

Utah's Recovery Potential Watershed Planning Tool

Introduction and Application

Location

Multi Agency

State Office Building

195 North 1950 West

DEQ Board Room, 1st Floor

Please check in with Reception upon arrival.

Contact Information

If you have questions about workshop logistics, please contact:

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Ben Holcomb: bholcomb@utah.gov, 801-536-4373

Purpose

- Introduce Recovery Potential Screening (RPS) watershed planning tool
- Review results of the Urban Watershed calibration efforts
- Provide participants with hands-on experience with calibration, analysis, and interpretation
- Obtain input for future development

Wednesday, February 19th

9:00-9:20 *Introductions*

Jeff Ostermiller, DWQ

Who is present? What is your Affiliation? What is your experience, if any, to recovery potential screening tools?

9:20-10:00 *Overview of Recovery Potential Screening*

Doug Norton, USEPA

Provide the basics of the recovery potential screening process and underlying concepts.

10:00-10:45 Utah Examples: Nutrient Reduction Prioritization within Urban Watersheds

Mike Paul, Tetra Tech

- Discuss the rationale of gathering professional input to develop recovery potential scenarios.
- Provide the results of several examples that we developed from professional input.

10:45-11:15 Utah's Recovery Potential Indicators

Ben Holcomb, DWQ and Doug Norton

Provide an overview of indicators that have been incorporated within Utah's Recovery Potential Screening Tool.

11:15-11:45 Running Recovery Potential: The Nuts and Bolts

Mike Paul and Doug Norton

Walk through the features of the RPS tool and perform an example screening run for Urban Waters. Review and discuss the results.

11:45-12:00 Introduce Afternoon Exercises

Mike Paul and Jeff Ostermiller

12:00-1:00 Lunch – Provided (Red Iguana)

1:00-2:00 Development of Recovery Potential Screening Tools: Prioritization of Nutrient Reduction Efforts in Areas with Primarily Non-Point Sources

Facilitators and Trainers: Mike Paul, Doug Norton, Jeff Ostermiller and Ben Holcomb

We'll break into several small groups who will develop recovery potential scenarios for several of Utah's watersheds where the majority of nutrients come from non-point sources. Instructors will facilitate discussion during the afternoon hands-on exercises. Group members should also agree on specific tasks for afternoon exercises.

2:00-3:30 Running RPS

Participants will all have the opportunity to work directly with the RPS tool. Scenarios will be developed and outputs saved. Instructors will circulate among groups to answer questions and provide assistance.

3:30-3:45 Break

3:45-4:30 Running RPS

Continuation of afternoon exercises with ongoing one-on-one instruction on the mechanics of running RPS tools.

Thursday, February 20th

9:00-10:00 **Regroup and Compile Results**

Facilitators and Trainers: Mike Paul, Doug Norton, Jeff Ostermiller and Ben Holcomb

Groups will convene to review and compile the results from individual screening runs. Prepare a brief summary presentation for morning discussions.

10:00-11:00 **Presentation of Group Results**

Each group will present key results and insights from their screening exercises.

11:00-11:30 **Insights Gleaned from RPS Exercises: Group Discussion**

Discussion Facilitators: Mike Paul and Doug Norton

Compare and contrast the approaches taken by different groups.

Were the outputs intuitive? How did RPS outputs vary across scenarios? How did the results differ among major watersheds?

11:30-12:00 **Discussion, Q&A and Wrap-up**

Final thoughts on potential uses of recovery potential screening in Utah. Solicit feedback on any potential additional indicators or functions to include in future iterations of the tool. Follow-on possibilities.

12:00 **Adjourn**

Optional

2:00-4:00 **A Broad Overview of Utah's Recovery Potential Tool**

Mike Paul (Tetra Tech) and Doug Norton (USEPA)

In the afternoon, we'll hold another discussion that provides a broad overview of Utah's Recovery Potential Screening (RPS) tool, including examples obtained from workshop outputs. This discussion is intended for managers or others who could benefit from an

introduction to the RPS process, but who do not require a hands-on familiarity with the software or RPS mechanics. Workshop participants should consider whether others within their organization could benefit from this dialogue. All are welcome to attend. Please contact seminar organizers for details.

QUICK REFERENCE SHEET FOR RPS TOOL USAGE
UT RPS WORKSHOP, FEBRUARY 2014

Most Important Key Points

1. **SAVE A BACKUP COPY** of the tool file before doing anything with it. If not directly copying the original file without opening it, be sure to save as file type EXCEL 97-2003 WORKBOOK or MACRO-ENABLED WORKBOOK (do not save as file type EXCEL WORKBOOK).
2. **ENABLE THE MACROS.** You probably are seeing a security message and an “options” box at the top of your screen immediately after the tool opens. Click on options and choose “enable this content”.
3. **AFTER ENABLING MACROS, IMMEDIATELY SAVE AS** a new file name that includes the date and your screening purpose (if known). You are likely to accumulate copies of the tool file that contain different screenings done on different dates – plan your file naming methods now. Saving the tool file for each scenario that you want to save is much easier and complete than taking notes on each scenario and erasing/resetting one copy of the file several times.
4. **IF ANY TOOL PERFORMANCE PROBLEMS OCCUR** during usage, open a new copy rather than using RESET repeatedly.
5. **SAVE** before closing the file. **RENAME** if the scenario turned out to do something different from the name you gave it in step 3. Again, save only as file types in #1.

Really useful additional points

1. **EXPLORE WITHOUT FEAR.** If you are using a renamed file copy you can't ruin or lose your original. Try out the following:
 - a. Just click on each tab along the screen bottom and read what each tab does. Note that some tabs contain all the indicator data for all watersheds statewide at two scales, all the indicator definitions, and several watershed subsets that may be of interest. Never edit or delete these parts of the file.
 - b. Then go back to the setup tab and select ALL HUCs, choose a few random indicators, and click on RUN SCENARIO.
 - c. Go to specific tabs at the screen bottom to view what your project created – see the tabs for SUMMARY SCORES, BUBBLE PLOT, AND MAP. Play with different color schemes or settings in BUBBLE PLOT OPTIONS and MAP OPTIONS. Look through everything that you can customize under these options.
2. **DON'T JUST SELECT 3 OR 4 WATERSHEDS TO TRY SCREENING.** RPS was designed to compare and contrast dozens, hundreds, even thousands of watersheds. Selecting too few watersheds doesn't provide a useful gradient for comparison, or a background context against which to consider a single watershed's score. If you really are interested in just two or three watersheds, screen a larger group (e.g. all HUC12s in the same HUC8) to compare them against as well as to one another.
3. **SELECT 3 TO 10 INDICATORS PER EACH OF THE THREE CLASSES (ECO, STRESSOR, SOCIAL).** Although everything may seem important, selecting too many indicators adds noise and actually diminishes the influence of the most important indicators. Better to choose fewer indicators and run several different scenarios aimed at the same purpose, then observing which watersheds scored consistently, than to choose too many indicators in one scenario.
4. **BE CREATIVE.** Choose different subsets of watersheds to compare, different combinations and weights of indicators, and display products. Make what you need, and save the best visuals.

This worksheet contains a description of ecological, stressor, and social indicators compiled in the UT RPS dataset and tool as of 2/12/2014.

Indicator Name	Indicator Type	Scale	Description
HUC_ID	Base	HUC8 & HUC12	Number of ID from standard HUC system in the Watershed Boundary Dataset (WBD)
HUC_NAME	Base	HUC8 & HUC12	Name from standard HUC system in the Watershed Boundary Dataset (WBD)
Perennial_StreamLengthKm	Base	HUC8 & HUC12	KM identified as Stream/River. Perennial streams only. UT DWQ generated.
HUC_Area_Hectares_Complete	Base	HUC8 & HUC12	Full watershed area in hectares, regardless of whether entirely in UT
HUC_Area_Hectares_UT	Base	HUC8 & HUC12	HUC area in hectares only within state of UT
HUC_All_UT	Base	HUC8 & HUC12	Denotes as Yes/No whether fully in state (Yes) or is a boundary overlapping HUC (No).
StreamLengthKm	Base	HUC8 & HUC12	KM of NHD Flowline per HUC identified as Stream/River, or artificial path within NHDArea identified as Stream/River. Perennial streams only. Based on high res NHD. TT generated.
WaterbodyHectares	Base	HUC8 & HUC12	Lake/reservoir/any polygonal waters area total per HUC. Based on lakes_132_poly layer provided by UT.
LandHectares	Base	HUC8 & HUC12	watershed area minus total watershed polygonal waterbody area, per HUC. Based on lakes_132_poly layer provided by UT.
WaterbodyPerimKm	Base	HUC8 & HUC12	Perimeter of any polygonal water body provided by UT.
OE Count	Base	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
TMAX_AVE	Base	HUC8 & HUC12	HUC average of the annual maximum of the predicted mean monthly air temperature (tenths of degree Celsius) derived from the PRISM data. Each watershed grid cell calculated as $MAX[X_i]$, where X_i = the predicted maximum air temperature for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates.
TMEAN_AVE	Base	HUC8 & HUC12	HUC average of the annual mean of the predicted mean monthly air temperature (tenths of degree Celsius) derived from PRISM data. Each watershed grid cell calculated as sum $X_i/12$, where X_i = the predicted mean air temperature for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates.
TMIN_AVE	Base	HUC8 & HUC12	HUC average of the annual minimum of the predicted mean monthly air temperature (tenths of degree Celsius) derived from PRISM data. Each watershed grid cell calculated as sum $X_i/12$, where X_i = the modeled mean air temperature for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates.
BLM	Base	HUC8 & HUC12	Area Bureau of Land Mgmt
BR	Base	HUC8 & HUC12	Area Bureau of Reclamation
Tribal	Base	HUC8	Area Tribal
Military	Base	HUC8 & HUC12	Area Military
Private	Base	HUC8	Area Private
State	Base	HUC8	Area Utah

Federal_1	Base	HUC8 & HUC12	Area Federal
Private_1	Base	HUC8 & HUC12	Area Private
State_1	Base	HUC8 & HUC12	Area Utah
Tribal_1	Base	HUC8 & HUC12	Area Tribal
Stream_Density	Ecological	HUC8 & HUC12	HUC area/stream length
MeanCorridorSlope	Ecological	HUC8 & HUC12	mean slope of watershed's corridor areas (200 m per side of all linear NHD, per HUC), derived from mean value of slope in 30M grid cells throughout HUC corridors; data from US NED grid datasets.
Percent_Forest	Ecological	HUC8 & HUC12	watershed percent forest by area in HUC
Percent_ForestCorridor	Ecological	HUC8 & HUC12	HUC Corridor % Forest is area of forest in corridor divided by total corridor area
Percent_NaturalCover	Ecological	HUC8 & HUC12	watershed percent by area in HUC in natural (non-urban, non-agr: forest, shrubland, grassland, barren, and wetland) cover categories from NLCD
Percent_NaturalCoverCorridor	Ecological	HUC8 & HUC12	Percent of watershed's corridor areas (20C ft per side of all linear NHD, per HUC) in natural cover. Measured by dividing area of Natural Cover in corridor divided by total corridor area
Percent_WoodyVeg	Ecological	HUC8 & HUC12	watershed percent woody vegetation by area in HUC
Percent_WoodyVegCorridor	Ecological	HUC8 & HUC12	HUC Corridor % woody vegetation in corridor divided by total corridor area
AvgCH_AVE	Ecological	HUC8 & HUC12	HUC mean high values of available water capacity of soils (fraction) from State Soil Geographic (STATSGO) Database
BODH_AVE	Ecological	HUC8 & HUC12	HUC mean high values of soil bulk density (grams per cubic centimeter) of soils from State Soil Geographic (STATSGO) Database
FST32_AVE	Ecological	HUC8 & HUC12	HUC average of the mean day of year (1-365) of the first freeze derived from the PRISM data.
HYDR_AVE	Ecological	HUC8 & HUC12	Mean of the minimum of mean monthly flows on record (baseflow) to the mean of the maximum of mean monthly flow interpolated from USGS gauging stations; mean value for the HUC.
MAXP_AVE	Ecological	HUC8 & HUC12	HUC average of the annual maximum of the predicted mean monthly precipitation (mm) derived from the PRISM data. Each watershed grid cell calculated as MAX[Xi], where Xi = the predicted maximum precipitation for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates
MAXWD_AVE	Ecological	HUC8 & HUC12	HUC average of the annual maximum of the predicted mean monthly number of days with measurable precipitation (days) derived from PRISM data. Each watershed grid cell calculated as sum Xi/12, where Xi = the predicted measurable precip for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates
MEANP_AVE	Ecological	HUC8 & HUC12	HUC average of the annual mean of the predicted mean monthly precipitation (mm) derived from the PRISM data. Each watershed grid cell calculated as sum Xi/12, where Xi = the predicted mean precipitation for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates
MINP_AVE	Ecological	HUC8 & HUC12	HUC average of the annual minimum of the predicted mean monthly precipitation (mm) derived from the PRISM data. Each watershed grid cell calculated as MIN[Xi], where Xi = the predicted minimum precipitation for month i (1-12) derived from 30 years (1971-2000) of PRISM climate estimates

MINWD_AVE	Ecological	HUC8 & HUC12	HUC average of the annual minimum of the predicted mean monthly number of days with measurable precipitation (days) derived from PRISM data. Each watershed grid cell calculated as $\text{MIN}[X_i]$, where $X_i = \text{the predicted minimum mean number of days with me}$
OMH_AVE	Ecological	HUC8 & HUC12 (STATSGO) Database.	HUC mean high value of organic matter content of soils (percent by weight) from State Soil Geographic
PERMH_AVE	Ecological	HUC8 & HUC12 (STATSGO) Database.	HUC mean high values of permeability of soils types within a basin (inches per hour), from State Soil Geographic
RDH_AVE	Ecological	HUC8 & HUC12	HUC mean high values of depth to bedrock (inches).
RH_AVE	Ecological	HUC8 & HUC12	HUC average of the annual mean of the predicted mean monthly relative humidity (percent) derived from PRISM data. Each watershed grid cell calculated as sum $X_i/12$, where $X_i = \text{the predicted mean relative humidity for month } i (1-12)$ derived from 30 years (1971-2000) of PRISM climate estimates.
WTAVGC_AVE	Ecological	HUC8 & HUC12	Mean value of cells in HUC where cells represent the percent of the underlying bedrock composed of calcium oxide (CaO). Percentages are the average percent CaO for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
WTAVGPERM_AVE	Ecological	HUC8 & HUC12	Mean value of cells in HUC where cells represent the average of permeability (PERM, micrometers/second) of the underlying bedrock. Cell values are the average PERM for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
WTDPH_AVE	Ecological	HUC8 & HUC12	HUC mean high values of seasonal water table depth (feet) of soils from State Soil Geographic (STATSGO) Database.
XWD_AVE	Ecological	HUC8 & HUC12	HUC average of the annual mean of the predicted mean monthly number of days with measurable precipitation (days) derived from PRISM data. Each watershed grid cell calculated as sum $X_i/12$, where $X_i = \text{the predicted mean number of days with measurable}$
Mean OE	Ecological	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
#Good OE	Ecological	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
%Good OE	Ecological	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
Ave TSI	Ecological	HUC8	Lakes - Carlson Trophic State Index
Max TSI	Ecological	HUC8	Lakes - Carlson Trophic State Index
Mean CHLA TS1	Ecological	HUC8	Lakes - Carlson Trophic State Index for Chl a
Erosion_Resistance1	Ecological	HUC8 & HUC12	Soil resistance to erosion1. Developed from area weighted mean STATSGO KFFACT Index Values per HUC in 200ft Corridor (see ErosionPotential_KFFACT). Calculated by the formula $(ErosionPotential_KFFACT \max value \text{ minus cell value})/ErosionPotential_KFFACT \max value$ to directionally reverse value gradient. High values indicate low vulnerability to erosion.
Erosion_Resistance2	Ecological	HUC8 & HUC12	Soil resistance to erosion1. Developed from area weighted mean STATSGO KWFACT Index Values per HUC in 200ft Corridor (see ErosionPotential_KWFACT). Calculated by the formula $(ErosionPotential_KWFACT \max value \text{ minus cell value})/ErosionPotential_KWFACT \max value$ to directionally reverse value gradient. High values indicate low vulnerability to erosion.
#UPDES	Stressor	HUC8 & HUC12	# permitted discharges
Mean TDS	Stressor	HUC8 & HUC12	Total Dissolved Solids - surrogate for sedimentation

Min TDS	Stressor	HUC8 & HUC12	Total Dissolved Solids - surrogate for sedimentation
Max TDS	Stressor	HUC8 & HUC12	Total Dissolved Solids - surrogate for sedimentation
Mean TSS	Stressor	HUC8 & HUC12	Total Suspended Solids- surrogate for sedimentation
Min TSS	Stressor	HUC8 & HUC12	Total Suspended Solids- surrogate for sedimentation
Max TSS	Stressor	HUC8 & HUC12	Total Suspended Solids- surrogate for sedimentation
Mean TN	Stressor	HUC8 & HUC12	Total Nitrogen-DWQ site data
Min TN	Stressor	HUC8 & HUC12	Total Nitrogen-DWQ site data
Max TN	Stressor	HUC8 & HUC12	Total Nitrogen-DWQ site data
Mean TP	Stressor	HUC8 & HUC12	Total Phosphorus- DWQ site data
Min TP	Stressor	HUC8 & HUC12	Total Phosphorus- DWQ site data
Max TP	Stressor	HUC8 & HUC12	Total Phosphorus- DWQ site data
TN%Mean	Stressor	HUC8 & HUC12	Sampled summer TN/ Predicted mean natural background summer TN (John Olson, USU in press)
TN%UpP _L	Stressor	HUC8 & HUC12	Sampled summer TN/ Predicted 95th percentile CI natural background summer TN (John Olson, USU in press)
TP%Mean	Stressor	HUC8 & HUC12	Sampled TP/ Predicted mean natural background TP (John Olson, USU in press)
TP%UpP _L	Stressor	HUC8 & HUC12	Sampled TP/ Predicted 95th percentile CI natural background TP (John Olson, USU in press)
TN Count	Stressor	HUC8 & HUC12	DWQ site data
TN # Over Indicator	Stressor	HUC8 & HUC12	Indicator value (0.55) from stressor response studies by Utah
TN % Sites Over indicator	Stressor	HUC8 & HUC12	Indicator value (0.55) from stressor response studies by Utah
TP Count	Stressor	HUC8 & HUC12	DWQ site data
TP # Over Indicator	Stressor	HUC8 & HUC12	Indicator value (0.55) from stressor response studies by Utah
TP % Sites Over Indicator	Stressor	HUC8 & HUC12	Indicator value (0.55) from stressor response studies by Utah
UTDWQ_ImpairedKm	Stressor	HUC8 & HUC12	Utah DWQ Integrated Report data
% Assessed Impaired	Stressor	HUC8 & HUC12	Utah DWQ Integrated Report data
#Diversions	Stressor	HUC8 & HUC12	# Diversions within HUC-Utah Dept Water Resources

Diversion_ACFT	Stressor	HUC8 & HUC12	Acre-feet diverted within HUC--Utah Dept Water Resources
#Returns	Stressor	HUC8 & HUC12	# Returns within HUC--Utah Dept Water Resources
Return_ACFT	Stressor	HUC8 & HUC12	Acre-feet returned within HUC--Utah Dept Water Resources
POTW	Stressor	HUC8 & HUC12	# Publicly Owned Treatment Works within HUC
Unique Impairment Causes	Stressor	HUC8 & HUC12	# Unique impairment causes within HUC
DAMS_SUM	Stressor	HUC8 & HUC12	Total number of dams that occur within the HUC based on the National Inventory of Dams map of dam locations (https://nids.usace.army.mil/)
KFACT_AVE	Stressor	HUC8 & HUC12	HUC mean soil erodibility factor of soils (no units) from State Soil Geographic (STATSGO) Database.
✓ MINES_SUM	Stressor	HUC8 & HUC12	Total number of mines that occur within the HUC based on the Mineral Resources Data System map of mine locations (http://tin.er.usgs.gov/mrds/)
WTAVGM_AVE	Stressor	HUC8 & HUC12	Mean value of cells in HUC where cells represent the percent of the underlying bedrock composed of nitrogen, measured as magnesium oxide (MgO). Percentages are the average percent MgO for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
WTAVGN_AVE	Stressor	HUC8 & HUC12	Mean value of cells in HUC where cells represent the percent of the underlying bedrock composed of nitrogen, measured as the total nitrogen (TN) of all forms. Percentages are the average percent TN for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
WTAVGP_AVE	Stressor	HUC8 & HUC12	Mean value of cells in HUC where cells represent the percent of the underlying bedrock composed of phosphorus, measured as the total phosphate (TP). Percentages are the average percent TP for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
ErosionPotential_KFFACT	Stressor	HUC8 & HUC12	Area weighted mean STATSGO KFFACT and KWFFACT Index Values per HUC in 200ft Corridor. Low values indicate low vulnerability to erosion, higher values mean higher susceptibility to runoff.
ErosionPotential_KWFFACT	Stressor	HUC8 & HUC12	Area weighted mean STATSGO KFFACT and KWFFACT Index Values per HUC in 200ft Corridor. Low values indicate low vulnerability to erosion, higher values mean higher susceptibility to runoff.
PercentUnstable	Stressor	HUC8 & HUC12	Unstable area in 20 meter corridor, using NLCD Classes 31-39 and 81-89, with slopes greater than 3 degrees.
percentPasture	Stressor	HUC8 & HUC12	watershed percent pasture from NLCD2006
percentCropland	Stressor	HUC8 & HUC12	watershed percent cropland from NLCD2006
percentUrban	Stressor	HUC8 & HUC12	watershed percent urban from NLCD2006, not including class 21 (urban open space)
✓ PercentImpervious	Stressor	HUC8 & HUC12	watershed percent impervious cover by area from NLCD2006 impervious cover analysis dataset
ImpairmentsCount	Stressor	HUC8 & HUC12	watershed impairments count (waterbody segment-pollutant cause combinations using EPA Med. Res. ATTAINS data)
RoadDensityAll	Stressor	HUC8 & HUC12	watershed paved road density as length over area (using UT AGRC data as source for road data)
✓ RoadDensityPaved	Stressor	HUC8 & HUC12	watershed paved and unpaved road density as length over area (using UT AGRC data as source for road data)

LengthImpairedKm	Stressor	HUC8	Km of impaired streams based on EPA's 303d data
PercentIncreaseAg	Stressor	HUC8 & HUC12	Increases only; decreases default to 0. Current Agriculture % per HUC minus Past Agriculture % per HUC.
PercentIncreaseUrban	Stressor	HUC8 & HUC12	Increases only; decreases default to 0. Current Urban % per HUC – Past Urban % per HUC; Only using NLCD classes 22-29, not using Urban Open Space (class 21). Based on NLCD 2001 and NLCD 2006
AUxDistanceCat	Stressor	HUC8	# AnimalUnits multiplied by categorical distance from water body- from Animal Feeding Operation program data
#Eut_AVE	Stressor	HUC8	Lakes -Carlson Trophic State Index
% Eut_Ave	Stressor	HUC8	Lakes -Carlson Trophic State Index
#EUT_CHLA	Stressor	HUC8	Lakes -Carlson Trophic State Index for Chl a
%EUT_CHLA	Stressor	HUC8	Lakes -Carlson Trophic State Index for Chl a
LST32_AVE	Stressor	HUC8 & HUC12	HUC average of the mean day of year (1-365) of the last freeze derived from the PRISM data.
WTAVGS_AVE	Stressor	HUC8 & HUC12	Mean value of cells in HUC where cells represent the percent of the underlying bedrock composed of sulfur (S). Percentages are the average percent S for all lithologies within the cell, weighted by lithology prevalence. Lithologies and their prevalences were derived from USGS Preliminary Integrated Geologic Map of the United States.
#Fair	Stressor	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
#Poor	Stressor	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
%Poor	Stressor	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
%Poor&Fair	Stressor	HUC8 & HUC12	Macroinvertebrate Observed/Expected- Categorized Good, Fair, Poor
TOTRECYCNRATE	Stressor	HUC8	The summed values of sewage, septic, Cty_manner, and Anth_RedN, which constitute the total estimated recycled N inputs in Kg per hectare per year, per HUC
HUC8TOTRECYCN	Stressor	HUC8	The total recycled N rate (TOTRECYCNRATE) times the HUC8 area, then divided by 10,000,000.000 to adjust area reporting units and obtain more convenient values mostly within the two-digit range. Used in states that did not provide N input source level of difficulty estimates.
ReNANIAB	Stressor	HUC8	The ratio of recycled anthropogenic N inputs to pre-European N inputs (natNfix + Nat_OxN)
TOTNEWNRATE	Stressor	HUC8	The summed values of syn_fert, nat_Nfix, cty_agNfix, Nat_OxN, and Anth_OxN, which constitute the total estimated new N inputs in Kg per hectare per year, per HUC.
HUC8TOTNEWN	Stressor	HUC8	The total new N rate (TOTNEWNRATE) times the HUC8 area, then divided by 10,000,000,000 to adjust area reporting units and obtain more convenient values mostly within the two-digit range. Used in states that did not provide N input source level of difficulty estimates.
NeNANIAB	Stressor	HUC8	The ratio of new anthropogenic N inputs to pre-European N inputs (natNfix + Nat_OxN)
Pred_TP	Stressor	HUC12	From John Olson predicted background nutrient concentrations. Mean sampled values predicted mean for HUC
UpPPL_TP	Stressor	HUC12	From John Olson predicted background nutrient concentrations. Mean sampled values predicted mean for HUC
Pred_TN_Sum	Stressor	HUC12	From John Olson predicted background nutrient concentrations. Mean sampled values predicted mean for HUC
UpPPL_TN_Sum	Stressor	HUC12	From John Olson predicted background nutrient concentrations. Mean sampled values predicted mean for HUC
Percent_PastureCorridor	Stressor	HUC12	HUC Corridor % pasture is area of pasture in corridor divided by total corridor area.
Percent_CropCorridor	Stressor	HUC12	HUC Corridor % cropland is area of cropland in corridor divided by total corridor area.
LengthImpaired1	Stressor	HUC12	Km of impaired streams based on EPA's 303d data (First value in worksheet)

<u>LengthImpaired2</u>	<u>Stressor</u>	<u>HUC12</u>	<u>Km of impaired streams based on EPA's 303d data (Second value in worksheet)</u>
# T&E spp	Social	HUC8 & HUC12	For each species there is a count or number of impairments in the two areas in which the species is found - this is based on DWR mapped them. For # of T&E, choose one HUC site the area of different species. Economic data
# BoatRamps	Social	HUC8 & HUC12	Utah DWR data
BlueRibbon River KM	Social	HUC8 & HUC12	Division of Wildlife Resources Blue Ribbon Designations
BR River Y/N	Social	HUC8 & HUC12	Division of Wildlife Resources Blue Ribbon Designations
BR Lake Count	Social	HUC8 & HUC12	Division of Wildlife Resources Blue Ribbon Designations
MajorFishing River Private (Km)	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
MajorFishing River Public (Km)	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
MajorFishing Secure Access (Km)	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
Major Fish Public Access (Km)	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
Major Fish Public Access (%)	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
Major Fish Public Access Y/N	Social	HUC8 & HUC12	From (http://wildlife.utah.gov/maps/stream_access/) got GIS layer from garyogborn@utah.gov
3A3B KM	Social	HUC8 & HUC12	Kilometers of designated Cold and Warm water uses
1C KM	Social	HUC8 & HUC12	Kilometers of primary drinking water uses
BLM_Wilderness	Social	HUC8 & HUC12	Area Bureau of Land Mgmt
NPS	Social	HUC8 & HUC12	Area National Park Service
StatePR	Social	HUC8 & HUC12	Area Utah Parks
StateW	Social	HUC8 & HUC12	Area Utah Wildlife
USFW	Social	HUC8 & HUC12	Area US Fish and Wildlife
USFS	Social	HUC8 & HUC12	Area US Forest Service
USFSW	Social	HUC8 & HUC12	Area US Forest Service Wilderness
ShannonInv	Social	HUC8 & HUC12	Diversity index - jurisdiction. Inverted in order that lower diversity is higher score.
SimpsonInv	Social	HUC8 & HUC12	Diversity index - jurisdiction. Inverted in order that lower diversity is higher score.
# JurisdictionInv	Social	HUC8 & HUC12	Count index - jurisdiction. Inverted in order that lower count is higher score.
Shannon.1Inv	Social	HUC8 & HUC12	Diversity index - jurisdiction. Inverted in order that lower diversity is higher score.
Simpson.1Inv	Social	HUC8 & HUC12	Diversity index - jurisdiction. Inverted in order that lower diversity is higher score.
# Jurisdictions.1Inv	Social	HUC8 & HUC12	Count index - jurisdiction. Inverted in order that lower count is higher score.
Assessed (Km)	Social	HUC8 & HUC12	Utah DWQ Integrated Report data
Percent Assessed	Social	HUC8 & HUC12	Utah DWQ Integrated Report data
Supporting (Km)	Social	HUC8 & HUC12	Utah DWQ Integrated Report data
% Assessed Supporting	Social	HUC8 & HUC12	Utah DWQ Integrated Report data
PS_TMDLCount	Social	HUC8 & HUC12	Number of point source TMDLs per HUC based on EPA spatial and tabular data on TMDLs
TMDLCount	Social	HUC8 & HUC12	watershed count of TMDLs completed (using EPA Med. Res. ATTAINS data)
TMDLRatio	Social	HUC8 & HUC12	watershed count of TMDLs divided by waterbody segment-pollutant causes (using EPA Med. Res. ATTAINS data)
LengthAssessedKm	Social	HUC8 & HUC12	Km of stream length assessed for impairment per HUC, based on EPA 305b data
Population	Social	HUC8 & HUC12	Population per HUC base on US Census income data
Income	Social	HUC8 & HUC12	Median income per HUC based on US Census income data
DistanceUrbanAreaKm	Social	HUC8 & HUC12	Distance to nearest major urban area in km. This is determined as distance from centroid to nearest
EducationPercent	Social	HUC8 & HUC12	Percent of people in HUC with Bachelor Degree or Graduate degree based on US Census Education data
#Priority Lakes	Social	HUC8	Utah priority management lakes - 132
ActiveWatershedGroupCategory	Social	HUC8	DWQ watershed group participation ranking per HUC
NET TOTAL ECON VALUE	Social	HUC12	Net Total economic value calculated per HUC-- DWQ economic study
REC USE VALUE	Social	HUC12	Total recreational use value calculated per HUC--DWQ economic study

Plans Written
• successful BMPs debris: FFCL
• well maintained and no
• prioritize
• ownership

