Rivers of Colorado Water Watch – Data Export Information

Purpose

The document provides information about River Watch data and program so data users can make informed and appropriate decisions regarding the use of this data. More information about other River Watch Program aspects or elements can be found at SITE. River Watch is a volunteer monitoring program that partners with CPW and other entities. River Watch 's objectives are to provide quality data over time for decision making processes while providing volunteers a hands-on experience to learn the value and function of river ecosystems, how to collect useable data and become stewards. Volunteer programs are not free but cost effective and as such River Watch does not operate like a commercial lab and the price for results is time. In general turnaround times for field results are three months, metals and nutrients six months and macroinvertebrate data nine months.

When combining data from multiple sources it is best management practice for the user to ensure field, laboratory and associated methods and data quality are sufficient to combine for each data objective that may be the same or different from original data sets. Data is a greater asset and of higher value when sufficient meta-data is provided so users can appropriately determine other uses. As such, River Watch provides as much meta-data as possible, but it is user's responsibility to ensure appropriate use for other objectives.

Data Exports

River Watch database application is relational and requires minimum data elements for data entry. River Watch data is input, validated, stored and exported in a sequel based data application that lives on a protected server. The system does not allow duplicate samples. The original system was implemented in 1998 and completely revamped n 2016 by CPW. Current database operation and maintenance employs best management practices. Volunteers and public users do not have access to original results, only exports. The system automates as much data validation (display of errors) as possible, including validation of laboratory and field quality control and assurance samples. Final validation is completed by CPW staff or trained contract staff. Validation is documented in the River Watch Operating Procedures Manual, Database Management Plan (SITE LINK).

Default exports replace results less that reporting limit with a zero and use a qualifier of (J). Method detection and reporting limits are also in the results export. A special export is available that will replace less than reporting limit values with "RL" and uses a qualifier of (Q). This export is primarily for large exports to import to National Portal or for CDHPE data calls. An export is being developed that will replace less than reporting limit and greater than detection limit values with actual result and use a qualifier of (?). Blank or null results are qualified with (X).

A large list of meta-data fields come with each export a user could further subset the data if needed. Those fields are explained below:

- Sample/Event ID = station number, data and military time
- Station number = Unique station ID
- Station name = Name of station
- River name = name of river station is located
- WBID = Water Quality Control Commission administrative unit, water body ID
- Water Code = CPW's administrative unit (how fishery is managed in that water)
- RW WS = River Watch Major basins in Colorado
- WSR = River Watch Watershed Reports (based on combining WBID's_
- WSG = River Watch gatherings by basin
- WQCC watersheds – Water Quality Control Commission Sub basins (5^{th} & 6^{th} letters of WBID)
- County = Counties in Colorado

When combining River Watch with other data sets or using for other data objectives, it is the responsibility of the user to ensure data quality is sufficiently equal to integrate. River Watch provides ample meta-data for the user to make an informed decision.

River Watch Sampling

River Watch standard operating procedures, including a quality assurance and data management plan can be found at SITE, and follows CDHPE laboratory and field protocols.

Each group receives the same equipment and required four day training, regardless of group type (school, CPW staff, adult, municipality, non-profit or industry.). Each group is subjected to the same degree of quality control and assurance checks. Each group must sign an annual memorandum of understanding and commit to the following baseline sampling. However, some may deviate in frequency or indicator for a variety of reasons. The parameters include field collection, metal collection (13 total and dissolved metals), nutrient collection and macroinvertebrate collection. Temperature, pH, dissolved oxygen, alkalinity and hardness are analyzed in the field by the volunteer. Metals and nutrient samples are shipped to CPW laboratories. Macroinvertebrates are shipped to CPW headquarters and delivered to a qualified taxonomist in batches.

Indicator	Frequency	Method	Reporting Limit
pH	monthly	Meter, probe for fresh water	0.1 S.U.
Temperature	monthly	Celsius thermometer	1.0 unit
Dissolved Oxygen	monthly	SM 421.B	0.5 mg/l
Phenol/Total Alkalinity	monthly	EPA 310.1	2 mg/l
Total Hardness	monthly	SM 314 B	2 mg/l
Aluminum	monthly	EPA 200.7 (ICP)	15 ug/l
Arsenic	monthly	EPA 200.7 (ICP)	15 ug/l
Calcium	monthly	EPA 200.7 (ICP)	100 ug/l
Cadmium	monthly	EPA 200.7 (ICP)	0.15 ug/l
Copper	monthly	EPA 200.7 (ICP)	1.0 ug/l
Iron	monthly	EPA 200.7 (ICP)	10 ug/l
Magnesium	monthly	EPA 200.7 (ICP)	100 ug/l
Manganese	monthly	EPA 200.7 (ICP)	5 ug/l

Lead	monthly	EPA 200.7 (ICP)	5 ug/l
Potassium	monthly	EPA 200.7 (ICP)	100 ug/l
Selenium	monthly	EPA 200.7 (ICP)	5 ug/l
Zinc	monthly	EPA 200.7 (ICP)	3 ug/l
Ammonia	High/Low Flow	EPA 350.1	.01 mg/l
Nitrate-Nitrite	High/Low Flow	EPA 353.2	.02 mg/l
Total Nitrogen	High/Low Flow		
Total Phosphorus	High/Low Flow	EPA 365.1 and .3	.005 mg/l
Chloride	High/Low Flow	EPA 325.1	1.0 mg/l
Sulfate	High/Low Flow	EPA 375.4	0.5 mg/l
Total Suspended Solids	High/Low Flow	Standard Methods	4 mg/l
Macroinvertebrates	Annually/Fall	See RW Sample Plan – bugs ID'd by taxonomist, D -net, 4, 60 sec kicks, sandy/rocky methods	NA
Physical habitat	Annually/Fall	Micro for bug kick, macro both banks assessed	NA
Field quality assurance samples	Two unknowns/yr	NA	80-120% recovery pH 96-104%
Metals quality assurance samples	10%	NA	Function(test)

River Watch Analyses

Field methods have not changed since program's 1989 inception... Dissolved oxygen titration test was not implemented until 1992. Initially, field and metal sampling occurred 24 times per year; that was dropped to 12 times per year in 2002 when we began collecting macroinvertebrates and conducting a physical habitat assessment annually.

Metals collection began in 1989 however only groups in known metals laden areas collected filtered samples. All groups filtered metals by 1995. Analyses were atomic absorption until 1999 (when everyone made the transition to ICP technology). Metals added in 1999 included Al, Ar, Ca, K, Mg and Na, thus dates before this will not include these metals. In 2010 the ICP machine was replaced. Actual results will vary from these dates depending upon when received and analyzed. As such, detection and reporting limits a varied slightly for several metals but have not impacted the intended use of the data. Al, Se and Ar are screening values and further investigation should occur if results are found for these metals. In 2018 River Watch will be operating an ICPMS machine making Al, Se and Ar more than screening results.

Nutrients were fully integrated into River Watch in 2002; therefore results for associated indicators will not exist before then with a few exceptions.

Macroinvertebrate and physical habitat sampling was formally integrated in River Watch in 2000. The macroinvertebrate component of the program is very important, but is not fully funded and therefore not every station has macroinvertebrate data.

River Watch standard operating procedures, including a quality assurance and data management plan can be found at SITE.

Program Overview

The River Watch Program started in 1989 with 5 schools on the Yampa River, reached capacity in 1994 and continues to serve 140 groups annually. River Watch groups annually monitoring about 600 stations on 300 rivers each year. The database holds information on more than 1000 stations and 700 rivers, some lakes, wetlands and other water bodies. In any given River Watch year, approximately 85% of our volunteer organizations are school groups and the remaining 15% are a diverse mix of adult groups. Each group receives about $3000 in equipment to use, must attend a four day intensive training, commit to one year of monthly sampling for most indicators, comply with our methods and protocols for collection and sign an annual memorandum. River Watch performs 20% quality assurance and control measures in the field and laboratory versus the 10% industry standard. All equipment is provided, tested and reclaimed if unused.

The main goal of River Watch is to collect long term high quality data on the health of Colorado Rivers while providing a hands-on experience for volunteers to understand the value and function of river ecosystems learn how to generate usable data and become stewards. The Clean Water Act (CWA) drives the majority of water quality decisions; therefore the primary targeted decision makers for the data are the Water Quality Control Division (WQCD), the Colorado Water Quality Control Commission (WQCC), Colorado Parks & Wildlife (CPW) Biologists and goals of volunteer groups. The targeted decision processes involve Commission implementation of the Clean Water Act (CWA), assessment of water quality standards across the state, and the alignment of the goals of individual volunteers with River Watch data objectives. Thus, all field and laboratory methods match or compliment WQCD methods for CWA assessment processes, standard development, and protection and restoration efforts. River Watch standard operating procedures, including and quality assurance and data management plan can be found at SITE.