

Johnson Creek

Legacy Pesticide Study 2003-2005

Background:

Johnson Creek flows 26 miles from its headwaters between Gresham and Sandy (east of Highway 26) to its confluence with the Willamette River in Milwaukie. Along the way the creek passes through four cities (Gresham, Happy Valley, Portland, and Milwaukie) in Clackamas and Multnomah Counties. The adjacent streamside lands are used for forestry, agriculture, industry and urban living.

DDT and Dieldrin are known as *legacy pesticides* which are chemicals that are not currently used but were commonly applied in the past to control insect pests. Although DDT and Dieldrin were banned in the United States in 1972, they remain in the soils where they were applied over three decades ago. The United States Geological Survey (USGS) first documented elevated levels of these legacy pesticides in Johnson Creek's streambed in 1988. Subsequently these pesticides have also been found in the stream water, fish tissue and other aquatic life living in the stream. DDT and Dieldrin, have both been shown to have negative health effects on humans. Pesticides bind tightly to the soil, but when released into the waters of Johnson Creek, they become more harmful because they are readily available to aquatic life. When fish and animals are exposed to these pesticides on a regular basis, they accumulate in their bodies. Therefore, as DDT and Dieldrin persist in the water, the potential to cause harm becomes more dramatic throughout the stream ecosystem.

As mandated by the Federal Clean Water Act, the Oregon Department of Environmental Quality (DEQ) has been evaluating the water quality in streams and rivers to determine the potential harm to human health and recreational activities. Standards for safe pollutant levels for a number of chemicals are set, and if exceeded the stream is determined to be an environmental health risk. DEQ's most recent assessment of Johnson Creek documented levels of DDT and Dieldrin above the standard of safety. Although fishing and other types of recreation are not common in Johnson Creek, the stream drains to the Willamette River, and on to the Columbia River where fish consumption and water sports are more common.

Previous Studies:

DDT and Dieldrin were some of the first synthetic pesticides developed. These pesticides were used widely for control of insects in both urban and agricultural areas. Although there are no records that specify the amount of either DDT or Dieldrin applied in the Johnson Creek basin, use of these pesticides in the United States peaked in the mid-1960's. Both DDT and Dieldrin were banned in the early 1970's due to public-health concerns.

The occurrence of DDT and Dieldrin in water and streambed sediment from Johnson Creek was first identified by the USGS in a study in 1989-90, and has been detected in several subsequent studies. Samples of streambed sediments taken from Johnson Creek in 1992 had the highest concentration of DDT and Dieldrin of any samples taken in the Willamette Basin. Studies done in 1994 and 2002 revealed continued detections of both DDT and Dieldrin in the water, and in most samples, concentrations exceeded acceptable health standards. In general, samples collected in these studies had the highest concentrations of legacy pesticides at the most upstream sampling points in the basin.

A USGS study in 2004 indicates that the concentrations are decreasing over time, but the levels still exceed acceptable health standards regularly. The amount of DDT in the stream is related to the amount of suspended sediment in the stream water. Other factors, including the size of the storm, and the timing of sampling relative to storm events may affect the pesticide/sediment relationship.

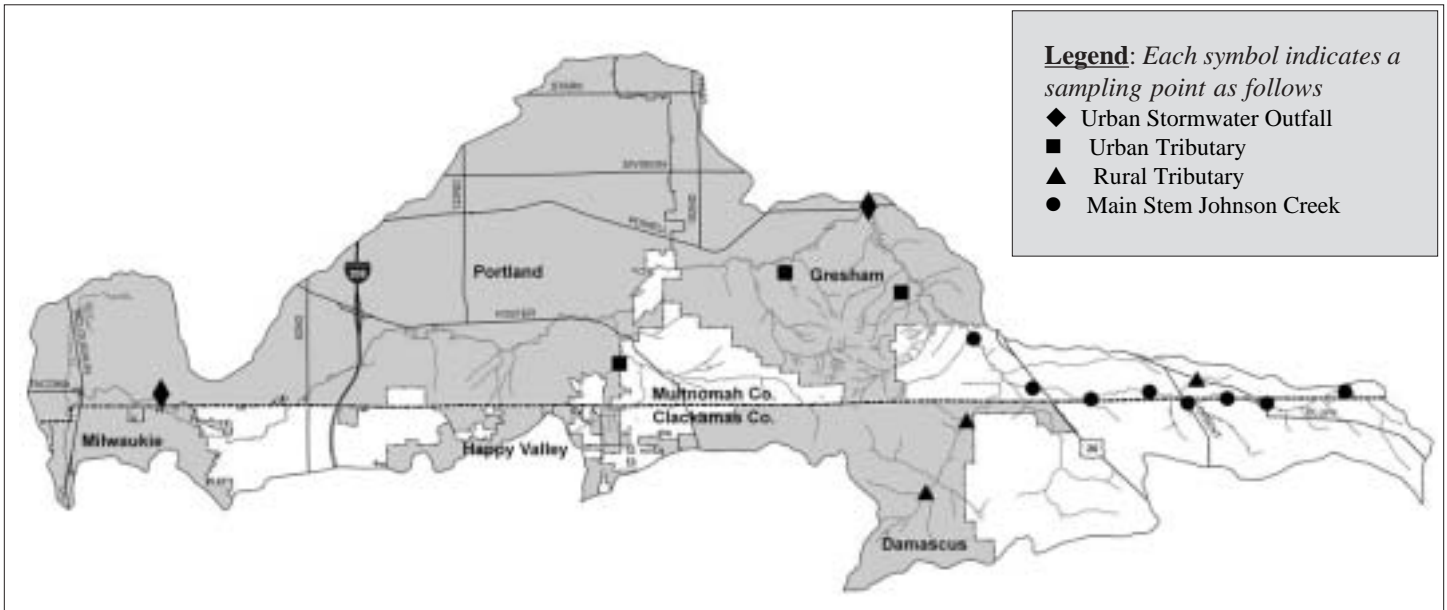
SIGNIFICANT FINDINGS

A total of 16 locations were sampled on 5 separate occasions between October 2003 and June 2004.

- ◆ During rain storms there is a strong relationship between soil suspended in the water and concentrations of DDT.
- ◆ Legacy pesticide concentrations were higher in the rural areas of the watershed than in the urban.
- ◆ Many samples collected in both urban and rural locations, exceeded the acceptable water quality standards.

This project was made possible through a partnership, which includes the Cities of Milwaukie, Portland, Gresham, and Clackamas and Multnomah Counties as well as the USGS, DEQ, and the Johnson Creek Watershed Council (JCWC). Project funding was provided in large part by an Environmental Protection Agency (EPA) non-point source pollution grant from Oregon DEQ and administered by the JCWC.

Map1: Johnson Creek Watershed



Study Overview

The purpose of this study was to gain a greater understanding of where the legacy pesticides in the creek originate. Since previous studies focused on the area of Johnson Creek west of Highway 26 (Lower Johnson Creek), this study focused more on the stream east of Highway 26 (Upper Johnson Creek). Past studies found that pesticide concentrations decrease as the stream flows towards the Willamette. Therefore the main objectives of this study were to identify areas where higher DDT and Dieldrin concentrations occur and compare the concentrations in the upper creek to concentrations in the lower creek. To meet these objectives, water samples were collected at 16 locations, (see Map1). These locations include 2 stormwater outfalls that drain urban areas, 3 tributaries that drain urban areas, 3 tributaries that drain rural areas, and 8 sites on the mainstem of Johnson Creek. A variety of stream flow, and seasonal weather conditions were targeted in the five sampling events between October 2003 and June 2004.

Results

Figure 1 illustrates the relationship between DDT and sediment found in stream samples collected during rain storms.

- ◆ During rain storms there is a strong relationship between soil suspended in the water (total suspended solids) and the DDT concentrations.
- ◆ No such relationship exists during dry weather, indicating that erosion from rainfall carries DDT contaminated soil into the stream.

Figure 1: DDT vs. Sediment in Stream (During Rain Storms) -All Sites

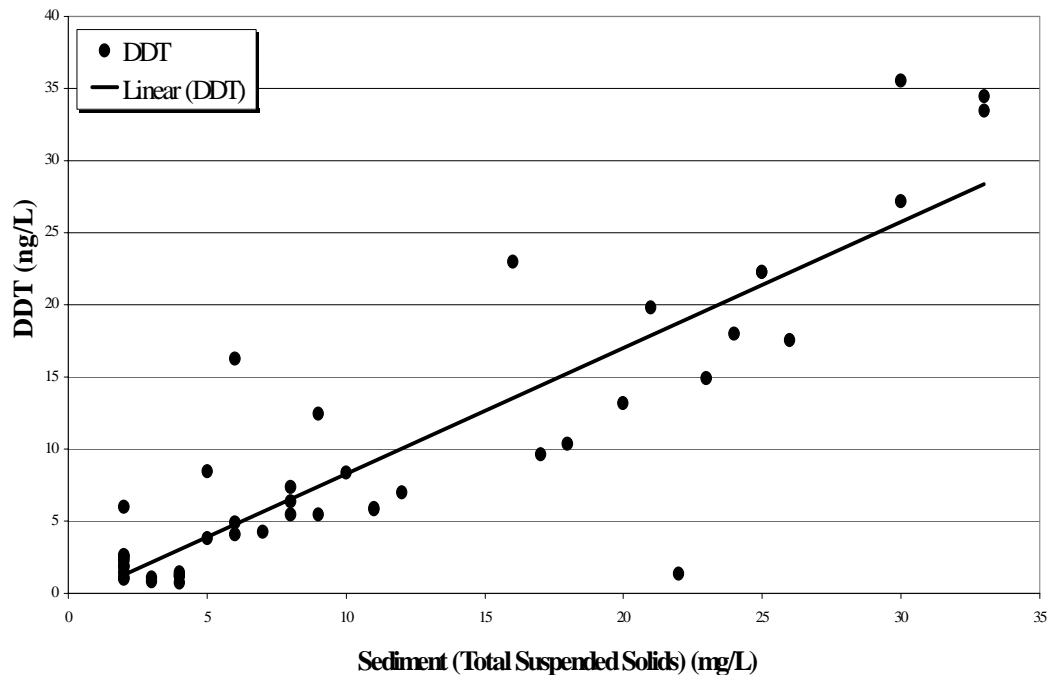
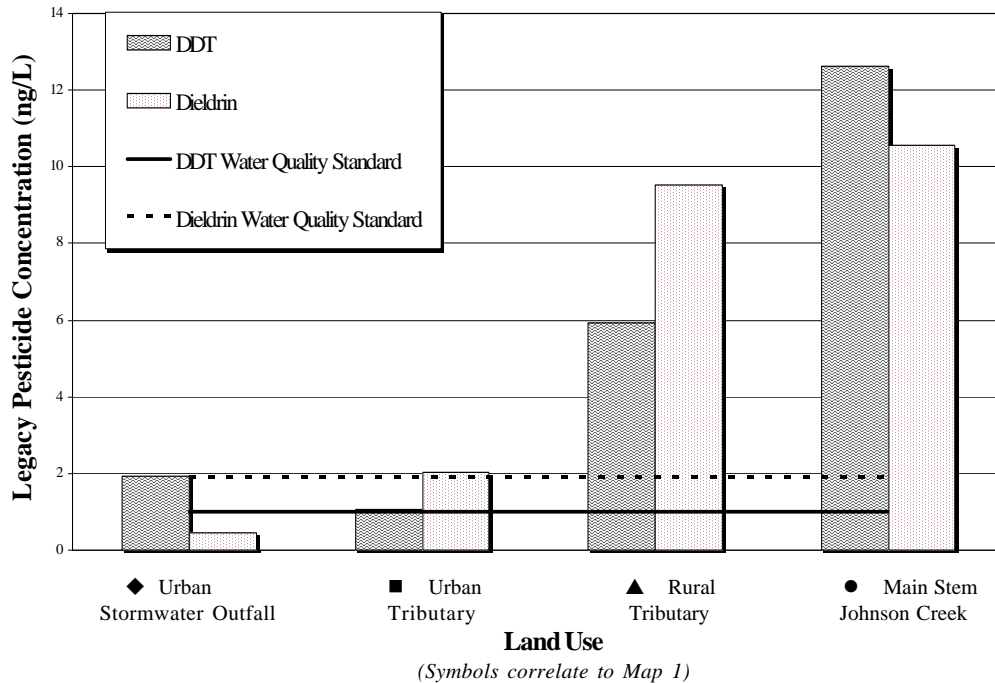


Figure 2: Legacy Pesticides- Average by Land Use



Results continued

Figure 2 illustrates the concentration of DDT and Dieldrin found at the four types of monitoring locations (upper main stem, rural tributaries, urban tributaries and urban stormwater outfalls).

◆ The concentrations of both DDT and Dieldrin is higher in the rural area of the watershed than in the urban portion.

◆ Most samples exceed the acceptable water quality standards (shown on the graph).

“What We Can Do” To minimize the amount of sediment – and attached pollutants, such as pesticides – that are washed into Johnson Creek and tributaries, it is important to implement proper erosion control measures whenever you are involved with a soil-disturbing activity. Basic erosion control measures include, but are not limited to:

Residential Activities:

- Many city stormwater drains lead directly to Johnson Creek. As much as possible keep soil from running off your land and into a storm drain.
- When gardening or landscaping, keep soil on-site by covering exposed piles with tarps or mulch.
- If you have a private roadway, direct the drainage into upland areas at many points or allow runoff to flow into a vegetated buffer strip to filter out pollutants before it leaves your property.
- Add clean gravel to the surface of an unpaved driveway.
- When hiking or mountain biking stay on the trail. In certain instances, feet and tires can both cause soil erosion.

Agricultural Activities:

- Maintain vegetated buffers along streams to filter out sediment in runoff from fields and farm roads.
- Avoid irrigation induced erosion.
- If livestock are confined to one area, maintain a vegetated buffer around the area.
- Avoid grazing to the point of creating bare patches in your pastures, especially near streams and ditches that drain into streams.
- Consider avoiding the use of ditches that directly discharge to a creek. As an alternative, allow runoff to flow into a vegetated buffer strip to filter the pollutants before it leaves the farm.

Construction Activities: *If you are planning to engage in soil-disturbing construction activity, please contact your City or County before you begin to determine the best ways to control erosion and to determine if a permit is needed.*

- Cover exposed areas and piles of soil with tarps or mulch to minimize storm-driven and wind-borne erosion of soil.
- Avoid the placement or movement of soils onto paved areas.
- Install appropriate measures to trap sediments and filter runoff before it leaves the site.
- Quickly re-seed or replant after soil-disturbing activity is complete.

For more information on erosion control measures or pesticide use refer to contacts on the next page.

Summary:

The use of DDT and Dieldrin, known as legacy pesticides, was banned in the United States three decades ago. However, small amounts of these pesticides remain mixed in the upper soil layers where they were originally applied.

Rain fall related soil erosion can quickly move these pesticides from soils into Johnson Creek and its tributaries.

If we all do our part to prevent soil from entering Johnson Creek and its tributaries, we can help reduce the amount of DDT, Dieldrin and other pesticides in the creek.

Resources:

For more information on erosion control practices and pesticide use, refer to the contacts below.

City

Gresham, Stormwater Division (503) 618-2405

Happy Valley, (503) 760-3325

Portland, Erosion Control Hotline (503) 823-0900

Milwaukie, Stormwater Division (503) 786-7615

County

Multnomah, Land Use Planning Division (503) 988-3043

Clackamas, Water Environment Services (503) 353-4567

Soil & Water Conservation District

East Multnomah (503) 222-7645

Clackamas (503) 656-3499

State

Oregon Department of Agriculture, Natural Resources Division
(503) 986-4700

Oregon Department of Environmental Quality (503) 229-5263



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