SWE & April-July Runoff Volume

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+ Results
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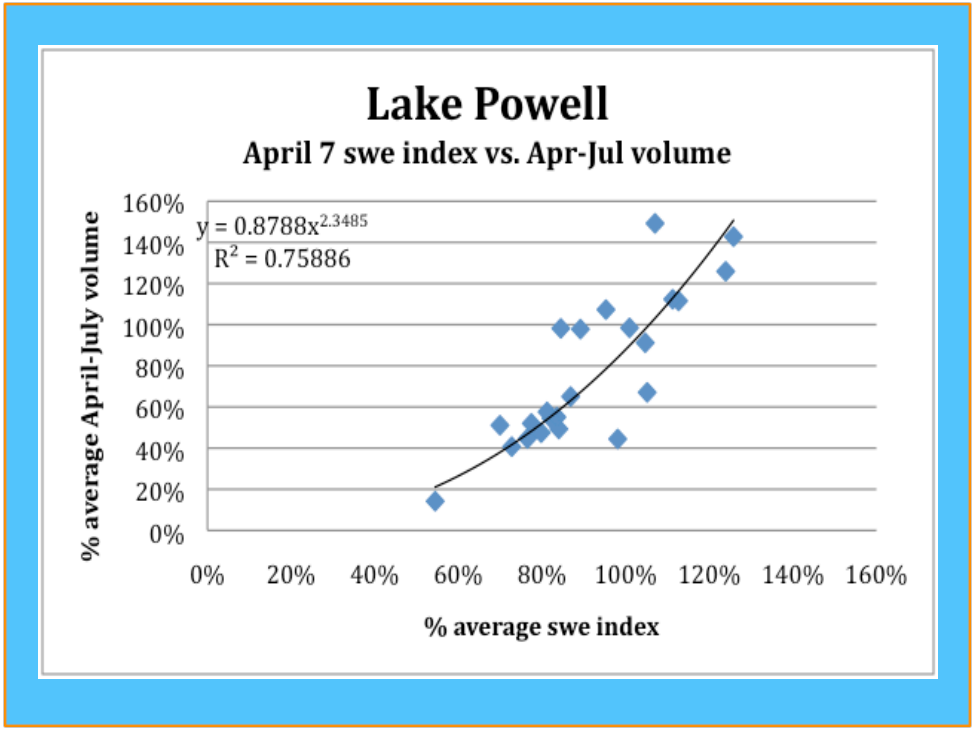
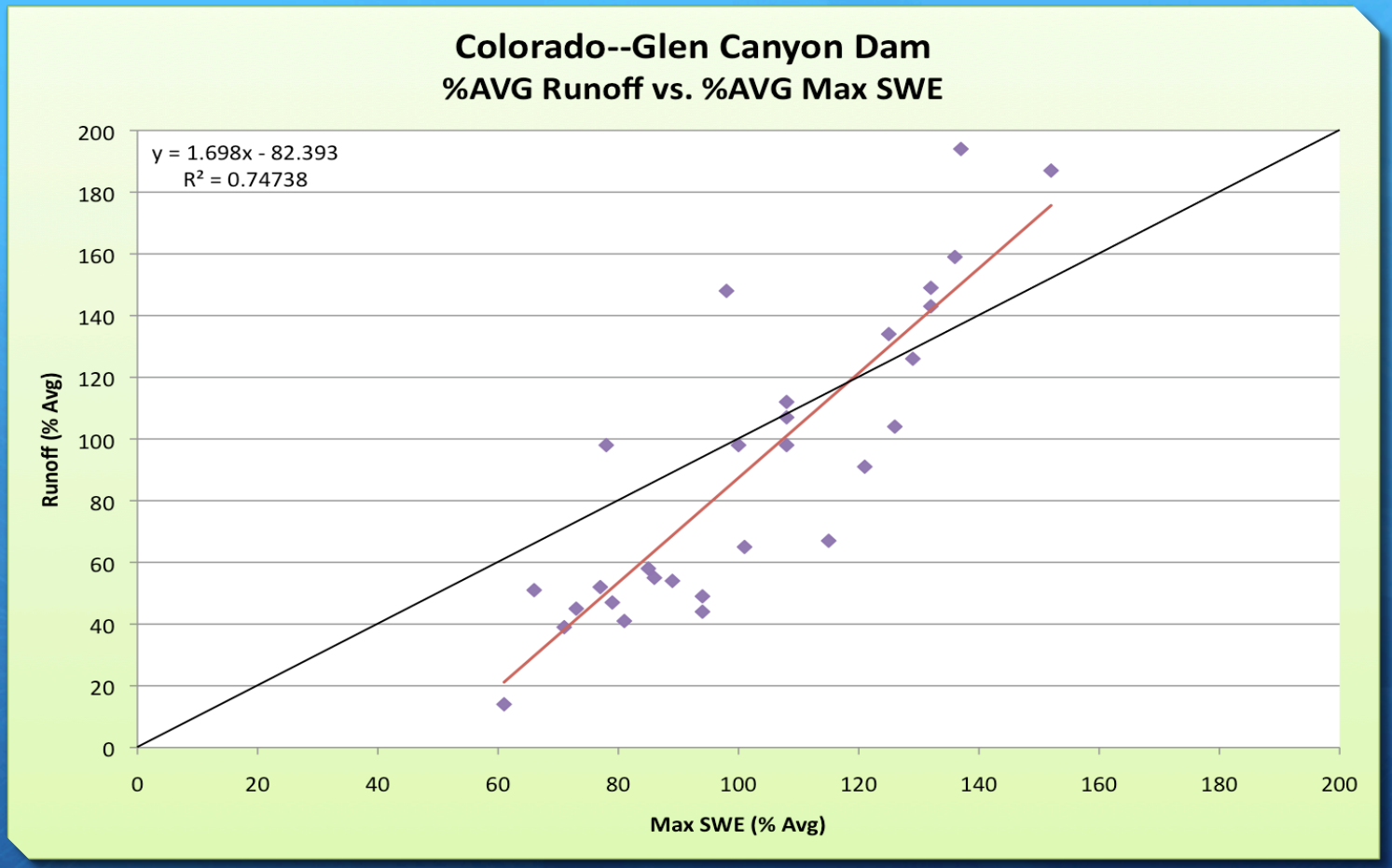
+ Future Work

Motivation & Objective

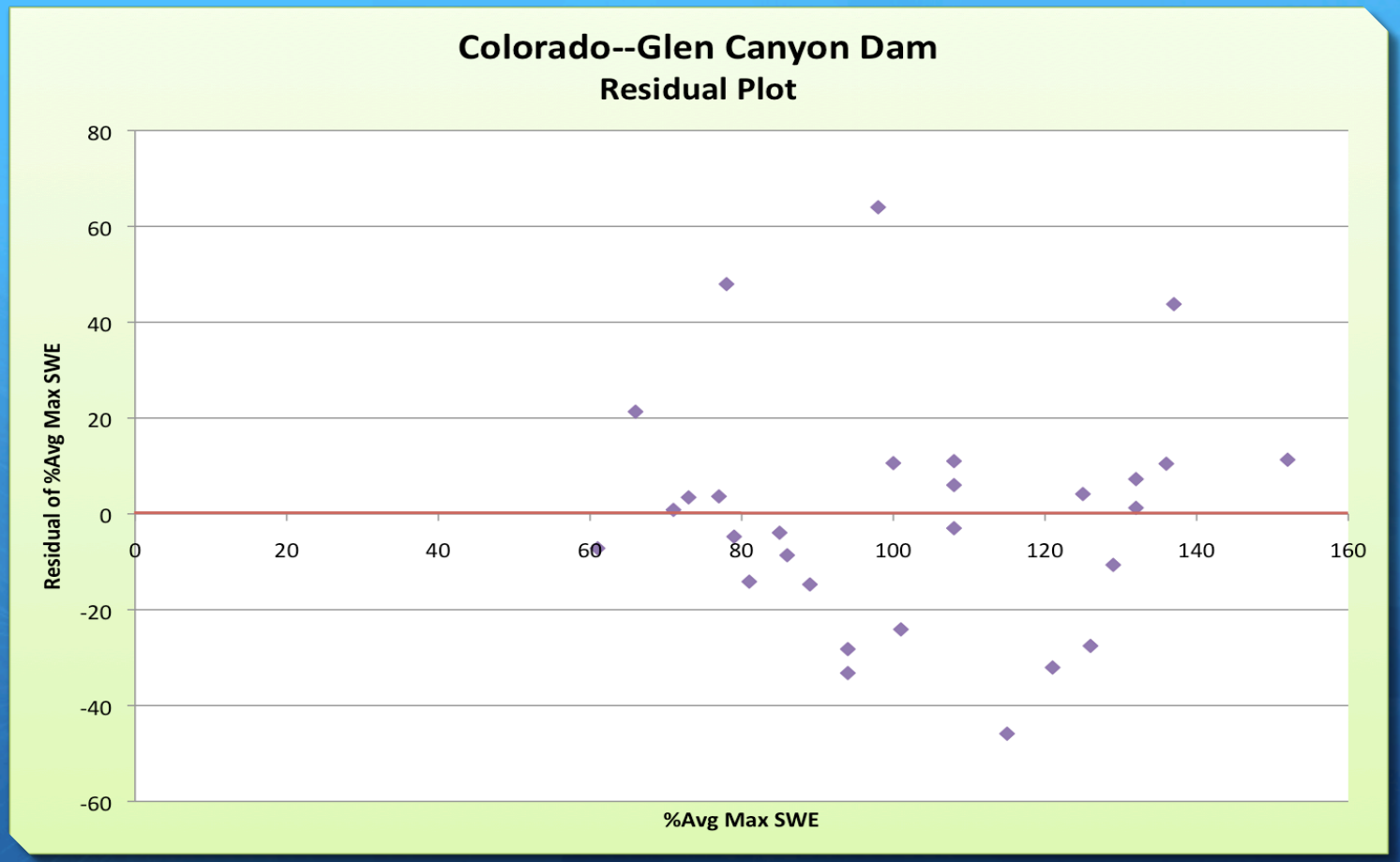
- A CBRFC April 2010 analysis of Lake Powell inflows showed that spring SWE and April-July runoff exhibited a non-linear relationship, prompting questions from stakeholders who expect that "normal" conditions would produce "normal" runoff.
- To provide insight on the relationship between spring SWE and 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.



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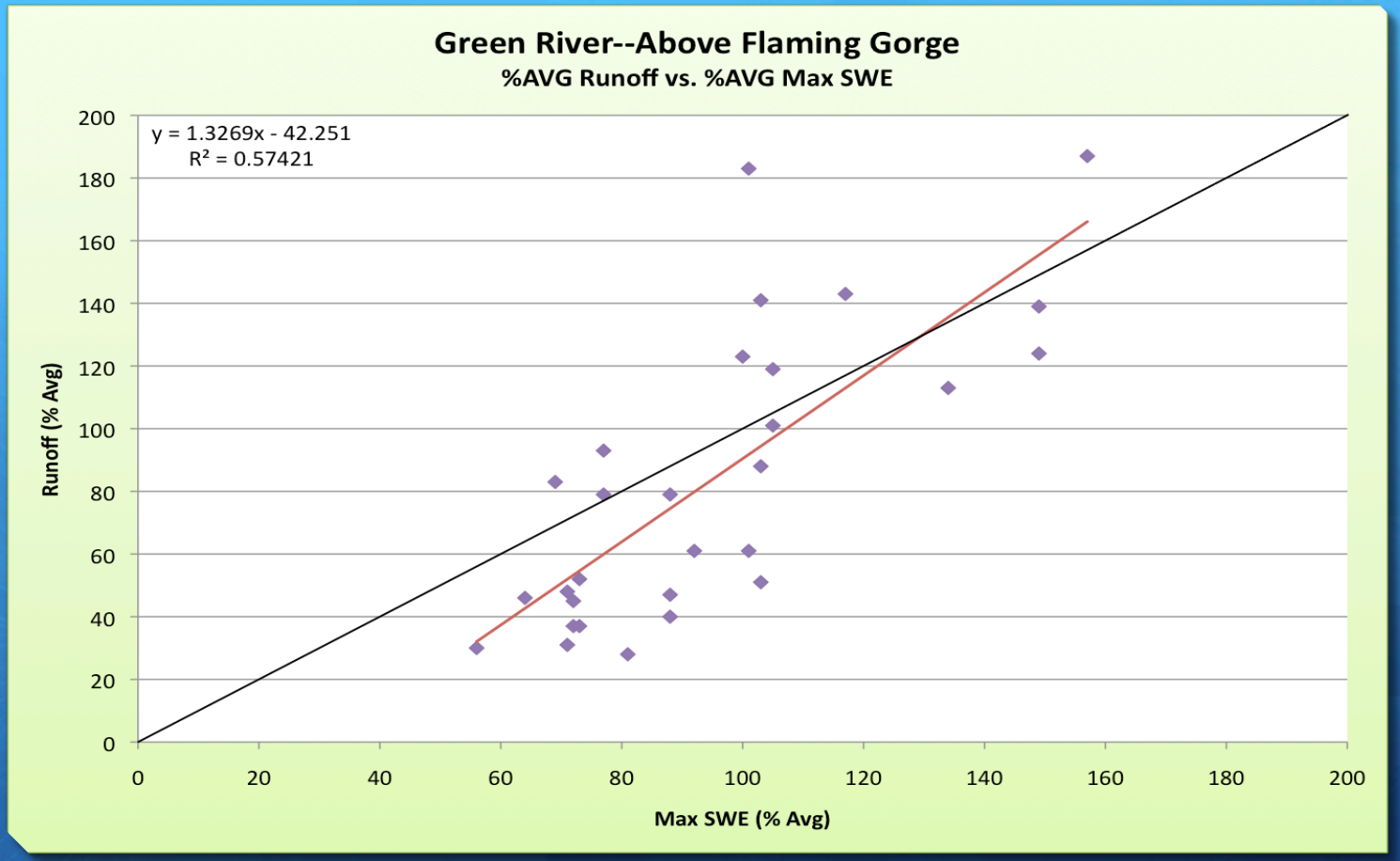
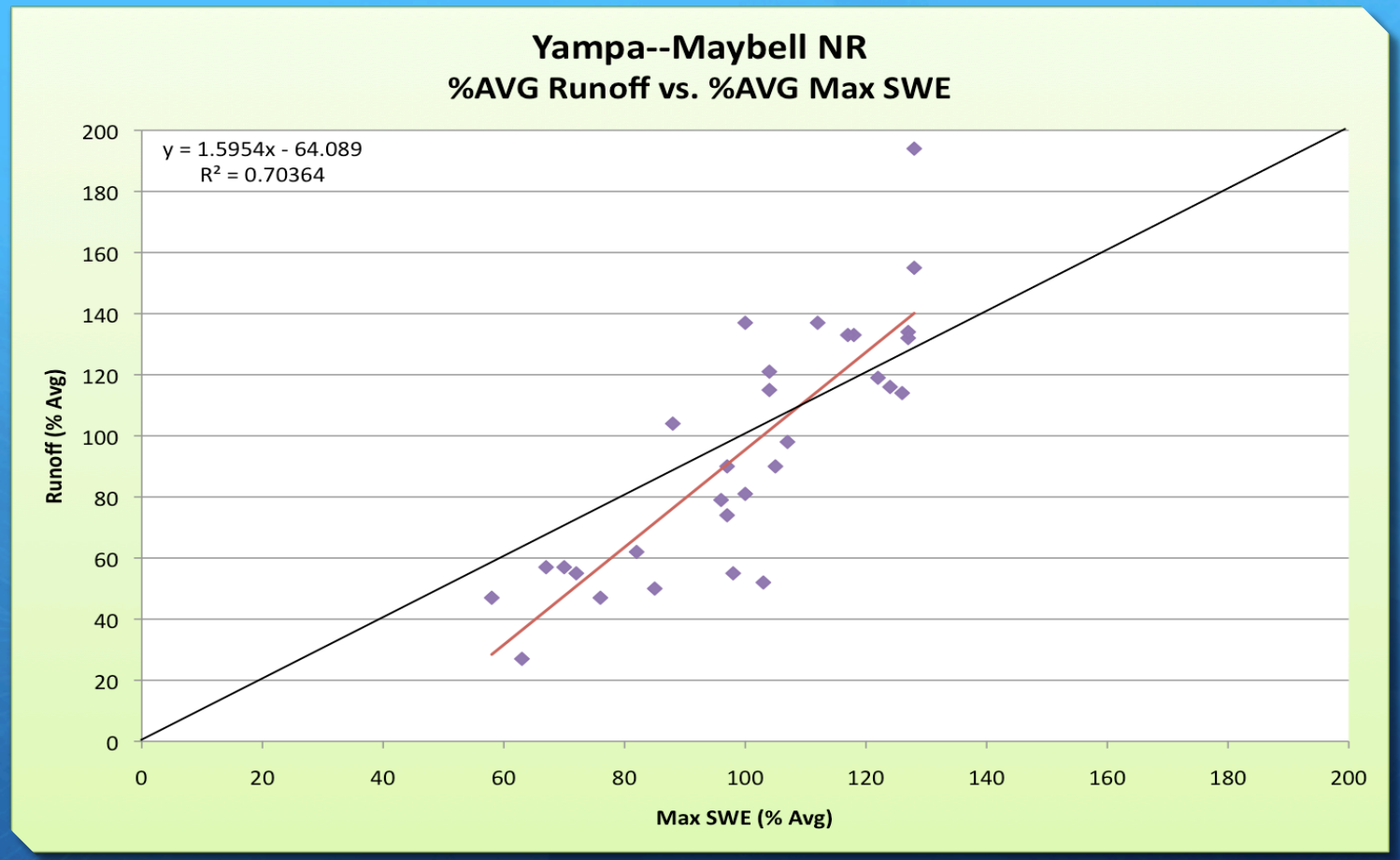


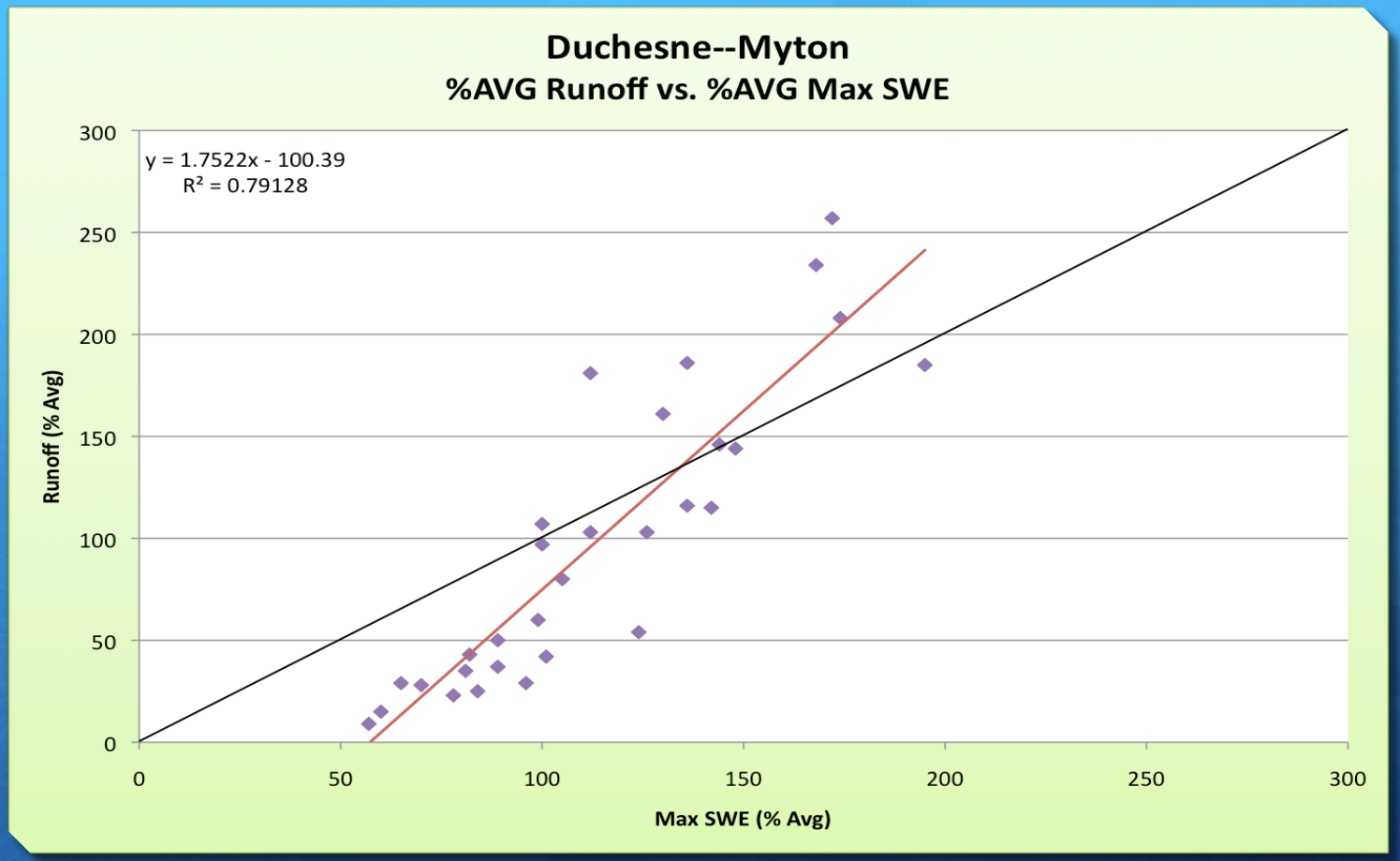
Green—Above Flaming Gorge

- 0.57421 R^2 correlation.
- 0.65992 R^2 correlation without 1983 .



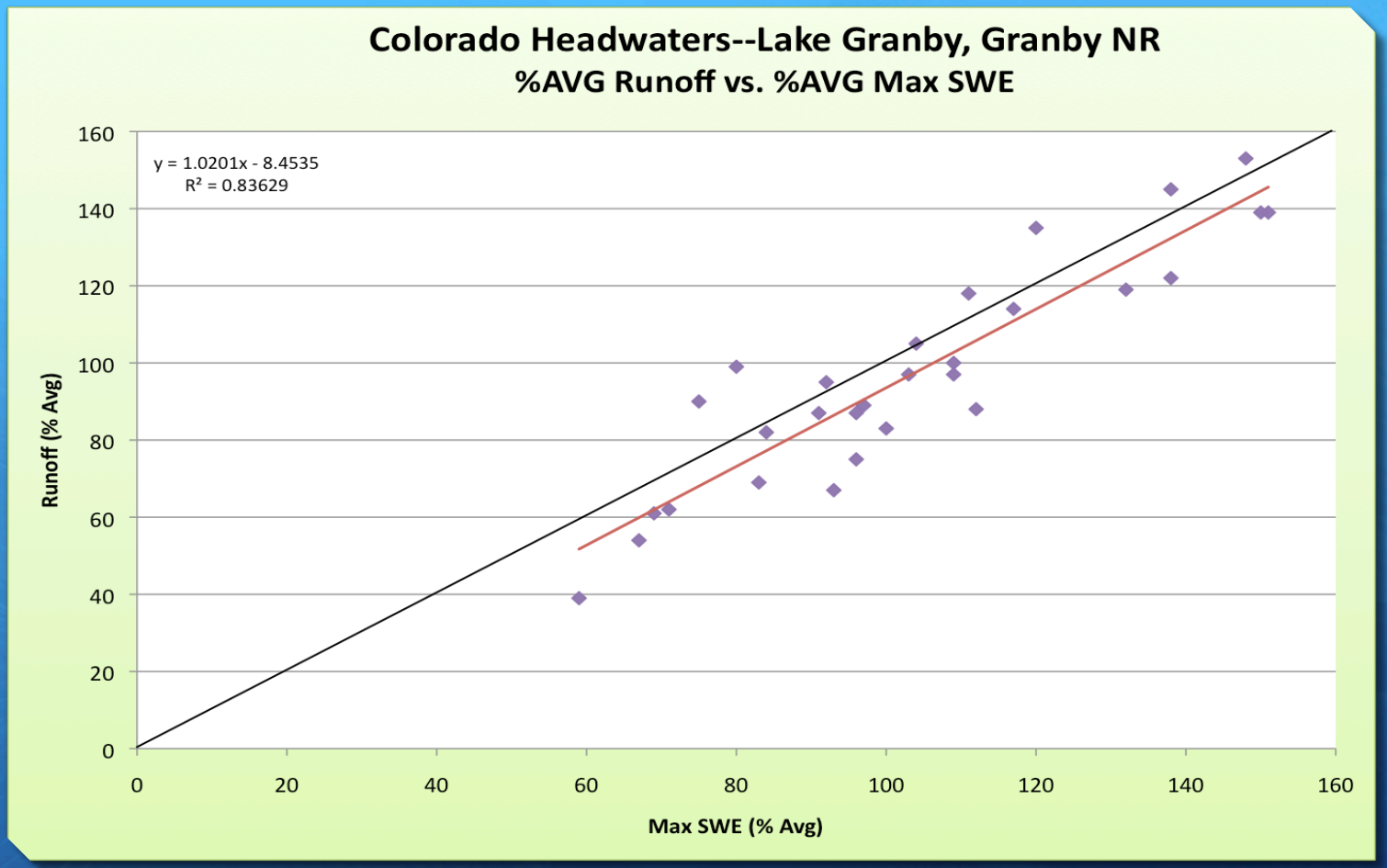
Yampa—Maybell NR

- 0.70364 R^2 correlation.



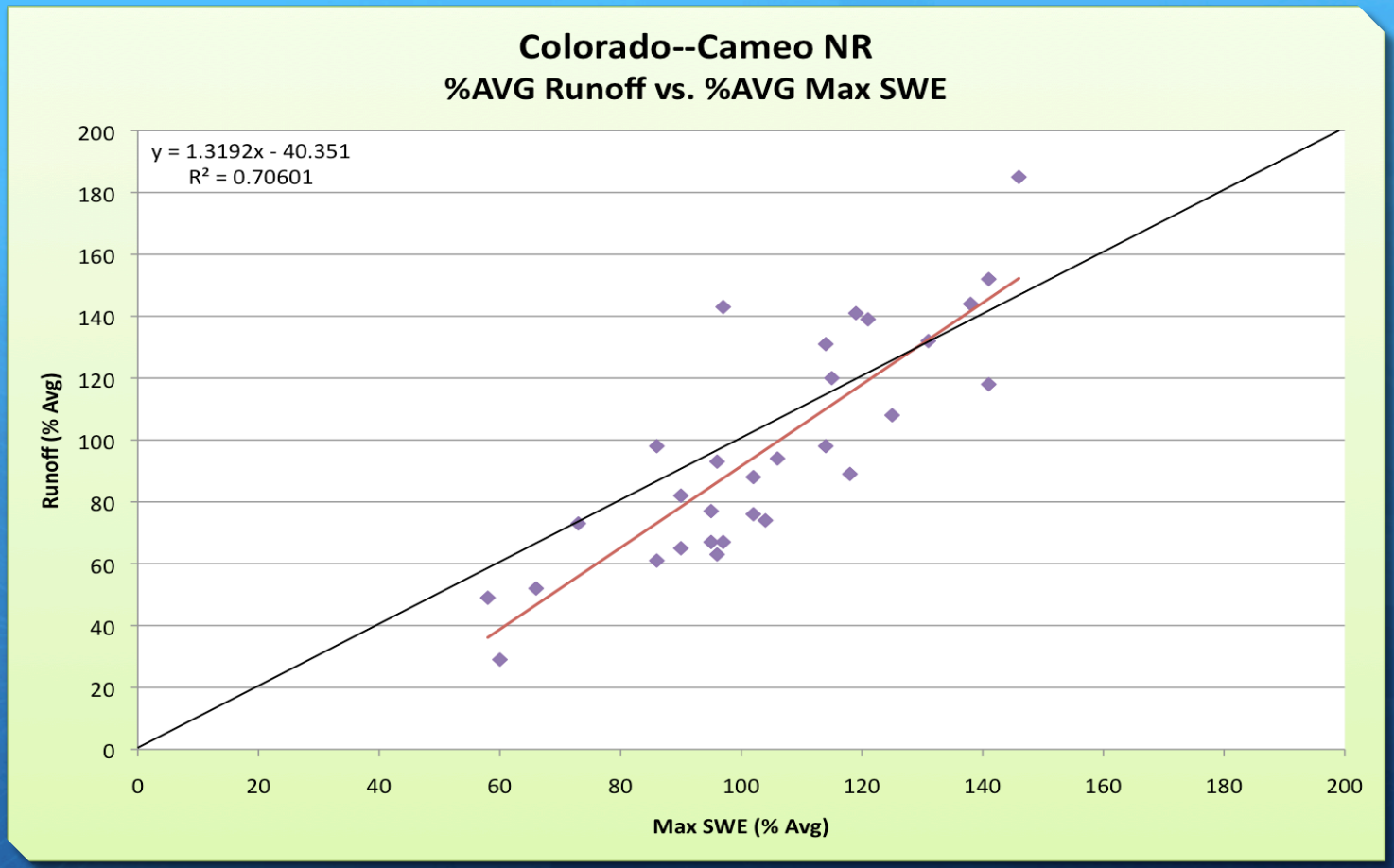
Duchesne—Myton

- 0.79128 R^2 correlation



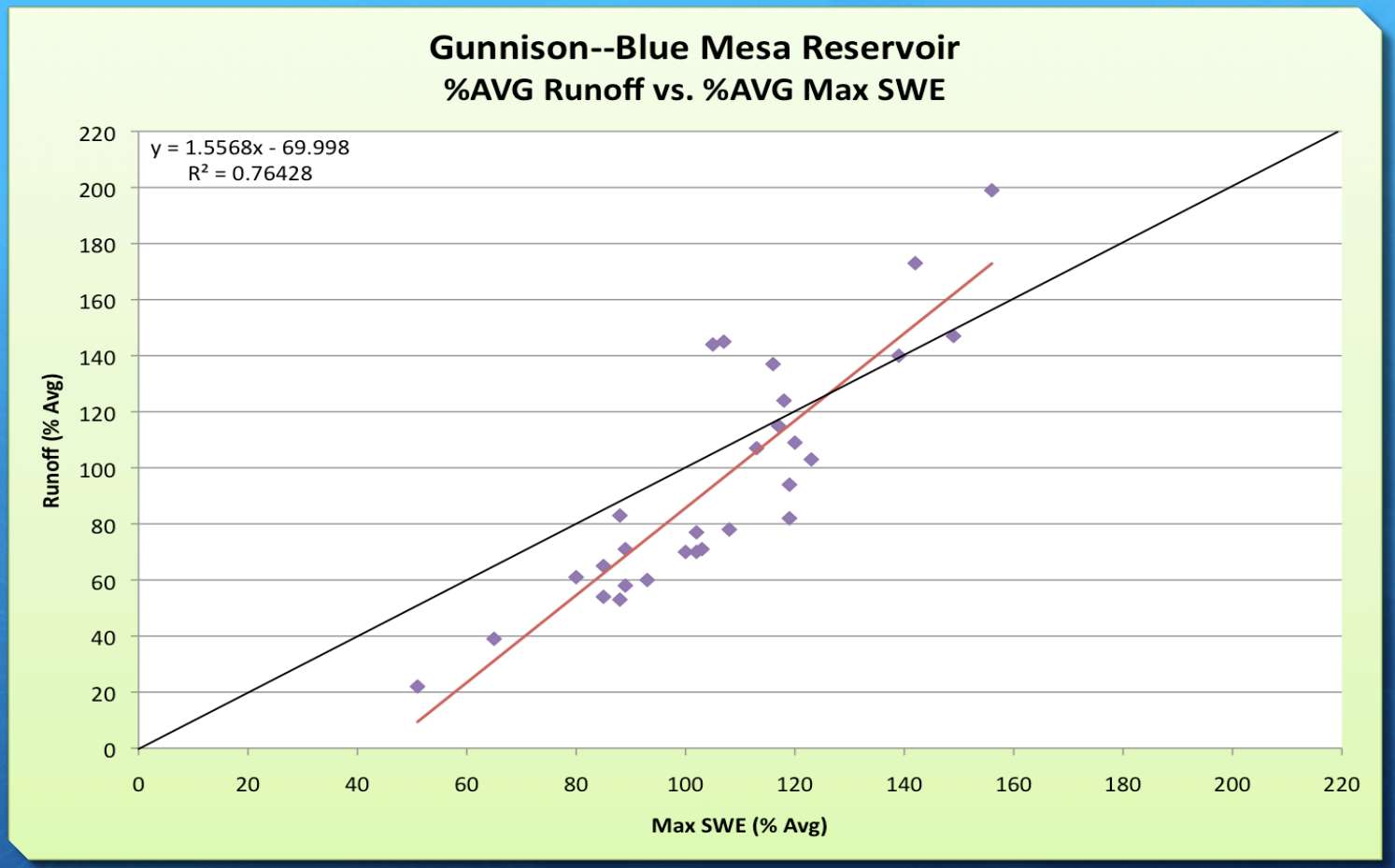
Colorado—Lake Granby, Granby NR

- 0.83629 R^2 correlation



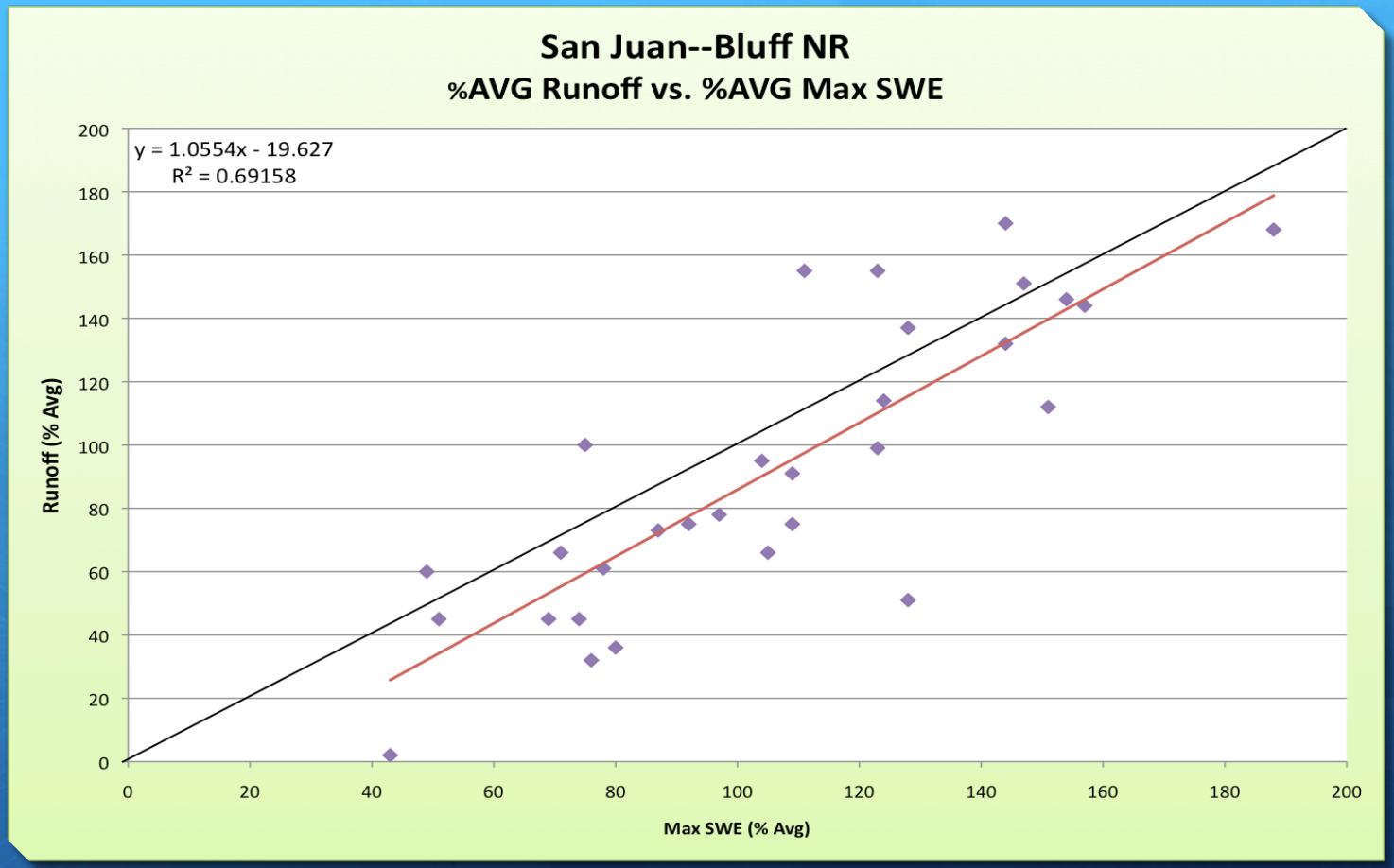
Colorado—Cameo NR

- 0.70601 R^2 correlation.



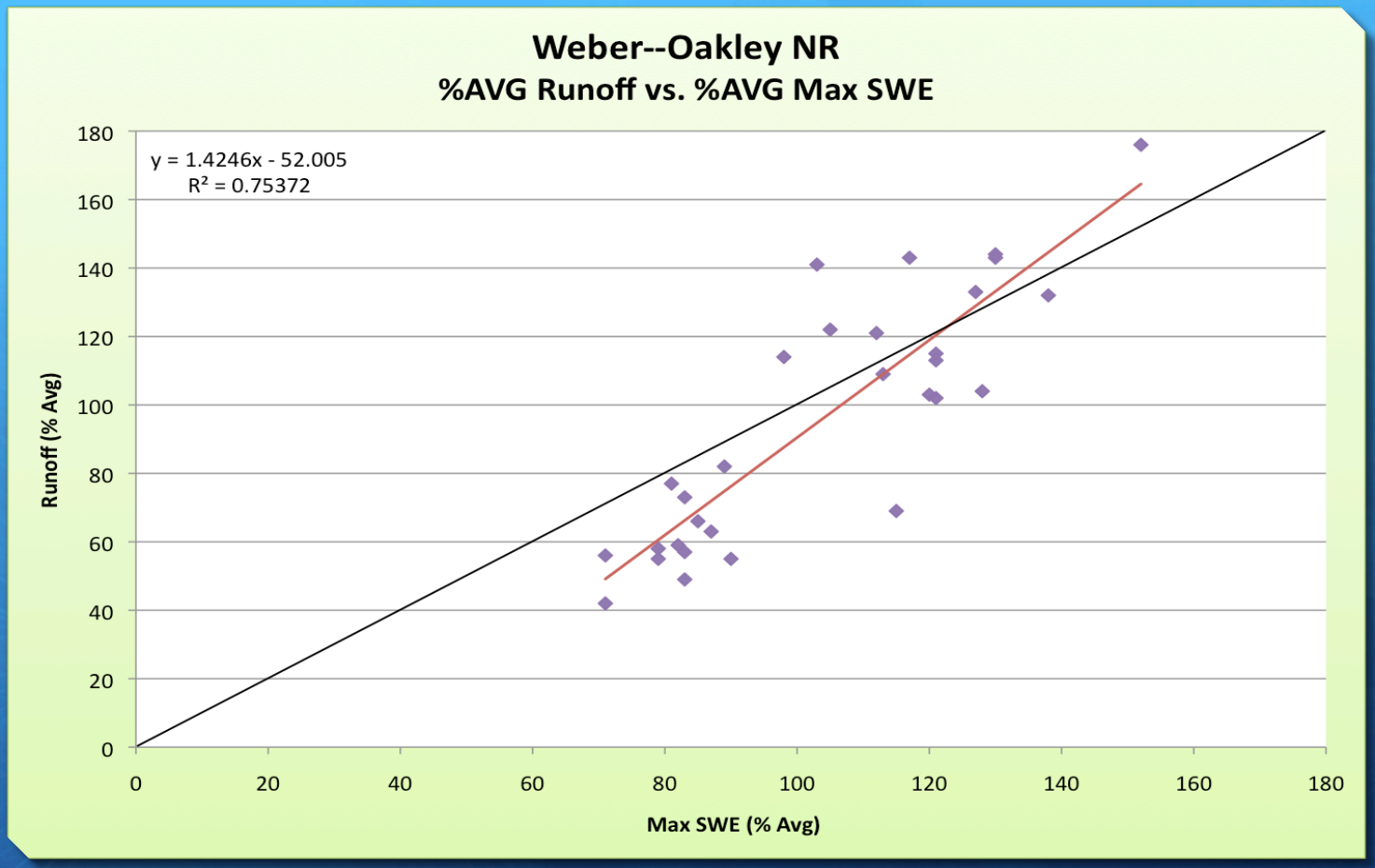
Gunnison—Blue Mesa Reservoir

- 0.76428 R^2 correlation.



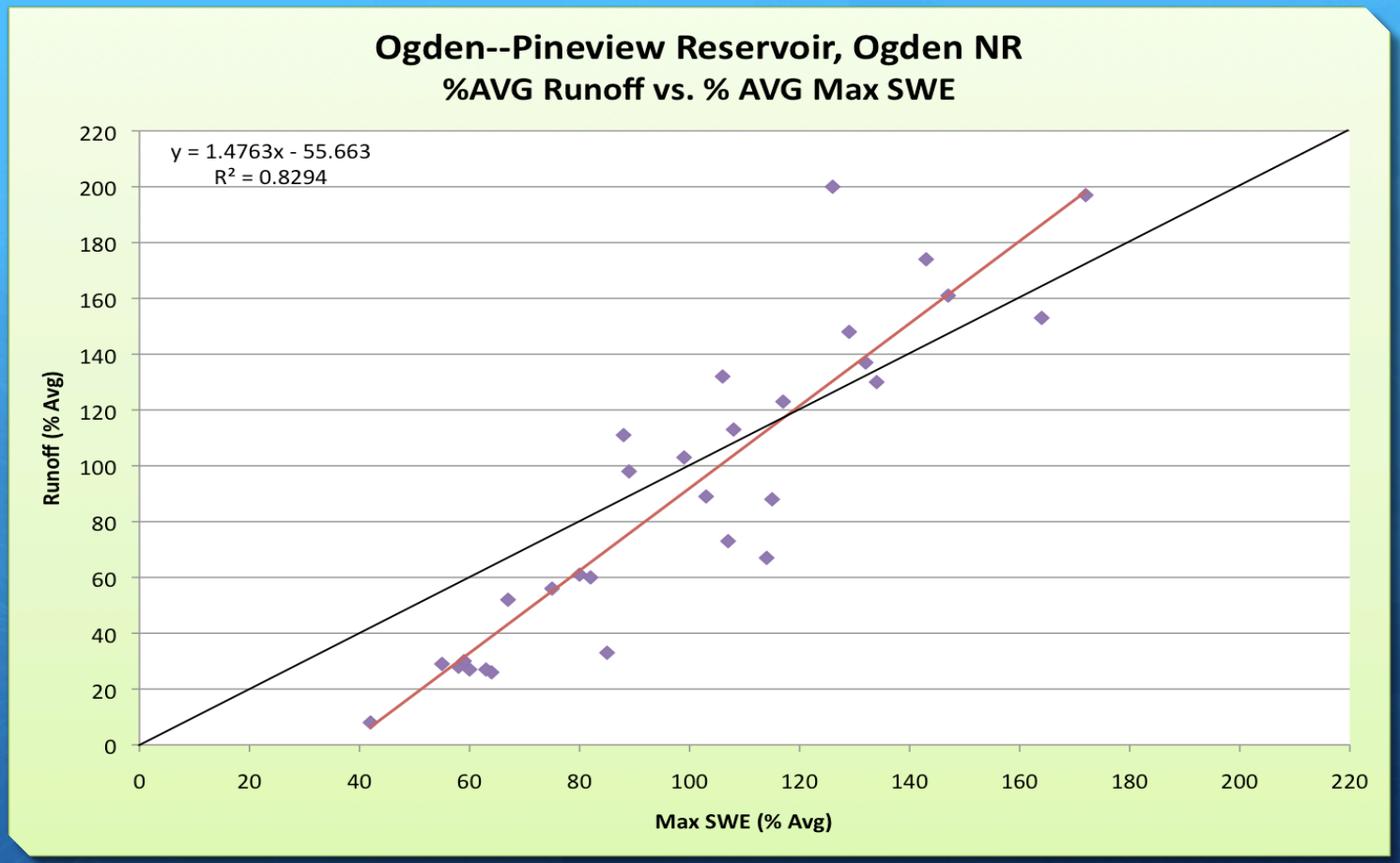
San Juan—Bluff NR

- 0.69158 R^2 correlation.



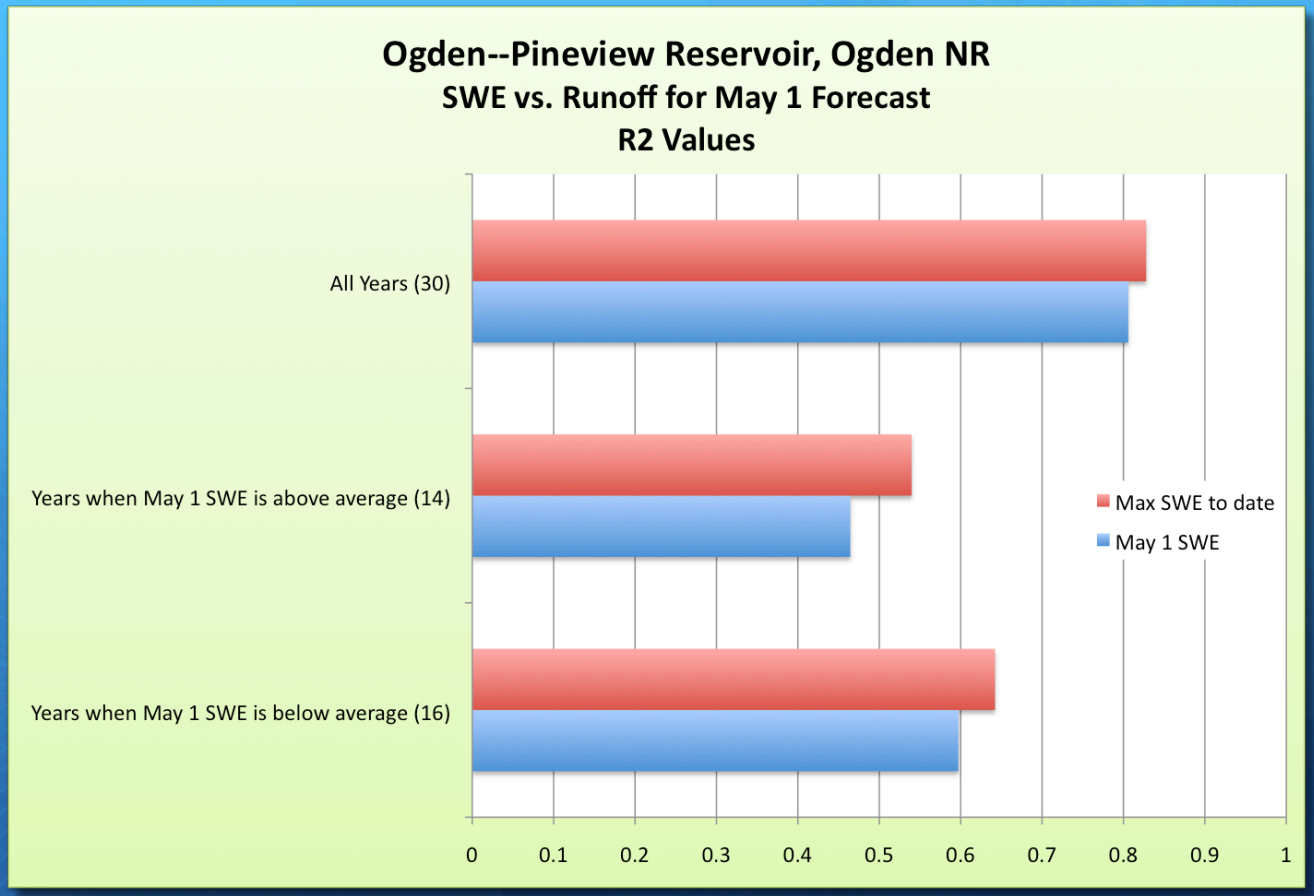
Weber—Oakley NR

- 0.75372 R^2 correlation.

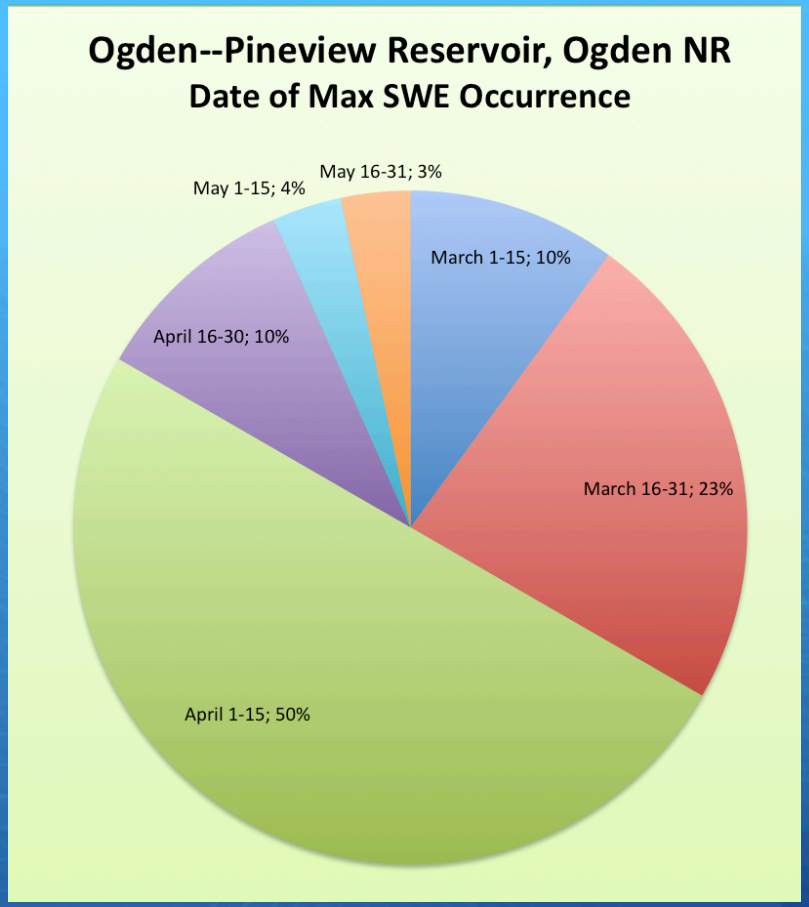


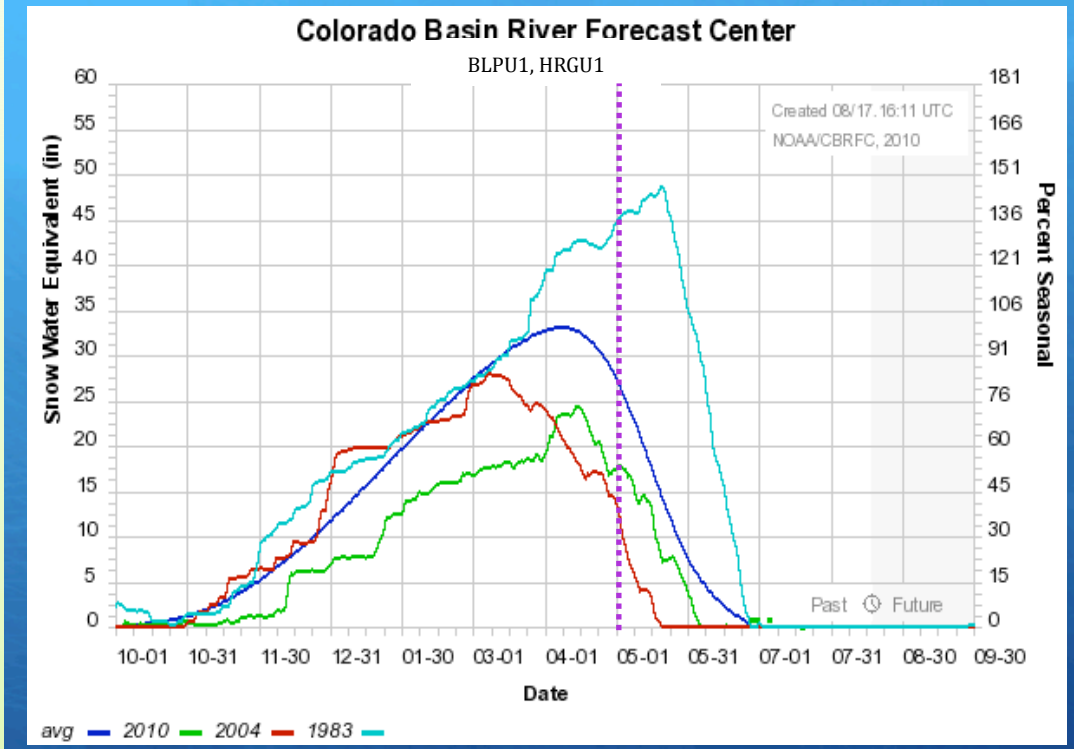
Ogden—Pineview Reservoir, Ogden NR

- 0.8294 R^2 correlation.

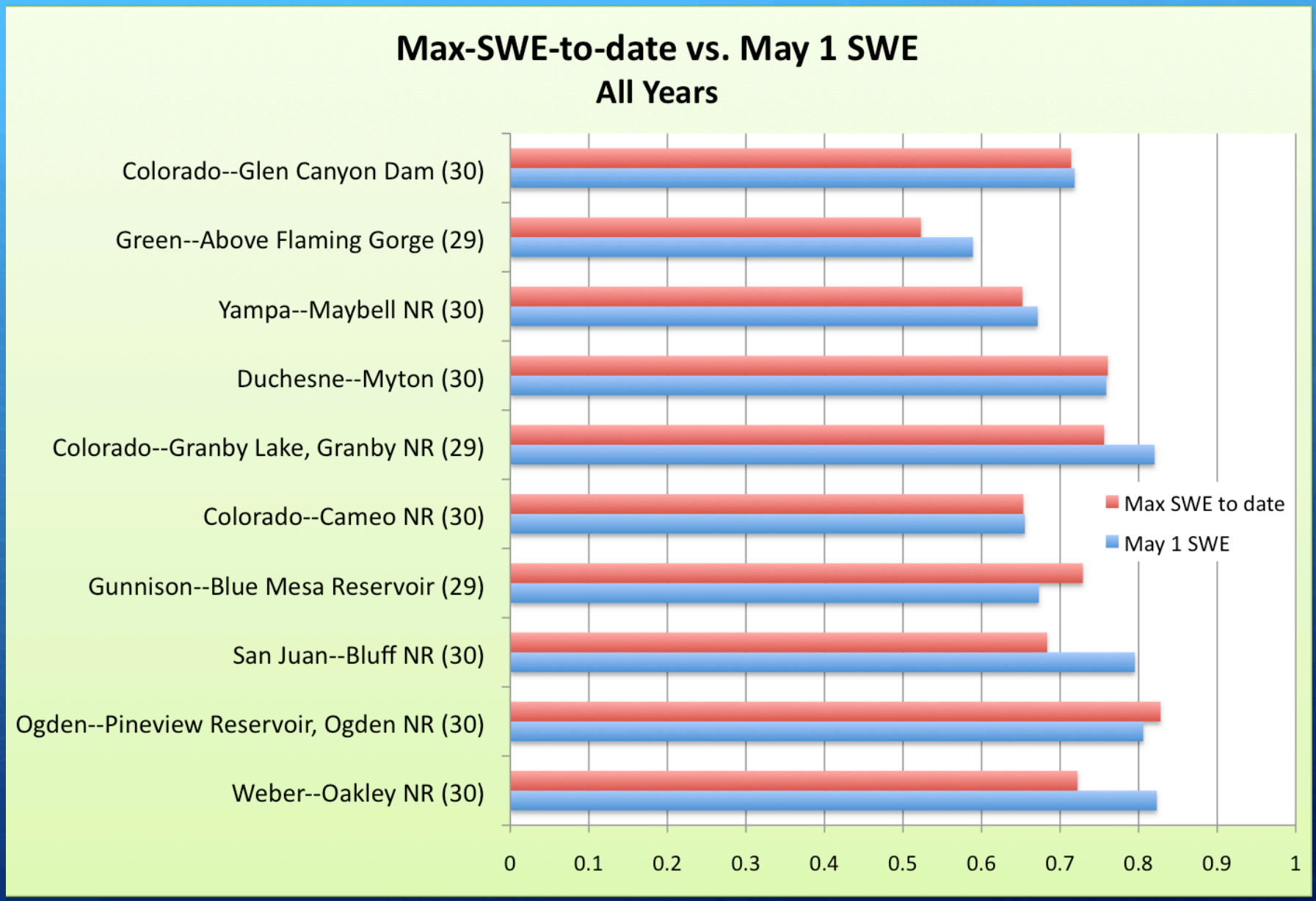


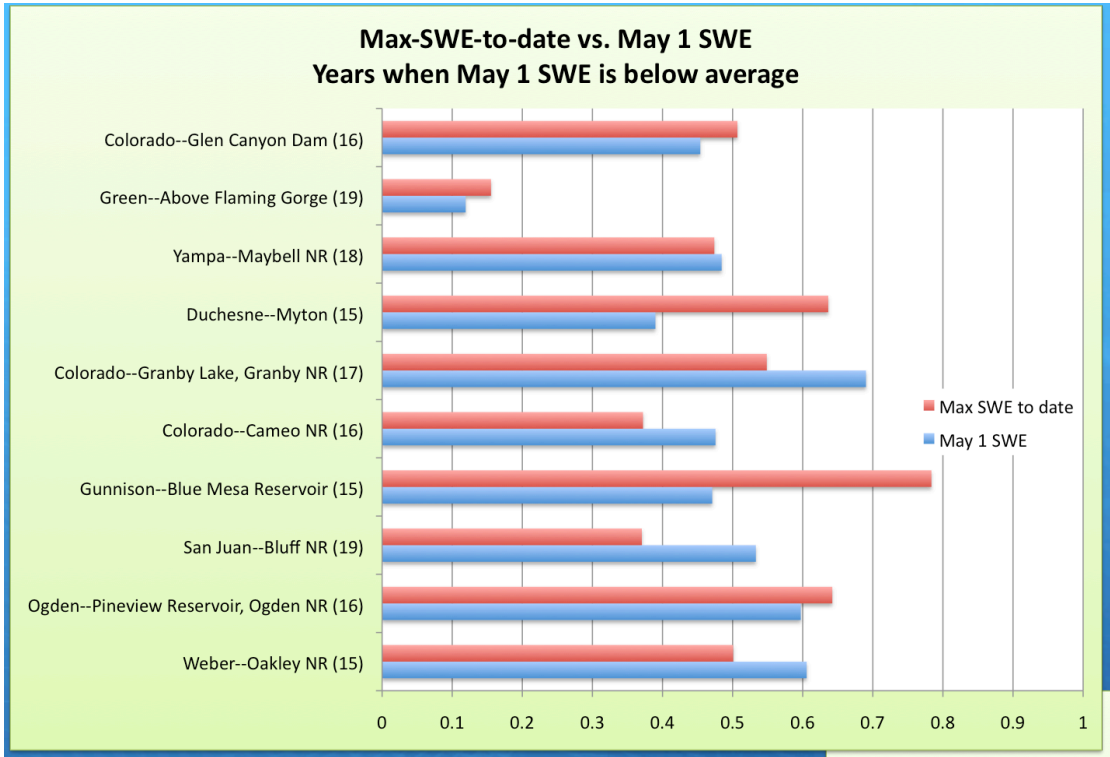
In all three scenarios, max-SWE-to-date is the better predictor of April-July runoff.

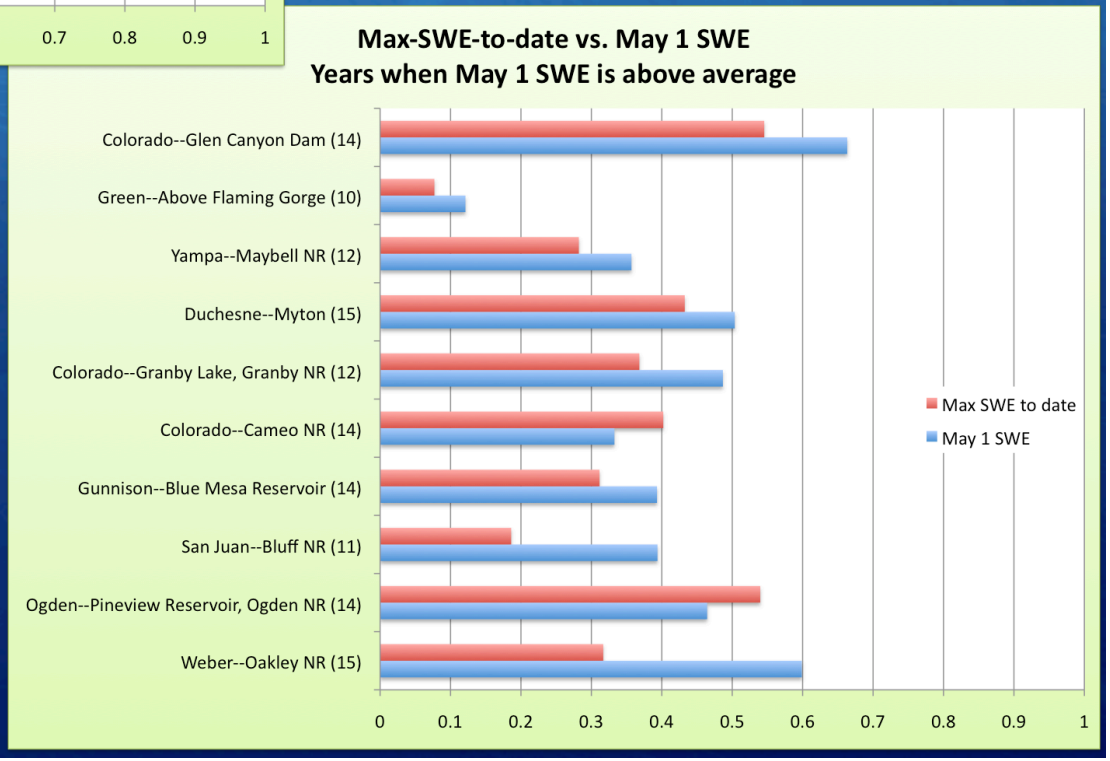




The mean date of max SWE is April 8th, approximately three weeks before May 1. Significant melt out has already occurred, thus using the May 1 SWE may underestimate the runoff volume.


Max-SWE-to-date vs. May 1 SWE
All Years
Colorado--Glen Canyon Dam (30)
Green--Above Flaming Gorge (29)
Yampa--Maybell NR (30)
Duchesne--Myton (30)
Colorado--Granby Lake, Granby NR (29)
Colorado--Cameo NR (30)
Gunnison--Blue Mesa Reservoir (29)
San Juan--Bluff NR (30)
Ogden--Pineview Reservoir, Ogden NR (30)
Weber--Oakley NR (30)
Max SWE to date
May 1 SWE
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Max-SWE-to-date vs. May 1 SWE
Years when May 1 SWE is below average
Colorado--Glen Canyon Dam (16)
Green--Above Flaming Gorge (19)
Yampa--Maybell NR (18)
Duchesne--Myton (15)
Colorado--Granby Lake, Granby NR (17)
Colorado--Cameo NR (16)
Gunnison--Blue Mesa Reservoir (15)
San Juan--Bluff NR (19)
Ogden--Pineview Reservoir, Ogden NR (16)
Weber--Oakley NR (15)
Max SWE to date
May 1 SWE
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Max-SWE-to-date vs. May 1 SWE
Years when May 1 SWE is above average
Colorado--Glen Canyon Dam (14)
Green--Above Flaming Gorge (10)
Yampa--Maybell NR (12)
Duchesne--Myton (15)
Colorado--Granby Lake, Granby NR (12)
Colorado--Cameo NR (14)
Gunnison--Blue Mesa Reservoir (14)
San Juan--Bluff NR (11)
Ogden--Pineview Reservoir, Ogden NR (14)
Weber--Oakley NR (15)
Max SWE to date
May 1 SWE
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

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?