Enhancing Access to Drought Information Using the CUAHSI Hydrologic Information System

H43H-1325

CUAHSI HIS
http://his.cuahsi.org

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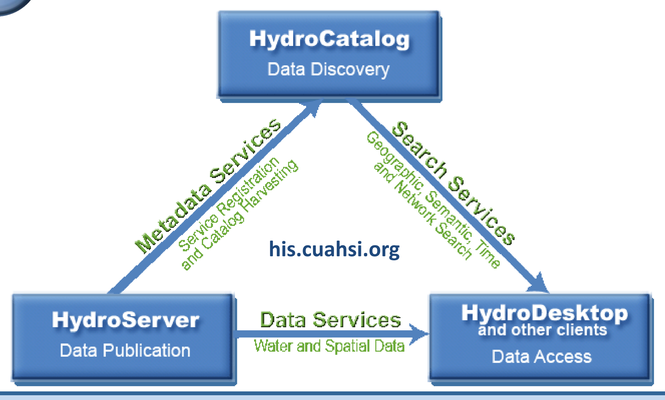
1 Introduction

As part of a pilot project for the **National Integrated Drought Information System (NIDIS)**, a hydrologic information system is being developed to enhance access to drought information for the **Upper Colorado River Basin**. The system is based on a **CUAHSI HIS HydroServer**, with significant expanded capabilities for re-scaling the data, dimensionally, temporally and spatially, which is used to create and share numerous drought parameters. When combined with **CUAHSI's HydroDesktop**, users can both view and access pre-calculated drought parameters, explore the data behind those parameters, and even calculate their own custom drought parameters.

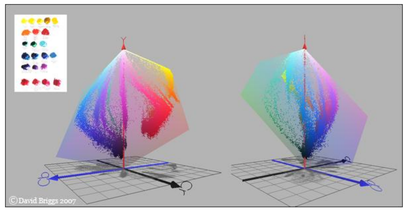
Pilot Study Area – Upper Colorado River Basin

2 CUAHSI HIS : Data Sharing System



3 Data Objective

By viewing data from a different perspective, patterns emerge that might otherwise be unidentified. For example, here are the dimensions of color shown from two different perspectives.



$$\Delta S = S_{t2} - S_{t1} = \sum_{i=0}^{n} Q_i$$

Similarly, drought related data can be viewed from several different perspectives. The perspective used for this project is based on that of the water balance equation.

Water balance equation perspective:

- **Volumetric** (acre-feet)
- **Change in water content** (delta storage or flow)
- **Per zone** (HUC10s)
- **Per period** (month & half-month)

It turns out that this is the perspective used by many common drought indicies!

4 Initial Data & Sources

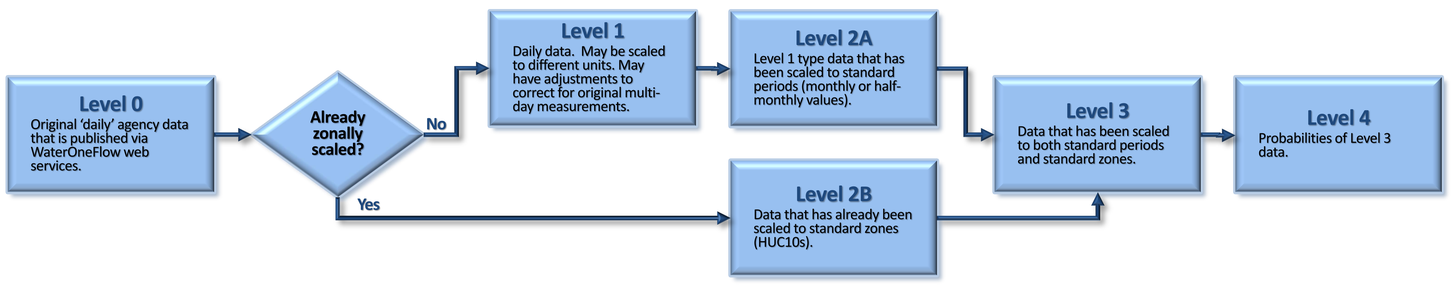
Time Series Data:

- Streamflow (USGS NWIS)
- Reservoir Storage (USBR)
- Precipitation (NCDC)
- Snow Water Equivalent [raster] (NWS NOHRSC SNODAS)
- Snow Water Equivalent [point] (NRCS SNOTEL)

Spatial Data:

- Normal Annual Precipitation (PRISM)
- Stream & Reservoir Network (NHDPlus)
- HUC 10 Shapefiles – 523 in UCRB, an additional 119 touching UCRB (NHDPlus)

5 Derived Data Workflow



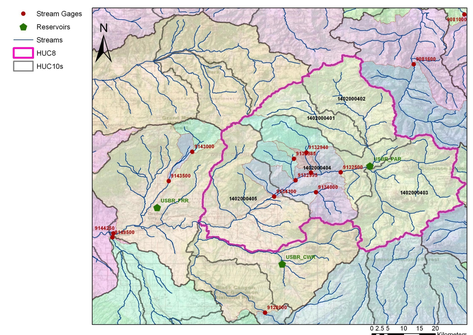
6 Zonal Re-scaling

The techniques used to derive Level 3 (zonal) data from Level 2A (point) data.

Streamflow: Determine flow originating in an area defined by zones based on adding and subtracting area weighted gage flows.

Example Streamflow Weights

HUC10	Gage/Reservoir	Weight
1402000401	09132500	0.3587
1402000401	09132940	0.3291
1402000401	USBR_PAR	-0.3587
1402000402	09132500	0.5290
1402000402	USBR_PAR	-0.5290
1402000403	09132500	0.8877
1402000403	USBR_PAR	-0.8877
1402000404	09132500	-1.4257
1402000404	09132940	-0.9207
1402000404	09132960	0.8430
1402000404	09132985	-1.0656
1402000404	09132995	0.4227
1402000404	09134000	0.1841
1402000404	09134100	1.6409
1402000404	USBR_PAR	-0.2152
1402000405	09128000	-0.5314
1402000405	09132500	-0.4235
1402000405	09132960	-0.4235
1402000405	09132995	-0.4235
1402000405	09134000	-0.4235
1402000405	09134100	-0.1080
1402000405	09143500	-0.5314
1402000405	09144250	-0.5314
1402000405	USBR_CWR	-0.5314
1402000405	USBR_FRR	-0.5314



Gage Subwatersheds in HUC8-14020004

Precipitation: Determine zone average precipitation by weighted averaging adjusted for proximity and normal flows.

Example Precipitation Weights

HUC10	Precip Station	Weight
1402000401	5037299999	0.2811
1402000401	5174399999	0.3575
1402000401	5630699999	0.3614
1402000402	5037299999	0.4382
1402000402	5174399999	0.3565
1402000402	5548499999	0.0026
1402000402	5630699999	0.2026
1402000403	5037299999	0.1142
1402000403	5366299999	0.0820
1402000403	5160999999	0.0002
1402000403	5174399999	0.0000
1402000403	5195999999	0.3545
1402000403	5630699999	0.4489
1402000404	5037299999	0.1531
1402000404	5366299999	0.0133
1402000404	5160999999	0.0000
1402000404	5174399999	0.1086
1402000404	5195999999	0.0515
1402000404	5630699999	0.6735
1402000405	5037299999	0.0082
1402000405	5366299999	0.0078
1402000405	5160999999	0.0292
1402000405	5174399999	0.1032
1402000405	5195999999	0.0011
1402000405	5219699999	0.0990
1402000405	5572299999	0.0447
1402000405	5630699999	0.7068

Precipitation Station Tessellations in HUC8-14020004

7 Conclusions & Recommendations

- **Re-scaling and re-dimensioning the variables simplifies many analyses that were difficult, and therefore not readily used.**
- **The CUAHSI HIS system provides a useful framework for storing and sharing the data, allowing effort to be re-focused on providing useful derived data series instead of managing data.**
- **The workflow is automated, providing several benefits over many manual approaches:**
  - **Minimizing the time and associated costs**
  - **Minimizing inconsistencies**
  - **Clearly documenting the process**
- **These techniques are scalable to different time and spatial scales, within the limitations of the quality and quantity of the input data, allowing optimal scales to be used.**
- **Additional data sources and derived time series that would be useful:**
  - **Soil Moisture (SCAN)**
  - **Reservoir Storage (NWS)**
  - **Surface Water Supply Index (SWSI)-related Indices**

References

Briggs, D. , http://www.huevaluechroma.com, last accessed 11/28/2011.

CUAHSI, http://his.cuachi.org, last accessed 11/28/2011.

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