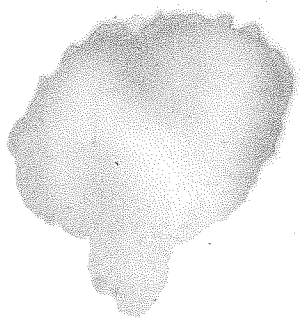
90-16

# SANTA ROSA SUBREGIONAL WATER RECLAMATION SYSTEM

# KELLY FARM DEMONSTRATION WETLAND: PROJECT DESCRIPTION

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# KELLY FARM DEMONSTRATION WETLAND

## INTRODUCTION

The Santa Rosa Subregional Water Reclamation system is considering wetlands as a means of creating fish and wildlife benefits through reuse of reclaimed water.

Before wetlands are developed as part of the Reclamation Alternative, the Subregional System has established a demonstration project to identify optimal strategies for the design and management of wetlands created using reclaimed water.

### PROJECT OBJECTIVES

Numerous projects have been conducted throughout the world that involved the creation of wetland systems to treat raw, primary or secondary wastewater. Use of tertiary or reclaimed water to create wildlife habitat is less common but has received attention in recent years. Although much of the experience with existing systems is applicable to Santa Rosa, wetland systems are highly site-specific and can be designed to achieve a wide range of objectives.

To be implemented as part of the Reclamation Alternative, created wetlands must maximize fish and wildlife benefits. Thus, the objectives of the demonstration are to:

- Identify design criteria such that the fish and wildlife benefits are maximized.
- Determine how the natural biological processes of a wetland affect the quality of reclaimed water.
- Evaluate the impact of the reclaimed water on the wetland.
- Provide wildlife and water quality data to key regulatory agencies, public groups, and individuals throughout the study including:
  - California Department of Fish and Game
  - Regional Water Quality Control Board
  - NOAA (Marine Fisheries Service and Sanctuary)
  - Marin/Sonoma Mosquito Abatement Districts (SCMAD)
  - U.S. EPA
  - U.S. Army Corps of Engineers
  - U.S. Fish and Wildlife Service

## WETLAND DESIGN

Constructed wetlands can be designed primarily for environmental enhancement or wastewater treatment. Enhancement wetlands use treated effluent as the basis for wetland habitat development and may incidentally provide effluent polishing. Treatment wetlands are engineered to maximize the biological reactions that reduce levels of regulated pollutants. These wetlands offer wildlife habitat as a secondary, incidental function.

The objective of the demonstration project is to determine how best to develop enhancement wetlands to provide wildlife benefits using reclaimed water produced by Santa Rosa Subregional Water Reclamation System. The wetlands may also provide removal of inorganic nutrients (e.g., nitrogen and phosphorus), metals, organic toxins and viruses.

Wildlife enhancement wetlands are expected to include areas of open water, emergent vegetation, islands and riparian vegetation. The type of vegetation, relative amounts of emergent vegetation and open water can be varied to promote desirable fish and wildlife species. The specific fish and wildlife objectives will be developed for each site in the reclamation project area through consultation with regulatory agencies such as the California Department of Fish and Game, the United States Fish and Wildlife Service and the National Marine Fisheries Service.

## KELLY FARM

Of six potential wetland creation sites, Kelly Farm met all of the suitability criteria for development of demonstration wetland. The Kelly Farm site was selected for development of a demonstration wetland project because it is City-owned, mostly out of the 100-year floodplain, is not under conflicting land use and possesses the topographic and ecological features to simplify demonstration of treatment and enhancement marshes.

The Kelly Farm site provides for design features and management schemes which would be applicable for any enhancement wetlands planned for the reclamation project area. The marshes are also be designed to demonstrate sediment control and other nonpoint pollution treatment features.

## DEMONSTRATION WETLANDS STUDY PROGRAM

The demonstration wetland program includes wetland monitoring, research and management to identify and demonstrate optimal methods of providing environmental enhancement. The design variables for the monitoring, research and management are described below.

- Habitat design and management variables. Aquatic and riparian vegetation (e.g., open water, emergent aquatic vegetation, shrub-covered islands, and trees) are combined variously to create areas with differing

habitat characteristics. The use of these areas by resident and migratory birds for feeding, nesting and roosting is being evaluated.

- Hydraulic operating variables. During operation water depth, flow rates and cell retention times are being varied to evaluate the impact on water quality and biota. Water quality constituents of concern include nitrate, ammonia, phosphorus and metals. Biota of concern include various wetland plants and other organisms that are used as food organisms for birds.

- Nuisance control. The methods and strategies for managing constructed wetlands to minimize nuisance problems (e.g., vectors and avian botulism) while maximizing habitat value and water quality are being evaluated.

# DESCRIPTION OF FACILITY

## PROJECT LOCATION

The Kelly Farm demonstration wetland is located on Kelly Farm. Kelly Farm is owned by the City of Santa Rosa and used for reclaimed water irrigation. Kelly Farm is located between Santa Rosa and Sebastopol, near the Laguna de Santa Rosa.

## FACILITY PLAN

### Layout

The demonstration wetland system has been constructed within the existing Kelly Pond No. 2 basin and in the irrigation return flow recovery area between Kelly Pond Nos. 1 and 2. The wetland system is comprised of five wetland cells connected in series (Figure 1). These five wetland cells cover a total area of approximately 10 acres, divided equally between the five cells.

### Water Supply

The water supply for this wetland system is the reclaimed water from the City of Santa Rosa's Subregional Wastewater Treatment Plant on Llano Road. A pressure line which delivers irrigation water to sites north of the plant passes within 500 feet of Kelly Pond was taped at an air relief valve for a water source. The reclaimed water is delivered to Cell No. 1 by pressure through a buried 8-inch pipe. The maximum flow for this system is 2 million gallons per day (mgd) or approximately 1,400 gallons per minute (gpm).

### System Hydraulics

Waters circulation and detention time are important variables affecting water quality control and for prevention of nuisance conditions such as foul odors, mosquito breeding, and avian botulism. Water circulation in all marsh cells is maintained with weirs located between basins.

## MANAGEMENT PLAN

A management plan for the demonstration wetland provides the basis of interpreting monitoring data and incorporating monitoring results into marsh operation strategies. The plan will be modified as appropriate during the demonstration project so that a refined plan is available if and when additional wetlands are constructed as part of a long-term reclamation project. The management plan includes the following sections:

- Strategies for Vegetation Management
- Control of Nutrients and Metals
- Control of Sediment
- Monitoring Plan
- Management of Public Education and Recreation

### STRATEGIES FOR VEGETATION MANAGEMENT

The five cells of the Kelly Farm Demonstration Wetland have been designed to provide different mixtures of habitat types within each cell as delineated in Table 1. Management goals for each basin are recommended as initial goals and for consideration by the Wetland Technical Advisory Committee (WTAC). As of July 12, 1990, 1,009 tules had been planted at Kelly Farm Demonstration Wetland. Table 2 provides cell by cell and percent survival data for these tules.

Vegetation management will consist of the additional planting of specific desired species following the initial planting effort, periodic thinning or removal of undesirable or dense stands of some vegetation types and water level manipulation to encourage continued propagation of desired species.

#### Water Level Fluctuation Schedule to Accomplish Vegetation Management Goals

Stands of some vegetation types become too thick and create problems such as excessive mosquito production or severe limitation wildlife use for nesting and shelter. Removal or thinning vegetation in certain areas may be necessary to remedy these problems.

### Riparian Vegetation

The riparian vegetation planting plan was developed by a professional forester familiar with plant ecology of the Laguna. The plan has been implemented by a landscape contractor. The landscape contractor provides a long-term monitoring and maintenance plan for the riparian vegetation (Table 3).

As the riparian trees mature, understory vegetation should be promoted and planted if necessary. Understory vegetation consists of shrubs and small trees that can add to the habitat value of the riparian community. Figure 2 depicts a mature wetland with respect to riparian and emergent vegetation.

## CONTROL OF NUTRIENTS AND METALS

The processes of nitrogen, phosphorus and metals treatment in wetlands are described in this section to provide a basis of operational decisions to test treatment effectiveness.

The key elements of the nitrogen cycle that occur in wetlands are the conversion of ammonia to nitrate (nitrification) and the uptake by plants of ammonia and nitrate.

These methods of nitrogen removal are potentially key functions of a successful wetland system in the Reclamation Alternative. The management strategies to maximize the effectiveness of the wetland system for nitrogen removal are being developed in the demonstration project.

The removal of phosphorus in wetland systems is intermittent and little is understood about biological mechanism involved in uptake. The principal phosphorus removal mechanisms are precipitation and adsorption to sediments. Phosphorus is rapidly immobilized in organic soils and the adsorptive capacity of soils is reached rapidly. Ultimate removal of phosphorus from wetlands is achieved by harvesting of plants and dredging of sediments.

Metals are removed from solution in wetlands by biological uptake, chemical precipitation and adsorption to inorganic material.

## CONTROL OF SEDIMENT

Natural wetlands are strips of vegetated land bordering streams that overflow into the wetland during periods of peak flow. Wetlands are excellent traps for sediment because water velocity is slowed by the plants and turbulence is reduced so particles do not remain suspended. All but the colloidal suspended material can sediment in wetland systems. Depending on the particle size distribution, up to 80 percent of the mass of suspended particles can be removed in wetlands with a detention time of four hours.

Cell No. 4 will receive potentially significant sediment loads and is being used to study sedimentation effectiveness.

## MONITORING PLAN

A monitoring program is necessary to:

- Provide a basis for evaluating the effectiveness of and modifying the operations and management of the demonstration wetland to more fully accomplish project objectives.

- Provide a basis for design of wetlands as part of the long-term reclaimed water reuse alternative.

A recommended monitoring program has been developed to evaluate performance of the wetland in the following categories:

- Wildlife and fishery impacts (beneficial and adverse).
- Enhancement of reclaimed and local runoff water quality.
- Adverse sediment and water quality impacts.

The components of the recommended monitoring program are described below:

### Water and Sediment Monitoring Locations

The location of water and sediment monitoring stations are described below:

| Station | Description |
|---|---|
| 1 | Reclaimed water influent to demonstration marsh |
| 2 | Cell No. 1 effluent, Cell No. 2 influent |
| 3 | Cell No. 2 effluent, Cell No. 3 influent |
| 4 | Cell No. 3 effluent |
| 5 | Local runoff |
| 6 | Cell No. 4 effluent, Cell No. 5 influent |
| 7 | Cell No. 5 discharge to Pond No. 1 |
| 8 | Cell No. 5 discharge to Laguna |

### Water and Sediment Monitoring

The water, sediment and vegetation monitoring program includes monthly sampling for nutrients, metals, bacteria, and plankton from the aqueous phase and annual sampling from the sediment and vegetation (Table 4). The program is designed to provide the basis for conducting water and nutrient balance on the demonstration wetland to identify the fate of key constituents. Initial results of the monitoring program are being reviewed and the monitoring schedule is being modified as necessary to provide a cost-effective program. Preliminary nutrient data (Figure 3) indicate a sharp reduction in plant nutrients between Station 1 and Station 8. Preliminary metals data are provided on Figures 4 and 5. Note the sharp reduction in metal concentrations. Also note that

effluent concentrations from each cell are below the EPA, Ambient Water Quality Criteria for Protection of Aquatic Life.

**Wildlife and Fish Monitoring**

The usage of the demonstration wetland by fish and wildlife is being measured to evaluate the extent to which the demonstration wetland fulfills project objectives. Monitoring of bird populations (e.g., number of individuals, number of species, reproduction, feeding and behavioral patterns, etc.) has been initiated (Table 5). Semi-annual evaluation of fish population is also planned. A seine will be used to sample fish.

**Stocking Fish**

Fish are a desirable component of a wetland system because of their importance in vector control, their role in processing nutrients in a wetland, and the food they provide to birds. A desirable fish fauna includes fish that eat plankton, epiphytes and other fish. In a wetland system where excessive turbidity is undesirable, fish that disturb bottom sediments (e.g., carp) are not desirable. Fish should be introduced to the wetland to maximize the opportunity of achieving a desirable fish fauna. A list of species recommended for introduction into the demonstration wetland is given below. The California Department of Fish and Game will be consulted prior to any fish planting activity.

- Bluegill (*Lempois macrochirus*)
- Tule perch (*Hystercarpus traski*)
- Black bullhead catfish (*Ictalurus melas*)
- Sacramento perch (*Archoplites interruptus*)
- California roach (*Hesperoleucus symmetricus*)
- Sacramento blackfish (*Orthodon microlepidotus*)
- Mosquito fish (*Gambusia affinis*)
- Crayfish

The fish species currently inhabiting the demonstration wetland site are not known. The site will be sampled to determine which species are present.

The potential adverse impact of reclaimed water on fish will be evaluated. Fish tissue samples will be collected annually and analyzed for bioaccumulatory substances.

## MANAGEMENT OF PUBLIC EDUCATION AND RECREATION

To realize its full potential for benefits to the public, the demonstration wetland should be accessible to interested members of the public for bird watching and aesthetic enjoyment, and to scientists for wetland research. Accessibility includes providing conveniences such as trails and toilets. Although not designed for this purpose, the design of the demonstration wetland does not preclude onsite public involvement and should be encouraged once the wetland matures.

## CONTROL OF POTENTIAL NUISANCE PROBLEMS

Potential nuisance problems include vectors (mosquitos), and algal blooms. Strategies for the control of these potential nuisance problems are described below.

### Vector Control

Sonoma County contains 19 species of mosquitoes identified by the Mosquito Abatement District personnel. Of these, eight have potential to breed and reproduce in the demonstration wetland. The expected species of mosquitos are:

- *Culex tarsalis*
- *Culiseta incidens*
- *Culiseta inornata*
- *Culex erythrothrax*
- *Anopheles freeborni*
- *Anopheles occidentalis*
- *Culex pipiens*
- *Aedes squamiger*

The demonstration wetland is being operated and managed to control and/or prevent mosquito breeding at the marsh site. The demonstration wetland was designed with features to facilitate vector control (e.g., independent water level controls for each marsh and permanent wet areas for preservation of insectivorous fish populations when water level is lowered). In addition to design factors, operations strategies are being implemented to control potential vector problems. Therefore, vector control will consist of biological control, vegetation manipulation, water management, and monitoring practices to minimize growth and reproduction of vectors and to provide a basis for rapid corrective actions when necessary.

**Vector Monitoring.** Monitoring of populations of adult and larval mosquito and populations of biological controls (mosquito fish and certain insects) is a necessary component of vector control. Considerable amounts of research involving the many variables affecting mosquito production in marshes is planned by SCMAD. SCMAD is constructing a mosquito management computer model and research by that agency at the demonstration wetland assist in model development. Cooperation with this agency will be an important strategy to effectively control mosquitoes at the demonstration wetland.

The following vector monitoring program recommended by SCMAD, is in effect:

- Monitor larval populations by standard dipping or other techniques.
- Monitor adult mosquito populations with CDS traps ($CO_2$ baited).
- Monitor insect predator populations by aquatic light traps or other methods.

- Monitor fish predator populations.

Preliminary information for adult and larval mosquito populations (Tables 6 and 8) indicate that mosquitos are not a problem.

**Algal Blooms**

Algal bloom potential is determined visually. Nuisance algae are harvested from the cells, dried, and disposed of as necessary.

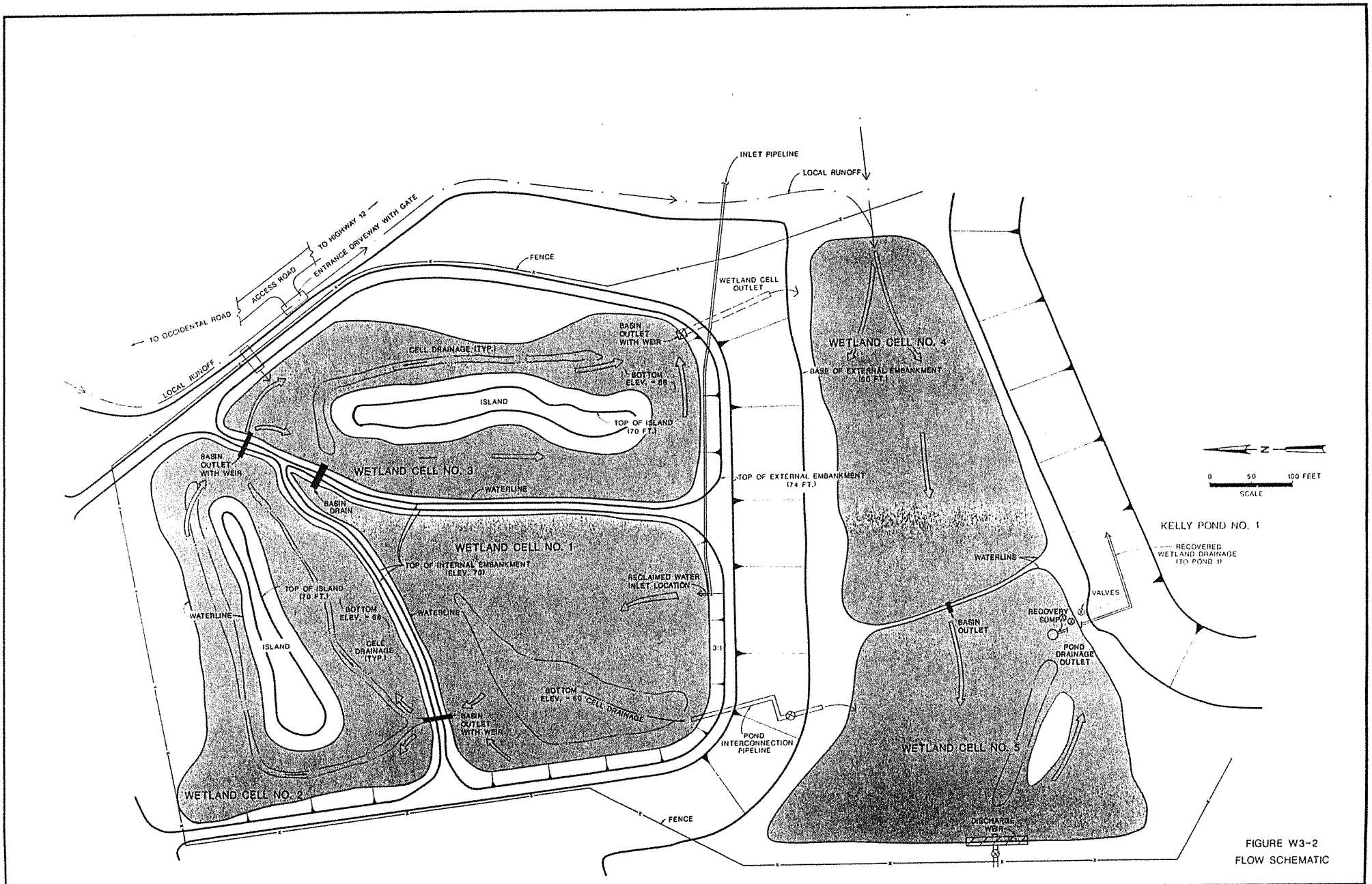



FIGURE W3-2
FLOW SCHEMATIC

**Table 1**
**Water Level Guidelines and Preferred Vegetation**

| Cell No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Water Source[a] | RW | RW | RW | RW+RO | RW+RO |
| Bottom Elevation (ft) | 62.5 | 65 | 65 | 55 | 54 |
| Bottom Slope | Varied | Flat | Flat | Varied | Flat |
| Operating Elevation (ft) | 68.5 | 68 | 67.5 | 57 | 56.5 |
| Optimum Depth (ft) | 6 | 3 | 2.5 | 1.5 | 2.5 |
| *Scirpus acutus* hardstem bulrush | | X | X | | |
| *Typha latifolia* (cattails) | X | | | X | X |
| *Potamogeton* sp. (pondweed) | X | X | | | |
| *Lemna* sp. (duckweed) | X | | | | |
| *Scirpus robustus* (alkali bulrush) | X | X | X | | |
| *Hydrocotyl* sp. (marsh pennywort) | | X | X | | |
| *Ruppia maritima* (wigeon grass) | | X | X | | |
| *Echinochloa crusgalli* (barnyard grass) | | | X | X | |

[a]RW = reclaimed water, RO = local storm runoff

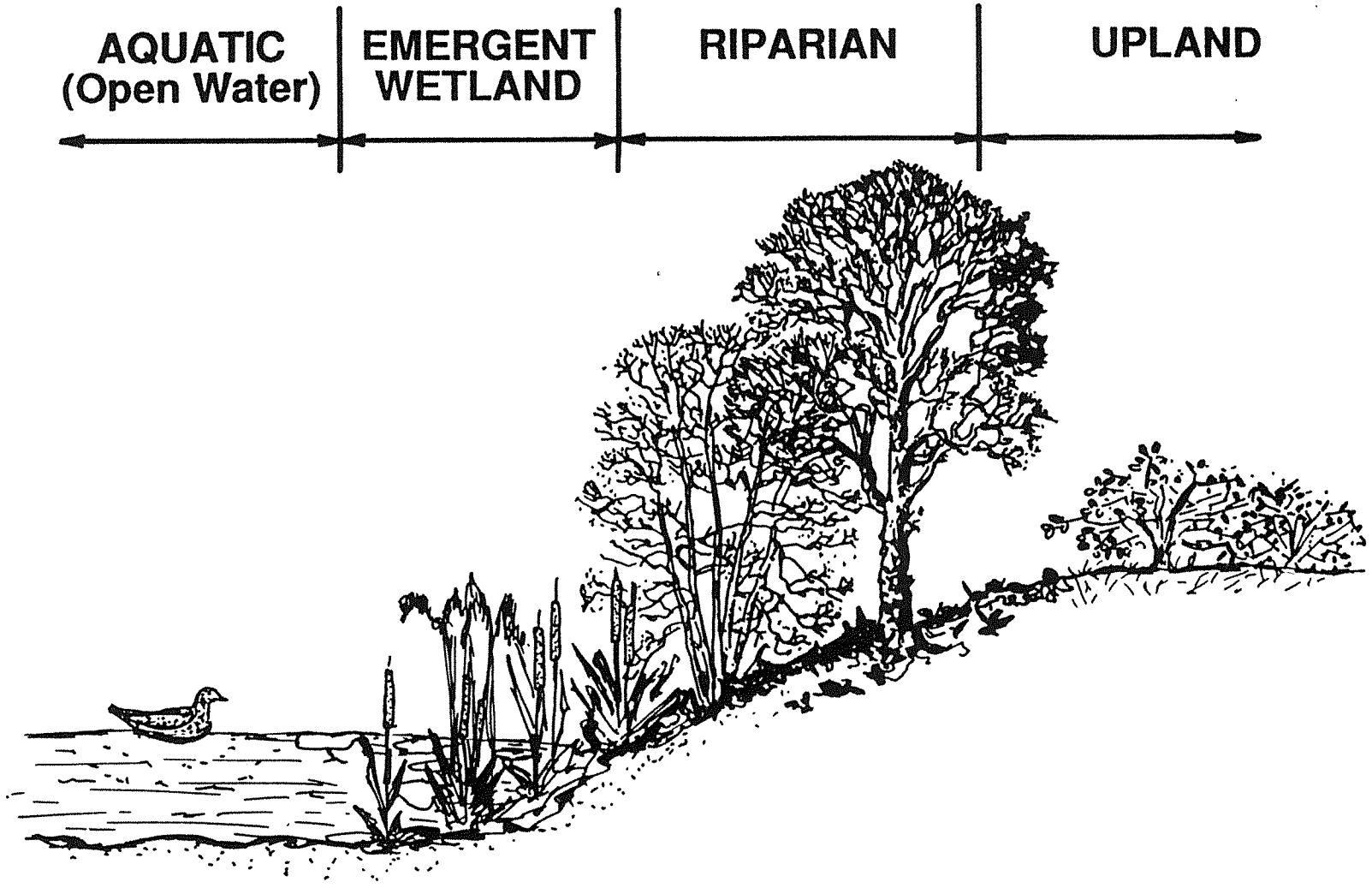
**Table 2**
**Tule Planting at Kelly Farm Demonstration Wetland**

| Date | No. Tules Planted | Percent Survival |
|---|---|---|
| **Cell No. 1** | | |
| 12/29/89 | 65 | 85 |
| 12/29/89 | 49 | 65 |
| 12/29/89 | 48 | 83 |
| Total | 162 | 78 |
| **Cell No. 2** | | |
| 12/29/89 | 48 | 98 |
| 12/29/89 | 20 | 43 |
| 12/29/89 | 9 | 89 |
| 12/29/89 | 12 | N/A |
| Total | 77 | 94 |
| **Cell No. 3** | | |
| 2/23/90 | 480 | N/A |
| 6/28/90 | 44 | N/A |
| 6/28/90 | 36 | N/A |
| 7/05/90 | 93 | N/A |
| 7/12/90 | 117 | N/A |
| Total | 770 | N/A |
| **Total Planted, Cells 1 through 3** | | **1,009** |

**Table 3**
**Riparian Vegetation Planting and Survival at Kelly Farm Demonstration Wetland**

| Species | No. Living | No. Planted | Percent Survival |
|---|---|---|---|
| Valley Oak (*Quercus lobata*) | 168 | 199 | 84 |
| Oregon Ash (*Fraxinus latifolia*) | 31 | 33 | 94 |
| Hawthorn (*Crataegus douglasii*) | 47[a] | 98 | >90[b] |
| Elderberry (*Sambucus caerulea*) | 4[a] | 82 | >90[b] |

[a]Incomplete count due to inaccessibility of the north island.
[b]Applies to south island, Cell 3.




| Aquatic | Emergent Wetland | Riparian Woodland | Upland Woodland |
|---|---|---|---|
| DUCKWEED | SEDGE | WILLOWS | ELDERBERRY |
| MARSH PENNYWORT | BULRUSH | COTTON WOODS | HAWTHORNE |
| PONDWEED | CATTAIL | OREGON ASH | VALLEY OAK |
| | | BOXELDER | |
| | | DOGWOOD | |

**Table 4**
**Water, Sediment, and Vegetation Sampling Schedule**

| Station | Constituents | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Flow | Routine | Nutrients | Metals | Bacteria | Plankton | Organics | Sedimentation |
| 1 | C | AM | AM,SA | AM,SA,VA | AM | AM | AA,SA | SA |
| 2 | | AM | AM,SA | SA,VA | | AM | | SA |
| 3 | | AM | AM,SA | SA,VA | | AM | | SA |
| 4 | C | AM | AM,SA | AM,SA | AM | AM | | SA |
| 5 | C | AM | AM,SA | AM,SA | | AM | | SA |
| 6 | | AM | AM,SA | SA | | AM | | SA |
| 7 | C | AM | AM,SA | AM,SA,VA | AM | AM | | |
| 8 | C | AM | AM,SA | AM,SA | AM | AM | AA,SA | |

Frequency

C = Continuous
M = Monthly
A = Annually

Type of Sample

A = Aqueous phase water sample
S = Sediment phase soil sample
V = Vegetation sample

Constituents

Routine: DO, temp, cond, pH
Nutrients: Filtered NO2, NO3, NH3, TRP, Unfiltered TKN, TRP
Metals: Cd, Cr, Cu, Pb, Zn, Se
Bacteria: Total and Fecal Coliform
Plankton: Chl a & 135 μm zoopl tow
Organics: EPA 624/625 (Priority Pollutants), Organochlorine pesticides
Sedimentation: Sed. accumulation

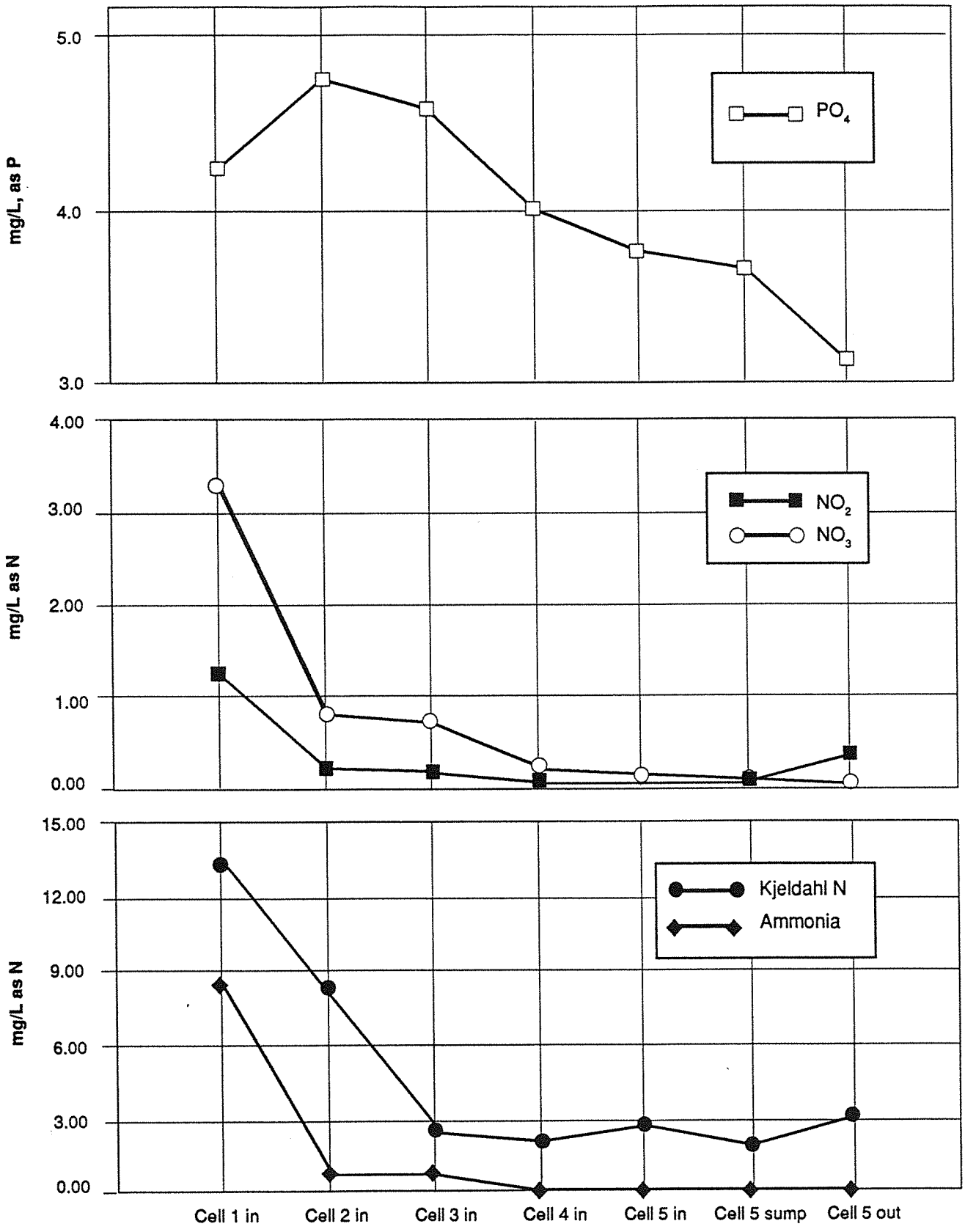



**FIGURE 3**
**KELLY FARM DEMONSTRATION WETLAND**
**NUTRIENT MONITORING PROGRAM**
**PRELIMINARY DATA**

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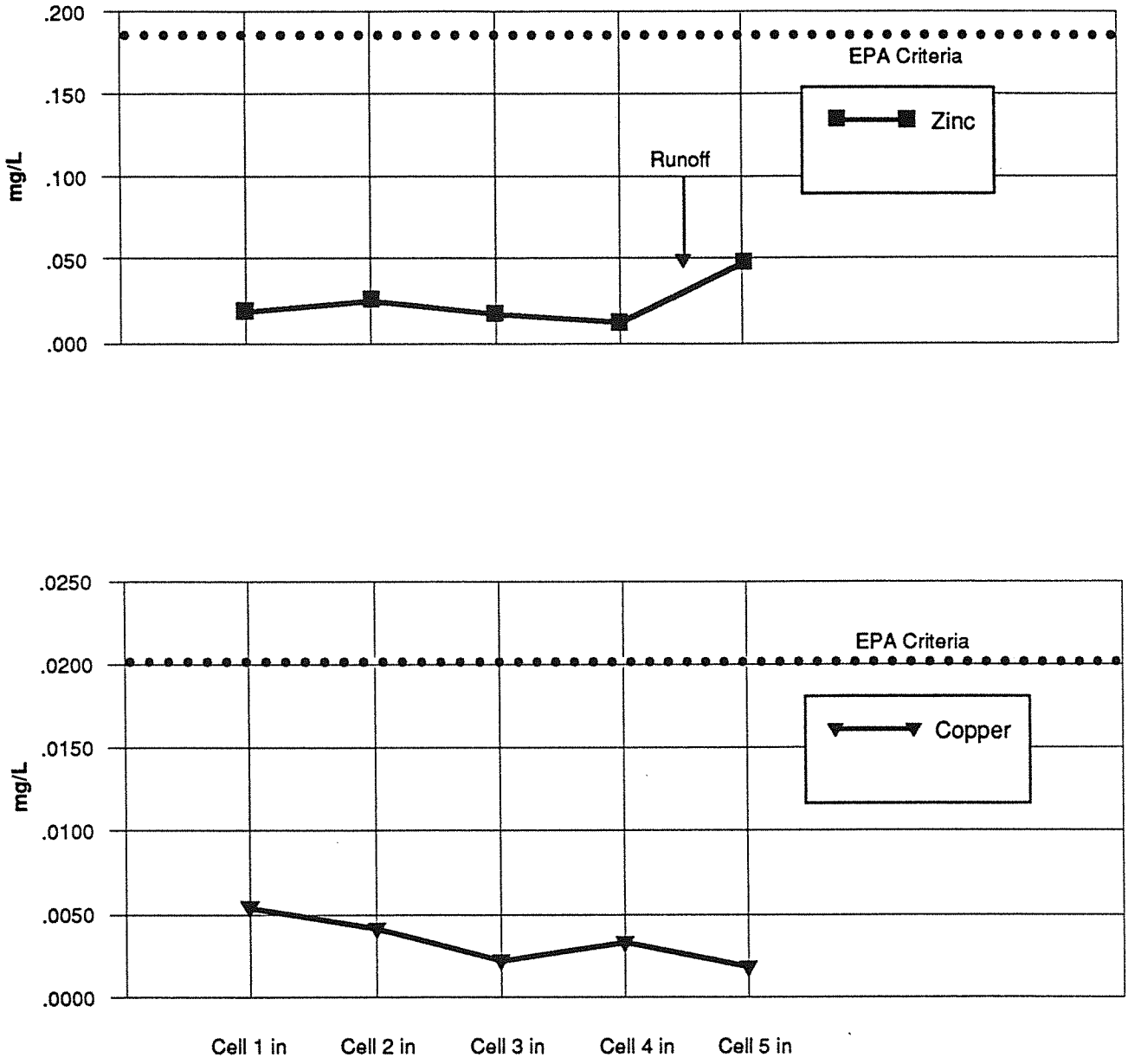
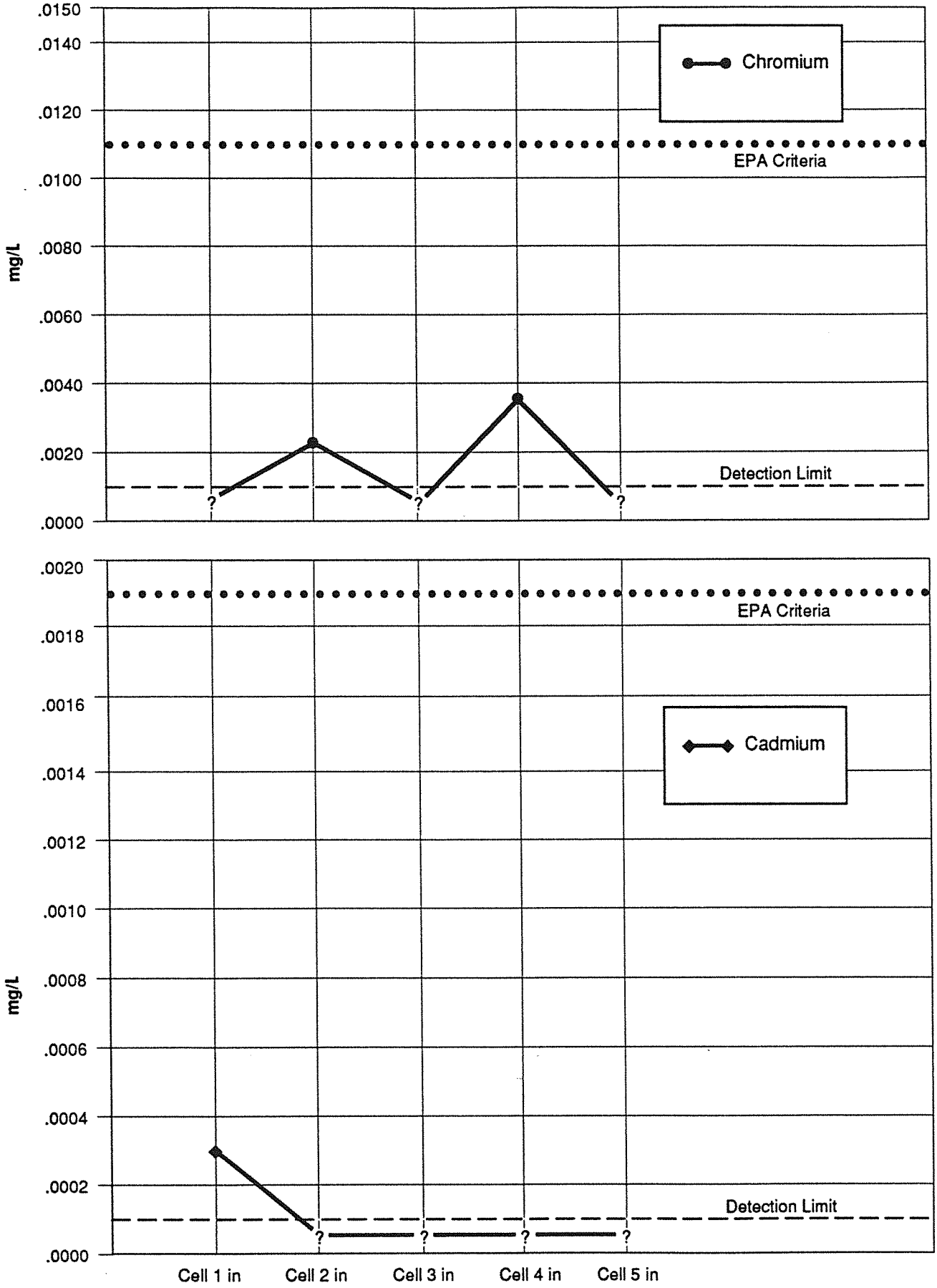



**Sampling Location, June 26, 1990**

**FIGURE 4**
**KELLY FARM DEMONSTRATION WETLAND**




**Sampling Location, June 26, 1990**

**FIGURE 5**
**KELLY FARM DEMONSTRATION WETLAND**

SFO19445.WA.05

**Table 5**
**Bird List for Kelly Ranch Demonstration Wetland**
**August 22-24, 1989**

| Species | 8/22 | 8/23 | 8/24 |
|---|---|---|---|
| Double-crested Cormorant | 5 | 5 | 6 |
| Great Blue Heron | 2 | 1 | 0 |
| Great Egret | 2 | 0 | 0 |
| Snowy Egret | 3 | 0 | 0 |
| Mallard | 1 | 0 | 0 |
| Least/Western Sandpiper | 0 | 0 | 1 |
| California Gull | 0 | 1 | 5 |
| Turkey Vulture | 1 | 1 | 2 |
| Black-shouldered Kite | 2 | 3 | 3 |
| Red-shouldered Hawk | 1 | 0 | 0 |
| Red-tailed Hawk | 0 | 2 | 1 |
| Osprey (?) | 0 | 1 | 0 |
| Kestrel | 1 | 0 | 1 |
| California Quail | 3 | 12 | 14 |
| Killdeer | 2 | 5 | 7 |
| Mourning Dove | 1 | 2 | 5 |
| Rock Dove | 1 | 0 | 0 |
| Great Horned Owl (?) | 1 | 0 | 0 |
| Allen's Hummingbird | 1 | 0 | 0 |
| Nuttall's Woodpecker | 1 | 0 | 3 |
| Acorn Woodpecker | 0 | 2 | 5 |
| Black Phoebe | 0 | 1 | 3 |
| Western Kingbird | 5 | 2 | 0 |
| Violet-green Swallow | 11 | 0 | 0 |
| Northern-rough-winged Swallow | 2 | 0 | 0 |
| Barn Swallow | 28 | 5 | 4 |
| Scrub Jay | 2 | 0 | 3 |
| American Crow | 15 | 1 | 2 |
| White-breasted Nuthatch | 1 | 3 | 0 |
| Loggerhead Shrike | 1 | 2 | 1 |
| Northern Mockingbird | 2 | 3 | 2 |
| European Starling | 14 | 12 | 11 |
| Marsh Wren | 0 | 2 | 0 |
| Warbling Vireo | 0 | 1 | 0 |
| Black-throated Gray Warbler | 1 | 0 | 0 |
| Common Yellowthroat | 1 | 2 | 0 |
| Brown Towhee | 3 | 3 | 4 |
| Song Sparrow | 3 | 10 | 9 |
| Savannah Sparrow | 7 | 7 | 7 |
| Western Meadowlark | 0 | 2 | 2 |
| Red-winged Blackbird | 92 | 84 | 130 |
| Brown-headed Cowbird | 1 | 0 | 0 |
| House Finch | 23 | 15 | 43 |
| American Goldfinch | 12 | 13 | 15 |
| Pine Siskin | 4 | 0 | 6 |
| Species: 44 | 36 | 29 | 27 |

| Table 6<br>New Jersey Light Trap, Located at Nunes Ranch<br>NW of Kelly Farm Demonstration Wetland |
|---|
| **Week Sample 6/20/90--6/26/90** |
| 27 female *Culex tarsalis*<br>9 male *Culex tarsalis*<br>1 female *Culex pipiens*<br>5 male *Culex pipiens*<br>14 female *Culex stigmatosoma*<br>9 male *Culex stigmatosoma*<br>3 female *Culiseta incidens*<br>4 female *Culiseta inornata* |
| **Week sample 6/27/90--7/2/90** |
| 23 female *Culex tarsalis*<br>16 male *Culex tarsalis*<br>12 female *Culex stigmatosoma*<br>4 male *Culex stigmatosoma*<br>5 female *Culiseta inornata* |
| **Week sample 7/3/90--7/11/90** |
| 9 female *Culex tarsalis*<br>6 male *Culex tarsalis*<br>1 female *Culex pipiens*<br>1 male *Culex pipiens*<br>9 female *Culex stigmatosoma*<br>6 male *Culex stigmatosoma*<br>1 female *Culiseta incidens*<br>2 female *Culiseta inornata* |

**Table 7**
**UV FAY Trap Supplemented with CO2 Located at Kelly Farm Demonstration Wetland, NE Corner Cell 3**

| | | |
|---|---|---|
| 7/2/90 | 12 female *Culex tarsalis*<br>2 male *Culex tarsalis*<br>4 female *Culex pipiens*<br>4 male *Culex stigmatosoma* | |
| 7/11/90 | 10 female *Culex tarsalis*<br>1 male *Culex tarsalis*<br>9 female *Culex stigmatosoma*<br>4 female *Culex pipiens* | (note: CO2 out before morning collection) |

**Table 8**
**Larval Mosquito Collections**
**Using Standard 8-oz Sample Cup**

| Date | Cell | No. of Dips | Larvae Caught | |
|---|---|---|---|---|
| | | | No. | Species |
| 7/2/90 | 1 | 37 | 0 | |
| | 2 | 35 | 0 | |
| | 3 | 35 | 4 | *Culex tarsalis* |
| 7/9/90 | 1 | 60 | 0 | |
| | 2 | 37 | 0 | |
| | 3 | 60 | 0 | |