

# udwqTools

January 15, 2019

**Title** A Collection of R Tools for Utah Division of Water Quality

**Version** 0.0.0.9000

**Description** This package is intended to house R tools developed and for use by UDWQ staff as well as support the UDWQ irTools package.

**Depends** R (>= 3.5.1)

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.1.1

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calcTSI	<i>Calculate TSI values from input data</i>
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### Description

This function calculates TSI values according to Utah’s IR methods from input data containing values for of chlorophyll, total phosphorus, and secchi disk depth. Note that inputs for these parameters must be specified in units of ug/L, mg/L, and meters, respectively.

### Usage

```
calcTSI(x, in_format = "wide", chl_ugL = "chla", TP_mgL = "TP",
        SD_m = "SD")
```

**Arguments**

x	Input dataset
in_format	One of "wide" or "flat" to specify data input format. Note that only wide format inputs are currently supported.
chl_ugL	Name of chlorophyll-a variable in ug/L
TP_mgL	Name of total phosphorus variable in mg/L
SD_m	Name of secchi disk depth variable in m

**Examples**

```
data(ul_trophic)
head(ul_trophic)
tsi=calcTSI(ul_trophic,chl_ugL="ChlA",TP_mgL="Phosphate.phosphorus.Total",SD_m="Depth.Secchi.disk.depth")
head(tsi)
plot(TSIchl~ChlA,tsi)
```

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facToNum	<i>Convert factors to numeric equivalents</i>
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**Description**

Converts input object to number if class=="factor". If class != "factor", input object is returned un-altered.

**Usage**

```
facToNum(x)
```

**Arguments**

x	Input vector object
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readECHO_ec	<i>Read effluent chart data from EPA ECHO webservices</i>
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**Description**

This function extracts effluent chart data from EPA ECHO for multiple stations & combinations of parameters. All arguments are optional except p\_id. At least one p\_id must be specified.

**Usage**

```
readECHO_ec(..., print = TRUE)
```

**Arguments**

...	additional arguments to be passed to ECHO query path. See <a href="https://echo.epa.gov/tools/web-services/effluent-charts#!/Effluent_Charts/get_eff_rest_services_download_effluent_chart">https://echo.epa.gov/tools/web-services/effluent-charts#!/Effluent_Charts/get_eff_rest_services_download_effluent_chart</a> optional arguments for effluent chart data reads. Note that arguments for output are ignored.
print	Logical. If TRUE (default), print summary table of facilities & parameters returned.
p_id	Permitted facility ID. Either a single text value (in quotes) or a vector of text values.
parameter_code	Parameter code. Either a single text value (in quotes) or a vector of text values.
start_date	Query start date in "mm/dd/yyyy" format.
end_date	Query end date in "mm/dd/yyyy" format.

**Value**

A flat data frame of EPA ECHO effluent chart data

**Examples**

```
#Extract effluent chart data for facility UT0025241, all outfalls
UT0025241_ec=readECHO_ec(type="ec",p_id="UT0025241")
head(UT0025241_ec)

# Extract effluent total phosphorus data from outfall 001 for facility UT0025241
UT0025241_tp_001=readECHO_ec(p_id="UT0025241", parameter_code="00665", outfall="001")
UT0025241_tp_001_effluent=UT0025241_tp_001[UT0025241_tp_001$monitoring_location_desc=="Effluent Gross",]
head(UT0025241_tp_001_effluent)

# Extract flow through facility from UT0021717
UT0021717_flow=readECHO_ec(p_id="UT0021717", parameter_code="50050")

# Extract flow & TP from UT0025241 & UT0021717
tp_flow=readECHO_ec(p_id=c("UT0025241","UT0021717"), parameter_code=c("50050","00665"))
```

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readECHO\_fac

*Read facility information from EPA ECHO webservices*


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**Description**

This function extracts facility information from EPA ECHO based on argument inputs.

**Usage**

```
readECHO_fac(type = "", ...)
```

**Arguments**

...	Additional arguments to be passed to ECHO query path. See <a href="https://echo.epa.gov/tools/web-services/facility-search-water#!/Facility_Information/get_cwa_rest_services_get_facility_info">https://echo.epa.gov/tools/web-services/facility-search-water#!/Facility_Information/get_cwa_rest_services_get_facility_info</a> for optional arguments for facilities. Note that arguments for output are ignored.
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**Value**

A data frame of EPA ECHO facility information

**Examples**

```
# Read facility locations in Utah
ut_fac=readECHO_fac(p_st="ut", p_act="y")
head(ut_fac)
# Read facility locations for two permit IDs
two_fac=readECHO_fac(p_pid=c("UT0021717", "UT0025241"))
two_fac
```

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readWQP	<i>Read EPA Water Quality Portal Data</i>
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**Description**

This function extracts water quality data from EPA's Water Quality Portal based on user arguemnt inputs. Note that connections to the WQP occassionally time out during download. This function tries to download requested files up to 10 times before exiting. All arguments except type are optional, but at least one should be provided to limit download size and prevent errors connecting to WQP. Note that some, but not all, special characters in characteristic names have been accounted if. If in doubt, use the WQP web interface to determine the appropriate syntax for odd characteristic names.

**Usage**

```
readWQP(type = "result", ..., print = TRUE)
```

**Arguments**

type	Data type to read. One of "result", "narrowresult", "sites", "activity", or "de-tquantlim".
...	additional arguments to be passed to WQP query path. See <a href="https://www.waterqualitydata.us/portal/">https://www.waterqualitydata.us/portal/</a> for optional arguments.
print	Logical. Print summary table of sites & characteristics (only for result or narrowresult types).
startDateHi	Query start date in 'mm-dd-yyyy' format.
startDateLo	Query end date in 'mm-dd-yyyy' format.

**Value**

A data frame of WQP data

**Examples**

```
# Read some data from Mantua Reservoir (2016-2018)
nr=readWQP(type="narrowresult", siteid=c("UTAHDWQ_WQX-4900440", "UTAHDWQ_WQX-4900470"), startDateLo="01-01-2016",
           endDateHi="12-31-2018", characteristicName=c("Dissolved oxygen (DO)"))

# Read just Arsenic, Cadmium, and DO, all dates
nr=readWQP(type="narrowresult",
           siteid=c("UTAHDWQ_WQX-4900440", "UTAHDWQ_WQX-4900470"),
           characteristicName=c("Arsenic", "Cadmium", "Dissolved oxygen (DO)"))

# Read all Total dissolved solids statewide (2016-2018) (& note statecode for Utah)
tds_sw=readWQP(type="result",
               statecode="US:49",
               characteristicName="Total dissolved solids",
               startDateLo="01-01-2016", startDateHi="12-31-2018",
               print=F)

# Read sites in Utah
sites=readWQP(type="sites", statecode="US:49")
plot(LatitudeMeasure~LongitudeMeasure, sites[sites$LatitudeMeasure>0 & sites$LongitudeMeasure<0,])
```

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