

# Regional Storm Water Monitoring in North Central Texas



by  
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# What is NPDES?

- **National Pollutant Discharge Elimination System**
- **USEPA outfall permitting program**
- **Storm water designated a point source under this program in 1990**
- **Cities of 100,000 or greater included in Phase I of program**
- **Phase II (remaining cities and counties in urbanized areas) exempted until March 2003**

## Phase I Attributes

- MS4s had to develop and submit comprehensive applications
- MS4s had to negotiate the permit details with USEPA or delegated State
- Wet and dry weather monitoring required
- Required to reduce or eliminate pollutants to the Maximum Extent Practicable
- Permits cover 5 years

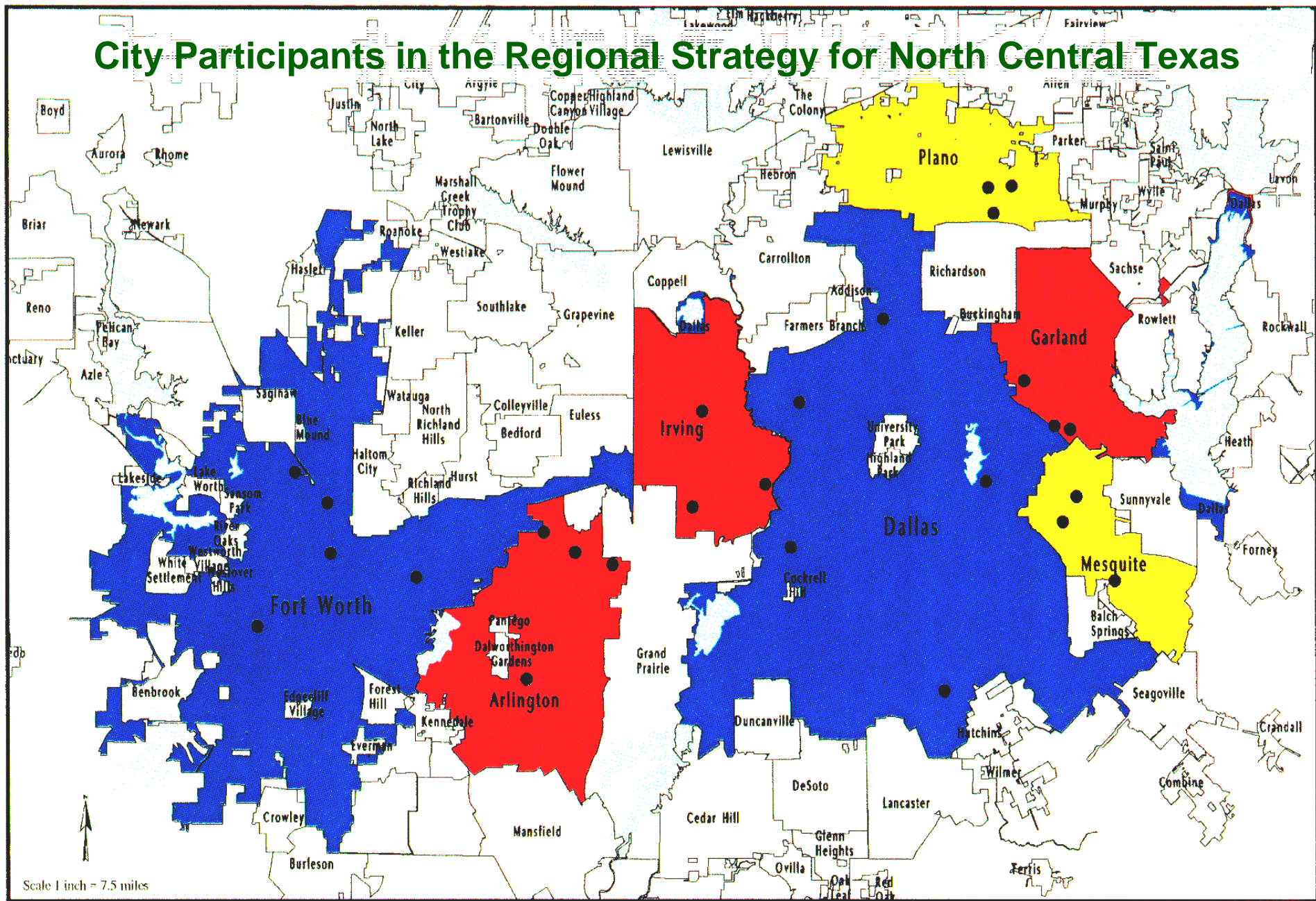
# Participants in the North Central Texas Regional Monitoring Program

- **Seven largest cities - Dallas, Fort Worth, Arlington, Irving, Garland, Mesquite, Plano**
- **Texas Department of Transportation - Dallas and Fort Worth Districts**
- **US Geological Survey**
- **North Central Texas Council of Governments**

# USGS Assistance with Application Phase Monitoring

- Establish and operate 30 water quality monitoring stations.
- Sample outfalls from small, single land use watersheds w/ automated samplers.
- Collect quantitative data from 7 storm events at each station = 210 indiv. events.
- Monitor for approx. 190 parameters.
- Estimate event mean concentrations and pollutant loads for selected parameters.
- Assist in designing a monitoring program for the permit term.

# City Participants in the Regional Strategy for North Central Texas



Scale 1 inch = 7.5 miles

- Cities Greater Than 250,000  
Population Based on 1980 Census  
**Dallas Fort Worth**
- Cities Greater Than 100,000  
Population Based on 1980 Census  
**Arlington Garland Irving**
- Additional Cities Greater Than 100,000  
Population Based on 1990 Census  
**Mesquite Plano**
- Wet Weather  
Monitoring Sites

# Most Common Constituents Found for Each Land Use Category

## Residential

- Arsenic
- Chlordane
- COD
- Diazinon
- Fecal coliform
- Fecal streptococcus
- Total phosphorus
- Dissolved phosphorus
- Total nitrogen
- TKN

## Industrial

- Cadmium
- Chloride
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Oil & Grease
- Phenols
- Sulfate
- TSS
- Zinc

# Designing Permit Term Monitoring

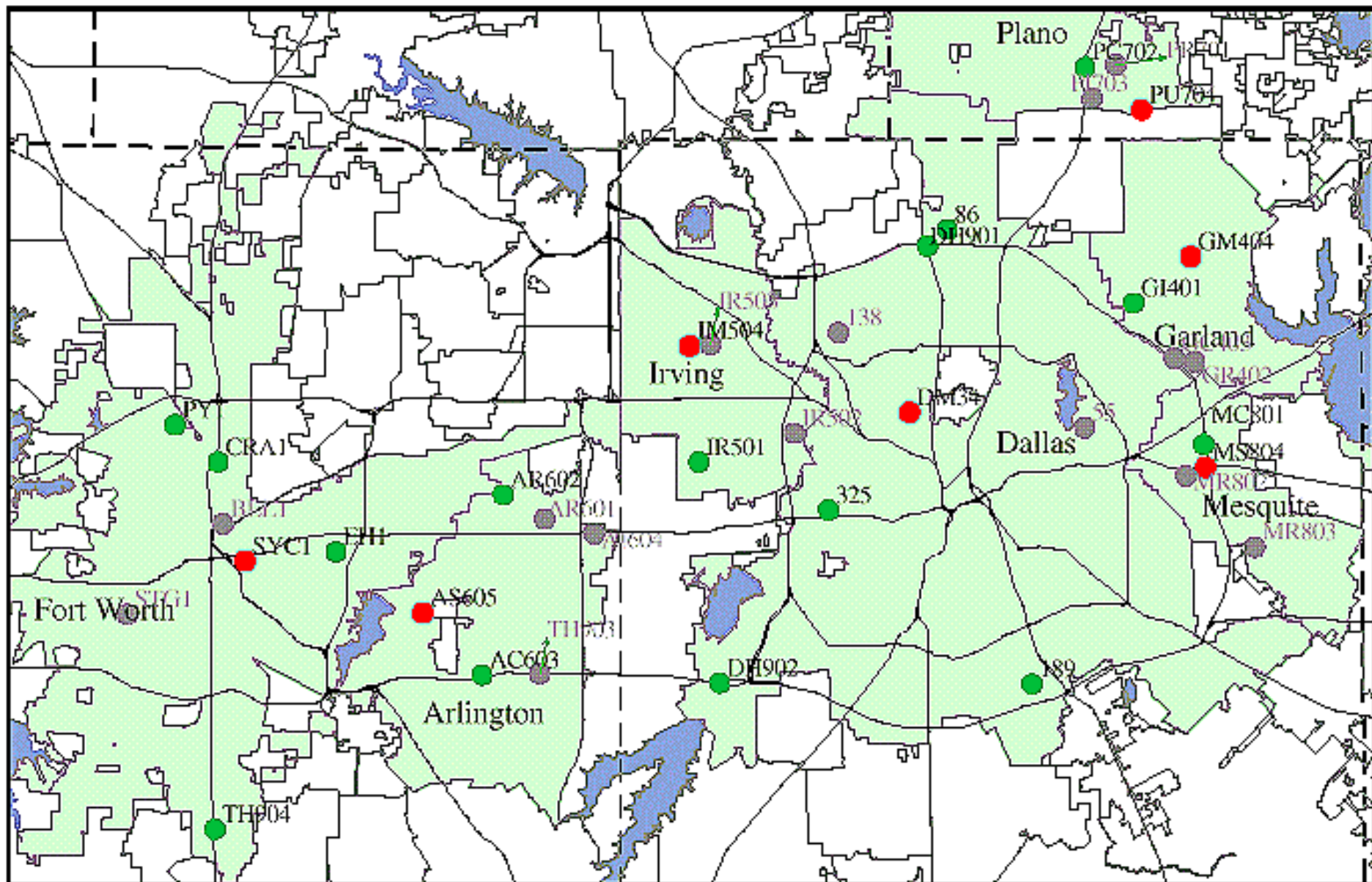
- USGS conducted a network analysis to statistically define the temporal and spatial variability of the water quality data.
- Reduced site redundancy by retaining 15 of the original 30 sites.
- Proposed 7 new sites in 3 new categories.
- Parameter set reduced from 190 to 22 key constituents.



# Regional Permit Term Monitoring Program

- Wet weather monitoring
  - 15 existing single land use sites
  - 4 new mixed land use outfall sites
  - 3 new mixed land use in-stream sites
  - total of 350 site-events over 5 years
- Bioassessment monitoring
  - Fort Worth program
  - Dallas program

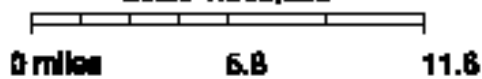
# NORTH CENTRAL TEXAS REGIONAL WET WEATHER MONITORING SITES



- Mixed Land Use
- Single Land Use (Active)
- Single Land Use (Inactive)



Scale 1:266,288



# Regional Permit Term Parameters

**Biochemical Oxygen Demand**

**Chemical Oxygen Demand**

**Total Suspended Solids**

**Total Dissolved Solids**

**Cadmium**

**Copper**

**Lead**

**Zinc**

**Dissolved Phosphorus**

**Total Phosphorus**

**Total Kjeldahl Nitrogen**

**Nitrates + Nitrites**

**Total Nitrogen**

**Chromium**

**Arsenic**

**Fecal coliform bacteria**

**Fecal streptococci bact.**

**pH**

**Diazinon**

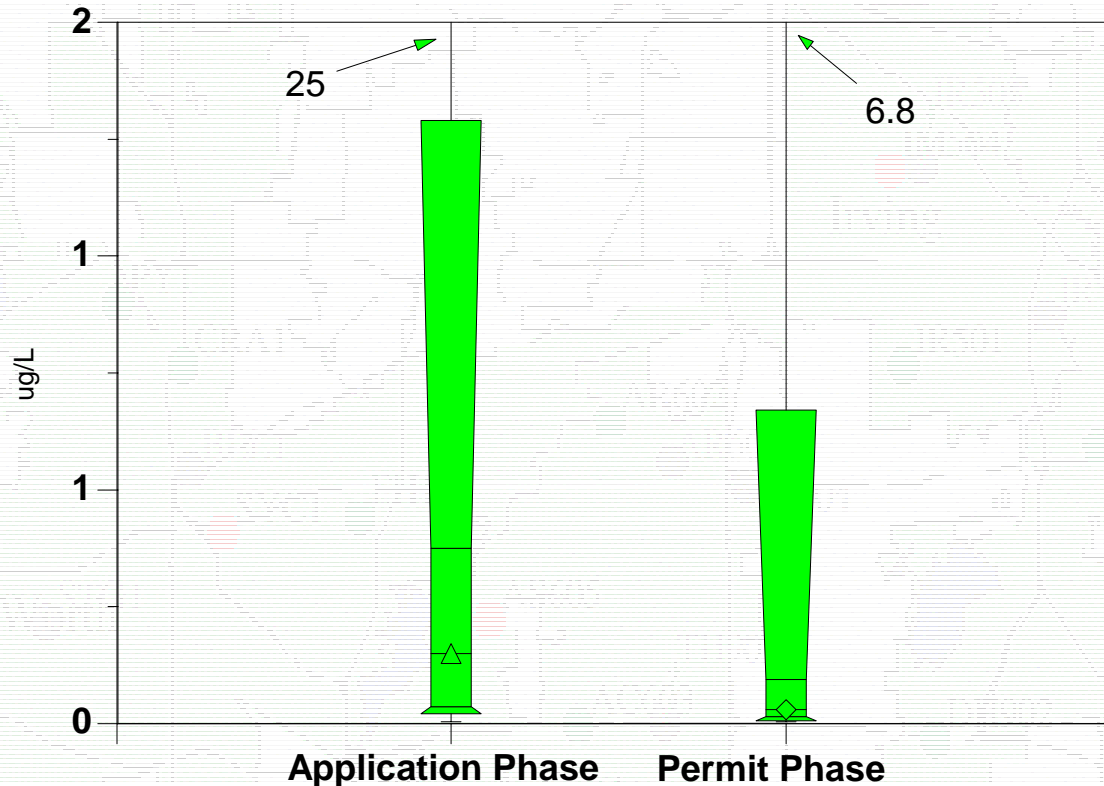
**Oil & Grease**

**Water Temperature**

**Total Hardness**

# Comparison of Permit Term Data

## Diazinon



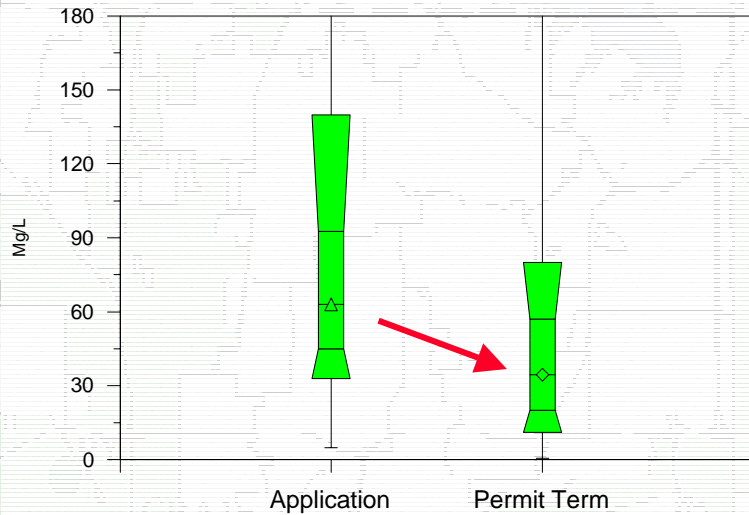
## Box-Whisker Plot

Shows actual distribution of the data. The horizontal lines of a box plot mark the minimum, maximum, and the 10th, 25th, 50<sup>th</sup> (median), 75th, and 90th percentile points.

# APPLICATION PHASE VS PERMIT TERM

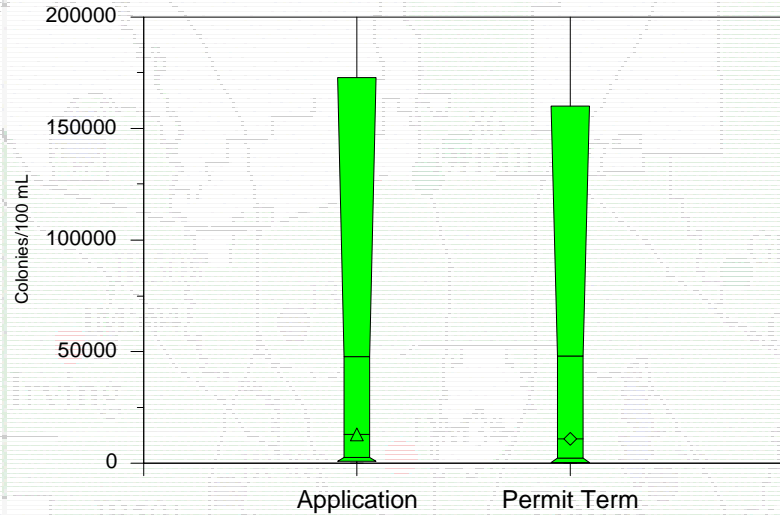
## CHEMICAL OXYGEN DEMAND

Application vs Permit Term (All Landuses Combined)



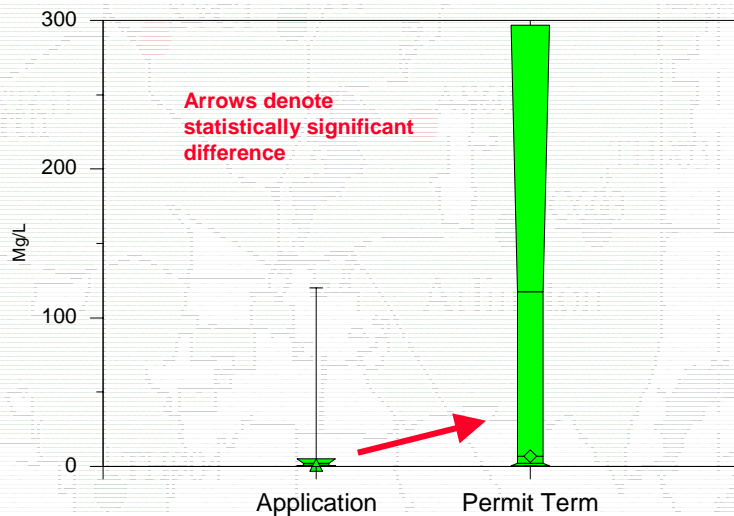
## FECAL COLIFORM

Application vs Permit Term (All Landuses Combined)



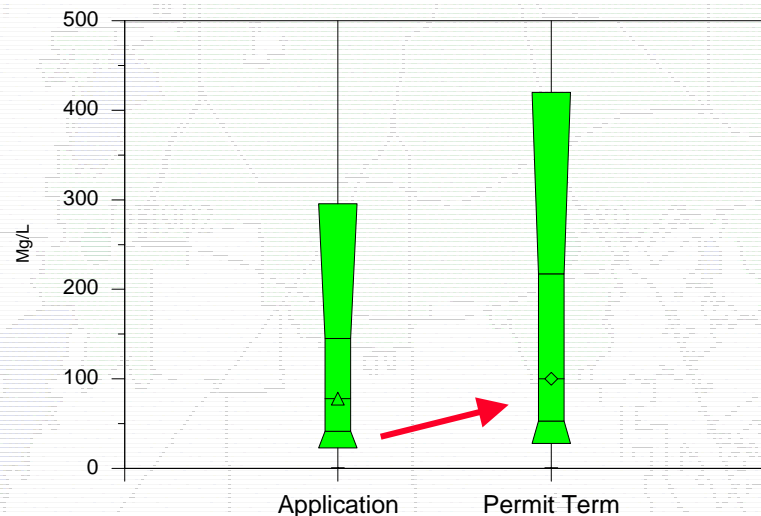
## OIL & GREASE

Application vs Permit Term (All Landuses Combined)



## TOTAL SUSPENDED SOLIDS

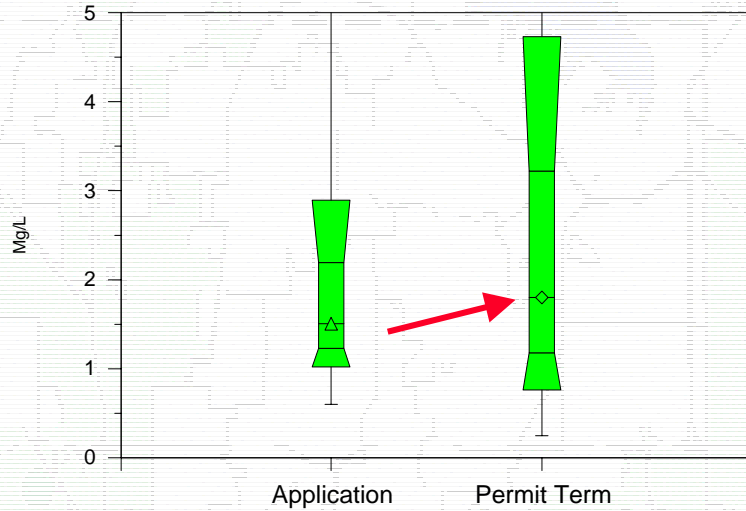
Application vs Permit Term (All Landuses Combined)



# APPLICATION VS PERMIT TERM

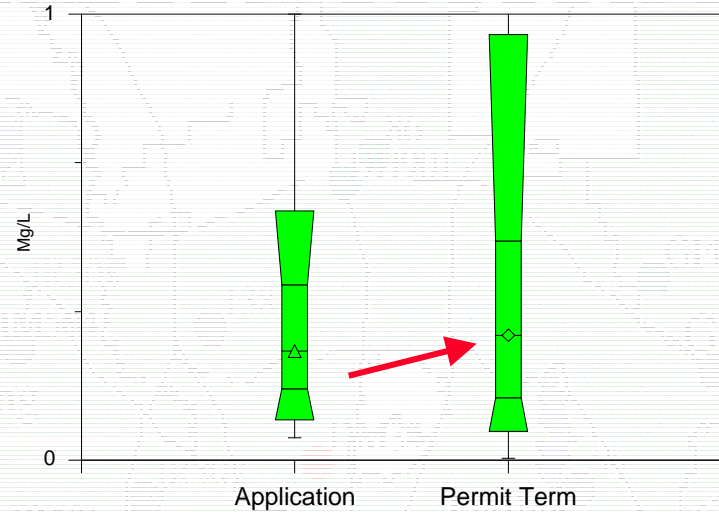
## TOTAL NITROGEN

Application vs Permit Term (All Landuses Combined)



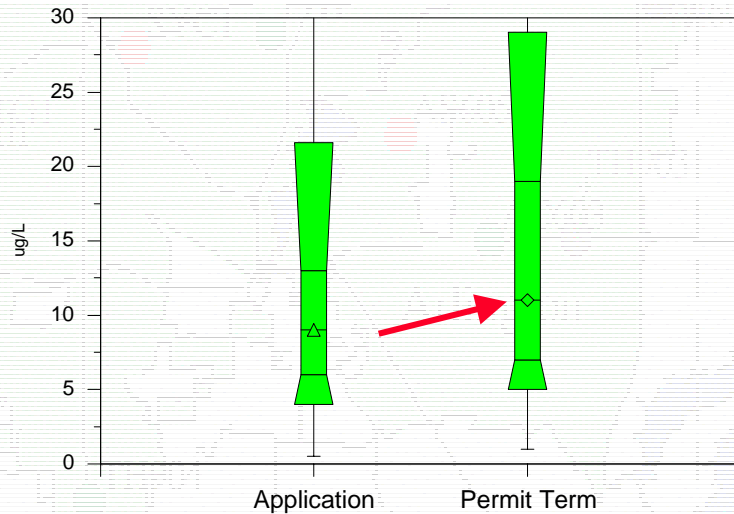
## TOTAL PHOSPHORUS

Application vs Permit Term (All Landuses Combined)



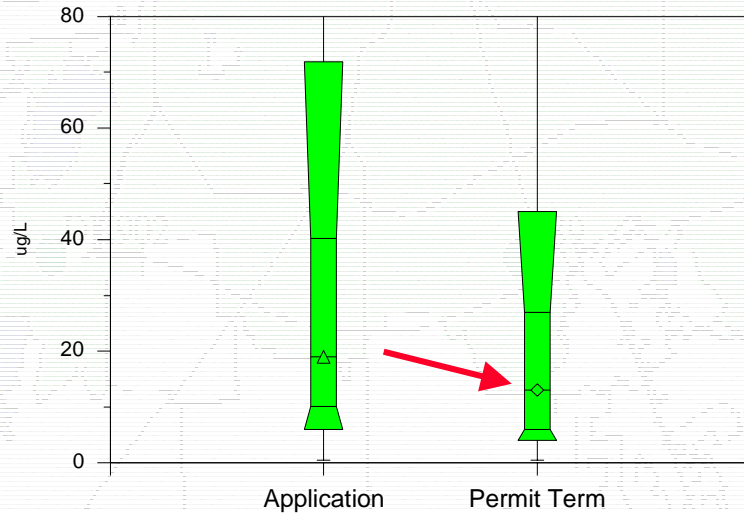
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Application vs Permit Term (All Landuses Combined)



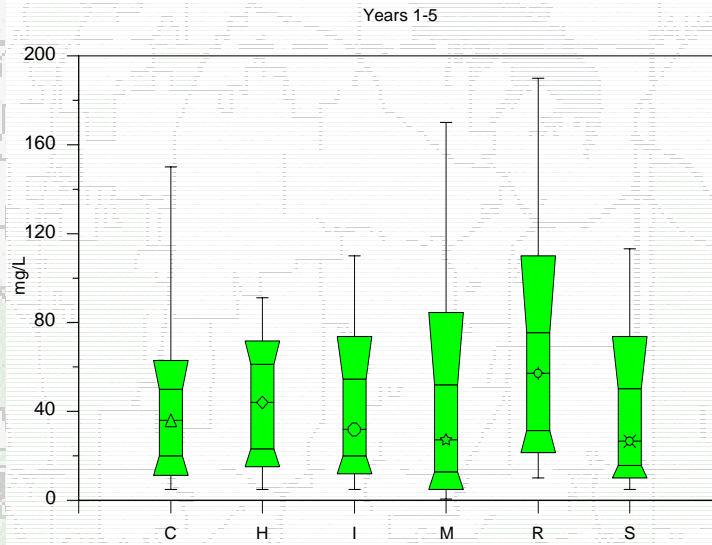
## LEAD

Application vs Permit Term (All Landuses Combined)

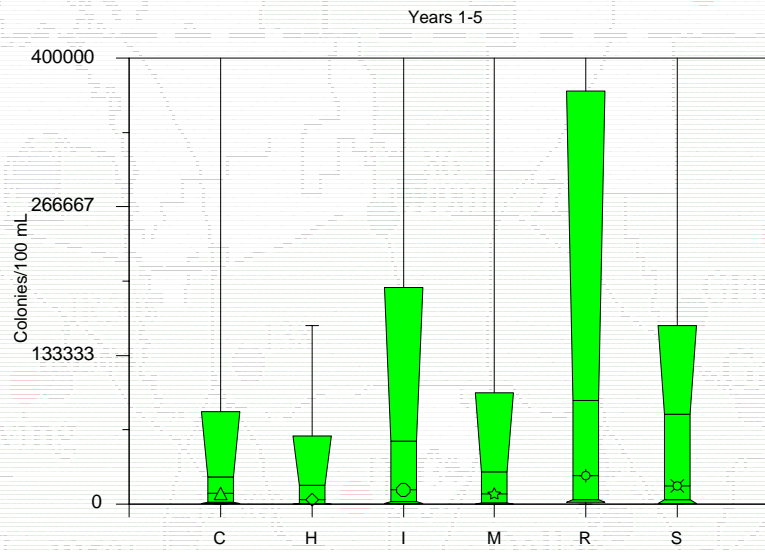


# LANDUSE COMPARISON (Cumulative Years 1 – 5)

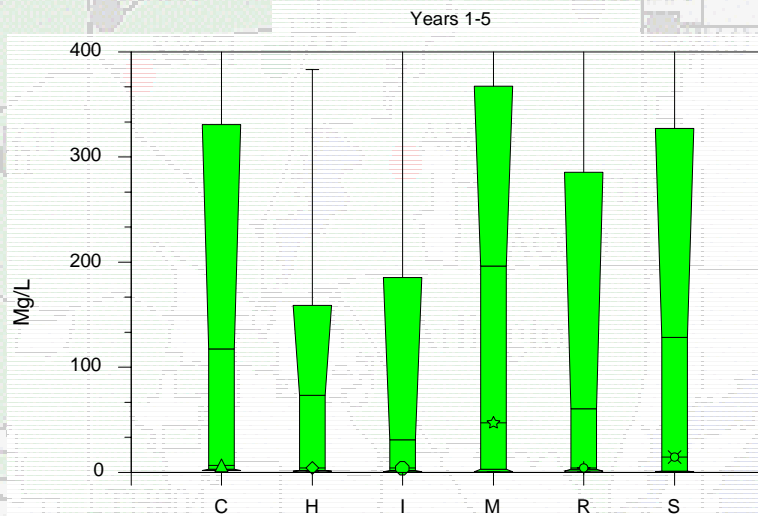
## CHEMICAL OXYGEN DEMAND



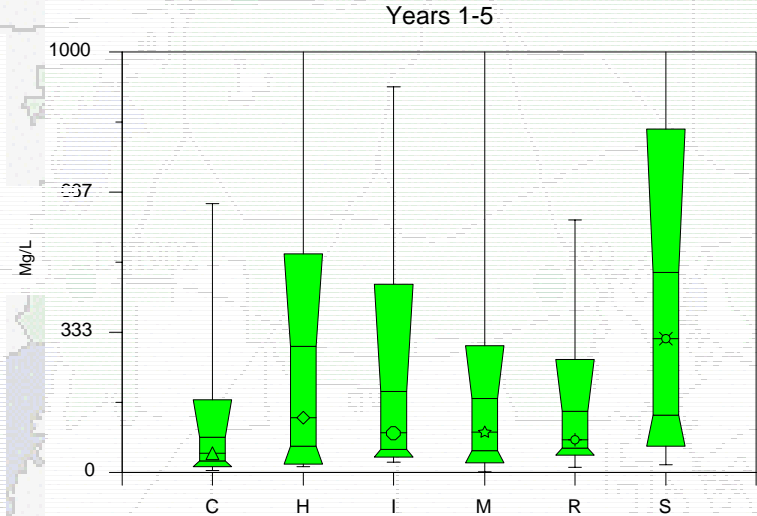
## FECAL COLIFORM



## OIL & GREASE

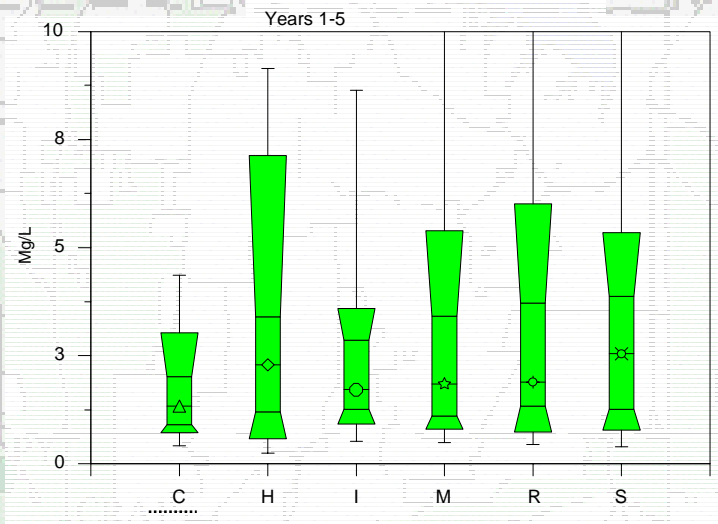


## TOTAL SUSPENDED SOLIDS

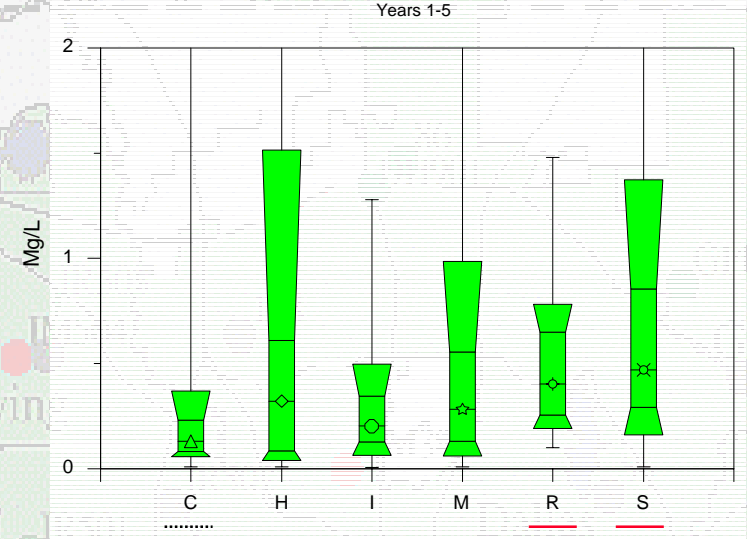


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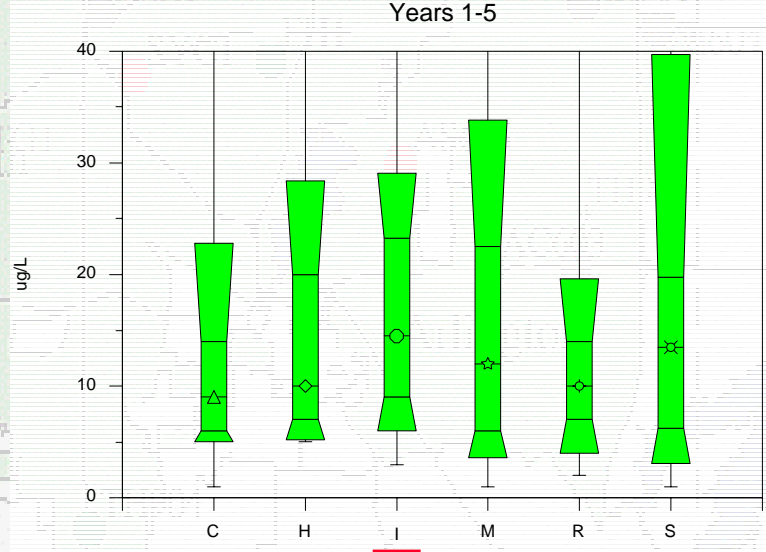
## TOTAL NITROGEN



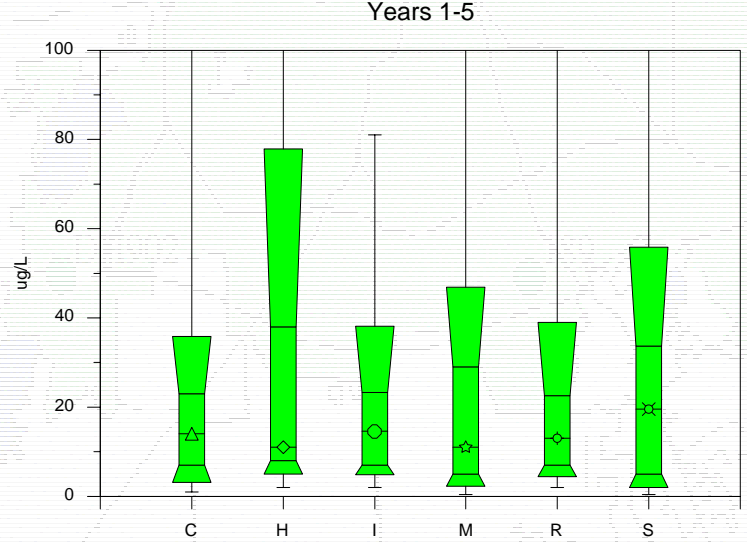
## TOTAL PHOSPHORUS



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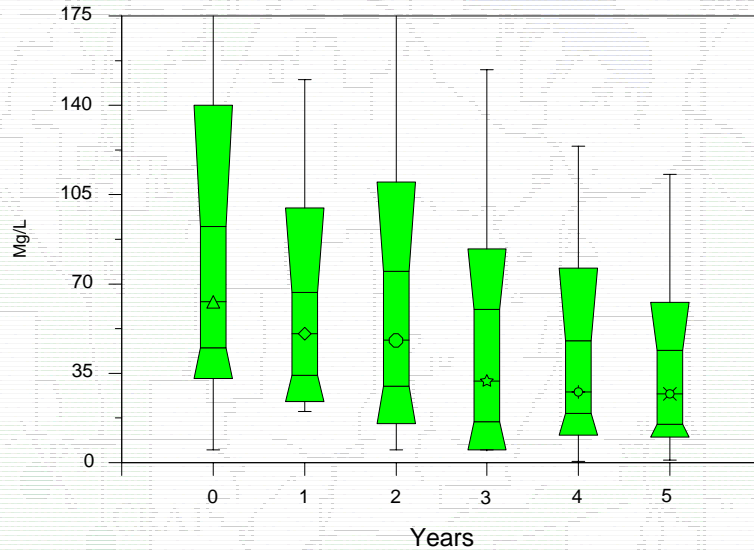
## LEAD



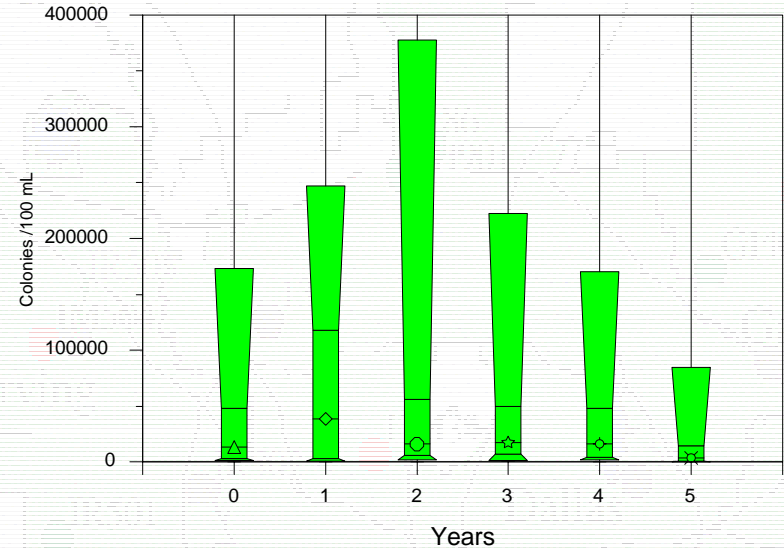


# PERMIT YEAR COMPARISON (All Land uses Combined)

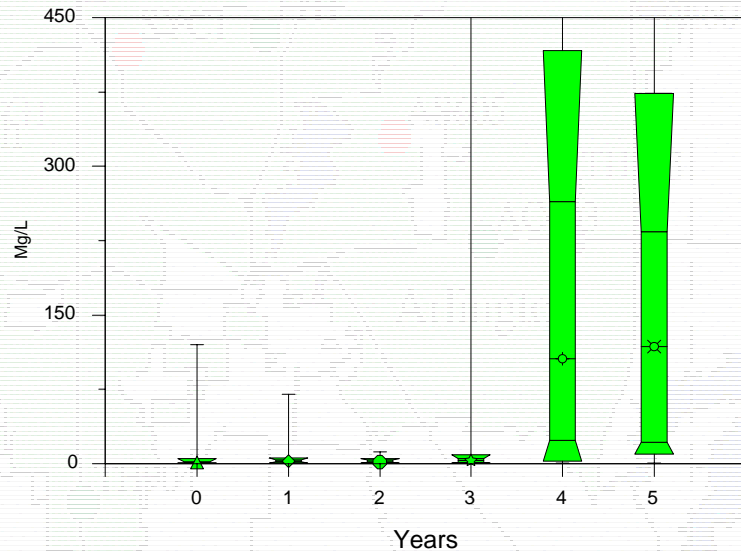
## CHEMICAL OXYGEN DEMAND All Landuses Combined



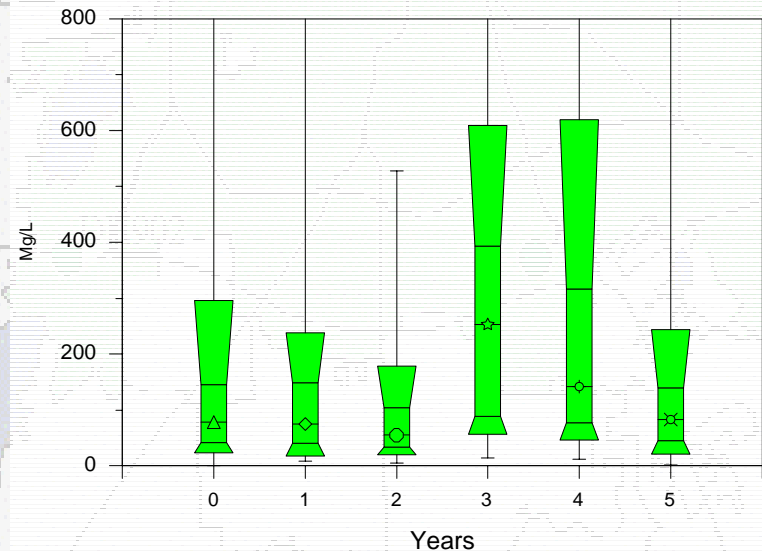
## FECAL COLIFORM All Landuses Combined



## OIL & GREASE All Landuses Combined



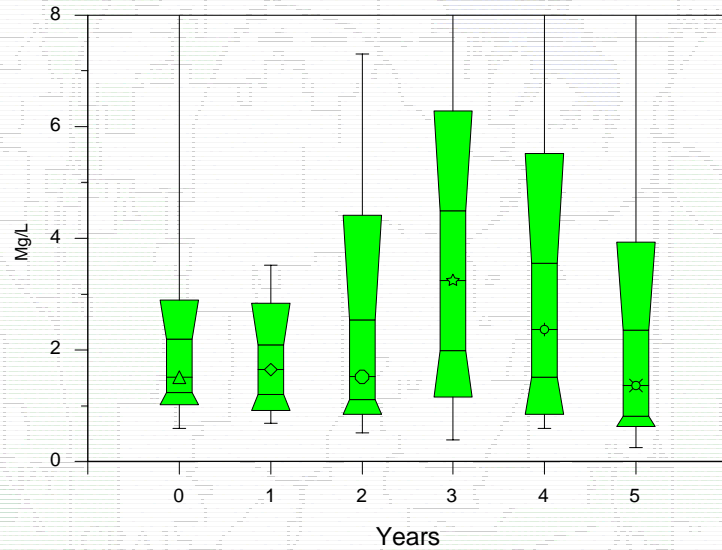
## TOTAL SUSPENDED SOLIDS All Landuses Combined



# PERMIT YEAR COMPARISON (All Land uses Combined)

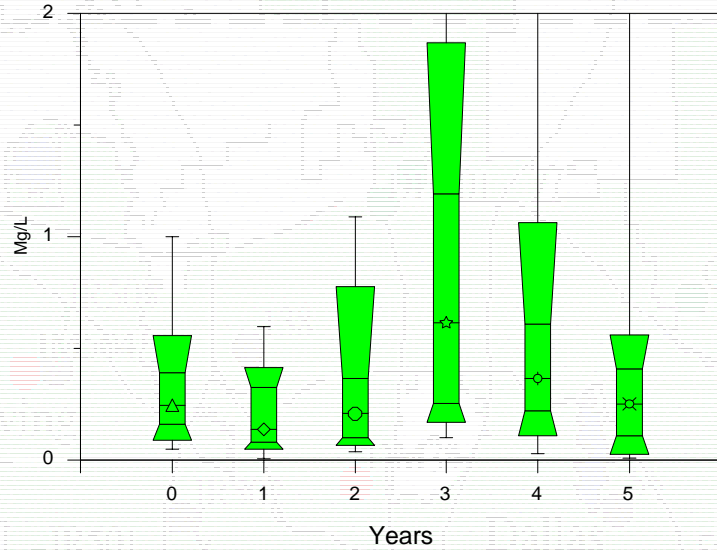
## TOTAL NITROGEN

All Landuses Combined



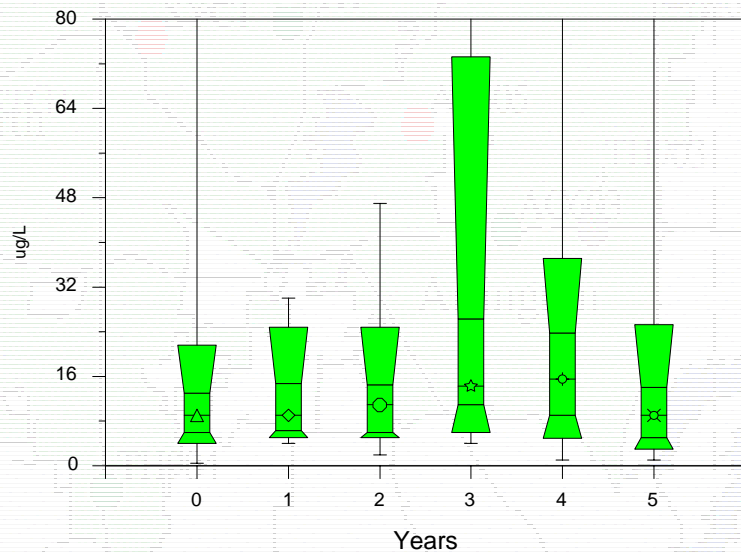
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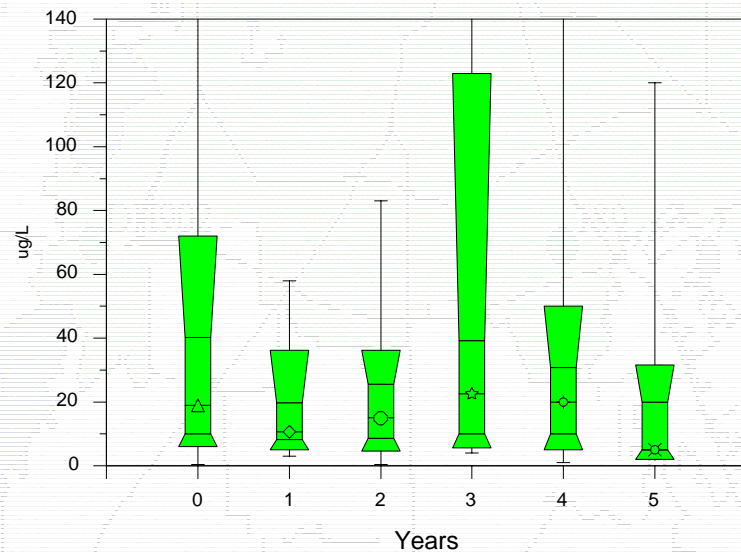
## COPPER

All Landuses Combined

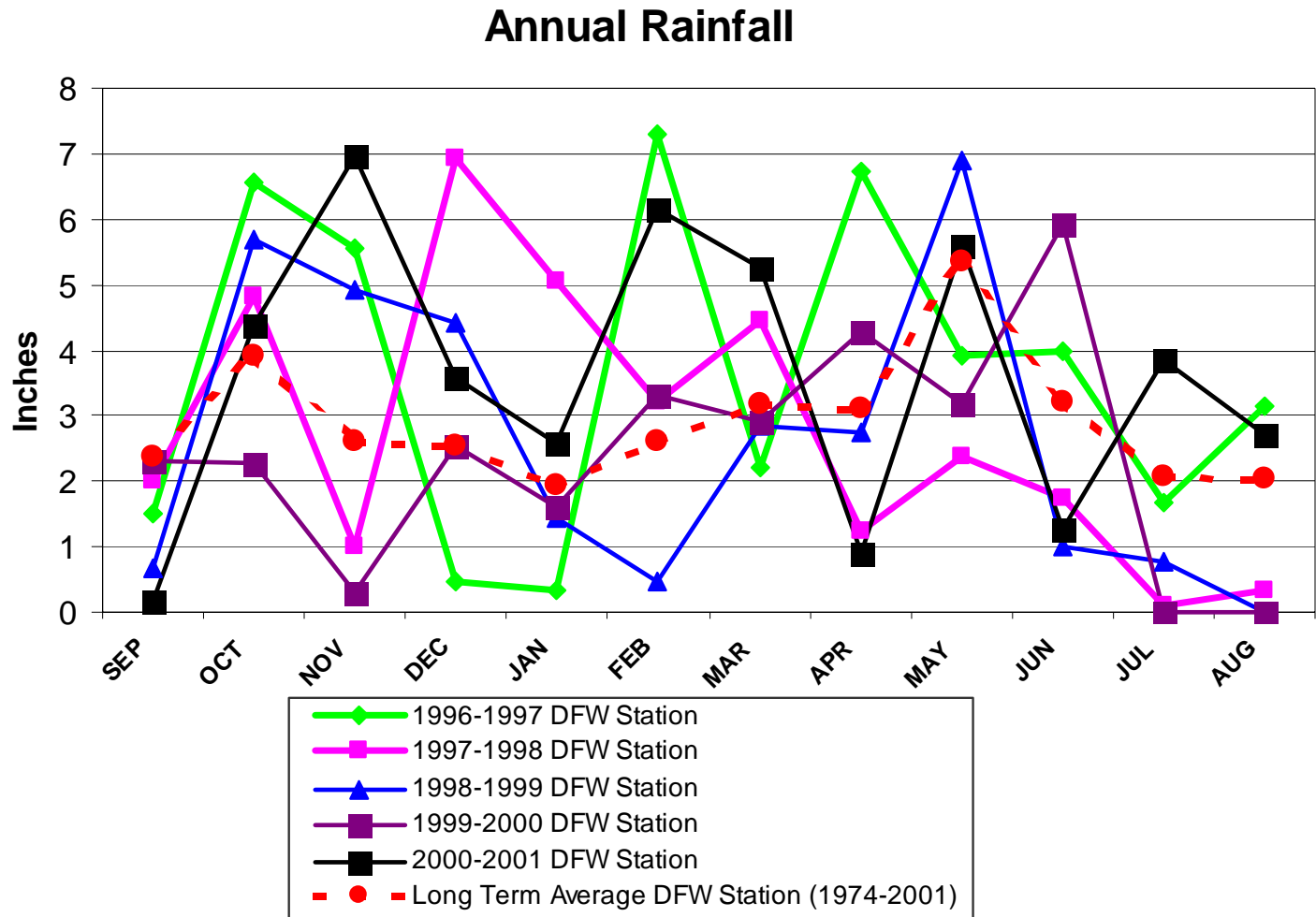


## LEAD

All Landuses Combined

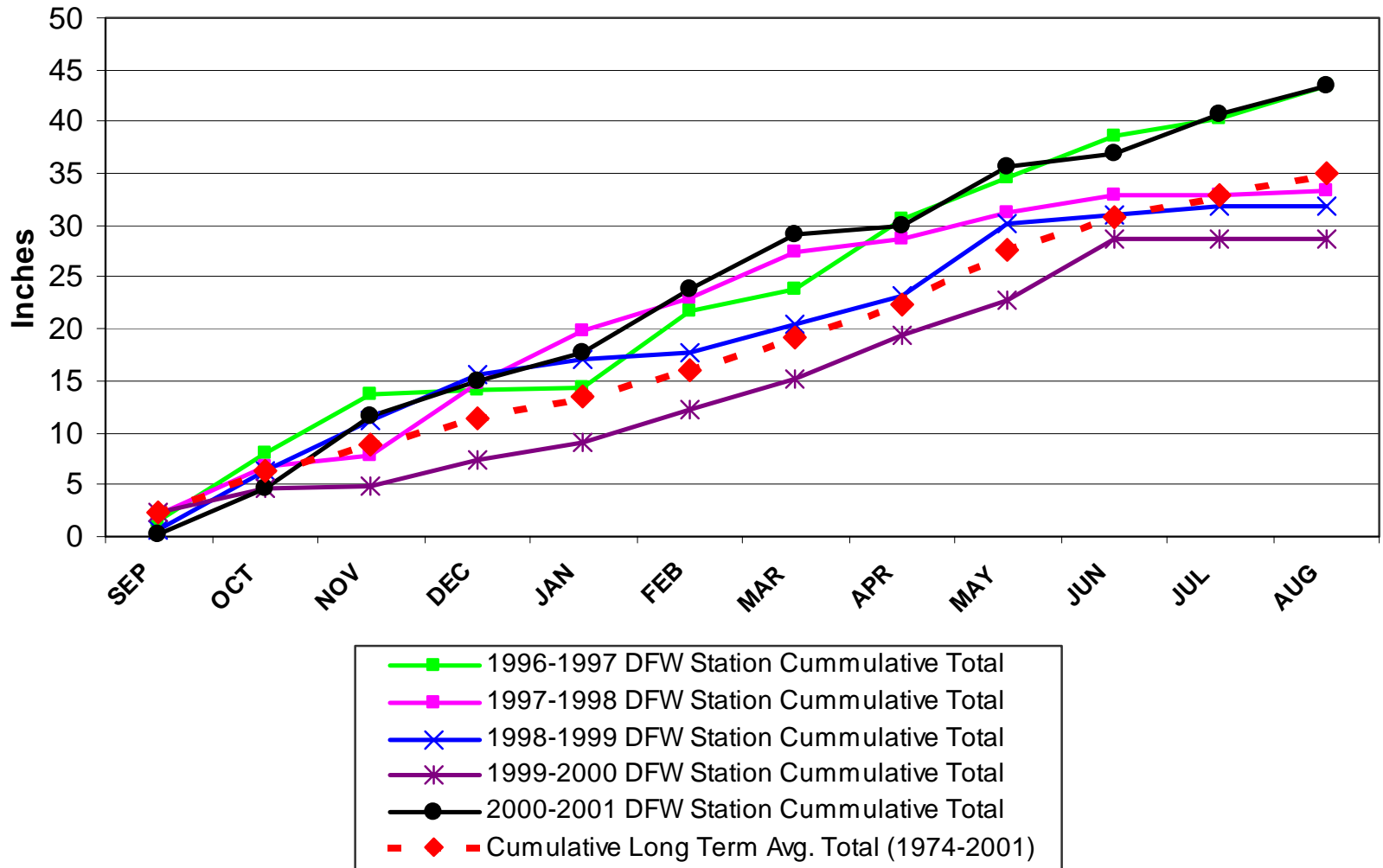


# DFW Annual Rainfall During Permit Term



# DFW Cumulative Annual Rainfall During Permit Term

## Cumulative Rainfall Totals



# Future of the Monitoring Program

- **Considering a total revision (tentatively approved by TNRCC)**
  - More of a large watershed approach
  - Each permittee address local watersheds
  - Move away from automated sampling to grab samples
  - In-stream sampling instead of storm drain outfall sampling
  - Sample minimum of three zones of each watershed (upper/middle/lower)
  - Participants responsible for collecting samples from their watersheds (using existing staff or hiring consultants)
  - All use a common lab for analysis
  - Participants sample one watershed a year and three watersheds per permit term
- **Opportunity to involve other entities in the region and to coordinate with current ambient water quality sampling programs**

# Proposed Regional Watershed Sampling Program

