Yurok Tribe Environmental Data Storage System:

Regional Tribal Mentoring Program and Custom Database Development

Ken Fetcho – Yurok Tribe

Region IX WQX/STORET Tribal Workshop

August 24-26, 2010

Tribal Mentoring Program

➢ Encourage Tribes to Pursue Exchange Network Funding

➢ Share YTEP's success story

➢ Provide input during proposal development

➢ Share custom database with Tribes

Why Pursue EN Funding?

➢ The Network provides an opportunity to streamline data handling (reducing staff time required to push data to EPA), share data within ecoregions, and improve the way Tribes evaluate and respond to changing environmental conditions that affect the health of their Nations.

Benefits to Tribes

➢ Everything the Yurok Tribe has done is available to any interested Tribe to build off of, utilize, or copy; we are interested in encouraging Tribes to improve their internal data handling processes as a primary use of the EN, with satisfaction of EPA's reporting requirements as a seamless component of that data management.

How YTEP Utilized EN Funds

➤ Developed Real-Time Monitoring Network

➤ Developed Custom Database (YEDSS) to transmit data to USEPA = node client
  - AQS
  - WQX
  - FRS

➤ Developed On-Line Data Portal

Data Storage & Analysis

➢ **Old System:**
- Excel-Based
- Required extensive work each year to analyze data and compose reports
- Resulted in numerous duplicate files and no security on unvalidated or validated data
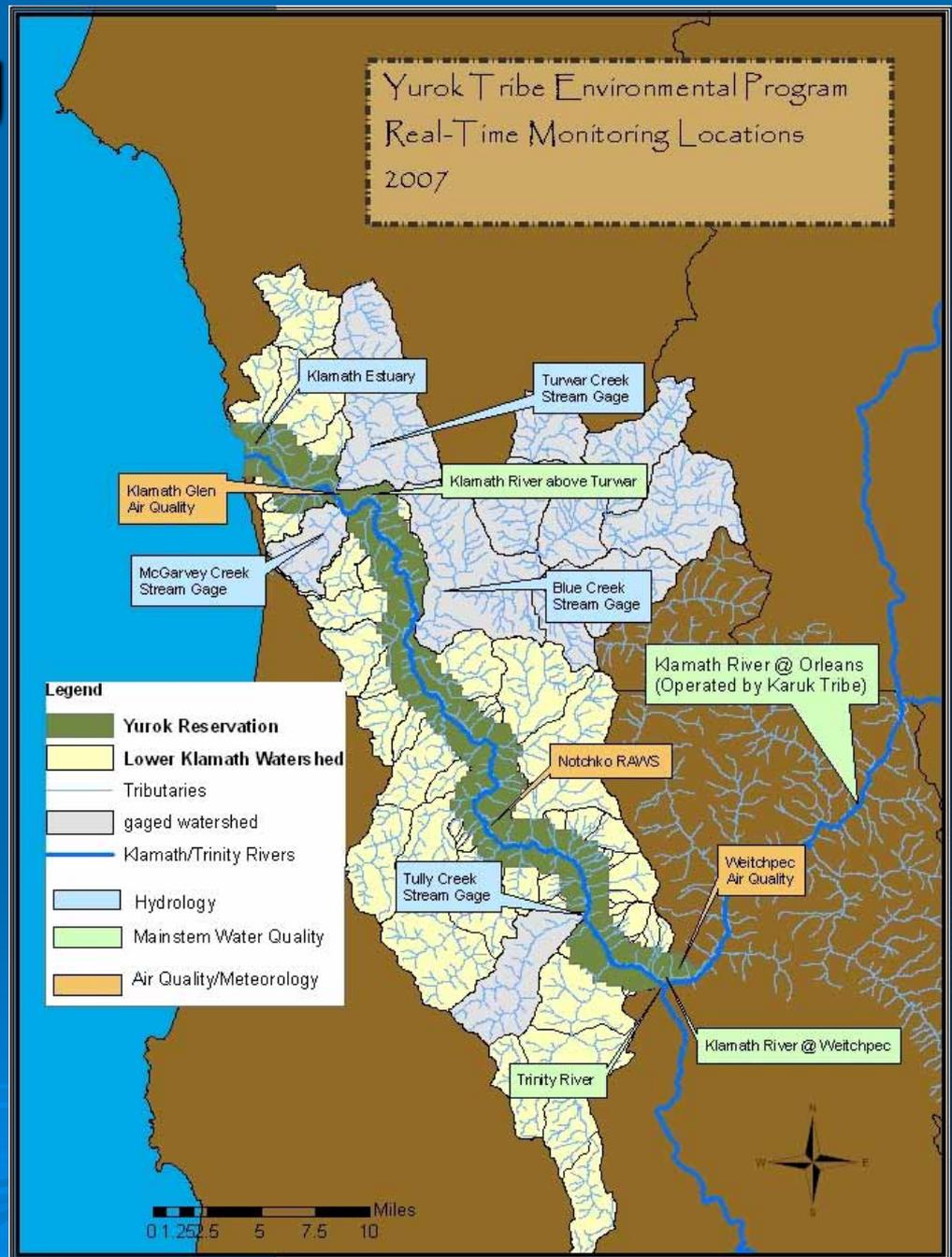- Data transfer to STORET or AQS extremely cumbersome

➢ **YEDSS:**
- Automates data validation
- Raw and validated data are segregated and protected
- Automates data summaries and charts for reports
- Pushes data manually to AQS and WQX
- Submits FRS data to CDX
- Stores metadata, QA data, and photos

Data Transmissions

➢ Uploading air quality data to AQS using YEDSS since March of 2007

➢ The Yurok Tribe was the first entity in Region 9 to upload water quality data to STORET/WQX in August of 2007

➢ Transmitted FRS data to CDX October 2008
    - UST and Class V UIC well inventory

NEIEN Funding – Element One

➢ Enabled equipment purchase and establishment of Real-Time Water Quality Monitoring Network

Yurok Tribe Environmental Program Real-Time Monitoring Locations 2007

Klamath Estuary

Turwar Creek Stream Gage

Klamath River above Turwar

Klamath Glen Air Quality

McGarvey Creek Stream Gage

Blue Creek Stream Gage

Klamath River @ Orleans (Operated by Karuk Tribe)

Notchko RAWS

Tully Creek Stream Gage

Weitchpec Air Quality

Klamath River @ Weitchpec

Trinity River

Legend

Yurok Reservation
Lower Klamath Watershed
Tributaries
gaged watershed
Klamath/Trinity Rivers
Hydrology
Mainstem Water Quality
Air Quality/Meteorology

Miles
0 1.25 2.5   5   7.5   10

Real-Time Data Delivery

- Developed Website to display real-time data
- Public can access hourly water and air quality data via internet
- YTEP staff uses network to monitor equipment status
- Scientists and managers use network to monitor current conditions

NEIEN Funding – Element Two

➤ **YEDSS Water Quality Modules**

- Grab Data (Bacteria, Nutrient, Metals) collection, validation, storage, analysis, and "push" to WQX

- Continuous Data collection, validation, storage, and analysis

- Hydrology Data collection, validation, storage, and analysis

NEIEN Funding – Element Three

➤ YEDSS Air Quality Modules

- Meteorological Data collection, validation, storage, analysis, and "push" to AQS
- Particulate Matter Data collection, validation, storage, analysis, and "push" to AQS

QA and Transmission

- All users have a security and access level
- Continuous data uploaded is auto-validated
- Data transferred to a "pending" log
- QA of at least 10% of data is required
- Data can be pushed from the pending log to the database by a higher level user
- Admin-level users can push data to WQX/AQS

YEDSS Security/Access Levels

Director/QA Officer

Database Administrator

Division Director – Water

Division Director – Cross-Media

Specialists – Water Quality & Hydrology

Specialists – Air Quality and LUST/SW

Technicians

PUBLIC INPUT/ACCESS
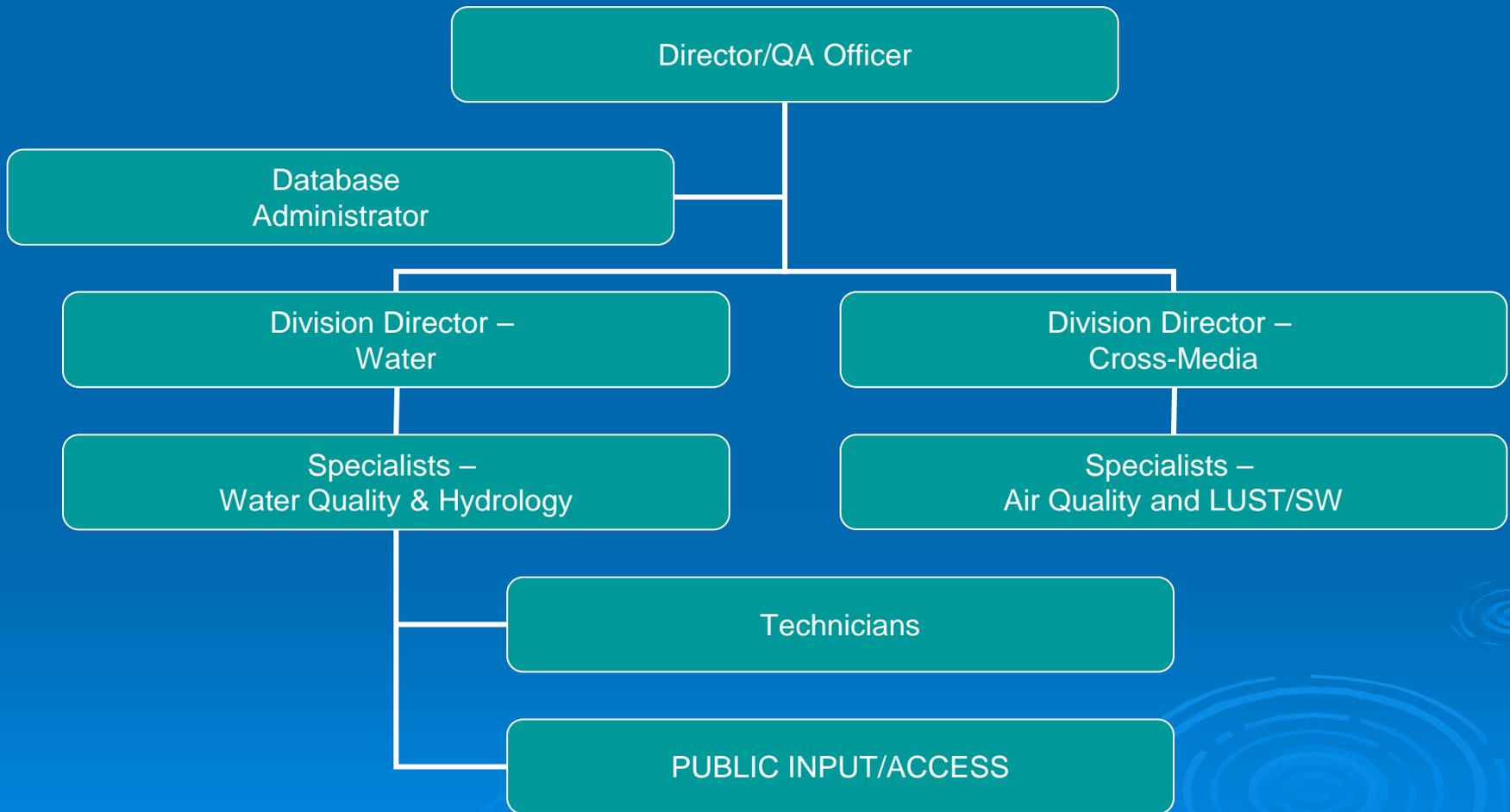
Recent Accomplishments

➢ Transmitted Continuous WQ data to WQX

➢ Developed Geo-referenced Data Portal Leveraging Google Earth Technology

➢ Mentored multiple Regional 9 Tribes to develop data collection, management and transmission to USEPA

Advantages for Tribes

➢ YEDSS or similar program is useful for the Tribal program (validation, storage, analysis) as well as fulfilling the data upload requirements of EPA

➢ YEDSS is built using open-source code and a common programming language (SQL) – can be copied or modified by any programmer

➢ YEDSS has extensive quality-assurance and validation mechanisms automated – saves staff time; also has cutting-edge security measures to preserve data and protect system

Managing and Reporting Your Environmental Data

YTEP INFORMATION NETWORK

GOES

DOMSAT

Data Logger Files

WWW

YEDSS

WI-FI

LRGS

NETWORK

DAPS

DCPs

DATABASE
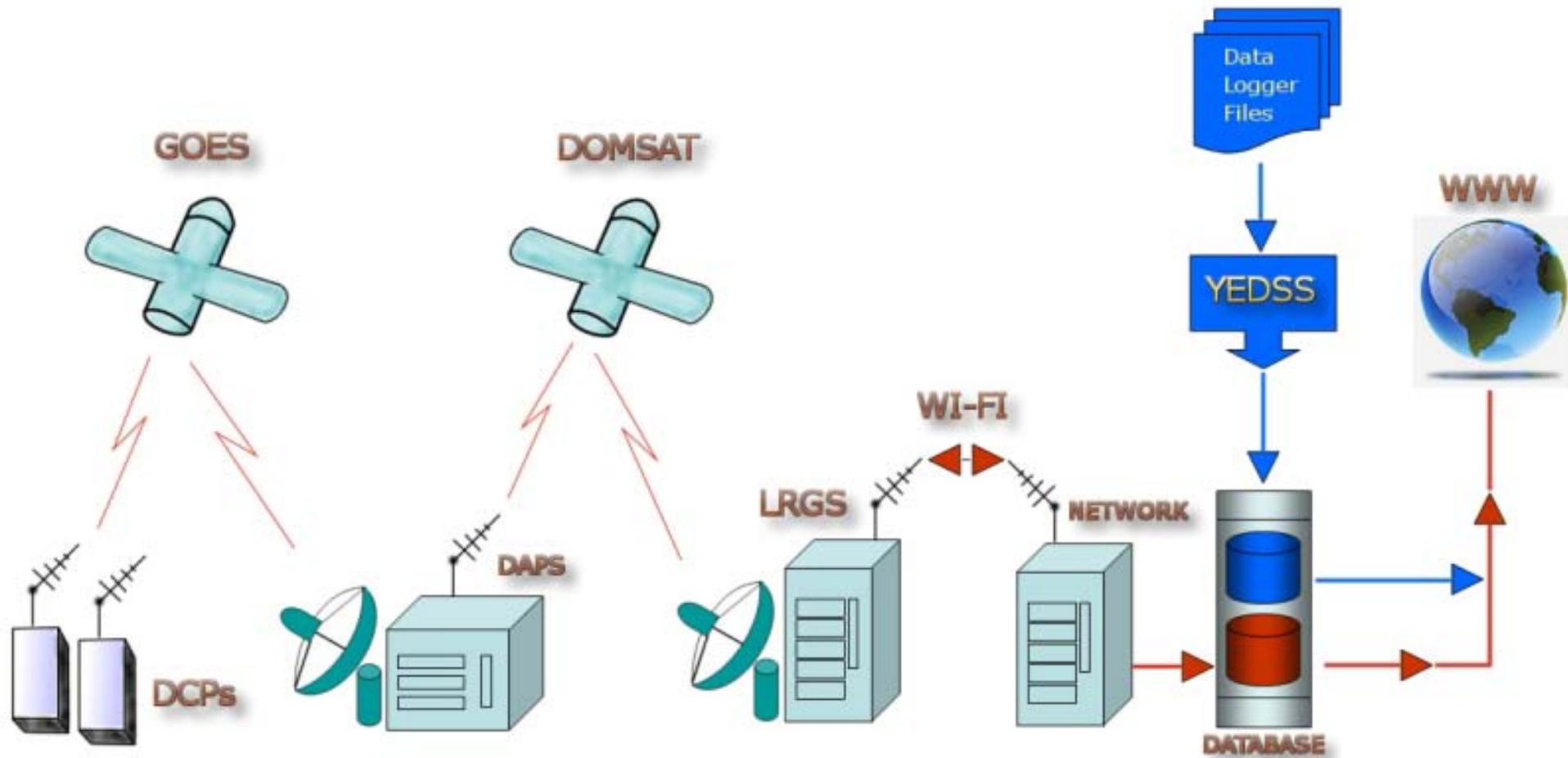
Data is transmitted from monitoring stations and posted on our internet website. Logger files are loaded into YEDSS

Data Types

➢ **Air Quality**

➢ **Water Quality**

➢ **Federal Registered Sites (FRS)**
  ● **UST / UIC**

Water Quality

Sensor Parameters Currently Supported:

Water Temp
Specific Conductivity
Percent Dissolved Oxygen
Dissolved Oxygen (MG/L)
Dissolved Oxygen (CHARGE)
PH (Potential Hydrogen)
PH (Milivolts)
Battery Voltage
Salinity
Turbidity
Chlorophyll A
Blue-Green Algae

Water Quality

Over 2,900 Constituents Supported:

Nutrients

Bacteria

Macroinvertebrates

Pesticides

Metals

Algae

Log book entry tracking

- Data is entered through the log book entry system similar to the in field tech data sheets.

- Logs track data grades, equipment serial numbers, and staff notes about a site visit

Data Quality Objectives (Flags)

> **Setting your flagging criteria tells YEDSS how to flag your continuous data.**

Review your results to find broken or malfunctioning sensors

C	DATE	TIME	tmFlag	HEIGHT	hFlag	AIRTEMP	atFlag	BATTYV	bvFlag
/EY	4/19/2006	12:15:00	☐	2.00	☐	23.58	☐	14.02	☐
/EY	4/19/2006	12:30:00	☐	1.97	☐	24.59	☐	14.10	☐
/EY	4/19/2006	12:45:00	☐	2.00	☐	23.56	☐	14.10	☐
/EY	4/19/2006	13:00:00	☐	2.00	☐	23.24	☐	14.02	☐
/EY	4/19/2006	13:15:00	☐	2.00	☐	23.36	☐	14.10	☐
/EY	4/19/2006	13:30:00	☐	1.98	☐	24.06	☐	14.02	☐
/EY	4/19/2006	13:45:00	☐	1.99	☐	24.93	☐	13.94	☐
/EY	4/19/2006	14:00:00	☐	1.99	☐	25.68	☐	14.02	☐
/EY	4/19/2006	14:15:00	☐	1.99		]0	☐	14.02	☐
/EY	4/19/2006	14:30:00	☐	2.01		)6	☐	14.02	☐
/EY	4/19/2006	14:45:00	☐	2.00		21	☐	13.94	☐
/EY	4/19/2006	15:00:00	☐	1.99		29	☐	13.94	☐
/EY	4/19/2006	15:15:00	☐	2.00		19	☐	13.78	☐
/EY	4/19/2006	15:30:00	☐	1.99		25.88	☐	13.78	☐
/EY	4/19/2006	15:45:00	☐	1.99	☐	25.55	☐	14.02	☐
/EY	4/19/2006	16:00:00	☐	2.00	☐	25.24	☐	13.86	☐
/EY	4/19/2006	16:15:00	☐	1.97	☐	24.94	☐	13.70	☐
/EY	4/19/2006	16:30:00	☐	1.99	☐	24.65	☐	13.86	☐
/EY	4/19/2006	16:45:00	☐	2.00	☐	24.35	☐	14.02	☐
/EY	4/19/2006	17:00:00	☐	1.99	☐	24.03	☐	13.63	☐

Dialog box:
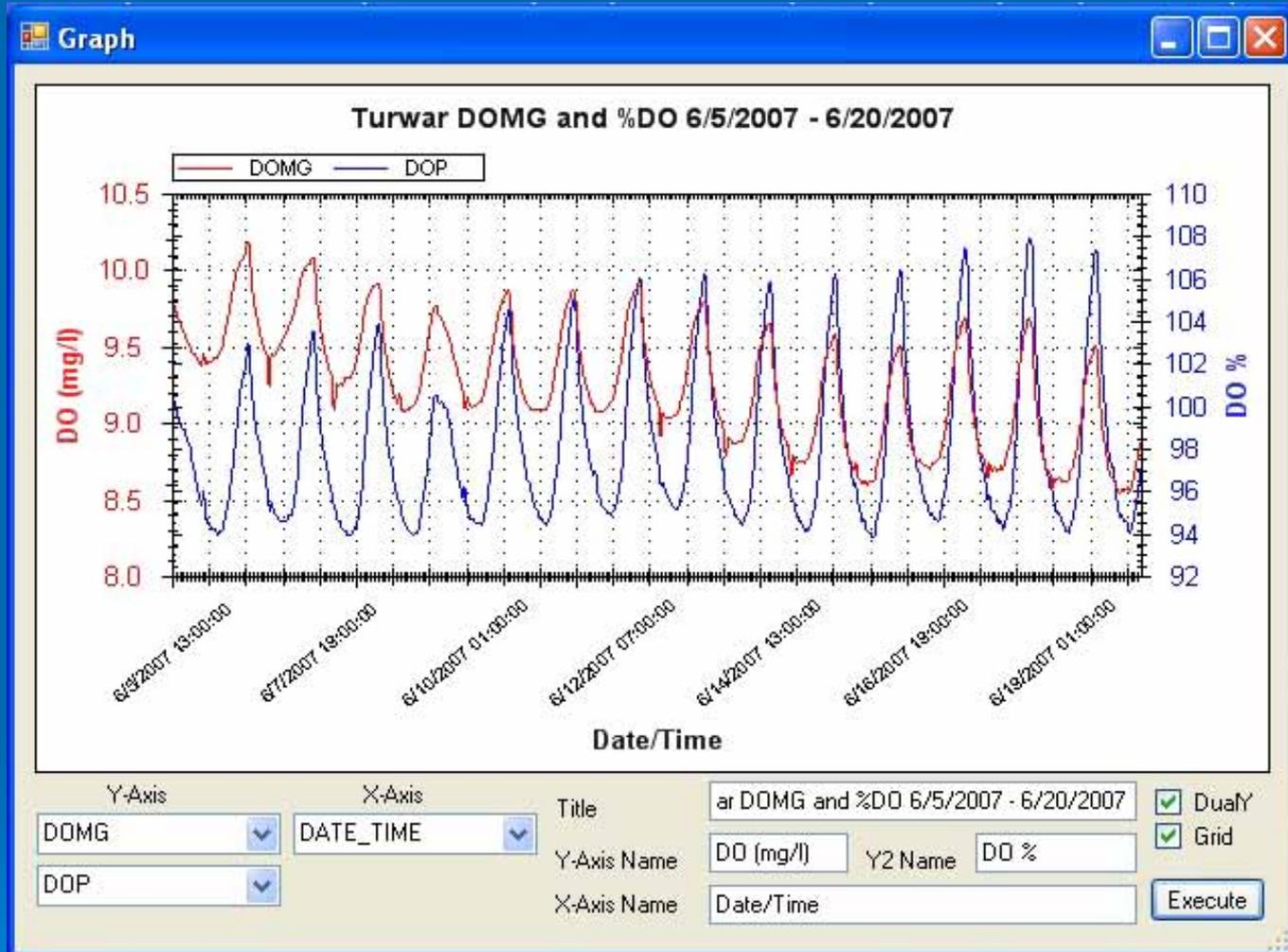13533 Rows of data
42 Item Flags
[OK]

➢ **Set or remove flags manually and save them for review.**

Spot data errors visually
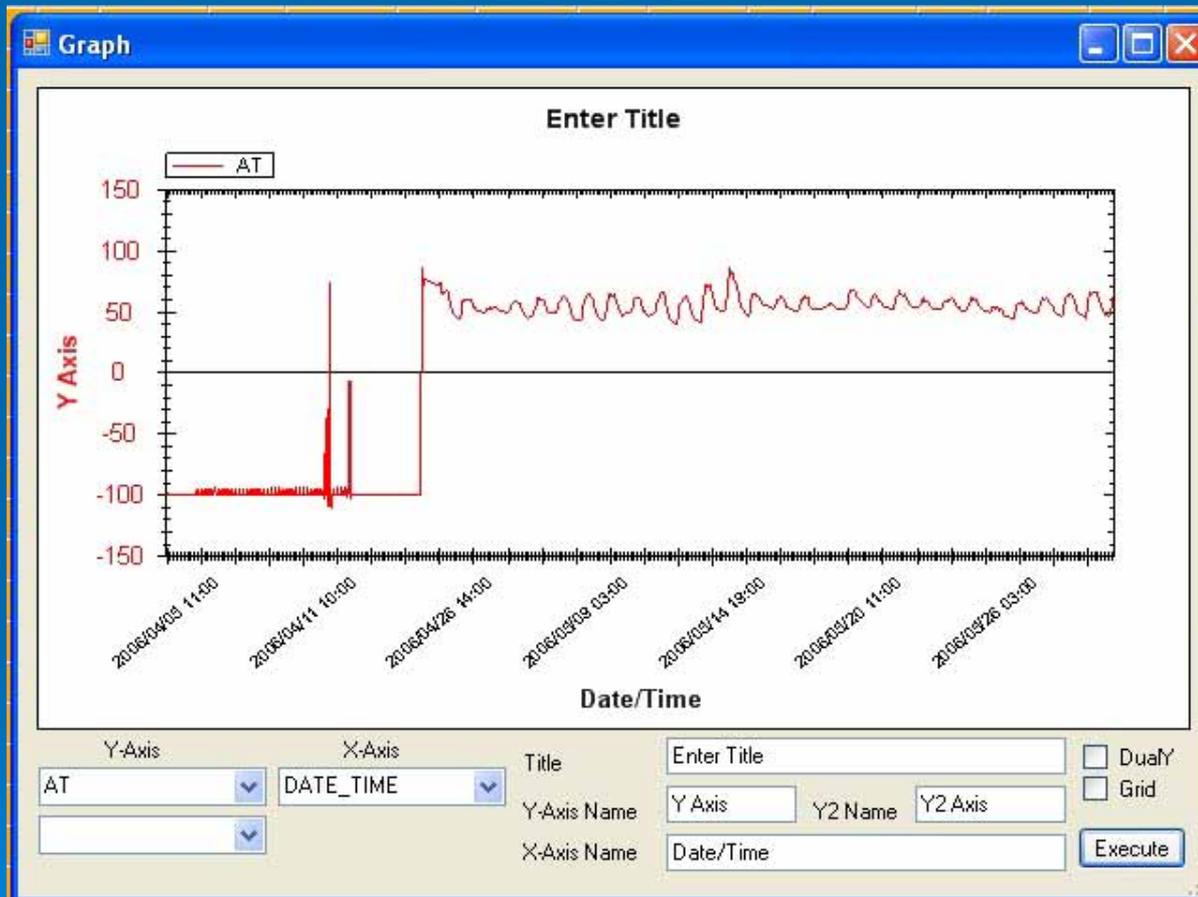
> Quickly graph data to help you make decisions about data flags.

Quickly graph your data to see trends

➢ The graph has many functions to aid the visual representation of your data such as dual axis and export functions.

Supervisors required to review data before it goes into the archive

➤ **Review data entered by your interns or technicians.**

➤ **You can view the flags and even know what has been changed.**

Query your archive

> Respond to data requests in minutes instead of searching through data files or Excel sheets.

Query your log entries

- **Information such as data grades and equipment changes can be useful for graphs and reports.**

Reports and Tools

➤ Daily Min / Max / Average for continuous data

	SITEID	DATE	WTEMP_MIN	WTEMP_MAX	WTEMP_AVG	SC_MIN	SC_MAX	SC_AVG	DOP_MIN
	KBW	5/17/2006	13.55	14.5	14.16	89	91	89.69	101.1
	KBW	5/18/2006	13.57	14.43	14.04	85	88	86.15	100.8
	KBW	5/19/2006	12.87	14.21	13.51	85	87	86.09	100.6
	KBW	5/20/2006	12.29	12.95	12.65	84	87	85.34	100.9
	KBW	5/21/2006	12.78	13.16	13.00	88	91	89.28	99.9
▶	KBW	5/22/2006	12.64	13.35	12.98	91	93	92.09	99.3
	KBW	5/23/2006	12.56	13.02	12.78	90	99	94.30	99.8
	KBW	5/24/2006	12.02	12.62	12.23	92	98	94.89	100.6
	KBW	5/25/2006	12.09	12.47	12.23	91	95	92.91	100.1
	KBW	5/26/2006	11.92	12.33	12.22	95	106	99.94	99.3
	KBW	5/27/2006	11.46	12.24	11.82	102	103	102.17	98.9
	KBW	5/28/2006	11.62	13	12.16	103	107	104.98	99.4
	KBW	5/29/2006	12.48	13.98	13.16	107	110	108.11	99.2
	KBW	5/30/2006	12.93	14.48	13.64	109	112	109.85	99

Graph   **Export To CSV**

Report your validated data to EPA
Flagged data is not reported to AQS or WQX

WQX XML TOOL

Load Data From Archive

From:
Date: 3/12/2004

Time:

To:
Date: 2/ 8/2007

Time:

KR below WT

Get Data

Data View

	SITE	DATE_TIME	TC_RESULT	TC_LIMIT	TC_UNITS	TC_METHOD	ECOLI_RESULT	ECOLI_LIMIT	EC
▶	KR below WTP	3/12/2004 09:05:00	295	10	count	9223-B	ND	10	co
	KR below WTP	4/23/2004 08:03:00	226	10	count	9223-B	ND	10	co
	KR below WTP	5/18/2004 11:10:00	546	10	count	9223-B	30	10	co
	KR below WTP	6/10/2004 06:57:00	161	10	count	9223-B	ND	10	co
	KR below WTP	7/20/2004 07:13:00	1374	10	count	9223-B	20	10	co
	KR below WTP	8/17/2004 07:25:00	2613	10	count	9223-B	ND	10	co
	KR below WTP	9/14/2004 06:52:00	2933	10	count	9223-B	10	10	co
	KR below WTP	10/27/2004 10:46:00	2863	10	count	9223-B	20	10	co
	KR below WTP	11/30/2004 12:15:00	275	10	count	9223-B	ND	10	co
	KR below WTP	1/31/2005 10:23:00	86	10	count	9223-B	ND	10	co
	KR below WTP	2/24/2005 14:45:00	41	10	count	9223-B	31	10	co
	KR below WTP	4/7/2005 15:38:00	384	10	count	9223-B	10	10	co
	KR below WTP	5/13/2005 09:45:00	512	10	count	9223-B	31	10	co
	KR below WTP	6/21/2005 09:06:00	309	10	count	9223-B	ND	10	co
	KR below WTP	7/27/2005 07:01:00	4106	10	count	9223-B	10	10	

Fields To Export

TC
Ecoli
Enterococci

>>   >
<<   <

TC
Ecoli
Enterococci

Activity: Bacteria Sampling
Monitoring Location: KR below WTP

Export To WQX XML File

Utilities

WQX Sample Prep MetaData

WQX Activity Manager

WQX Monitoring Location Manager

Transmission Log

tdate	tuser	media	sitenic	start_date_time	end_date_time	destination
3/27/2007	cwatt	Bacteria	KR above WTP	3/6/2006 12:50 PM	2/28/2007 2:49 PM	WQX
3/29/2007	cwatt	Bacteria	KR above WTP	3/6/2006 12:50 PM	2/28/2007 2:49 PM	WQX
3/29/2007	micah	Air	WEITCHPEC	10/1/2006	1/1/2007	AQS
6/26/2007	cwatt	Bacteria	KE	3/12/2004 9:17 AM	2/28/2007 2:10 PM	WQX
7/23/2007	micah	Air	WEITCHPEC	1/1/2007	3/31/2007 11:00 PM	AQS
7/26/2007	cwatt	Bacteria	KR below WTP	3/12/2004 9:05 AM	2/28/2007 2:30 PM	WQX
7/26/2007	cwatt	Bacteria	KR above WTP	3/12/2004 8:50 AM	2/28/2007 2:49 PM	WQX
8/14/2007	micah	Air	WEITCHPEC	1/1/2007	3/31/2007	AQS
8/17/2007	cwatt	Bacteria	KE	3/12/2004 9:17 AM	2/28/2007 2:10 PM	WQX
8/20/2007	cwatt	Bacteria	TR	12/17/2003 12:10 PM	1/25/2006 12:48 PM	WQX
8/20/2007	cwatt	Bacteria	TG	12/17/2003 8:45 AM	1/25/2006 10:26 AM	WQX
8/20/2007	cwatt	Bacteria	TC	1/25/2006 11:55 AM	1/25/2006 11:55 AM	WQX
8/20/2007	cwatt	Bacteria	WE	12/17/2003 11:45 AM	1/25/2006 12:50 PM	WQX

$$ Exchange Network $$

➢ Funding assists Tribes in meeting data reporting requirements

➢ Assists Tribes in updating data management systems and making data available to a wide audience – information is power

Ken Fetcho – YTEP

(707) 954-1523   kfetcho@yuroktribe.nsn.us