



NONPOINT SOURCE SUCCESS STORY

California

Reducing Endosulfan Use in the Imperial Valley Drains Area

Waterbody Improved

The Imperial Valley Drains, an extensive gravity flow drainage system consisting of 1,450 miles of ditches, was listed as impaired for the pesticide endosulfan in 1996. In 2000, the U.S. Environmental Protection Agency (USEPA) began phasing out endosulfan. The 2005 Imperial Valley Drains Sediment Total Maximum Daily Load (TMDL) and Implementation Plan required growers to implement improved sediment best management practices (BMPs) to reduce runoff and decrease subsequent endosulfan bioaccumulation in fish. Water quality has met the state standard for endosulfan since 2001. Fish tissue samples no longer exceeded standards for applicable beneficial uses: warm freshwater habitat and commercial or recreational collection. As a result, the Imperial Valley Drains were delisted for the endosulfan impairment in 2012.

Problem

The Imperial Valley Drains system consists of 1,450 miles of ditches that drain 500,000 acres of agricultural land into the New River, the Alamo River and the Salton Sea in southern California. The Salton Sea watershed (Figure 1) is one of the most productive agricultural centers in the world, with crops grown year-round. Irrigation tail water comprises most of the flow in the Imperial Valley Drains, with lesser inputs from storm water flows, groundwater, and industrial effluent discharges. The Salton Sea watershed is also a major center for avian biodiversity in the American Southwest, supporting over 350 species and averaging over 1.5 million birds annually. Use of the pesticide endosulfan was widespread in the Imperial Valley during the 1980s and 1990s. It attached to sediments and bioaccumulated in fish tissue, and was toxic to wildlife species, particularly fish and birds. Monitoring showed that levels of endosulfan in fish tissue samples exceeded standards for applicable beneficial uses (warm freshwater habitat and commercial or recreational collection), prompting California to add Imperial Valley Drains to the Clean Water Act (CWA) section 303(d) list of impaired waters for endosulfan in 1996.

Story Highlights

With increasing regulations and concerns over toxicity, the annual use of endosulfan in Imperial Valley steadily declined (Figure 2). USEPA began phasing out endosulfan in 2000. In 2005 California's Colorado River



Figure 1. Imperial Valley farmland (red outline) and monitoring locations (dots).

Basin Regional Water Quality Control Board (Colorado River Water Board) adopted the Imperial Valley Drains Sedimentation and Siltation TMDL and Implementation Plan, which began requiring growers to implement improved sediment management practices to reduce delivery of suspended sediment to the Imperial Valley Drains. Because sediment is the primary carrier for endosulfan to the drains, BMPs that reduce sediment transport to the drains also reduce pesticide transport and subsequent endosulfan bioaccumulation in fish. The implementation plan established four phases, each with increasingly lower interim numeric targets,

Table 1. Phases and interim targets for attainment of Imperial Valley Drains per sediment TMDL.

Phase	Time Period	Estimated Percent Load Reduction ¹	Interim Target TSS (mg/L)
1	2005 – 2006	10%	376
2	2007 – 2009	25%	282
3	2010 – 2012	20%	226
4	2013 – 2015	12%	200

¹ The reduction required in the average concentration at the end of each phase, beginning with the 2002 average concentration of 418 mg/L.

over a 12-year schedule to allow farmers time to reach the numeric total suspended solids (TSS) goal of 200 milligrams per liter (mg/L) (Table 1). The Imperial Valley Farm Bureau developed a program for compliance with the TMDL and assisted farmers in the Imperial Valley Drains watershed with installation of BMPs, supported in part with CWA section 319 grant funds.

Under the Imperial County Farm Bureau's (ICFB) Voluntary TMDL Compliance Program, farm plans are submitted to the Colorado River Water Board. The top five BMPs implemented by farmers to control the amount of sediment and pesticides in agricultural runoff in 2014 were: (1) agricultural tailwater structures; (2) irrigation water management; (3) land leveling, including field at proper grade near the drain box; (4) pan ditches (wide, flat-tail ditches); and (5) plastic sheeting used to control erosion. In 2014, farmers submitted 5,953 farm plans; and as of 2019, nearly 100 percent of farmers in the Imperial Valley Drains watershed are enrolled in the program.

Results

Monitoring data in the Imperial Valley from 1985 through 2014 shows a steady decline in endosulfan concentrations found in fish tissue collected from the Imperial Valley Drains (Figure 3). Additionally, with concerns over toxicity and increasing regulation, farmers moved away from endosulfan use; after 2007, there was little to no application of endosulfan in Imperial Valley. Since 2014, its application has stopped entirely.

In 2012, the Colorado River Water Board recommended delisting endosulfan from the impaired waters list for Imperial Valley Drains, based on several lines of evidence, including the National Academy of Science Water Quality Criteria (1972) maximum total endosulfan

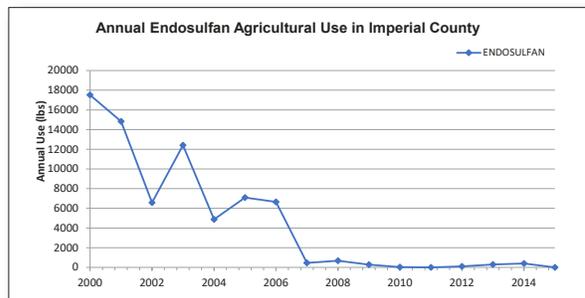


Figure 2. Endosulfan use over time.

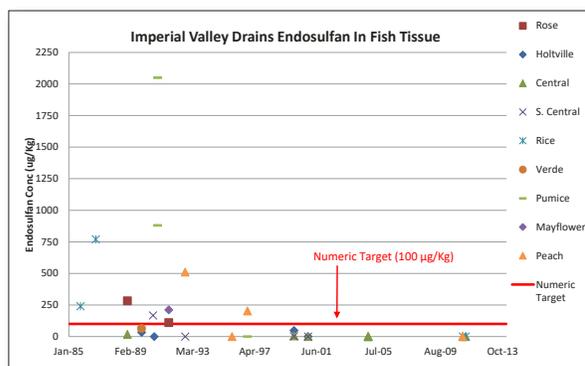


Figure 3. Fish tissue samples (1985–2014).

concentration of 100 micrograms per kilogram ($\mu\text{g}/\text{Kg}$) (wet weight) in tissue samples for protection of aquatic life from bioaccumulation. The delisting was approved by the State Water Board and USEPA.

Partners and Funding

The Colorado River Water Board, one of nine Regional Water Quality Control Boards in California, is responsible for implementing the federal CWA and state water quality regulations in the area. The ICFB developed the Voluntary TMDL Compliance Program in response to the Regional Board's Imperial Valley Drains Sedimentation and Siltation TMDL and Implementation Plan. The Imperial Irrigation District (IID) supplies nearly all water used by municipalities and agricultural operations in the Imperial Valley Drains watershed. Water is diverted at Imperial Dam on the Colorado River through the 82-mile All-American Canal, which IID operates and maintains. With more than 3,000 miles of canals and drains, IID is one of the largest irrigation districts in the nation.



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