# Monitoring the effects of drainwater in wetlands at selected duck clubs, Imperial Valley, California, as part of BOR-IID Cooperative Drainwater Reclamation and Reuse Study

Drainwater is being delivered to several duck clubs in the Imperial Valley to: 1) provide permanent wetland habitat; 2) slow down the movement of drainwater to the Salton Sea; and 3) decrease the volume of drainwater discharging to the Salton Sea by increasing the surface area exposed to evaporation. Several projects in the Imperial Valley, such as those involving the Salton Sea Focus area (part of the Intermountain West Joint Venture) and the BOR-IID Drainwater Reclamation and Reuse Study, have proposed using drainwater to create permanent wetland habitat. Resource agencies have expressed concern about several issues regarding drainwater and wetland habitat: 1) Drainwater can contain selenium at concentrations exceeding the 5 $\mu$g/L criterion established for the protection of aquatic life; and 2) Drainwater contains pesticide residues in tailwater runoff following application and subsequent irrigation. Concentrations of several organophosphorus pesticides have been detected in California State Water Resources Control Board monitoring programs on the Alamo River. These pesticides are at levels that cumulatively have killed non-native biomonitoring organisms (*Ceriodaphnia*). Before California and federal resource agencies will approve use of drainwater for wetland habitat in the Imperial Valley, several conditions likely will have to be met. First, clapper rail habitat which consists primarily of dense stands of cattails and bulrush should be avoided if possible. The

presence of an endangered species triggers additional requirements for environmental compliance and can create more work than money available. Second, the environmental fate of the selenium in duck club ponds needs to be determined. Is selenium concentrating in the bottom sediment, in benthic or aquatic invertebrates, in algae, or in higher trophic levels organisms? The major concern is on waterfowl food sources. Finally, the fate of organophosphorus pesticides in tailwater will have to be determined.

Selenium concentrations in the water entering and exiting the ponds currently is being monitored. These measurements indicate that some selenium is lost to the pond (all water spreading involves flow-through systems). For example, at one of the duck clubs, the in flowing selenium concentration is 7 $\mu$g/L and the out flowing selenium concentration is 3 $\mu$g/L. Loading estimates to the pond can be calculated using the inflow volume and concentration versus the outflow volume and concentration. A simple time-of-travel study would provide excellent information for selecting sampling sites within the pond. A fluorescent dye could be injected at the inflow and samples collected throughout the pond to demonstrate the flow and distribution patterns of water in the pond. Samples at the outflow would provide information on the residence time of water in the system. The pond will be subdivided by a numbered grid, and random water samples collected from the grid. Samples will be analyzed to determine concentrations of selenium and chloride. Field measurements will be made of specific conductance, pH, temperature, and dissolved oxygen concentration as

indicators of the environmental conditions in the pond. Because of the low concentrations in the water, selenium analyses will have to have a detection limit of 1 $\mu$g/L.

Bottom sediment and benthic invertebrate samples will be collected at a random number of the water sampling sites. A piston corer will be used to collect bottom sediment to a depth of 3 inches. The top 2 inches will be used for the sample. At each site, core samples from four surrounding grids will be composited into a single sample for analysis. At three sites, the cores will be subdivided by depth (defined by soil characteristics) into 4 sub samples for analysis. This information will be used to help estimate overall selenium loading to the bottom sediments of the pond.

Benthic invertebrates will be collected at the same sites selected for bottom sediment. An Eckman Dredge will be used for sample collection. The collected material will be washed using a 1mm screen. All organisms retained on the screen will be removed from the non-biological matter, placed in a sample container, frozen, and sent to the laboratory for selenium analysis. Organisms from each site will be homogenized and analyzed without identification. The goal of invertebrate sampling is to measure selenium concentrations in the food source, not in specific organisms.

Results from the water column, bottom sediment, and benthos sampling will

be evaluated and compared to available studies to assess the exposure of waterfowl using the pond to selenium contamination. The sampling will be performed 3 times, once in April, again in August, and finally in December. These times should represent the major seasonal changes that occur within the Imperial Valley.

Sample and cost breakdown

Water samples: Selenium to 1$\mu$g/L = $350 for 20 samples

Bottom sediment: Selenum = $460 for 10 samples

Biota (benthic invertebrates) = $460 for 10 samples

Equipment needed:

Water samples: Van Dorn water sampler

Hydrolab multi-parameter field meter (pH, temperature, specific conductance, dissolved oxygen)

Cartridge filters, peristaltic pump, bottles, ice chest, perservative, standards, deionized water

Bottom sediment: Piston corer

Sample containers, mixing bowl, spatulas

Biological sample: Eckman box core sampler

1mm wash screen

Sampling containers, miscellaneous buckets, tweezers, etc.