAYS = 31
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

JUN2:
  IF M2 <> 6 THEN GOTO JUL2
  MONTH$ = "June"
  TOTDAYS = 30
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

JUL2:
  IF M2 <> 7 THEN GOTO AUG2
  MONTH$ = "July"
  TOTDAYS = 31
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

AUG2:
  IF M2 <> 8 THEN GOTO SEP2
  MONTH$ = "August"
  TOTDAYS = 31
  ARROW = 14
  ARCOL = 67
  IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGS

SEP2:
  IF M2 <> 9 THEN GOTO OCT2
MONTHS$ = "September"
TOTDAYS = 30
ARROW = 14
ARCOL = 67
IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGDATE

OCT2:
    IF M2 <> 10 THEN GOTO NOV2
    MONTHS$ = "October"
    TOTDAYS = 31
    ARROW = 14
    ARCOL = 67
    IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGDATE

NOV2:
    IF M2 <> 11 THEN GOTO DEC2
    MONTHS$ = "November"
    TOTDAYS = 31
    ARROW = 14
    ARCOL = 67
    IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGDATE

DEC2:
    MONTHS$ = "December"
    TOTDAYS = 31
    ARROW = 14
    ARCOL = 67
    IF D2 < 1 OR D2 > TOTDAYS THEN GOTO FLAGDATE
    GOTO ADDTABLE

FLAGDATE:
    LOCATE 18,3,0
    PRINT MONTHS$; " has "; TOTDAYS; " Press <ENTER> to Continue";
    INPUT X$;
    LOCATE 18,3,0
    PRINT " "; TOTDAYS; " ";
    GOTO INITSCREEN

ADDTABLE:
    IF M1=1 THEN ADD1=0
    IF M1=2 THEN ADD1=31
    IF M1=3 THEN ADD1=59
    IF M1=4 THEN ADD1=90
    IF M1=5 THEN ADD1=120
    IF M1=6 THEN ADD1=151
    IF M1=7 THEN ADD1=181
    IF M1=8 THEN ADD1=212
    IF M1=9 THEN ADD1=243
    IF M1=10 THEN ADD1=273
    IF M1=11 THEN ADD1=304
    IF M1=12 THEN ADD1=334
    IF M2=1 THEN ADD2=0
IF M2=2 THEN ADD2=31
IF M2=3 THEN ADD2=59
IF M2=4 THEN ADD2=90
IF M2=5 THEN ADD2=120
IF M2=6 THEN ADD2=151
IF M2=7 THEN ADD2=181
IF M2=8 THEN ADD2=212
IF M2=9 THEN ADD2=243
IF M2=10 THEN ADD2=273
IF M2=11 THEN ADD2=304
IF M2=12 THEN ADD2=334
JDFRST = ADD1 + D1
JDLAST = ADD2 + D2
YEARS = Y2 - Y1
DAYS = JDLAST - JDFRST + (365 * YEARS)

CHECKLENGTH:
LOCATE 18,3,0
PRINT "Analysis Period is ";DAYS;" Days in Length. If"
PRINT " This is Correct."
LOCATE 19,3,0
PRINT "Press <ENTER> to Continue or, Type: 'C' to Change";
INPUT " and Press <ENTER>";SEL$
IF SEL$ = "" THEN GOTO UPDATEYEAR
IF SEL$ <> "C" AND SEL$ <> "c" THEN GOTO CHECKLENGTH
LOCATE 18,3,0
PRINT ";TAB(80);" ;
LOCATE 19,3,0
PRINT ";TAB(80);" ;
GOTO INITSCREEN

UPDATEYEAR:
IF YEARS > 0 THEN JDLAST = 365

WEATHSGRN:
CLS
COLOR 14,1
PRINT
PRINT "PLEASE SELECT A WEATHER DATA SET FROM THE"
PRINT "FOLLOWING LIST"
PRINT
PRINT "EXISTING DATA SETS:"
PRINT
WEATH$(1) = "LAKE CONCORDIA - 1974"
WEATH$(2) = "NEW ORLEANS - 1979"
WEATH$(3) = "NEW ORLEANS - 1980"
WEATH$(4) = "NEW ORLEANS - 1981"
WEATH$(5) = "FLORIDA - 1975"
WEATH$(6) = "FLORIDA - 1976"
WEATH$(7) = "FLORIDA - 1977"
WEATH$(8) = "FLORIDA - 1978"
WEATH$(9) = "FLORIDA - 1979"
FOR W = 1 TO 9
PRINT " ";WEATH$(W)
NEXT W
LOCATE 23,5,0
PRINT "MOVE CURSOR TO SELECTED DATA SET AND PRESS <ENTER> TO CONTINUE"
CURROW = 6

REPCUR:
LOCATE CURROW,29,0
COLOR 19
PRINT CHR$(178)
COLOR 14,1

CHOSES:
SELS = INKEY$
IF SEL$ = "" THEN GOTO CHOSES
DEF SEG=0:POKE 1050,PEEK(1052)
SELS = RIGHT$(SELS,1)
LOCATE CURROW,29,0
PRINT CHR$(32)
IF ggra = CHR$(72) THEN CURROW = CURROW + 1
IF SEL$ = CHR$(80) THEN CURROW = CURROW - 1
IF CURROW < 6 THEN CURROW = 6
IF CURROW > 14 THEN CURROW = 14
IF T$  = CHR$(13) THEN GOTO GOTSET
GOTO REPCUR

GOTSET:
NA = CURROW - 5

TELLSET:
LOCATE 20,2,0
PRINT "WEATHER DATA SET SELECTED IS: ";WEATH$(NA);".";
PRINT " IF THIS IS CORRECT,";
LOCATE 21,2,0
PRINT "PRESS <ENTER> TO CONTINUE OR TYPE: 'C' AND PRESS";
PRINT " <ENTER> TO MAKE A CHANGE."
INPUT CH$
IF CH$ = "" THEN GOTO CHAINWEATH
IF CH$ <> "C" AND CH$ = "C" THEN GOTO TELLSET
LOCATE 20,4,0
PRINT" ";TAB(80);" ";
LOCATE 21,4,0
PRINT" ";TAB(80);" ";
GOTO WEATHSCRN

CHAINWEATH:
IF NA = 1 THEN WDATA$ = "W74J.DAT"
IF NA = 2 THEN WDATA$ = "W79.DAT"
IF NA = 3 THEN WDATA$ = "W80.DAT"
IF NA = 4 THEN WDATA$ = "W81.DAT"
IF NA = 5 THEN WDATA$ = "W75F.DAT"
IF NA = 6 THEN WDATA$ = "W76F.DAT"
IF NA = 7 THEN WDATA$ = "W77F.DAT"
IF NA = 8 THEN WDATA$ = "W78F.DAT"
IF NA = 9 THEN WDATA$ = "W79F.DAT"
CLS
LOCATE 12,20,0
PRINT "CALCULATIONS IN PROGRESS, PLEASE WAIT"
RETURN
QUIT:
   CLOSE
   CHAIN PPATH$ + "MODI"

TRAP:
   SCREEN 2
   SCREEN 0,1,0,0
   COLOR 7,1
  CLS
   PRINT "";TAB(30);"ERROR INFORMATION"
   COLOR 14,1
   PRINT "=";TAB(30);"="
   DEF SEG=0:POKE 1050,PEEK(1052)
KNOWN:
   IF ERR < 24 THEN GOTO UNKNOWN
   IF ERR = 26 THEN GOTO UNKNOWN
   IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
   IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
   IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
   IF ERR = 69 THEN GOTO UNKNOWN
   IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
   IF ERR > 76 THEN GOTO UNKNOWN
   LOCATE 8,10,0
   PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:"
   LOCATE 10,5,0
   IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
       IF ERR = 24 THEN PRINT "OR PLUGGED IN"
   IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
   IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
   IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
   IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL"
   IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
       IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
       IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-"
       IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
   IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
   IF ERR = 71 THEN PRINT "Either the disk drive door is open or there"
   IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
   IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
   GOTO FAULT
UNKNOWN:
LOCATE 10,5,0
PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
LOCATE 11,5,0
PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
LOCATE 12,5,0
PRINT "NUMBER:";ERR;" OCCURRED IN SUB-ROUTINE: ";LINK$
LOCATE 20,28,0
COLOR 20
PRINT "PRESS ANY KEY TO CONTINUE"
COLOR 14,1
GOTO SCAN

PAUSE:
LOCATE 20,15,0
COLOR 20
PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
COLOR 14,1
CLOSE

SCAN:
SEL$ = INKEY$
IF SEL$ = "" THEN GOTO SCAN
CLS
RESUME BEGIN

Subroutine MODI

START:
DIM A$(24,2)
DIM A(24,1)
DIM F$(60)
DIM B(25)
DIM MENU$(10)
DIM RESULT$(10)
DIM FILESIN$(60)
COMMON DSKID$\ A$(/)\ F$(/)\ B$\ TYPES\ DIRECT$\ UNITS$
COMMON PPMDAYS\ INTTHIM\ DIR$\ SPECNAMES\ PERDRY
COMMON CHEMNAMES\ CRTPLACES\ LINK$\ PPATH$\ DPATH$
COMMON MENU$(/)\ MAXITEM\ RESULT$(/)\ TITLES\ COUNT\ CURBION
LINK$ = "MODI"
CLS
ON ERROR GOTO TRAP
IF DSKID$ = "HD" THEN GOTO BEGIN

PRINT:
COLOR 14,1
CLS
LOCATE 12,5,0
PRINT "Please Place Program Disk 1 (Module I - Fate)"
LOCATE 14,5,0
PRINT "in Drive ";PPATH$;" and Press any Key to Continue"

CHKCHOOSE:
SELS=INKEY$
IF SELS="" THEN GOTO CHKCHOOSE

OPEN PPPATH$ + "DSKID.CFH" FOR INPUT AS #1,
INPUT #1,DSK$
CLOSE #1
IF DSKCD$ = "PROG1" THEN GOTO BEGIN ELSE GOTO PRNTTEXT

BEGIN:
TITLE$ = " Restart Program Menu"
MENU$(1) = "1. Restart Program From Beginning"
MENU$(2) = "2. Load New Data File or Load Defaults"
MENU$(3) = "3. Change / Review Data"
MENU$(4) = "4. Help and Instructions"
MENU$(5) = "5. Exit HERBICIDE Program"
MENU$(6) = "6. Issue a DOS Command"
RESULT$(1) = "SELECT"
RESULT$(2) = "INPUT"
RESULT$(3) = "ENTER"
RESULT$(4) = "HELP1"
RESULT$(5) = "QUIT"
RESULT$(6) = "DOSCOM"
MAXITEM = 6
CHAIN PPPATH$ + "MENU"

TRAP:
SCREEN 2
SCREEN 0,1,0,0
COLOR 7,1
CLS
PRINT " ";TAB(30);"ERROR INFORMATION"
COLOR 14,1
PRINT "--------------------";
PRINT "--------------------"
DEF SEG=0:POKE 1050,PEEK(1052)
KNOWN:
IF ERR < 24 THEN GOTO UNKNOWN
IF ERR = 26 THEN GOTO UNKNOWN
IF ERR > 27 AND ERR < 52 THEN GOTO UNKNOWN
IF ERR > 53 AND ERR < 61 THEN GOTO UNKNOWN
IF ERR > 61 AND ERR < 68 THEN GOTO UNKNOWN
IF ERR = 69 THEN GOTO UNKNOWN
IF ERR > 72 AND ERR < 76 THEN GOTO UNKNOWN
IF ERR > 76 THEN GOTO UNKNOWN
LOCATE 8,10,0
PRINT "AN ERROR HAS OCCURRED DURING THE OPERATION OF THIS PROGRAM:";
LOCATE 10,5,0
IF ERR = 24 THEN PRINT "DISK DRIVE OR PRINTER IS NOT TURNED ON";
 IF ERR = 24 THEN PRINT "OR PLUGGED IN"
IF ERR = 25 THEN PRINT "HARDWARE MALFUNCTION"
IF ERR = 27 THEN PRINT "THE PRINTER IS OUT OF PAPER"
IF ERR = 52 THEN PRINT "THE FILE NAME IS INVALID. RENAME THE FILE."
IF ERR = 61 THEN PRINT "YOU WILL HAVE TO USE A NEW DISK. THIS ONE IS FULL!"
IF ERR = 68 THEN PRINT "TARGET DEVICE DOES NOT EXIST, THIS PROGRAM"
   IF ERR = 68 THEN PRINT "ATTEMPTED TO ACCESS A DISK DRIVE OR PRINTER"
   IF ERR = 68 THEN PRINT "WHICH IS NOT PRESENT. SOFTWARE MUST BE RE-
   IF ERR = 68 THEN PRINT "CONFIGURED TO PERFORM THE REQUESTED ACTION"
IF ERR = 70 THEN PRINT "THE DISK IS WRITE PROTECTED"
IF ERR = 68 OR ERR = 76 THEN PRINT "PROBABLY THE WRONG DISK IS IN"
   IF ERR = 53 OR ERR = 76 THEN PRINT "THE DISK DRIVE."
IF ERR = 71 THEN PRINT "EITHER THE DISK DRIVE DOOR IS OPEN OR THERE"
   IF ERR = 71 THEN PRINT "IS NO DISK IN THE DRIVE"
IF ERR = 72 THEN PRINT "THE DISKETTE IS PROBABLY BAD. USE A NEW DISKETTE"
GOTO PAUSE
UNKNOWN:
   LOCATE 10,5,0
   PRINT "AN ERROR HAS BEEN IDENTIFIED IN THIS PROGRAM. PLEASE CONTACT"
   LOCATE 11,5,0
   PRINT "YOUR SOFTWARE SUPPORT REPRESENTATIVE AND REPORT THAT ERROR"
   LOCATE 12,5,0
   PRINT "NUMBER":ERR," OCCURRED IN SUB-Routine: ";LINK$
   LOCATE 20,28,0
   COLOR 20
   PRINT "PRESS ANY KEY TO CONTINUE"
   COLOR 14,1
   GOTO SCAN
PAUSE:
   LOCATE 20,15,0
   COLOR 20
   PRINT "CORRECT THIS ERROR AND PRESS ANY KEY TO CONTINUE"
   COLOR 14,1
   CLOSE
SCAN:
   SEL$ = INKEY$
   IF SEL$ = "" THEN GOTO SCAN
   CLS
   RESUME START
APPENDIX C

Raw Data Sets
## Microcosm Study.

<table>
<thead>
<tr>
<th>Day = 0</th>
<th>Target</th>
<th>Plant Density Metric Tons / ha</th>
<th>2,4-D in water (mg/l)</th>
<th>2,4-D in plants (mg/kg wet weight)</th>
<th>2,4-D in sediments (mg/kg wet weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.90 liters / ha</td>
<td>108</td>
<td>1.300</td>
<td>17.028</td>
<td>0.036</td>
</tr>
<tr>
<td></td>
<td>4.90 liters / ha</td>
<td>28</td>
<td>1.407</td>
<td>8.936</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>4.90 liters / ha</td>
<td>56</td>
<td>1.573</td>
<td>8.362</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>2.45 liters / ha</td>
<td>108</td>
<td>0.287</td>
<td>4.964</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>2.45 liters / ha</td>
<td>28</td>
<td>0.260</td>
<td>1.514</td>
<td>0.051</td>
</tr>
<tr>
<td></td>
<td>2.45 liters / ha</td>
<td>56</td>
<td>0.667</td>
<td>1.643</td>
<td>0.043</td>
</tr>
<tr>
<td></td>
<td>0.49 liters / ha</td>
<td>108</td>
<td>0.207</td>
<td>2.076</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>0.49 liters / ha</td>
<td>28</td>
<td>0.067</td>
<td>0.662</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.49 liters / ha</td>
<td>56</td>
<td>0.093</td>
<td>1.433</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.10 liters / ha</td>
<td>108</td>
<td>0.053</td>
<td>0.235</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.10 liters / ha</td>
<td>28</td>
<td>0.060</td>
<td>0.317</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.10 liters / ha</td>
<td>56</td>
<td>0.053</td>
<td>0.774</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>0.25 ppm aqueous</td>
<td>108</td>
<td>0.080</td>
<td>0.055</td>
<td>0.238</td>
</tr>
<tr>
<td></td>
<td>0.05 ppm aqueous</td>
<td>28</td>
<td>0.053</td>
<td>0.000</td>
<td>0.043</td>
</tr>
<tr>
<td></td>
<td>0.10 ppm aqueous</td>
<td>56</td>
<td>0.060</td>
<td>0.032</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>100 sec. contact @ 2 PPM</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>10 sec. contact @ 2 PPM</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.075</td>
</tr>
<tr>
<td></td>
<td>1 sec. contact @ 2 PPM</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>56</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>
### Microcosm Study

<table>
<thead>
<tr>
<th>Day = 1</th>
<th>Plant Density</th>
<th>2,4-D in water (mg/l)</th>
<th>2,4-D in plants (mg/kg wet weight)</th>
<th>2,4-D in sediments (mg/kg wet weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target</strong></td>
<td><strong>Metric Tons / ha</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.90 liters / ha</td>
<td>108</td>
<td>0.100</td>
<td>24.236</td>
<td>0.111</td>
</tr>
<tr>
<td>4.90 liters / ha</td>
<td>28</td>
<td>0.153</td>
<td>16.482</td>
<td>0.000</td>
</tr>
<tr>
<td>4.90 liters / ha</td>
<td>56</td>
<td>0.133</td>
<td>9.433</td>
<td>0.000</td>
</tr>
<tr>
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## Microcosm Study

### Day = 7

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## Microcosm Study

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<th>2,4-D in plants (mg/kg wet weight)</th>
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### Microcosm Study.

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## Microcosm Study.

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### Day = 21

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Field Validation Study.

### Sample Type = Leaves day = -1

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<th>Total Weight per sq. Meter (kg)</th>
<th>Rinse Sample ID #</th>
<th>2,4-D in Rinse (mg/kg plant)</th>
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## Field Validation Study

### Sample Type = Leaves day = 2

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<th>2,4-D in Rinse (mg/kg plant)</th>
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# Field Validation Study

**Sample Type = Leaves day = 7**

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**Sample Type = Leaves day = 14**

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### Field Validation Study.

**Sample Type = Leaves day = 28**

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**Sample Type = Roots day = -1**

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<th>2,4-D (mg/kg) in Plant Tissue</th>
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Field Validation Study.

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Sample Type = Roots day = 2

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### Field Validation Study

**Sample Type = Roots day = 4**

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**Sample Type = Roots day = 7**

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Field Validation Study.

Sample Type = Roots day = 14

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Sample Type = Roots day = 28

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## Field Validation Study.

### Sample Type = Stems day = -1

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### Sample Type = Stems day = 1

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## Field Validation Study.

**Sample Type = Stems day = 2**

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Field Validation Study.

**Sample Type = Stems day = 7**

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**Sample Type = Stems day = 14**

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Field Validation Study.

Sample Type = Stems  day = 28

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### Field Validation Study.

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### Field Validation Study.

#### Sample Type = water day = 7

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REFERENCES


