

# Burnt Bridge Creek Water Quality

## Historic Comparison 1974-2006

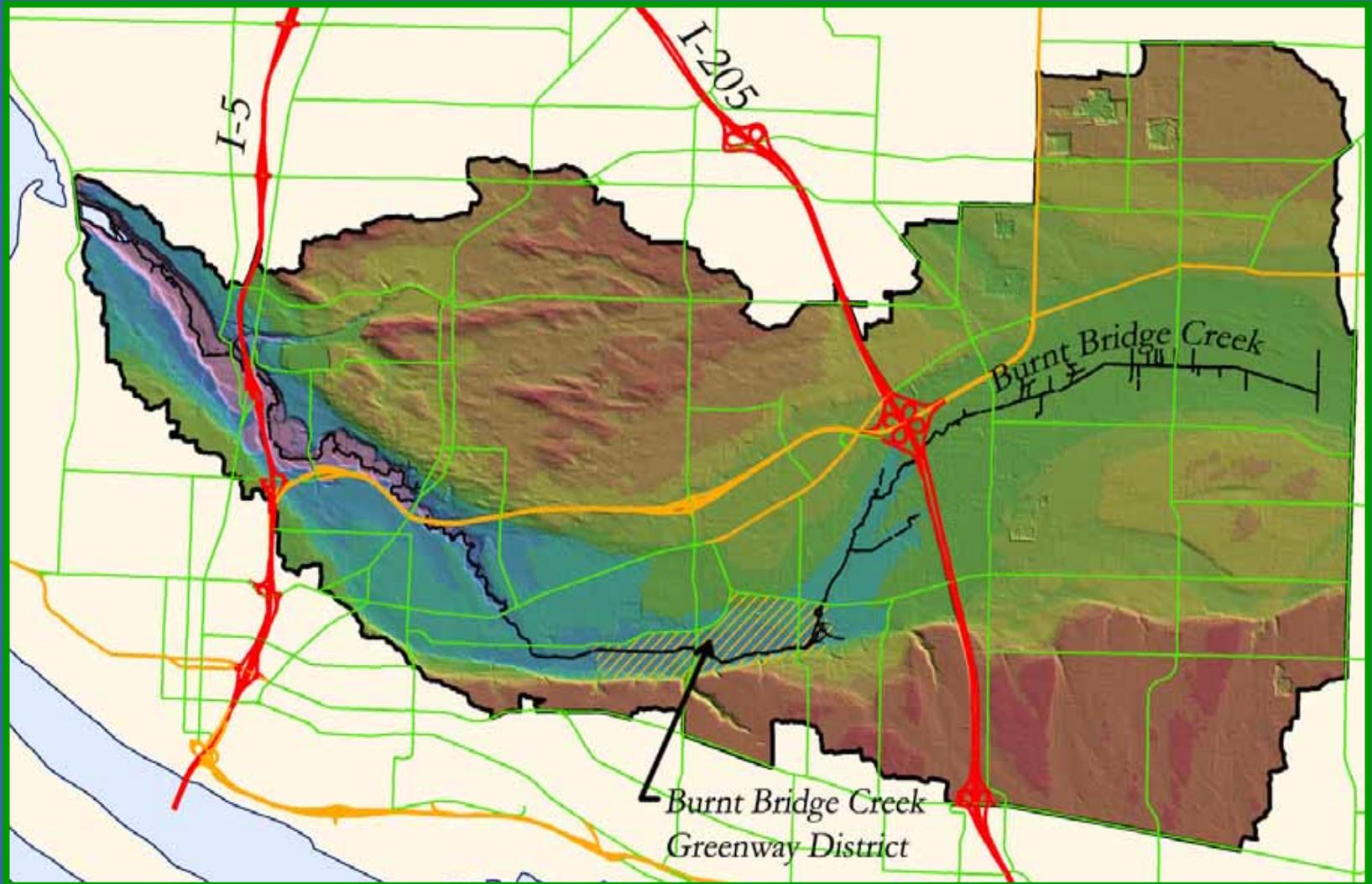


City of Vancouver  
Presentation to the Vancouver Lake Watershed Partnership  
June 20, 2007

# Burnt Bridge Creek Characteristics

- Highly modified urban stream, flows 12.6 miles westward
- Watershed covers approx. 27 square miles, portion of which lies outside city limits but within urban growth boundary (*Salmon Creek watershed approx. 90 sq miles. Vancouver Lake approx 4½ sq miles.*)
- Watershed once forested, now tree canopy of 20 percent
- Winter flows = Mean < 70 ft<sup>3</sup>/s      Maximum of 160 ft<sup>3</sup>/s
- Summer flows = Mean < 10 ft<sup>3</sup>/s      Minimum of 5.2 ft<sup>3</sup>/s
- (*Mouth of Burnt Bridge Creek, USGS 1998-2000*)
- (*Entire volume of flow for a summer month equal to about 3% of Vancouver Lake volume.*)

# Burnt Bridge Creek Watershed



# Current Headwaters

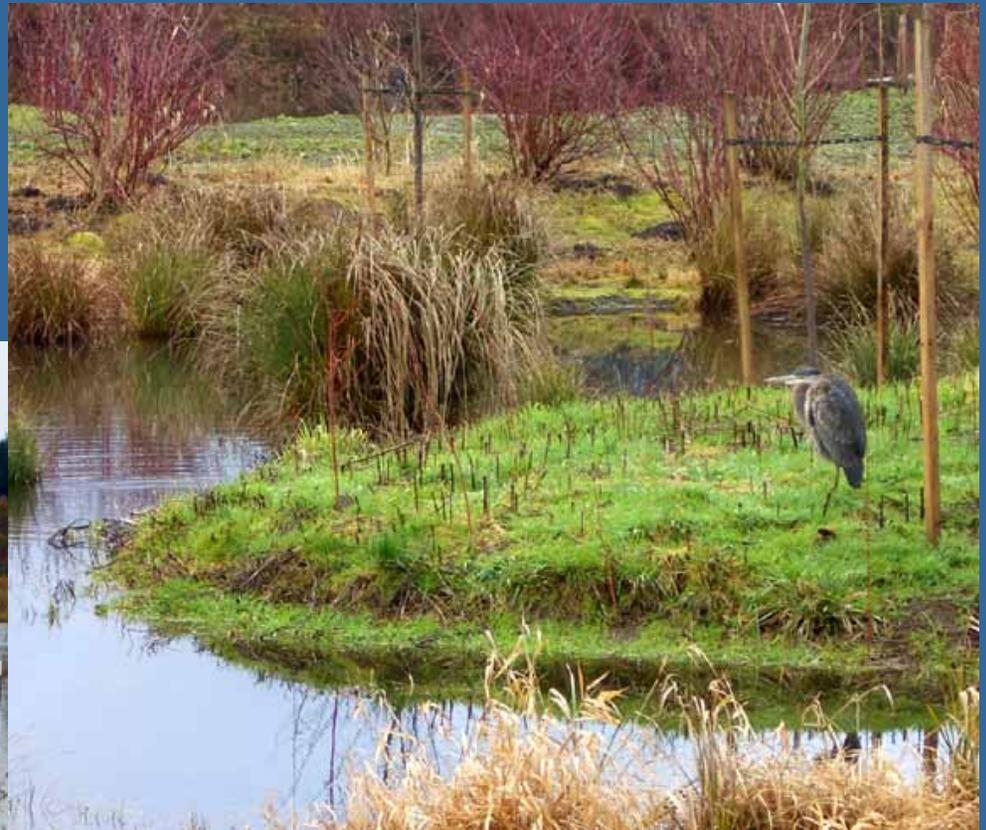
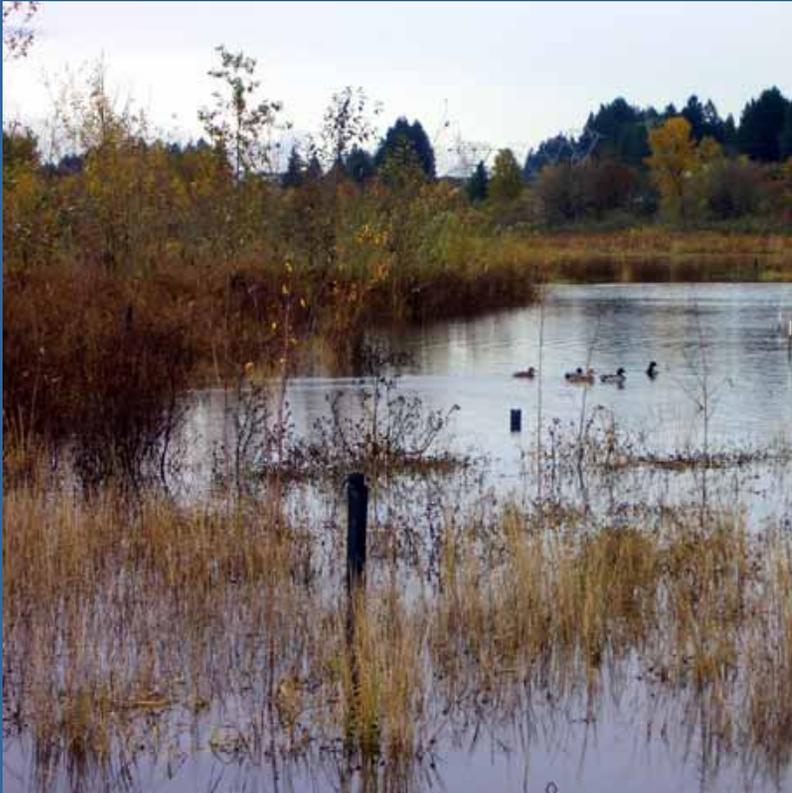
- Located near NE 162nd Avenue
- Most of stream east of NE 18th Street originated as a channelized ditch, constructed in the 1800s to drain land for farming.



Agricultural uses and channelized ditch still seen amid increasing urbanization and growth pressures.

# Central Portion

City's recent restoration efforts are returning the greenway to its natural wetlands environment ...



... providing wildlife habitat, improving flood control, increasing tree canopy and enhancing water quality.

# Western Portion and Terminus

- Less physically altered, more natural path west of 18th Street
- Flows down a steep gradient and into a steep-sided ravine
- Then westerly to Interstate 5 and finally to Vancouver Lake



# Burnt Bridge Creek Background

- 1978: Clark County and City of Vancouver form utility
- 1978 to 1997: Land acquisition, start of regional stormwater facilities, planning, monitoring and – to start - trash cleanup – *“737 tires, 30 beer kegs, 10 fifty-five gallon drums, 36 shopping carts, 6 sofas, a washing machine, one 750 gallon tank, a hot water heater, a car frame, various auto parts and numerous wood debris jams ...”* from one 9-mile stretch over a two-year period. *Excerpt from Burnt Bridge Creek Storm & Surface Water Utility, Historic Summary 1978-1997, Clark County Department of Public Works*
- 1996: Vancouver takes lead for creek efforts within city limits. Annexation brings in major eastern part of creek..

# **Burnt Bridge Creek Background continued**

## **1998 to Present – Growth of Watershed Programs**

- Surface Water Management, includes storm water treatment, Erosion Prevention Program and Burnt Bridge Creek Greenway Project.
- Urban Forestry Program - 2005
- Water Resources Protection Program - 2003
- Sewer Connection Incentive Program - 1998
- Water Resources Education Center - 1996

# Monitoring Background

- Water quality monitored extensively, but not consistently – critical season, time of day, site, etc. – since early 1970s
- Historic monitoring data for Burnt Bridge Creek shows impairments typical to urban streams
- Excursions from the state standards in temperature, dissolved oxygen, and fecal coliform have placed Burnt Bridge Creek on the federal 303(d) list of water quality impaired waterbodies
- Why monitor?
  - Characterize waters & identify changes over time
  - Identify specific existing or emerging problems
  - Gather information to design prevention or remediation programs
  - Determine whether program goals are being met

# Monitoring Considerations

## Functional Differences

### Lakes

\*water retained for  
days/months/years

\*energy fixed primarily  
in lake

\*most organisms suspended  
in water column

### Streams

\*water in transit almost  
immediately

\*energy fixed primarily  
in watershed

\*most organisms near/on  
or in substrate

# Monitoring Sites Compared for Presentation

## Target Creek Locations

- Burton Road
- 86<sup>th</sup> Avenue
- Northeast 18th Street – Greatest historic info for comparison

## Reason for site selection:

- Most historic data for comparison to recent monitoring data
- Centrally located in the watershed
- Downstream of major restoration efforts

## Historic Data Collection Sources

- Southwest Washington Health District
- Consulting firms for City of Vancouver and Clark County

## Recent Data Collection Source

- PBS Engineering and Environmental from 2004-2006

# Sampling Parameters Compared for Presentation

- **Temperature**
- **Dissolved Oxygen**
- **Fecal Coliform Bacteria**

- **Consistently monitored over the years**
- **Continue to be a concern**
- **Important to protecting aquatic life use and primary contact recreation**
- **Key to goal of making creek fishable/swimmable**

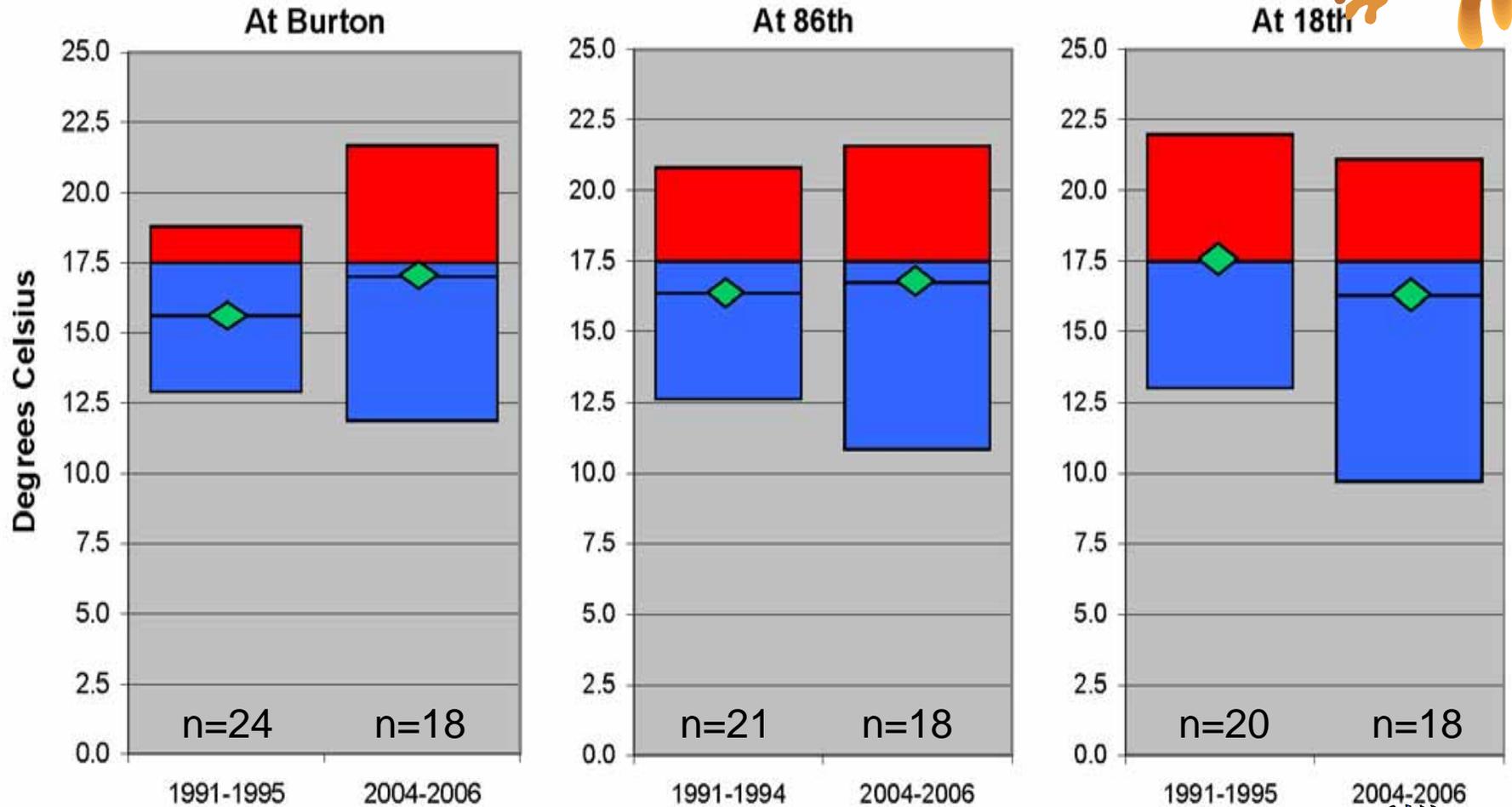
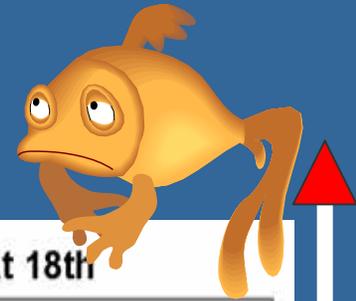
# Temperature

- Water temperature expressed in degrees Celsius (°C)
- Stream temperatures vary daily/seasonally
- Impacted by air temperature, weather, shading, and inputs from groundwater or urban stormwater
- Physical aspects cause natural variations in temperature
- Warmest temperatures of the year generally occur during summer and early fall – the critical season

# Sampling Temperatures

- Standard for Burnt Bridge Creek will reflect pre-settlement temperature as determined in a future study
- Current default standard for state salmonid-bearing streams is 17.5° C
- Maximum temperatures regularly exceed 20° C.
- Temperatures increase June through mid-September
- By October, temperatures generally below standard

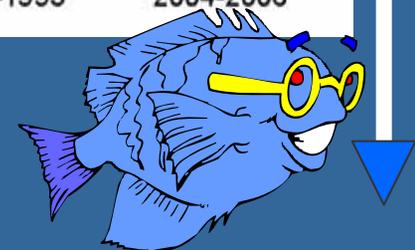
# BBC Water Temperature



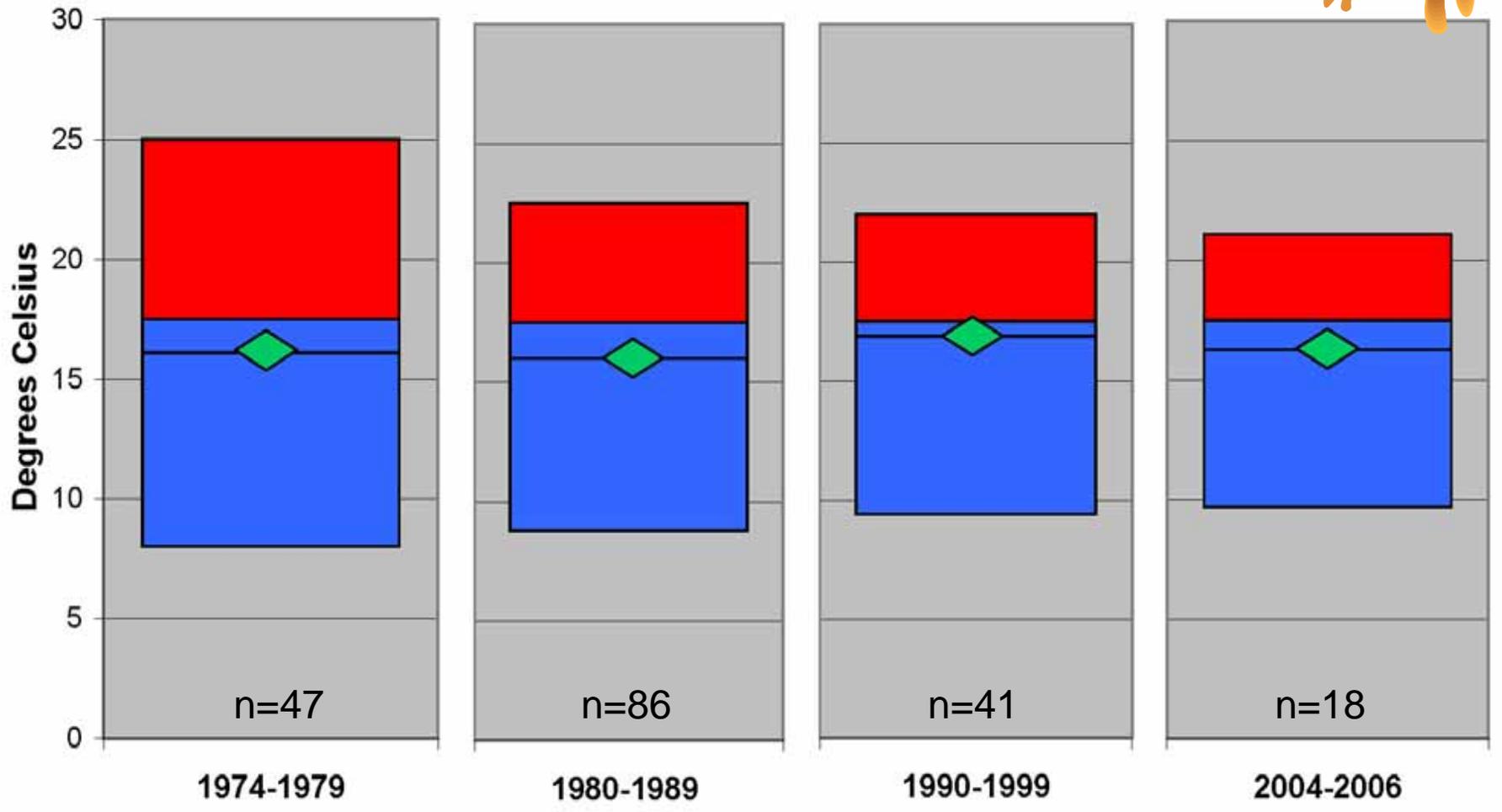
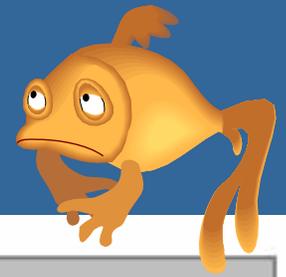
◆ Average  
n = Sample Size

■ Below Standard

■ Above Standard



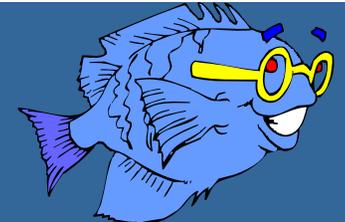
# BBC Water Temperature at 18th



 Average  
n = Sample Size

 Below Standard

 Above Standard



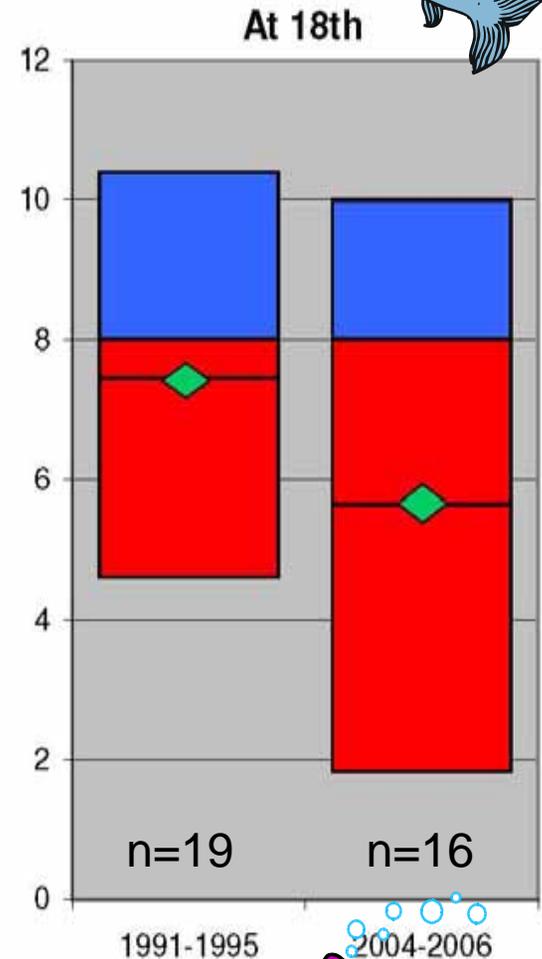
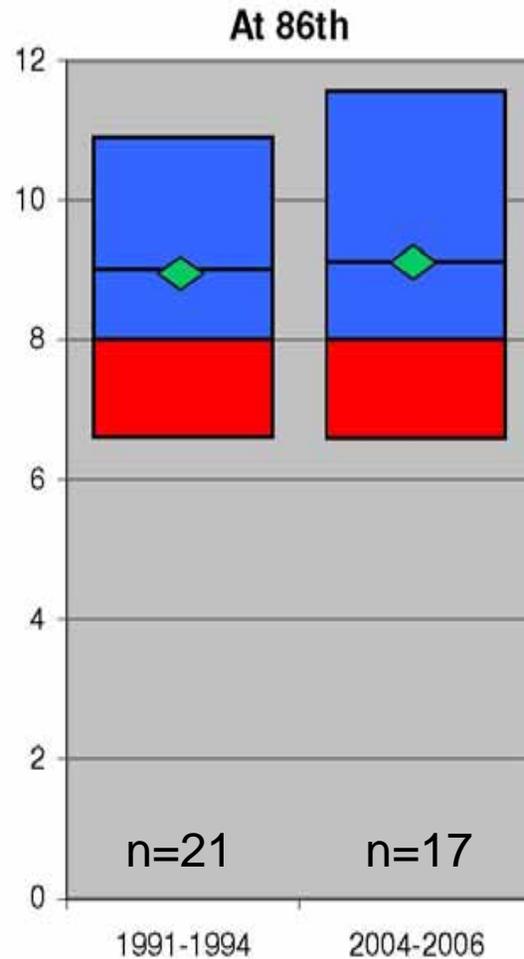
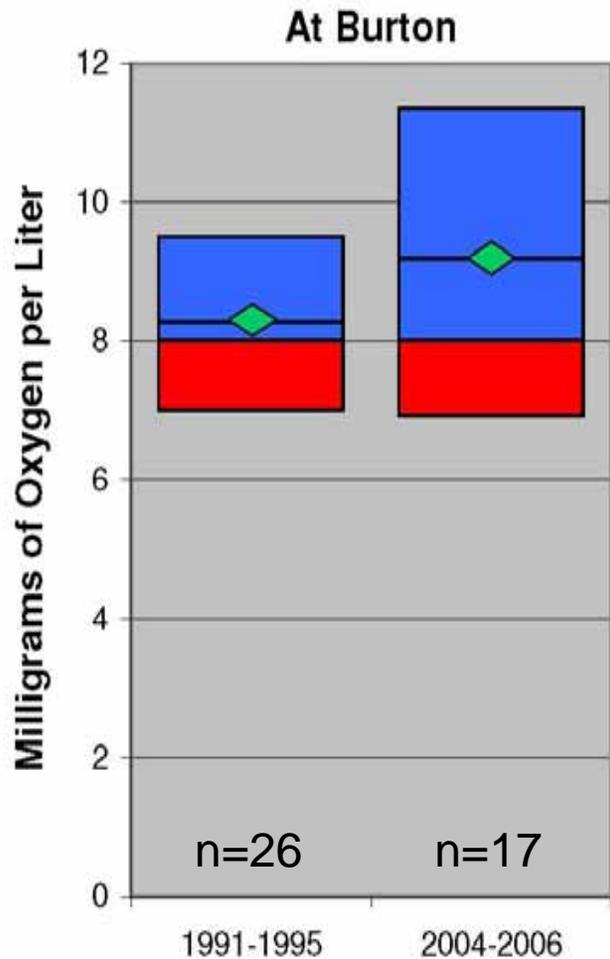
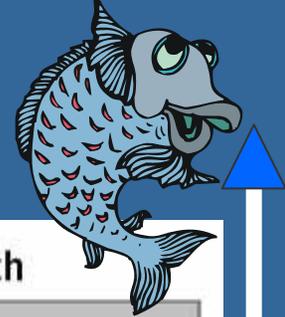
# Dissolved Oxygen (DO)

- Amount of oxygen dissolved in water, usually expressed in parts per million (ppm) or milligrams per liter (mg/L)
- Determines how much oxygen is available in the water for fish and other aquatic organisms to breathe
- Healthy waters generally have high levels of DO
- Many factors can affect DO
- Some areas, such as swamps, naturally have low DO levels

# Sampling DO

- Dissolved oxygen levels must be greater than or equal to 8.0 mg/L to stay within the state standard.
- Historically, Burnt Bridge Creek has not maintained sufficient levels of DO during summer months to support the designated aquatic life use.

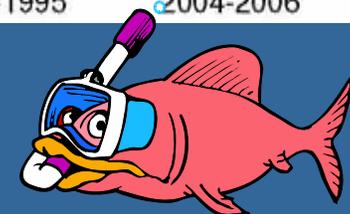
# BBC Dissolved Oxygen



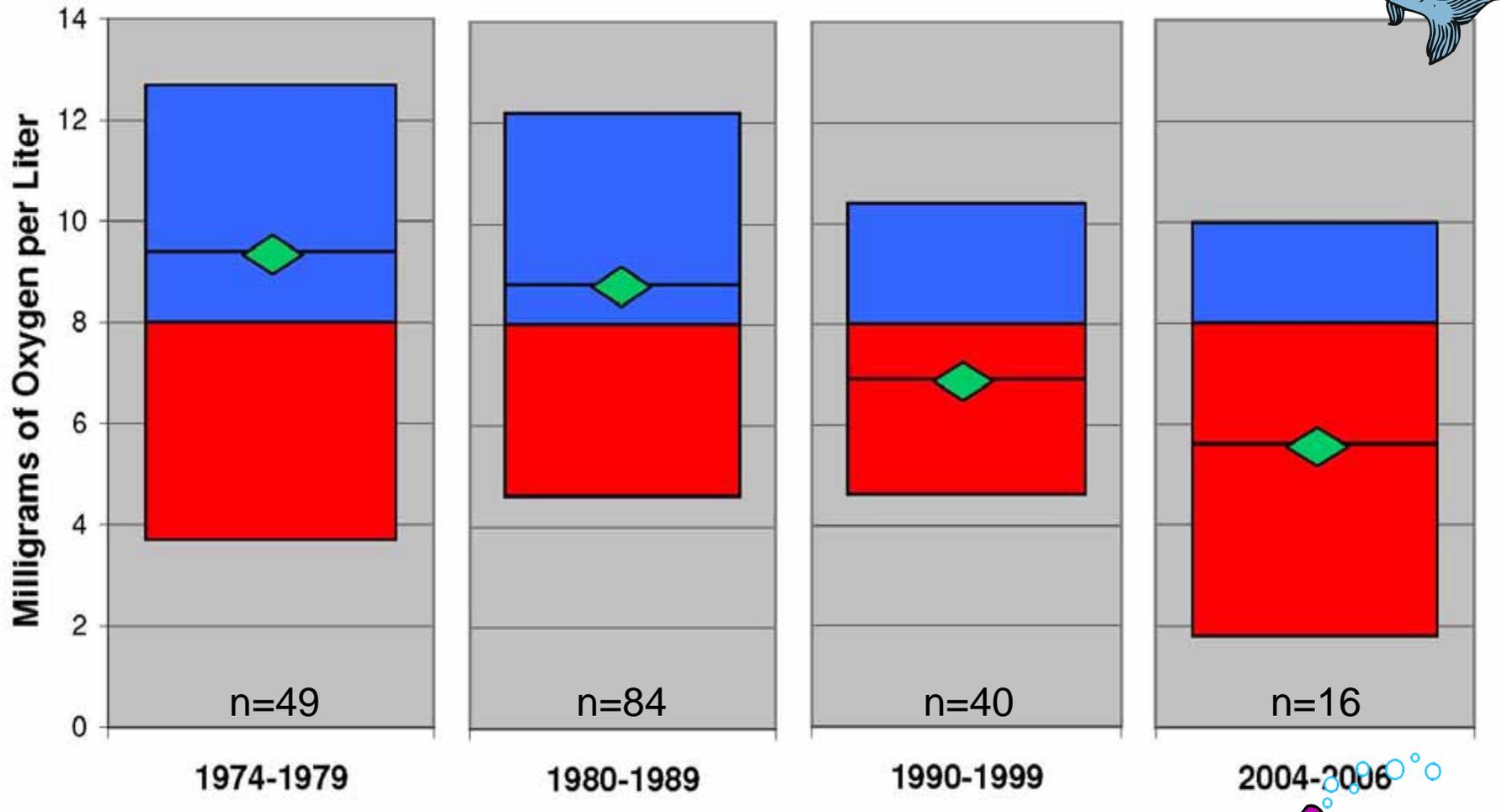
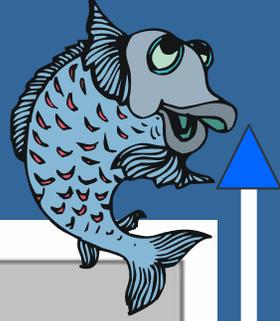
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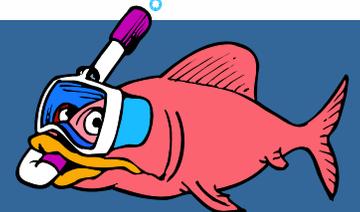
# BBC Dissolved Oxygen at 18th



◆ Average  
n = Sample Size

■ Above Standard

■ Below Standard



# Fecal Coliform

- Portion of coliform group present in intestinal tracts and feces of warm-blooded animals as detected by product of acid or gas from lactose in suitable culture medium within 24 hours at  $44.5 \pm 0.2$  degrees Celsius.

\* *Department of Ecology*

- *E. coli* is the indicator organism
  - It is not a pathogen
  - Indicates possible presence of pathogens
    - Bacteria such as Salmonella and Shigella
    - Protozoa such as Giardia or Cryptosporidia
    - Viruses

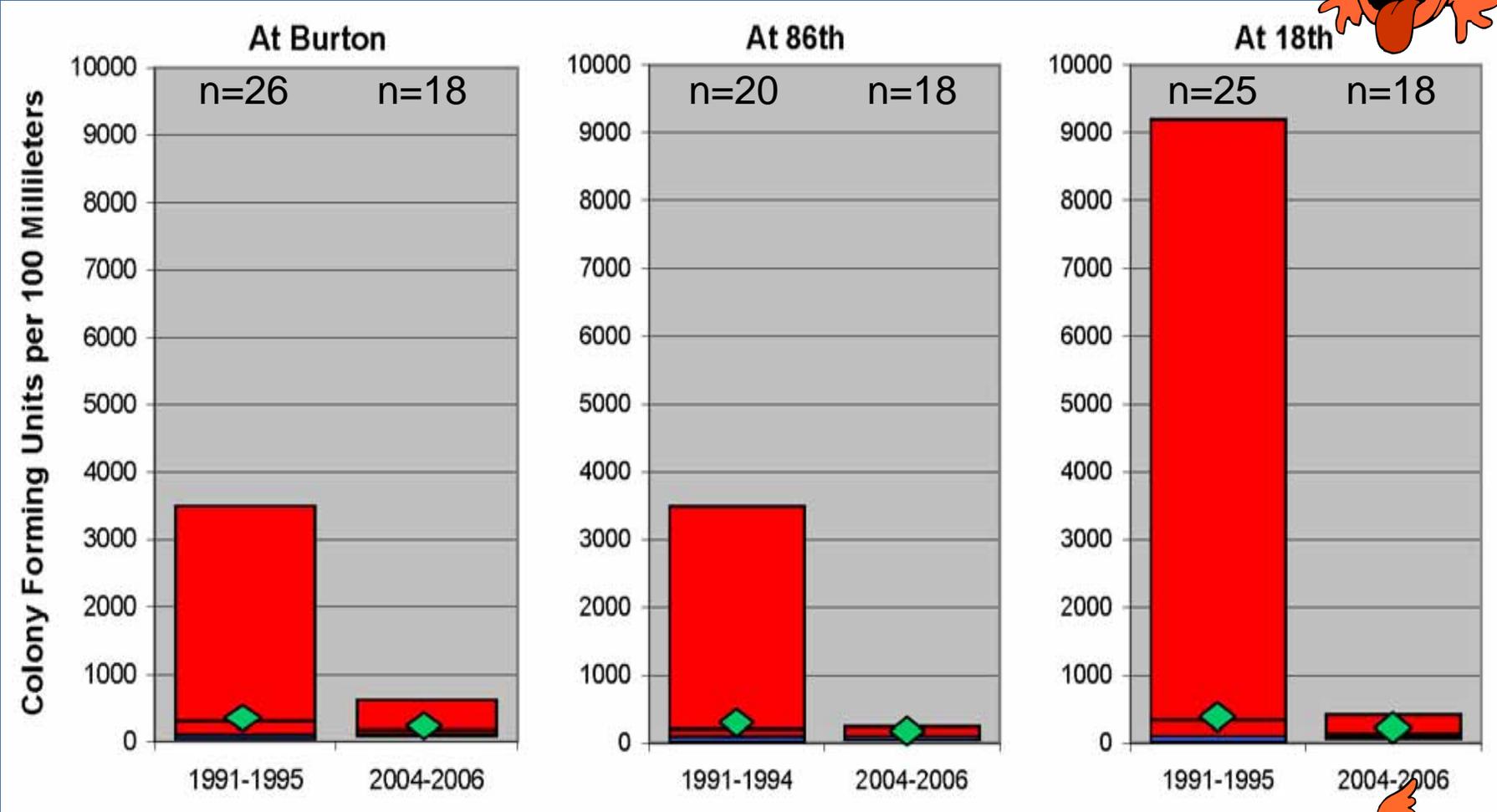
# Fecal Coliform

- In addition to health concerns, can also cause cloudy water, unpleasant odors and increased oxygen demand that may lead to low DO levels
- As living organisms, can multiply quickly when conditions are favorable or die quickly when conditions are not
- Natural bacteria levels in streams can vary significantly from location to location
- Sources of fecal contamination to surface waters include agricultural activities and livestock waste, failing septic systems, pet waste, and wildlife and waterfowl waste

# Sampling Fecal Coliform

- Current state standards compare geometric mean of samples collected to state water quality standard of 100 colony forming units per 100 mL of water
- In previous years, basis for comparison was median value, or middle value, of all the samples
- Median value and range of values used to reasonably compare historic vs. recent values

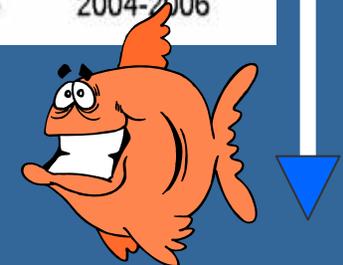
# BBC Fecal Coliform



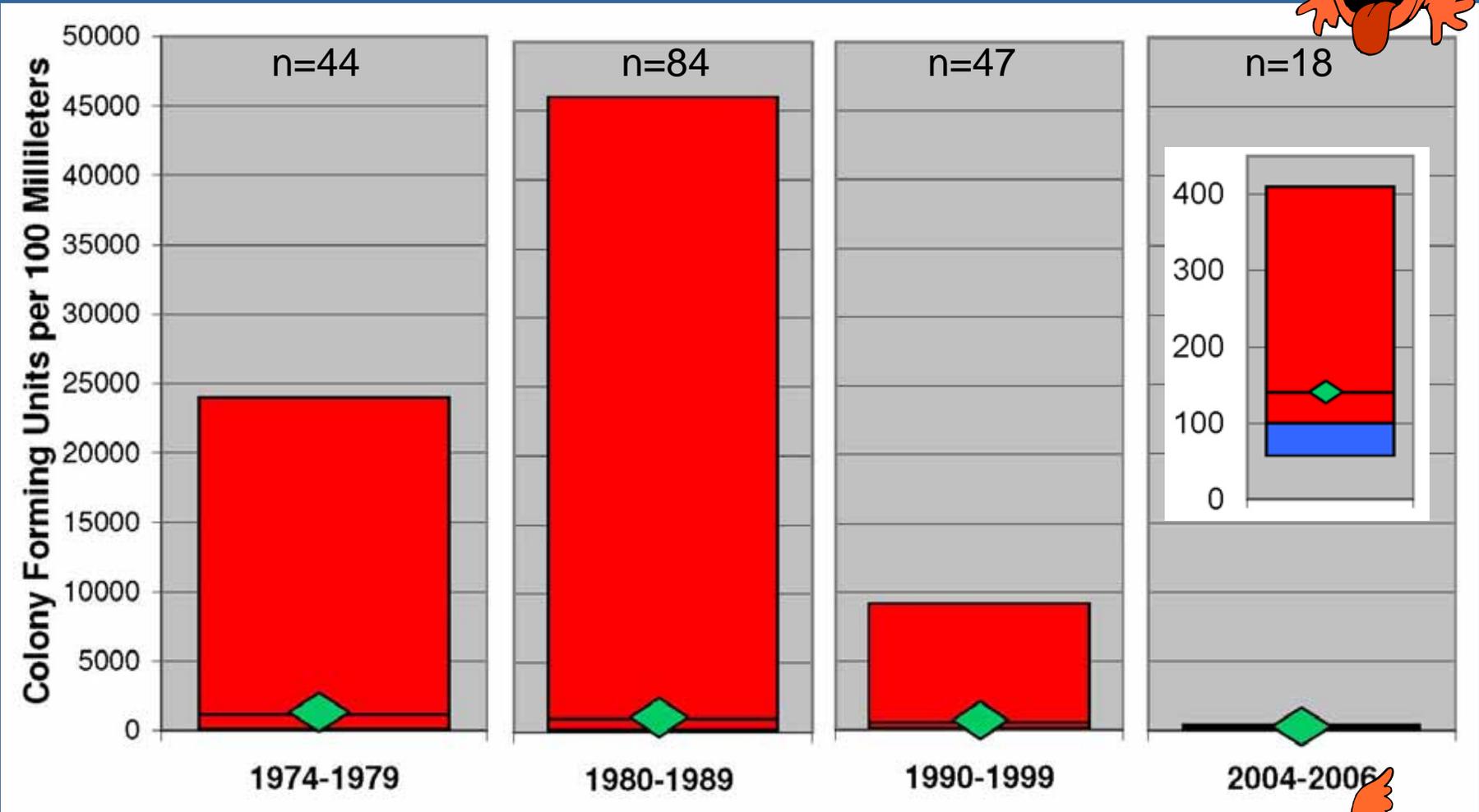
◆ Median  
n = Sample Size

■ Below Standard

■ Above Standard



# BBC Fecal Coliform at 18th



◆ Median  
n = Sample Size

■ Below Standard

■ Above Standard



# Looking Ahead

- Continued emphasis on Watershed Programs
  - Surface Water (stormwater design and planning, erosion prevention, greenway project, sensitive lands team, current Quality Assurance Project Plan monitoring, and more)
  - Urban Forestry Program
  - Water Resources Protection Program
  - Sewer Connection Incentive Program
  - Water Resources Education/Outreach
  - Watersheds Council development
- National Pollution Discharge Elimination System (NPDES)
- TMDL Potential
- Continued Best Management Practices/Advances in Science

# Draft Quality Assurance Project Plan for Stream Ambient Water Quality Monitoring

- Long-term monitoring program to assess effectiveness of programs and implement adaptive management strategies to protect resources
- Updates/builds upon existing, approved QAPP and current monitoring effort – to continue through 2007 critical season
- Draft QAPP sampling targets critical season – summer/early fall and six locations previously monitored
- Sampling to include: Temperature, pH, DO, Fecal coliform, Nitrate + Nitrite, Total Kjeldahl Nitrogen, Ammonia, Orthophosphate Phosphate, Total Phosphorus, Conductivity, Total Suspended Solids and Turbidity

# Draft Water Quality Monitoring Objectives

- Determine which reaches/tributaries most influence water quality within Burnt Bridge Creek
- Accurately characterize water quality conditions within creek
- Maintain consistency with past monitoring efforts
- Monitor water temperature continuously at the selected monitoring locations
- Provide high quality data for the City and other users.
- Determine whether trends or correlations are present in the water quality data
- Provide feedback for adaptive strategies in stormwater management programs

# Quality Assurance Project Plan for Stream Ambient Water Quality Monitoring

## Ultimate Goal:

Bring Burnt Bridge Creek into compliance with state water quality standards and so it can be removed from the 303(d) list of impaired streams.

- 2008: Target for implementation of updated QAPP
- May 2007: Draft plan submitted to Ecology for review
  - Sent to partner agencies
  - Posted for public comment

# Draft Quality Assurance Project Plan for Stream Ambient Water Quality Monitoring

Posted on the Internet at [www.cityofvancouver.us](http://www.cityofvancouver.us)

See: **Building, Planning & Environment/The Water All Around Us**

Deadline for comments: July 13, 2007

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