SWE & April-July Runoff Volume

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Motivation & Objective

A CBRFC April 2010 analysis of Lake Powell inflows showed that spring SWE and April-July runoff exhibited a non-linear relationship, prompting questions from stakeholders who expect that “normal” conditions would produce “normal” runoff.

To provide insight on the relationship between spring SWE and April-July runoff volume.
Colorado—Glen Canyon Dam

- 0.74738 $R^2$ correlation.
- Residual plot shows scatter with no obvious trend—indicative of a linear relationship.
Colorado—Glen Canyon Dam

- Residual plot shows scatter with no obvious trend—indicative of a linear relationship.
Green—Above Flaming Gorge

• 0.57421 $R^2$ correlation.
• 0.65992 $R^2$ correlation without 1983.
Yampa—Maybell NR

- $0.70364 \text{ R}^2$ correlation.
Duchesne—Myton

- 0.79128 $R^2$ correlation
Colorado—Lake Granby, Granby NR

- 0.83629 R² correlation
Colorado—Cameo NR

• 0.70601 $R^2$ correlation.
Gunnison—Blue Mesa Reservoir

- 0.76428 $R^2$ correlation.
San Juan—Bluff NR

- 0.69158 $R^2$ correlation.
Weber—Oakley NR

- **0.75372 $R^2$ correlation.**
Ogden—Pineview Reservoir, Ogden NR

• 0.8294 $R^2$ correlation.
In all three scenarios, max-SWE-to-date is the better predictor of April-July runoff.
The mean date of max SWE is April 8\textsuperscript{th}, approximately three weeks before May 1. Significant melt out has already occurred, thus using the May 1 SWE may underestimate the runoff volume.
Conclusion and Discussion

- Spring SWE and April-July runoff volume display a linear relationship, but not a perfect linear relationship (100% average SWE will not necessarily produce 100% average runoff).

- Linearity varies from basin to basin.

- Using max-SWE-to-date instead of May 1 SWE does not yield more accurate runoff forecasts for most basins.
Future Work

- What factors may contribute to interannual variability?
- Does runoff efficiency (runoff/SWE) vary as a function of spring or winter temperatures?