SWSI Automation Project Phase II

Water Availability Task Force

July 22, 2015

Open Water Foundation

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

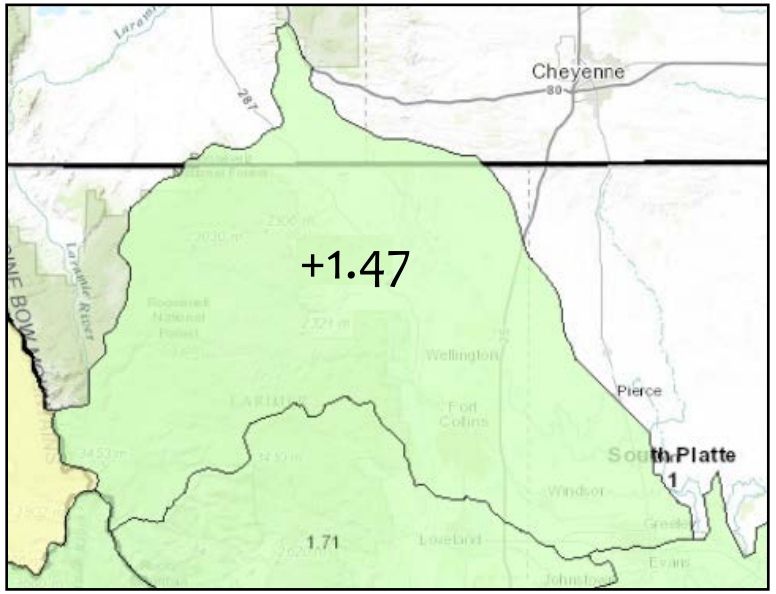
COLORADO
Division of Water Resources
Department of Natural Resources

Surface Water Supply Index

* May SWSI Example:

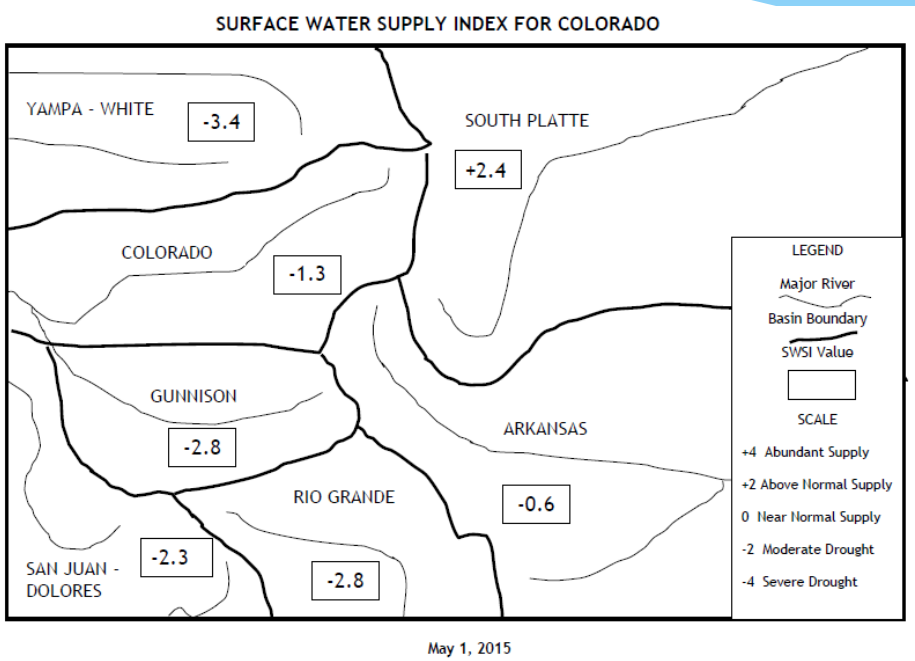
Year	Volume* of water in HUC	NEP
1999	460,388	76.12
1996	453,066	73.63
1974	440,361	71.14
2015	429,100	Interpolation: 70.19
1979	411,037	68.66
1998	396,116	66.17
1993	394,651	63.68

$$SWSI = \frac{NEP - 50}{12}$$

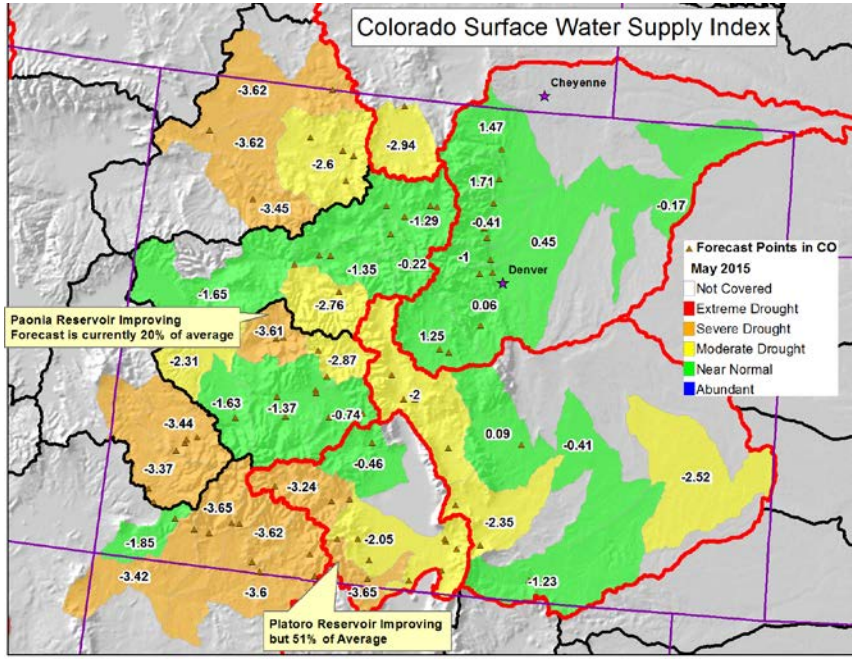


*Volume = Reservoir Storage + Forecasted Runoff

A brief history



COLORADO DROUGHT MITIGATION AND RESPONSE PLAN



SWSI Automation Project

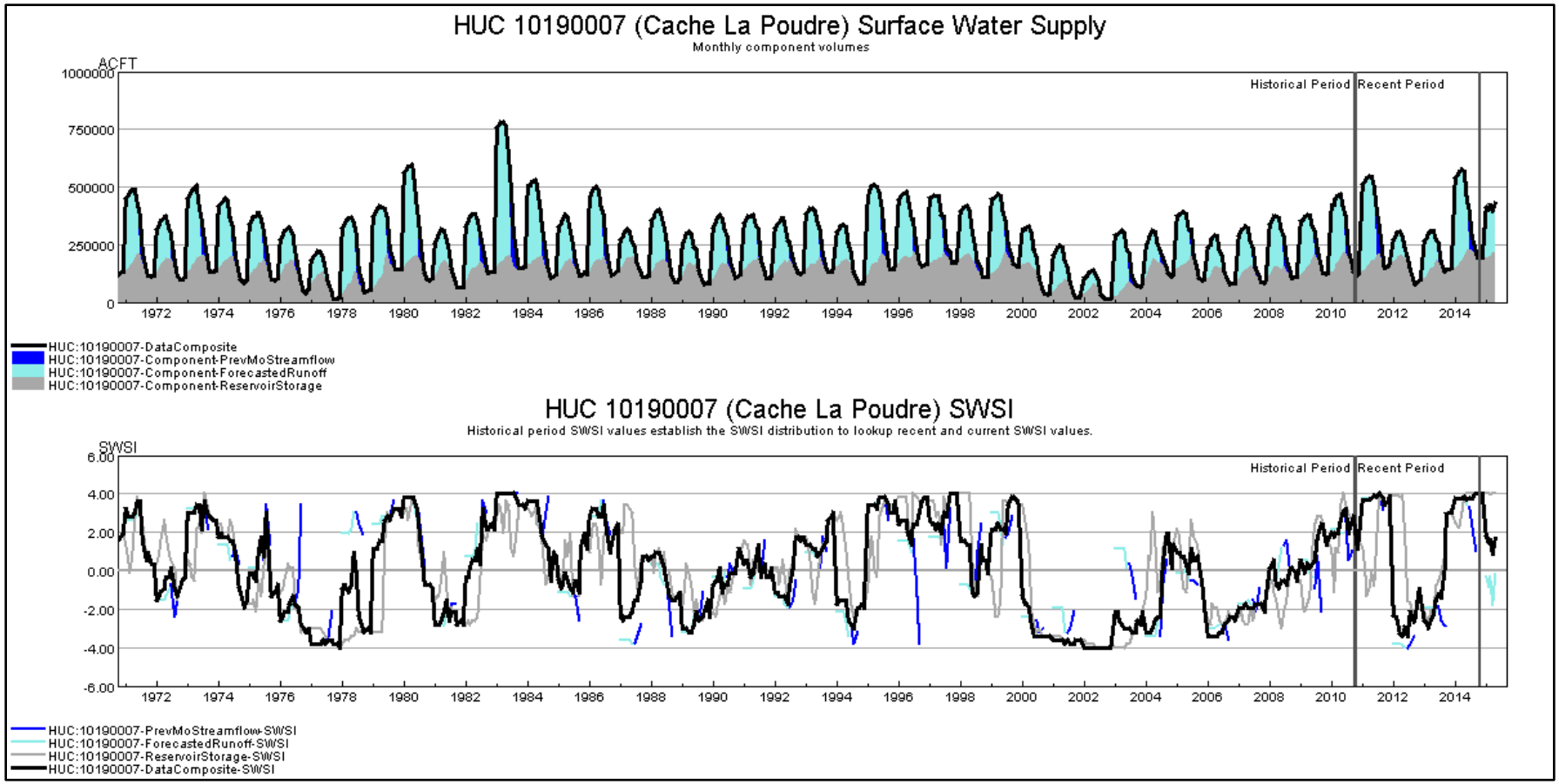
* Goal: Utilize TSTool to run SWSI calculations for Colorado through a transparent, automated process
* Phase I: Completed Summer 2014
  * TSTool program that closely mirrored existing excel spreadsheets
  * Lessons learned: Need greater ability to handle input data issues
* Phase II: Completed Summer 2015
  * Tools to address data input issues
  * User-friendly operating environment
  * Enhanced program verifications/checks
  * Enhanced output files

SWSI TSTool Process

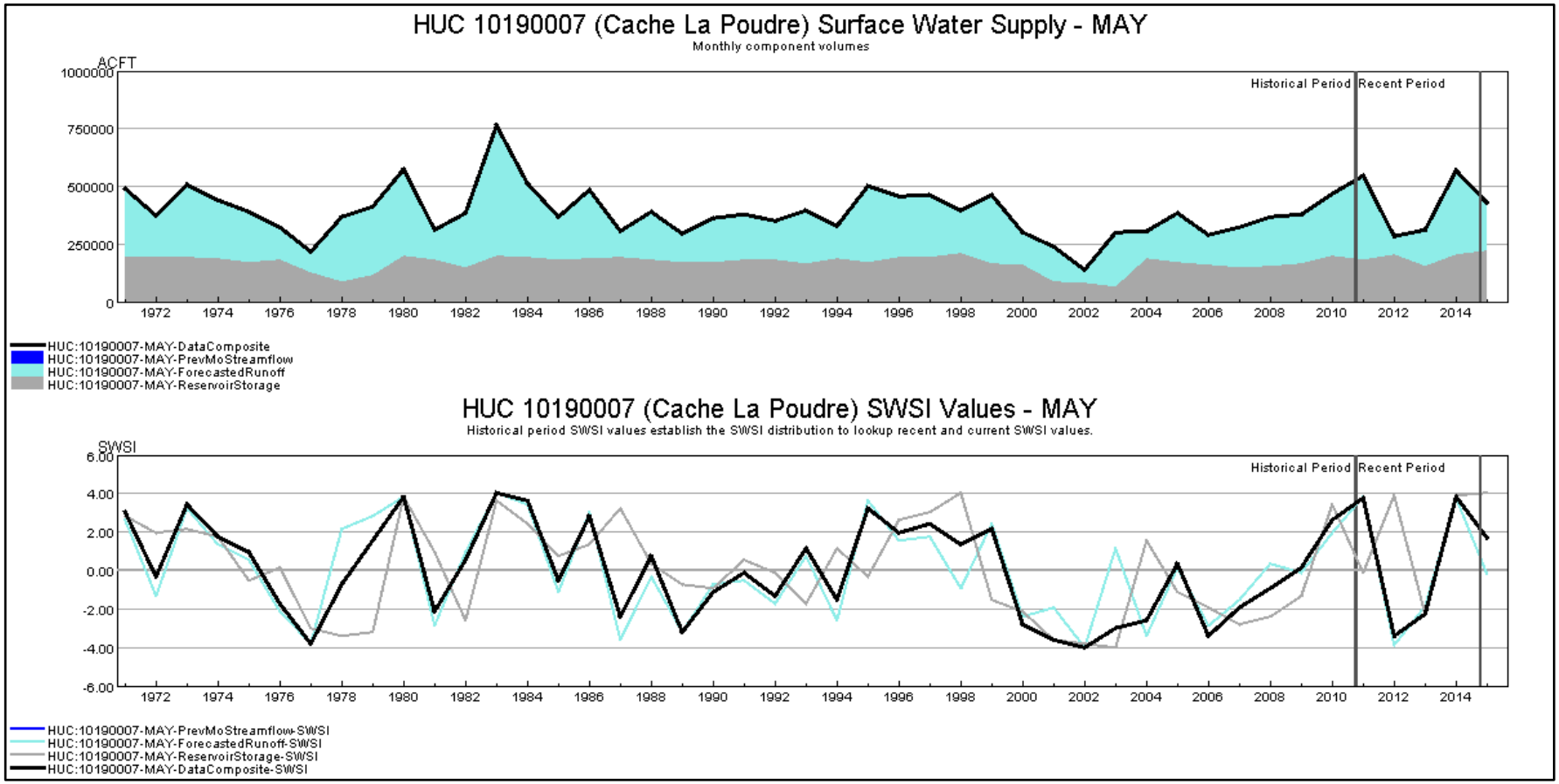
* Analysis parameters set in Excel workbook
* Bring in data from AWDB and DWR sources
* Series of data checks and fill steps to obtain complete data set. All data fills/manipulations are tracked.
* Calculate SWSI based on 2010 Drought Plan directive for HUC8 and HUC12 (Division wide) watersheds
* Create output files that can be used for reports and integration into Hydrobase, CIM, and CDSS Map Viewer

Time Period	Components
January - June	Forecasted Runoff + Reservoir Storage
July - September	Previous Month's Streamflow + Reservoir Storage
October - December	Reservoir Storage

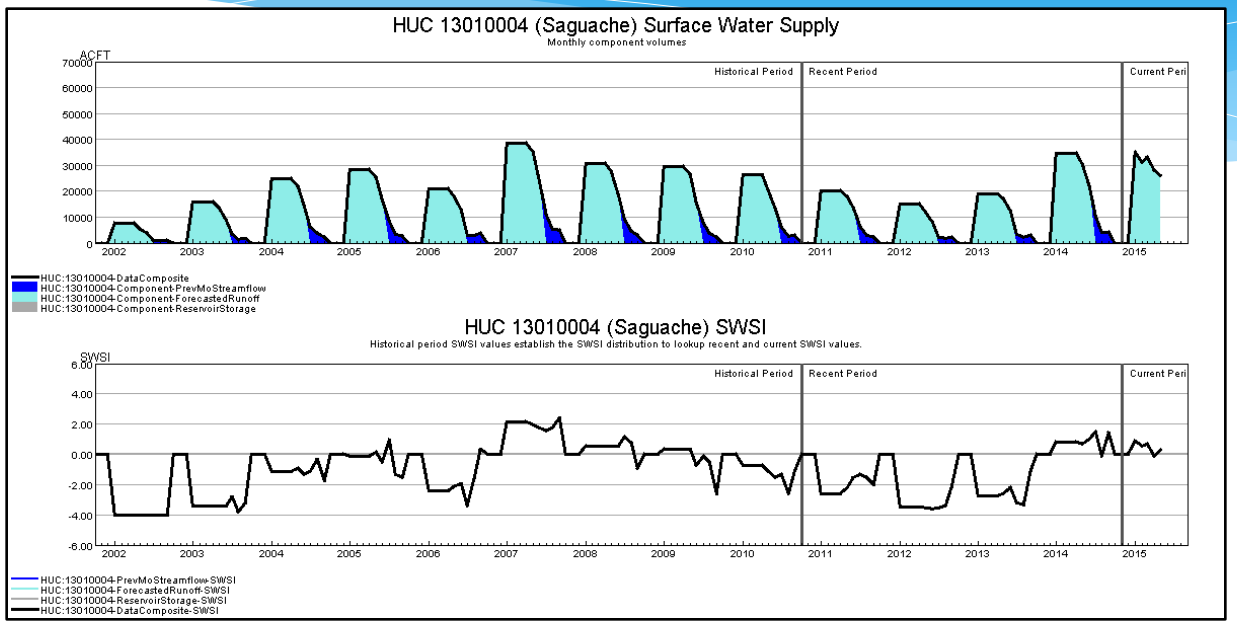
Results

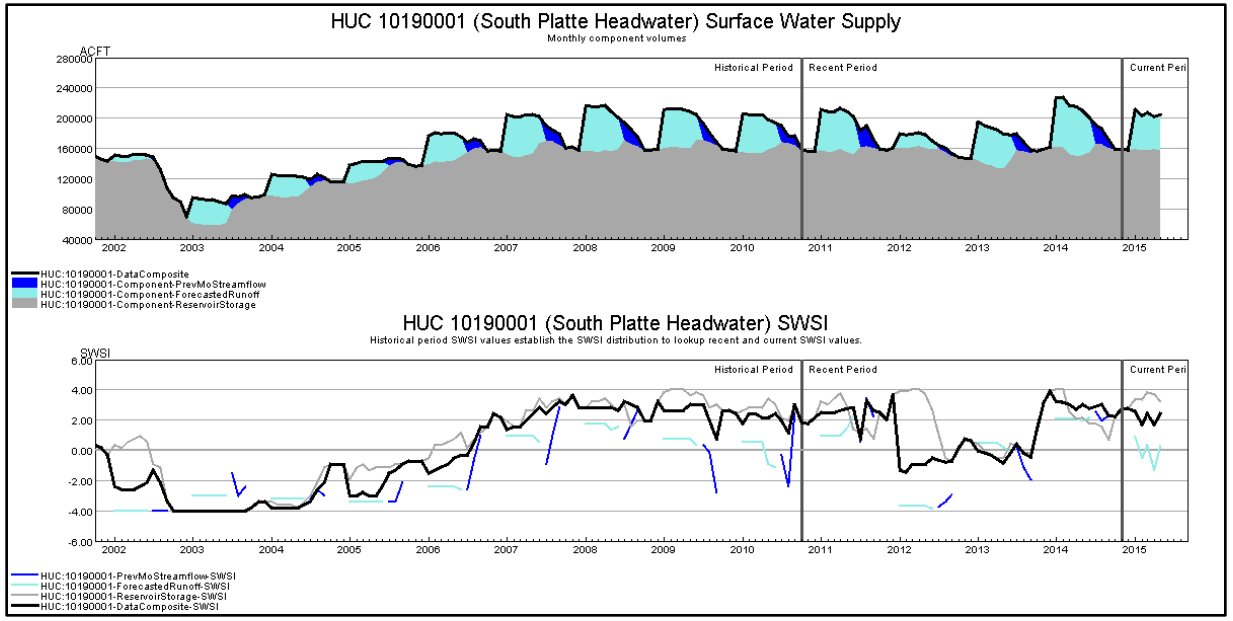

HUC 10190007 (Cache La Poudre) Surface Water Supply
Monthly component volumes
ACFT
1000000
750000
500000
250000
0
Historical Period
Recent Period
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
HUC:10190007-DataComposite
HUC:10190007-Component-PrevMoStreamflow
HUC:10190007-Component-ForecastedRunoff
HUC:10190007-Component-ReservoirStorage
HUC 10190007 (Cache La Poudre) SWSI
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
Historical Period
Recent Period
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
HUC:10190007-PrevMoStreamflow-SWSI
HUC:10190007-ForecastedRunoff-SWSI
HUC:10190007-ReservoirStorage-SWSI
HUC:10190007-DataComposite-SWSI

Results

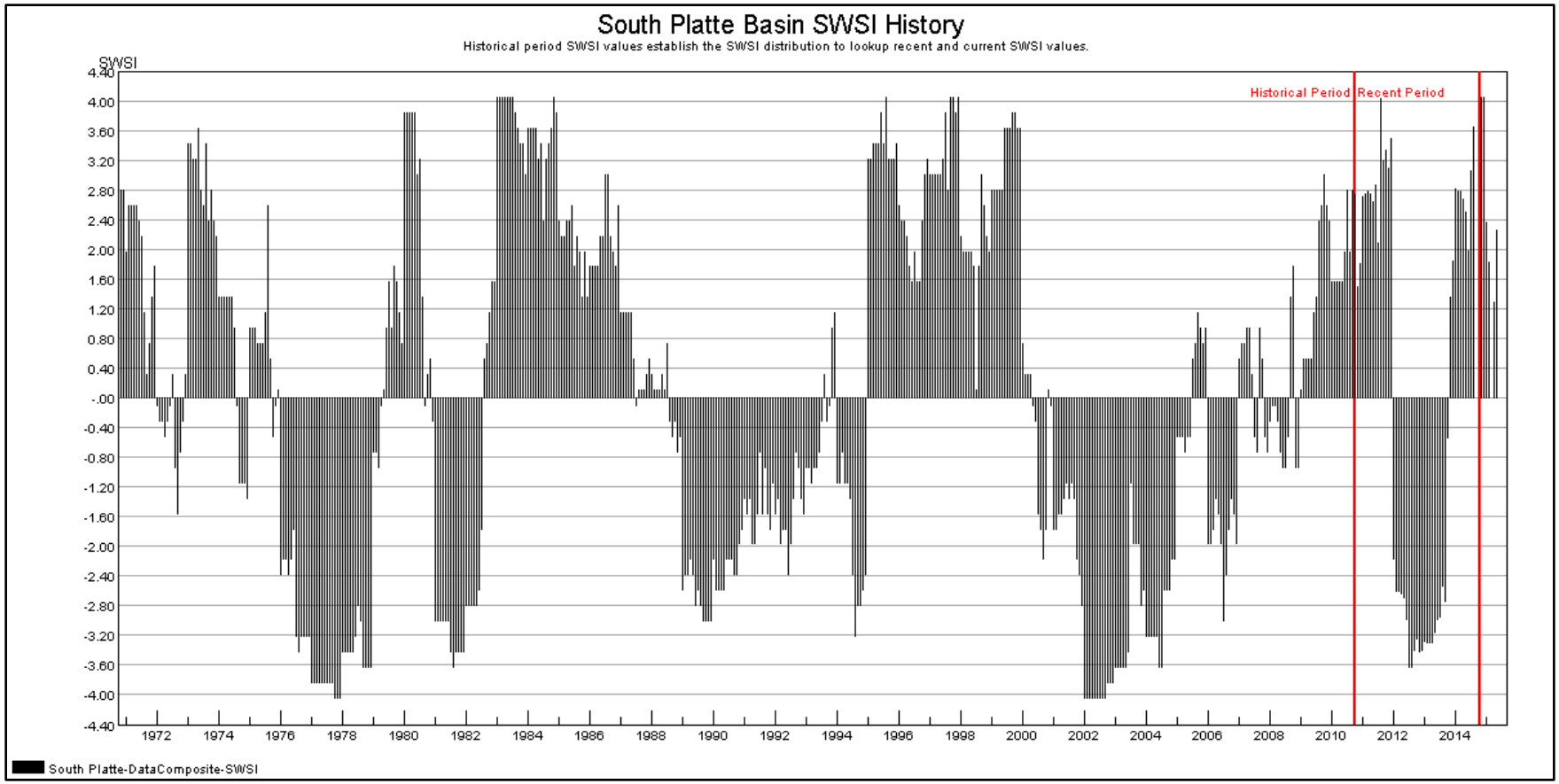

HUC 10190007 (Cache La Poudre) Surface Water Supply - MAY
Monthly component volumes
ACFT
1000000
750000
500000
250000
0
Historical Period
Recent Period
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
HUC:10190007-MAY-DataComposite
HUC:10190007-MAY-PrevMoStreamflow
HUC:10190007-MAY-ForecastedRunoff
HUC:10190007-MAY-ReservoirStorage
HUC 10190007 (Cache La Poudre) SWSI Values - MAY
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
Historical Period
Recent Period
HUC:10190007-MAY-PrevMoStreamflow-SWSI
HUC:10190007-MAY-ForecastedRunoff-SWSI
HUC:10190007-MAY-ReservoirStorage-SWSI
HUC:10190007-MAY-DataComposite-SWSI

Results

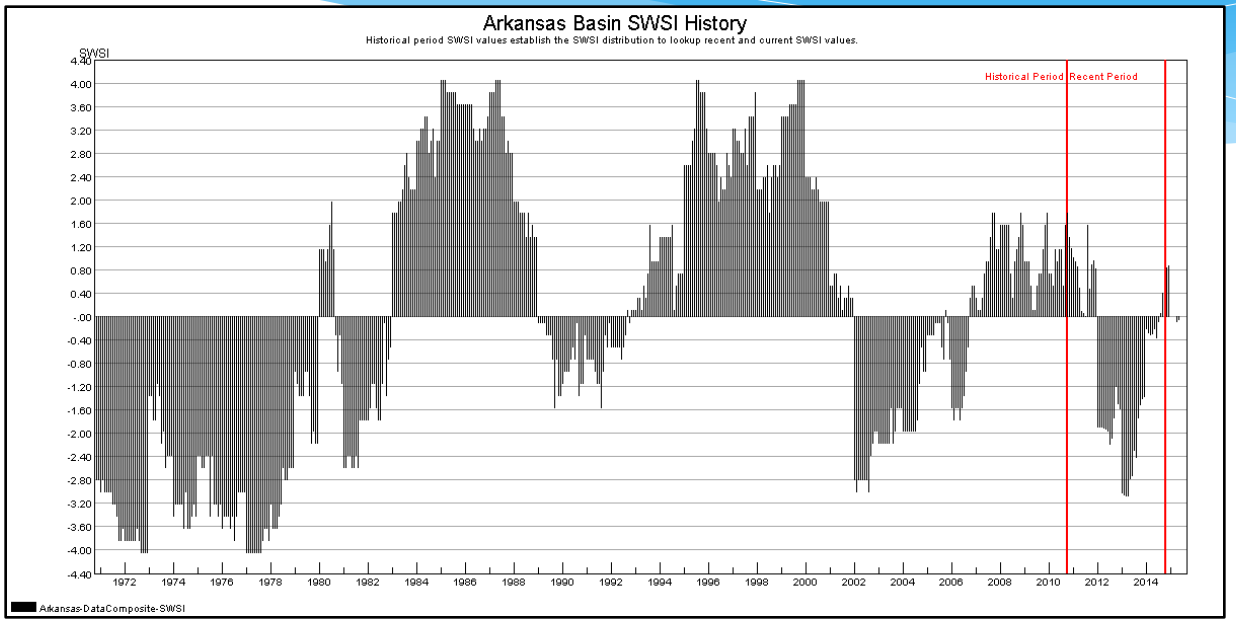

HUC 13010004 (Saguache) Surface Water Supply
Monthly component volumes
ACFT
70000
60000
50000
40000
30000
20000
10000
0
Historical Period
Recent Period
Current Peri
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
HUC:13010004-DataComposite
HUC:13010004-Component-PrevMoStreamflow
HUC:13010004-Component-ForecastedRunoff
HUC:13010004-Component-ReservoirStorage
HUC 13010004 (Saguache) SWSI
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
HUC:13010004-PrevMoStreamflow-SWSI
HUC:13010004-ForecastedRunoff-SWSI
HUC:13010004-ReservoirStorage-SWSI
HUC:13010004-DataComposite-SWSI


HUC 10190001 (South Platte Headwater) Surface Water Supply
Monthly component volumes
ACFT
280000
240000
200000
160000
120000
80000
40000
Historical Period
Recent Period
Current Peri
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
HUC:10190001-DataComposite
HUC:10190001-Component-PrevMoStreamflow
HUC:10190001-Component-ForecastedRunoff
HUC:10190001-Component-ReservoirStorage
HUC 10190001 (South Platte Headwater) SWSI
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
HUC:10190001-PrevMoStreamflow-SWSI
HUC:10190001-ForecastedRunoff-SWSI
HUC:10190001-ReservoirStorage-SWSI
HUC:10190001-DataComposite-SWSI

Results


South Platte Basin SWSI History
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
Historical Period
Recent Period
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
-.00
-0.40
-0.80
-1.20
-1.60
-2.00
-2.40
-2.80
-3.20
-3.60
-4.00
-4.40
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
South Platte-DataComposite-SWSI

Results


Arkansas Basin SWSI History
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
Historical Period
Recent Period
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
-.00
-0.40
-0.80
-1.20
-1.60
-2.00
-2.40
-2.80
-3.20
-3.60
-4.00
-4.40
1972
1974
1976
1978
1980
1982
1984
1986
1988
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1992
1994
1996
1998
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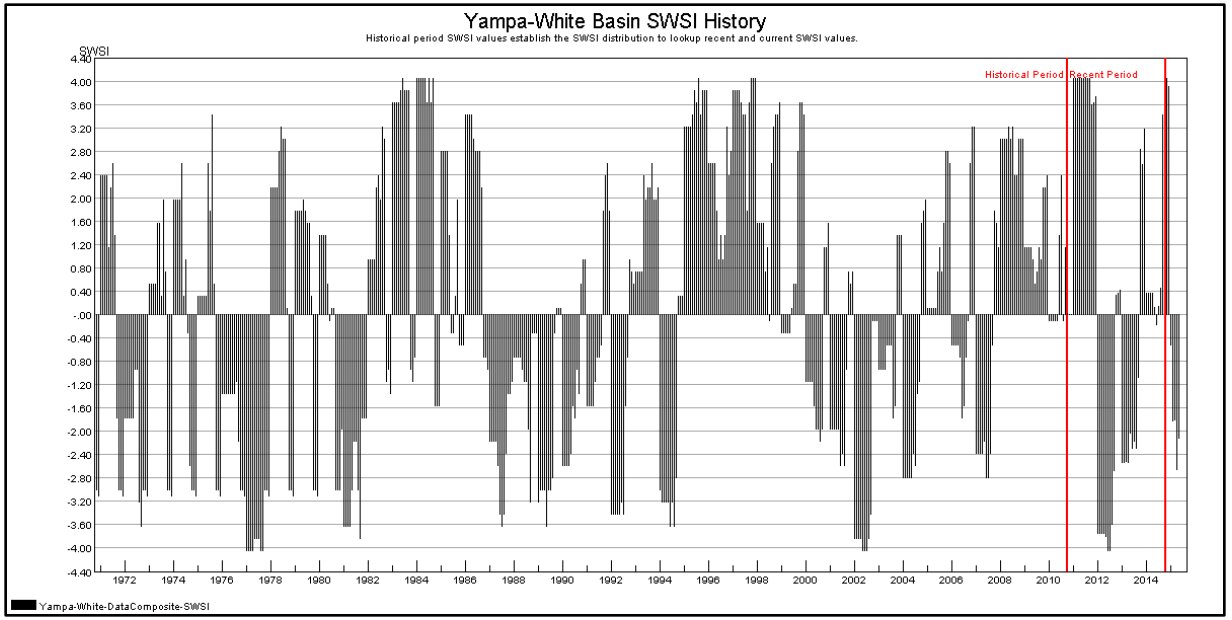
2002
2004
2006
2008
2010
2012
2014
Arkansas-DataComposite-SWSI


Yampa-White Basin SWSI History
Historical period SWSI values establish the SWSI distribution to lookup recent and current SWSI values.
SWSI
Historical Period
Recent Period
4.40
4.00
3.60
3.20
2.80
2.40
2.00
1.60
1.20
0.80
0.40
-.00
-0.40
-0.80
-1.20
-1.60
-2.00
-2.40
-2.80
-3.20
-3.60
-4.00
-4.40
1972
1974
1976
1978
1980
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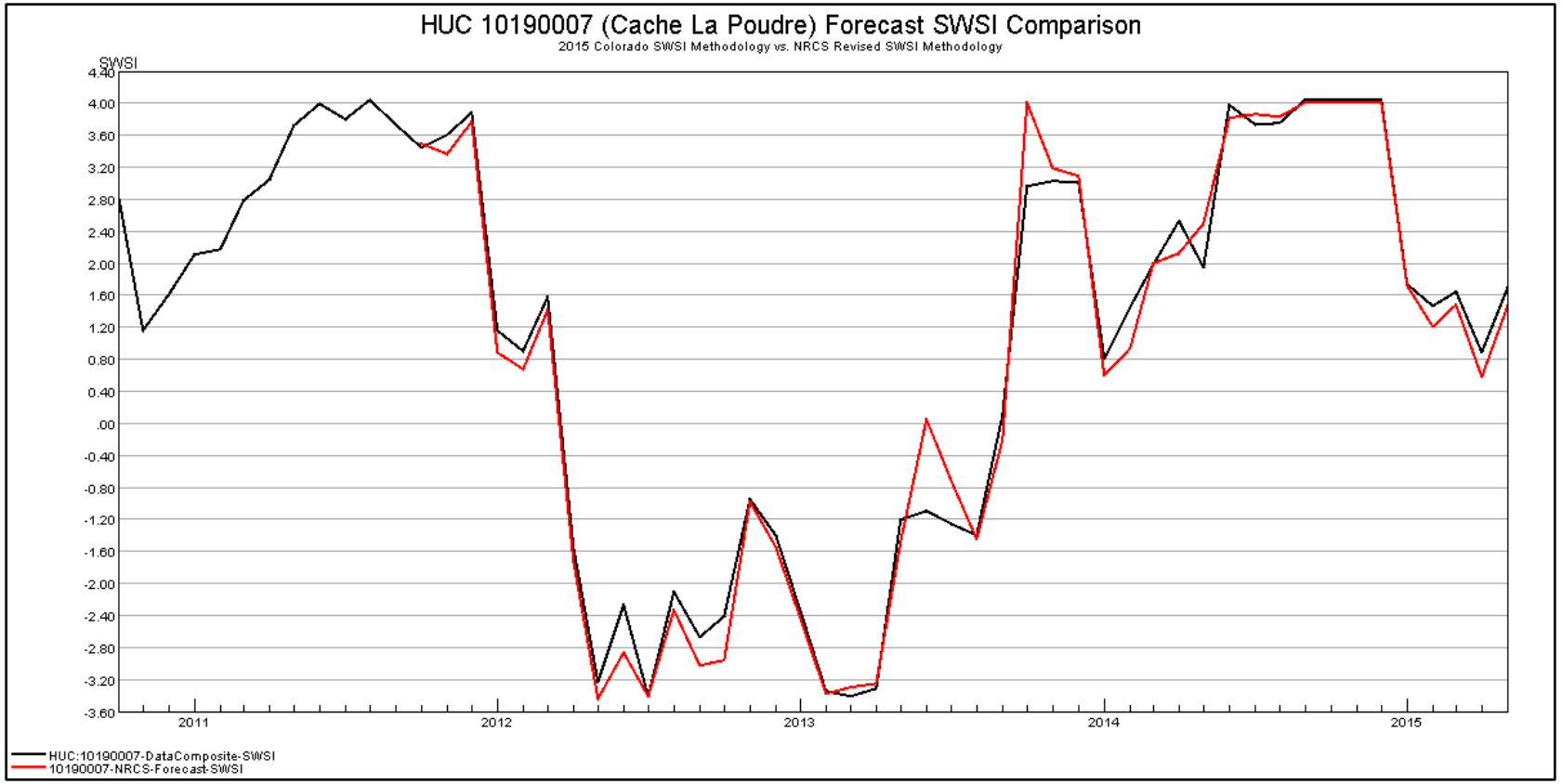
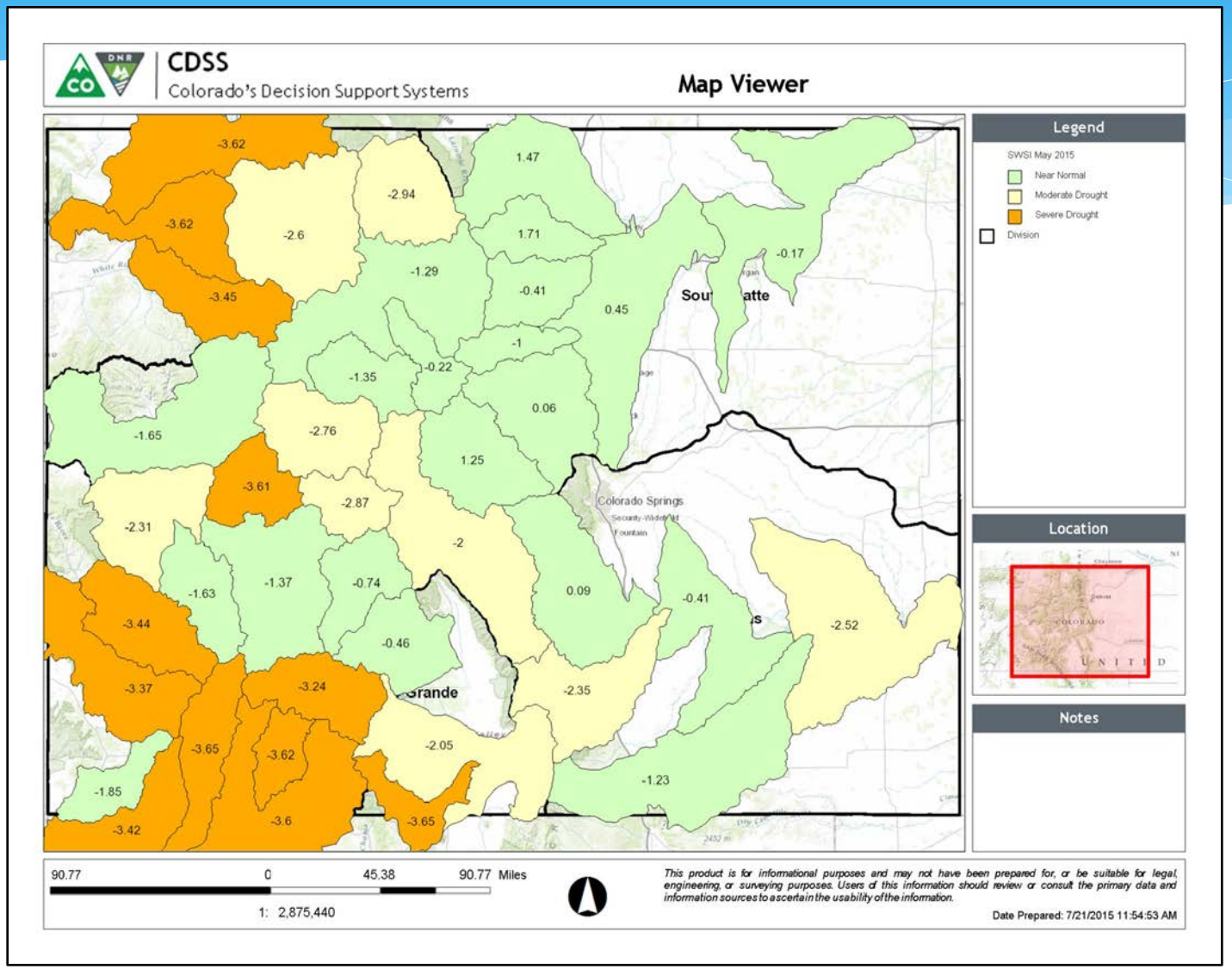
2012
2014
Yampa-White-DataComposite-SWSI

Program Verification



Automated SWSI Tool Highlights



Next Steps

* Work with NRCS to redefine how we present the SWSI to the WATF
* Integrate SWSI results into Hydrobase, CIM, MapViewer, and Laserfiche
* WATF: Propose that DWR retire the old SWSI calculation
* WATF: Propose that we present the SWSI using NEP instead of +4/-4 index

Questions?

Special thanks to:

- Open Water Foundation
- Riverside Technology, Inc
- NRCS Snow Survey Colorado
- NRCS National Water and Climate Center
- Northern Water
- Denver Water