

System Administrator

From: Aycock, Gordon L <GAycock@usbr.gov>
Sent: Tuesday, August 17, 2010 8:50 AM
To: Barfield, David
Attachments: 2009-11-30_Forecasting_Republican_Water_Supply.pps; 2009-11-30_Preliminary_2009_Results_and_2010_Forecast.pps

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Forecasting Republican River Basin Water Supply



Jim Schneider

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Resources

Overview

- A simplified approach to estimating the Basin Water Supply
- A proposed approach for predicting Nebraska's water supply and water use for an upcoming dry year
- Incorporating this forecast into the Compact Compliance flowcharts

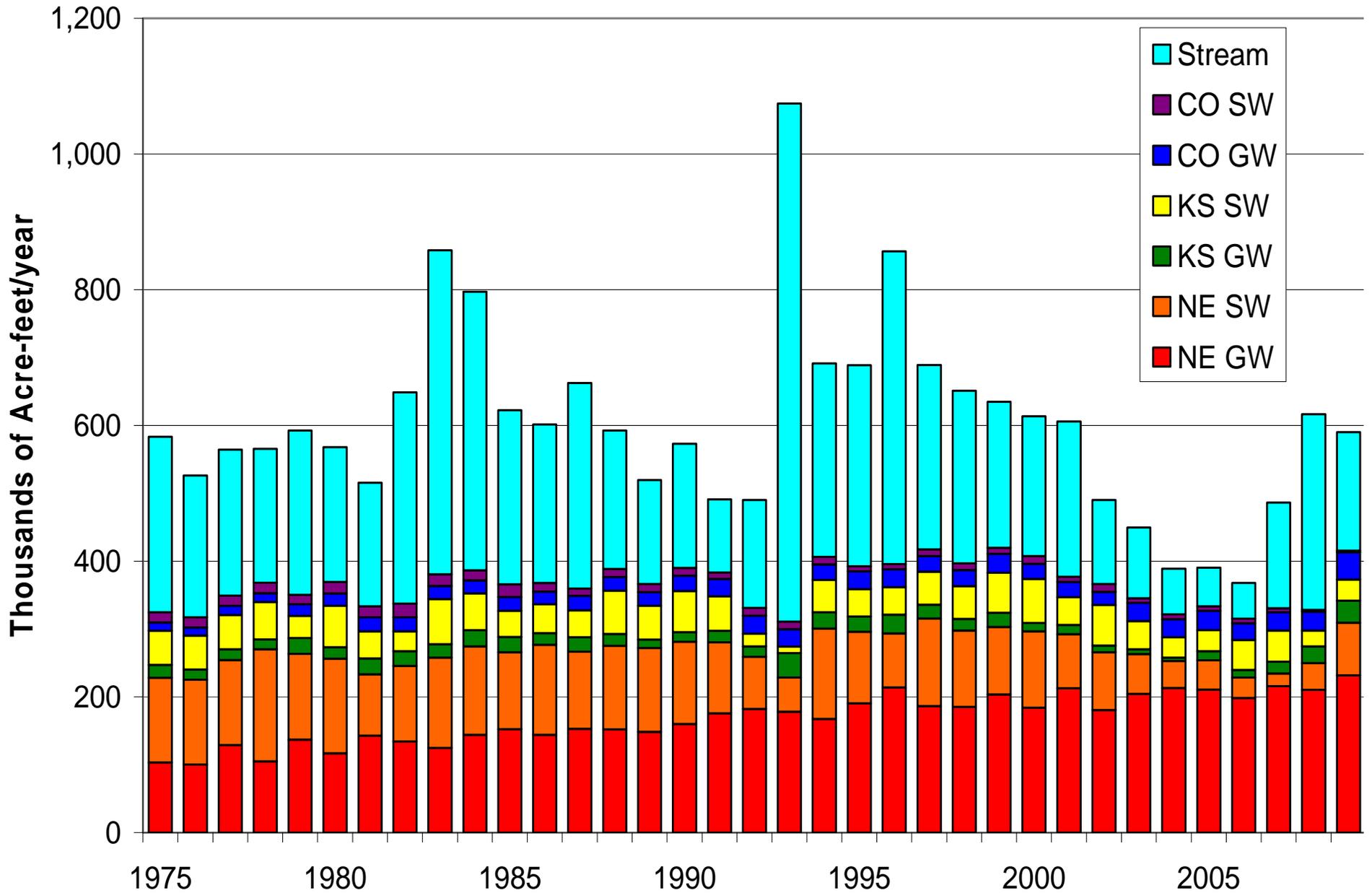
A Simplified Approach to Estimating the Basin Water Supply

- RRCA Computed Water Supply (CWS) – Output from RRCA accounting procedures and spreadsheet, input data count is ~250
- Republican River Basin Water Supply (BWS) – An estimate of the total basin supply using consumptive use totals and total streamflow at the basin outlet

Republican River BWS

- CO GW use
- KS GW use
- NE GW use
- CO SW use
- KS SW use
- NE SW use
- Streamflow: Hardy + Courtland Canal

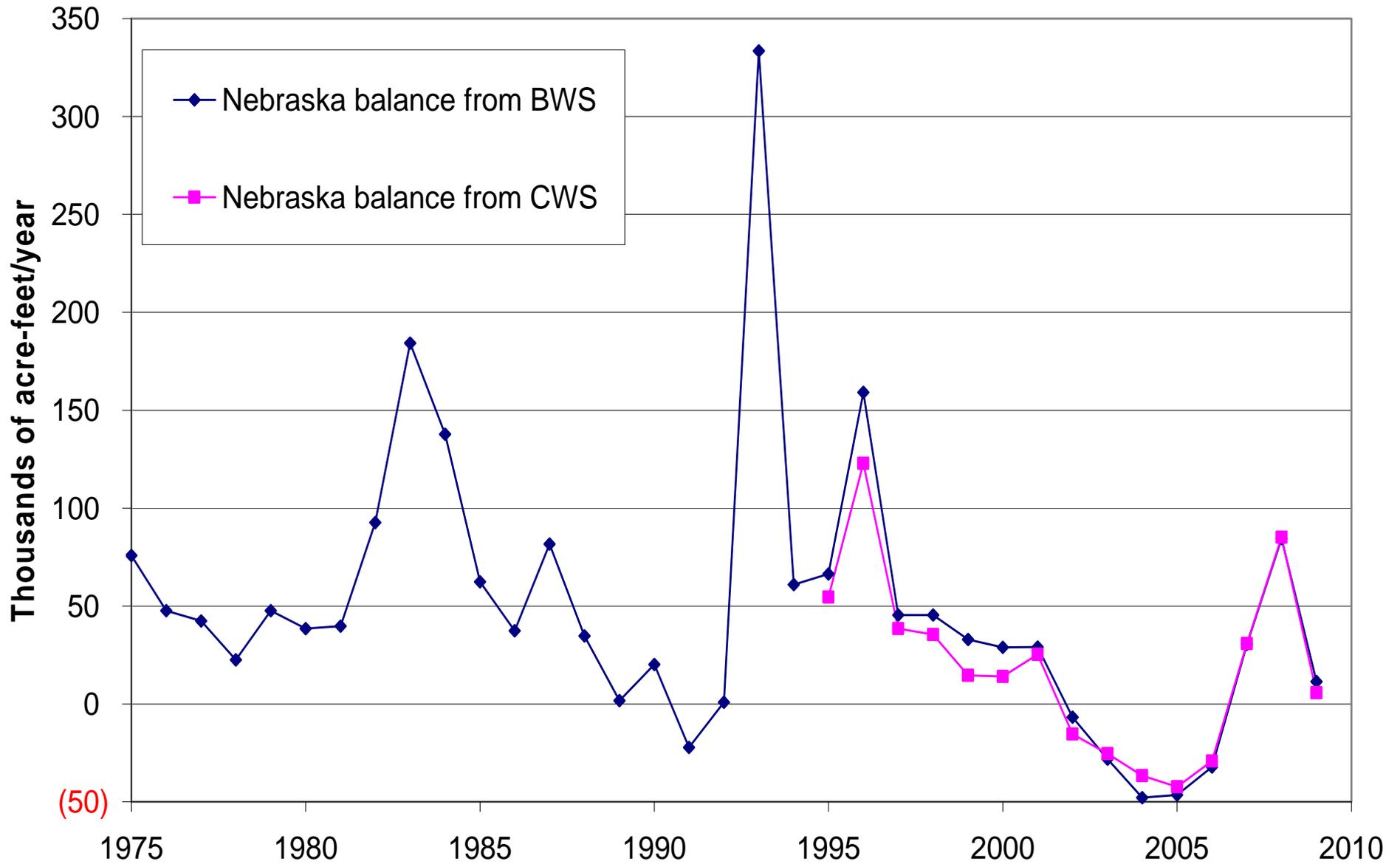
Republican River Basin Water Supply



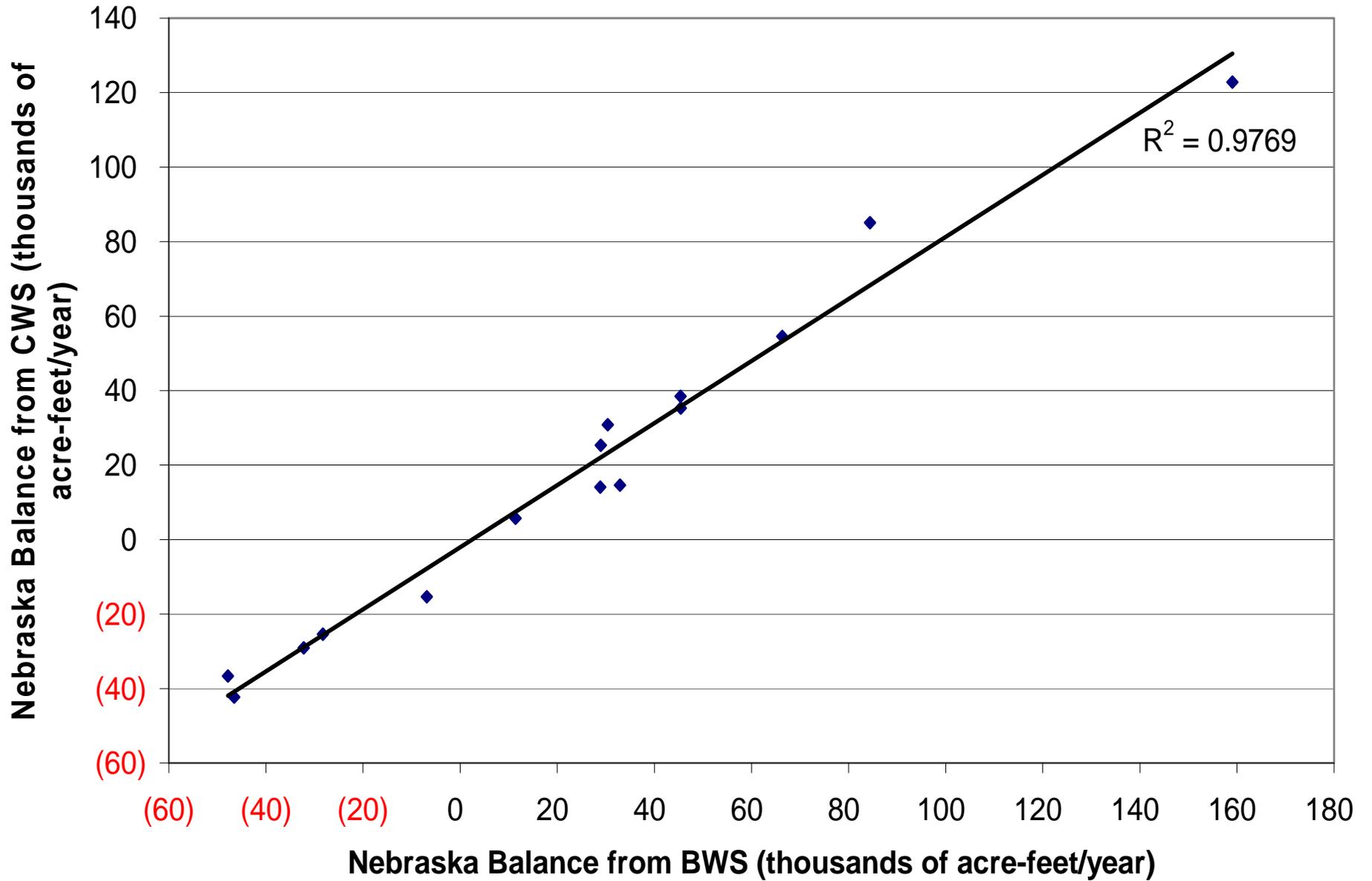
Nebraska's Annual Balance

- Nebraska's Water Supply
 - The total BWS multiplied by 0.5
 - The IWS Credit
- Nebraska's Water Use
 - NE GW use
 - NE SW use

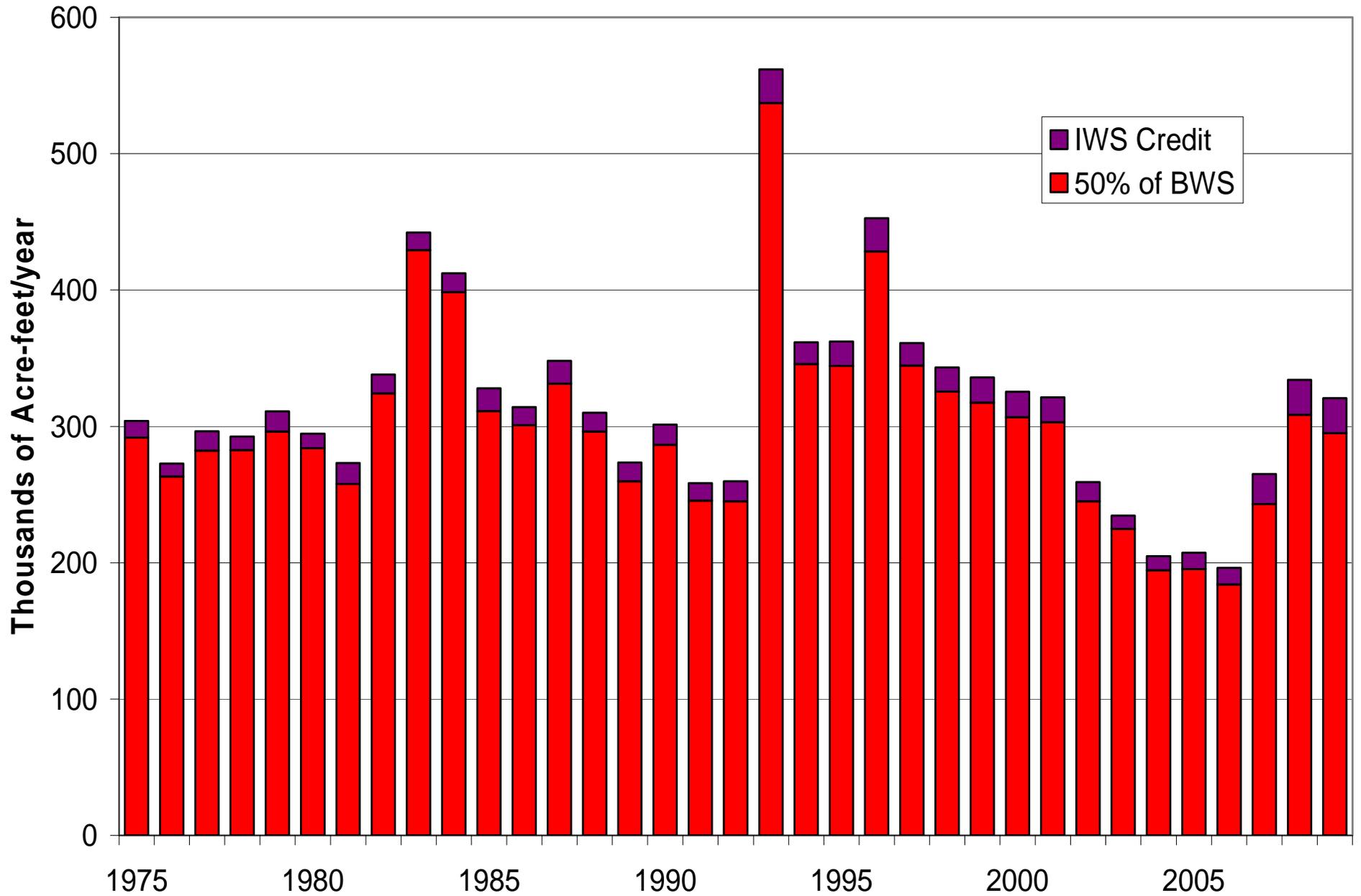
Nebraska's annual balance of water use and water supply



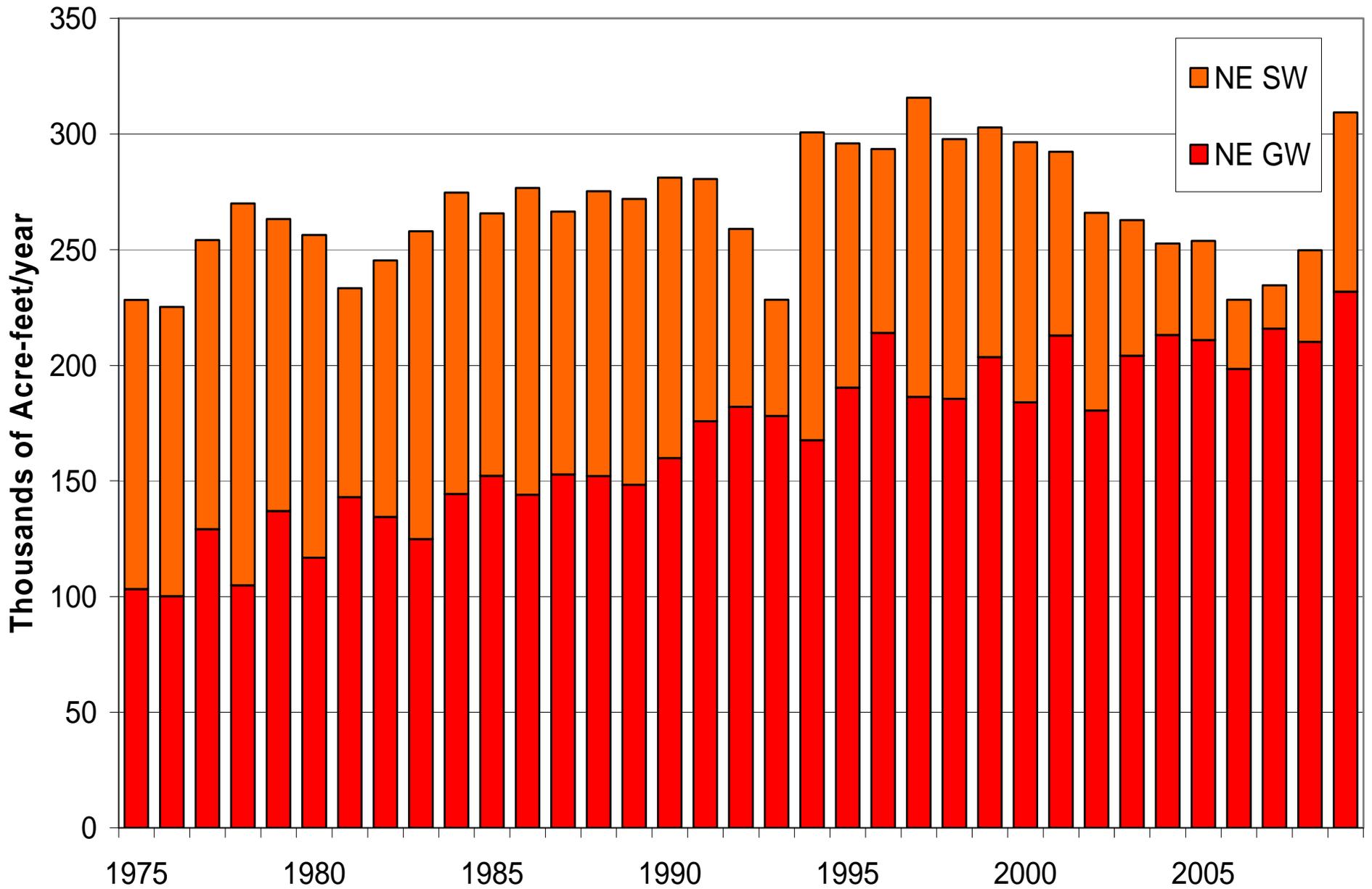
Comparison of Nebraska Balance from BWS vs. CWS



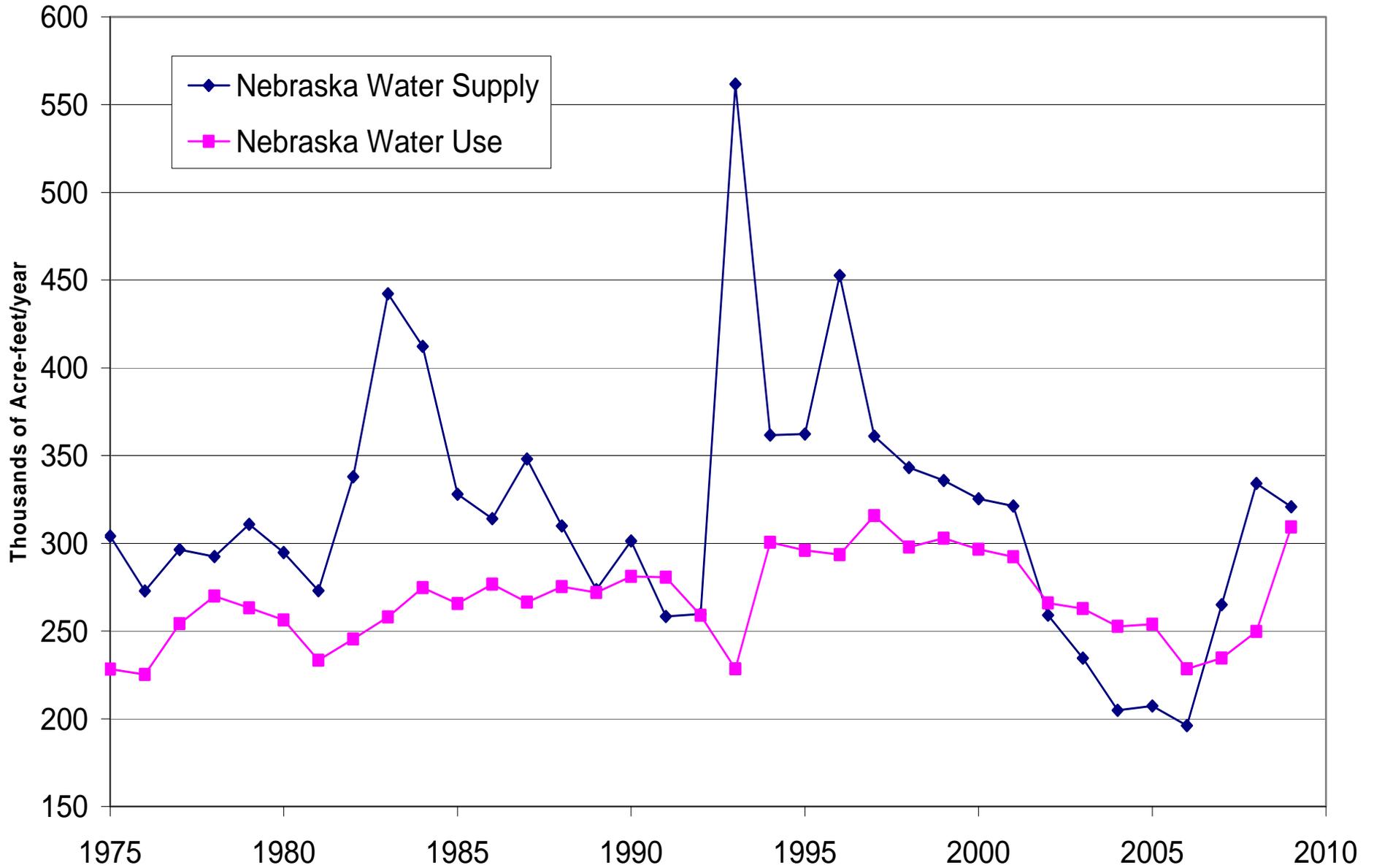
Nebraska's Water Supply Above Hardy



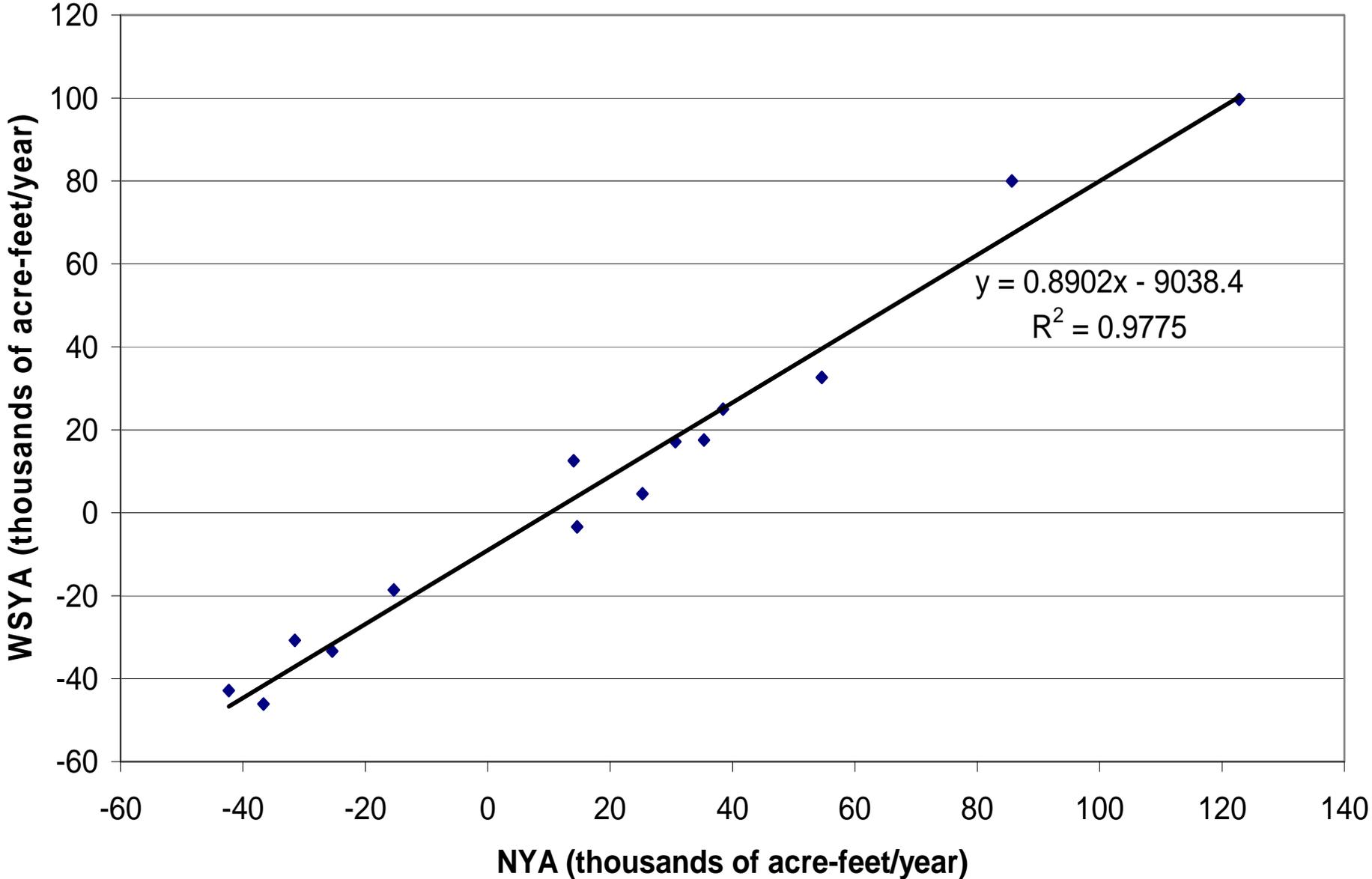
Nebraska's Water Use Above Hardy



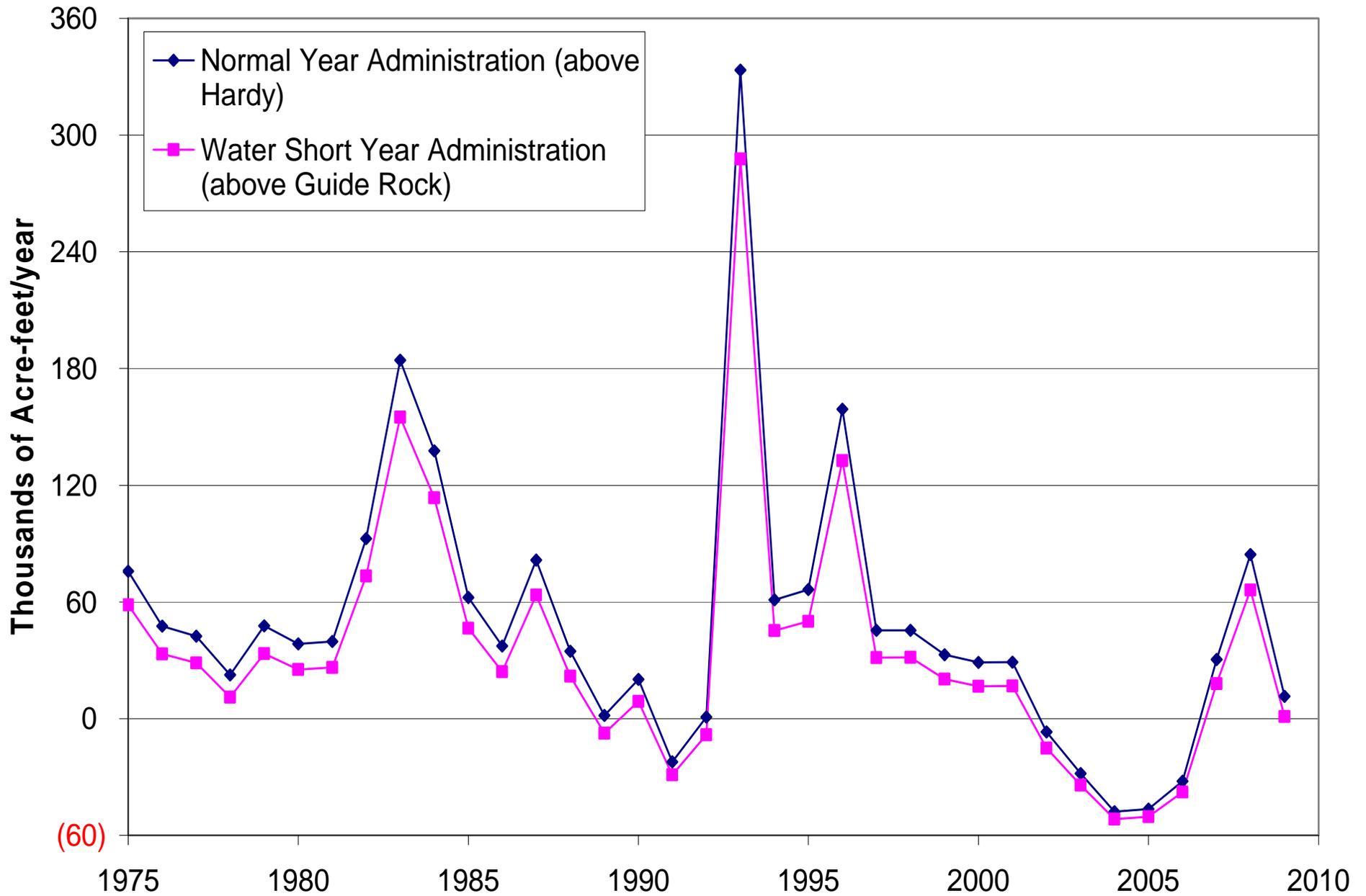
Water Supply and Water Use above Hardy



Normal Year Administration (NYA) vs.
Water Short Year Administration (WSYA)



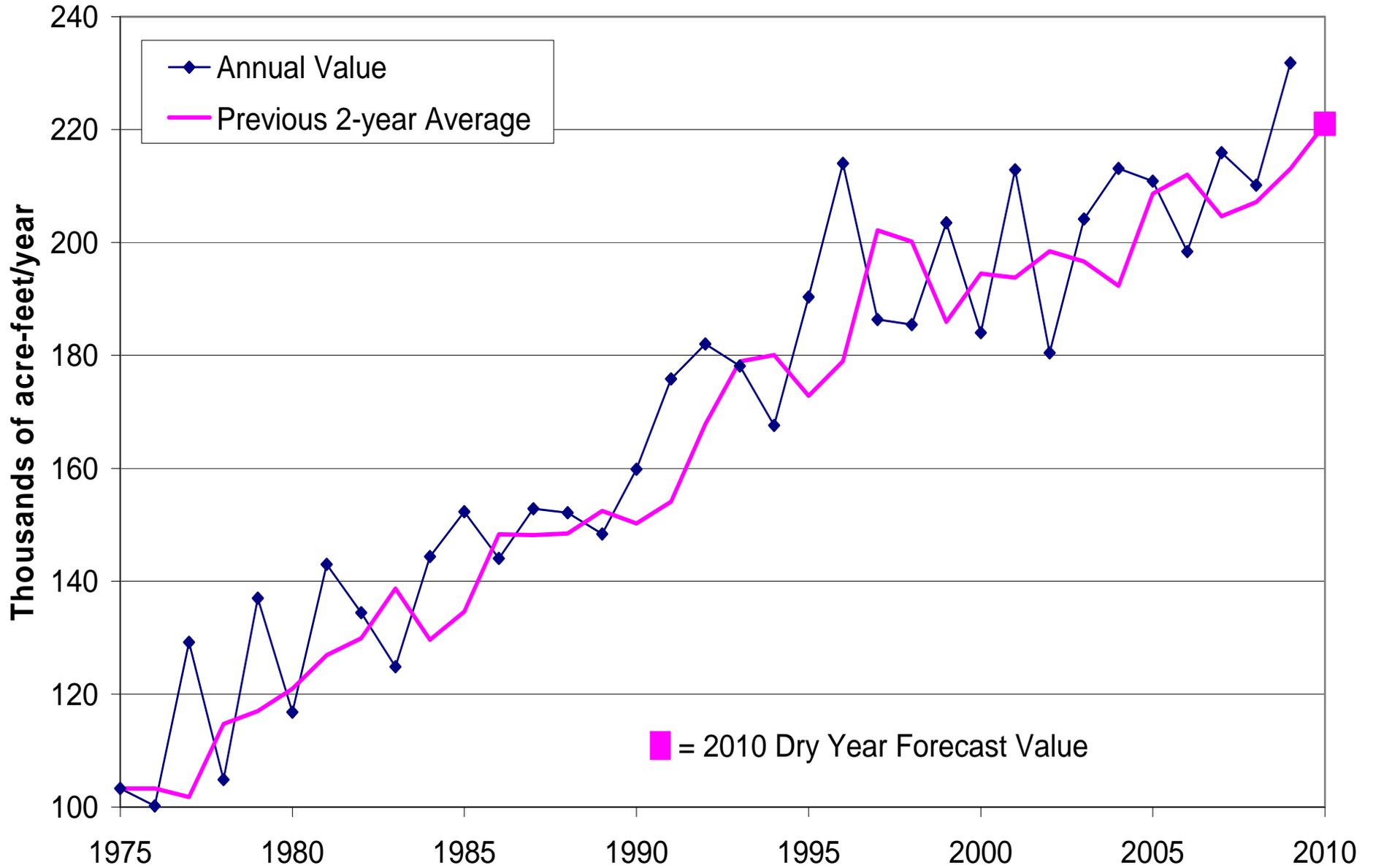
Nebraska Annual Water Supply minus Water Use



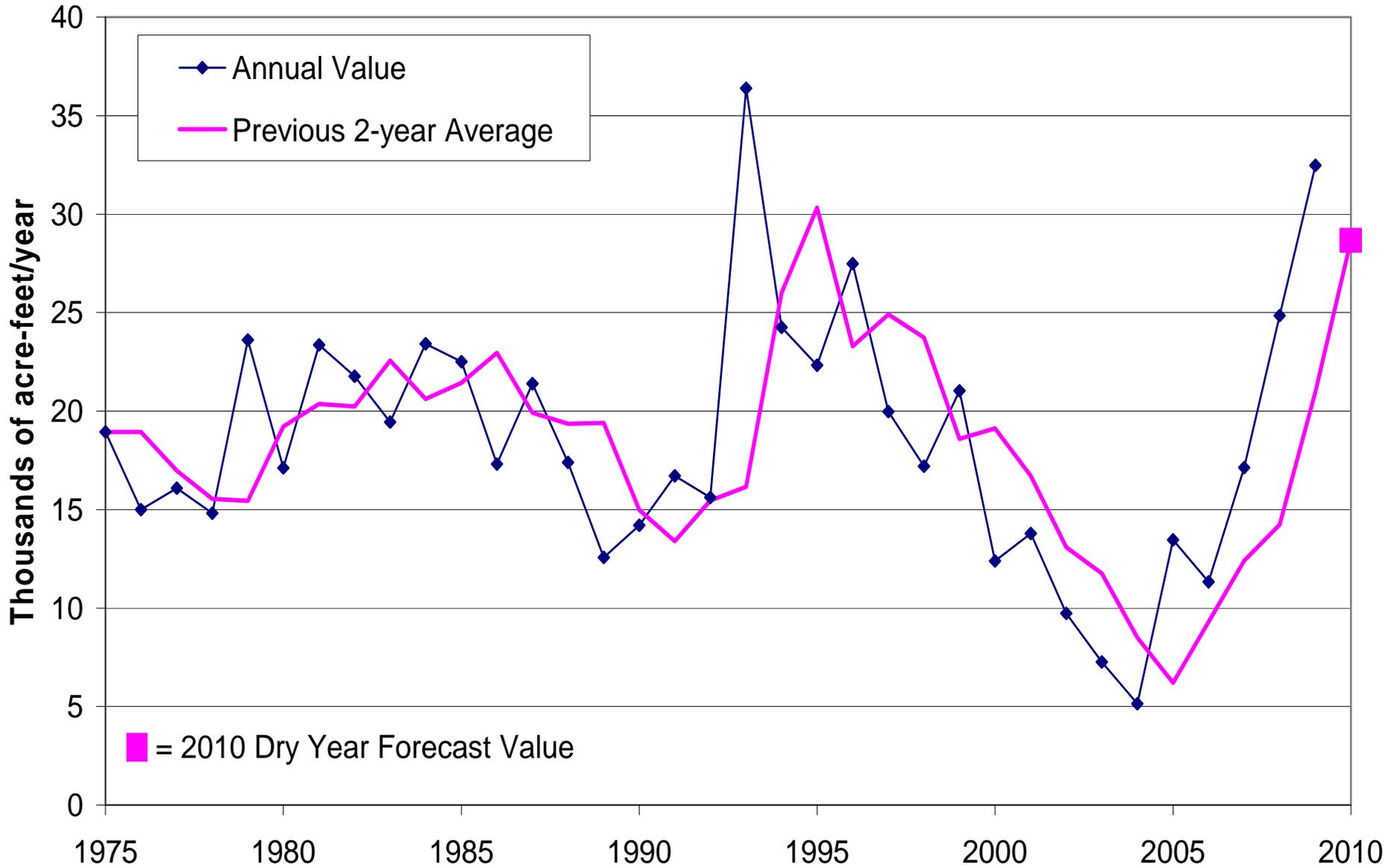
A Proposed Approach for Predicting Nebraska's Water Supply and Water Use for an Upcoming Dry Year

- The preceding approach to estimating Nebraska's Compact balance requires a total of eight values
- If we can estimate these values during the upcoming year, assuming that year will be dry, we can estimate Nebraska's annual balance for an upcoming dry year

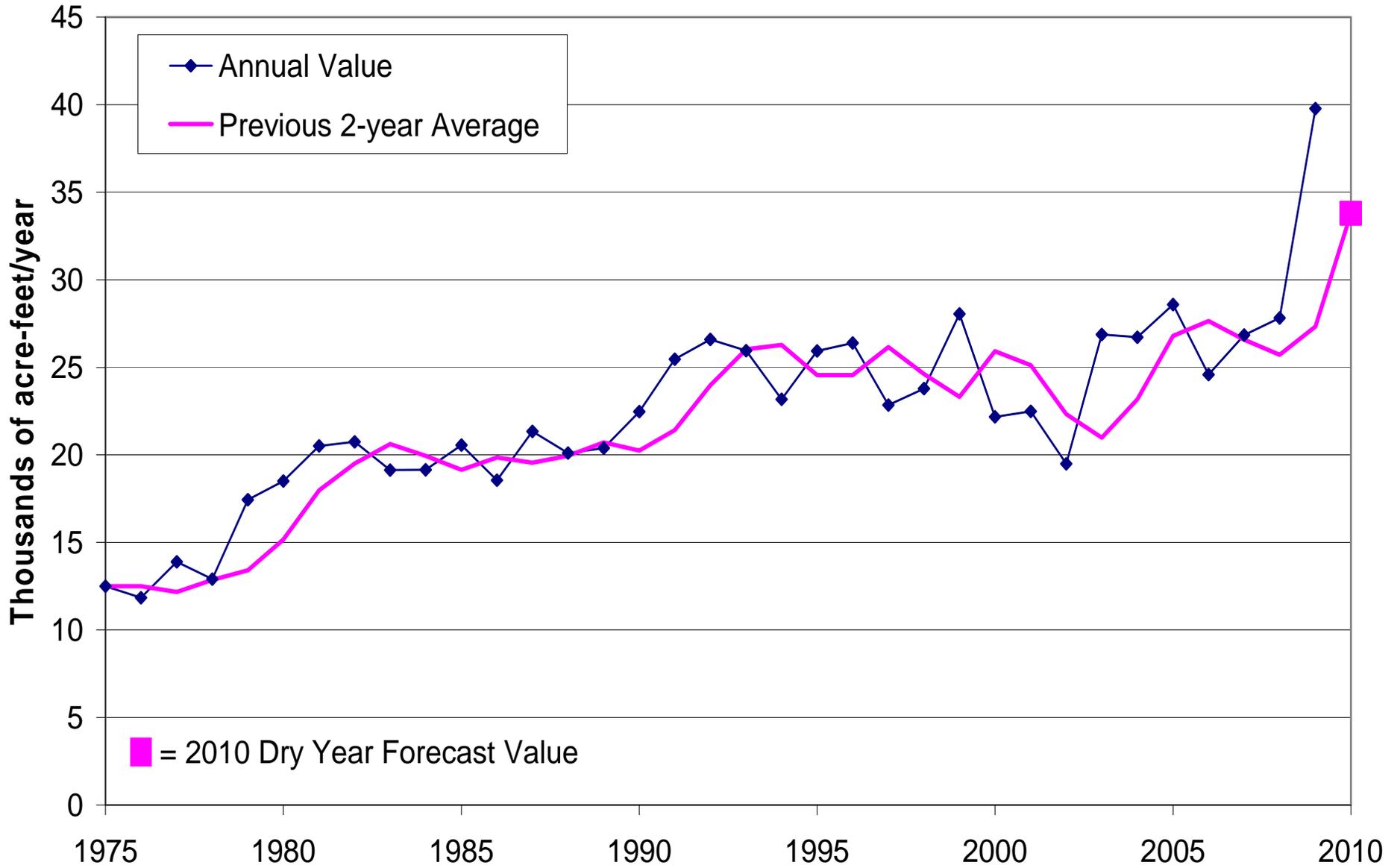
Nebraska groundwater CBCU



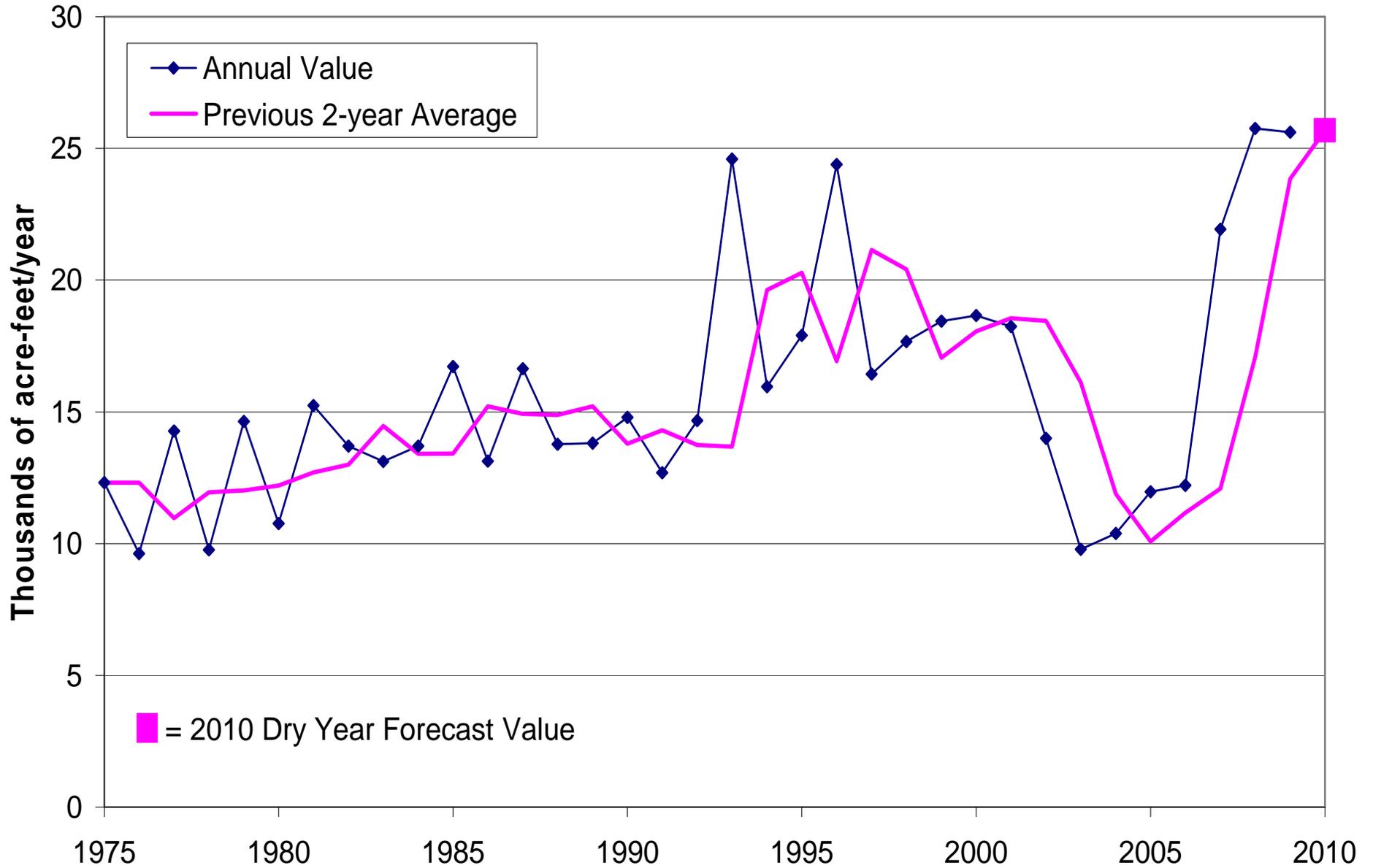
Kansas groundwater CBCU



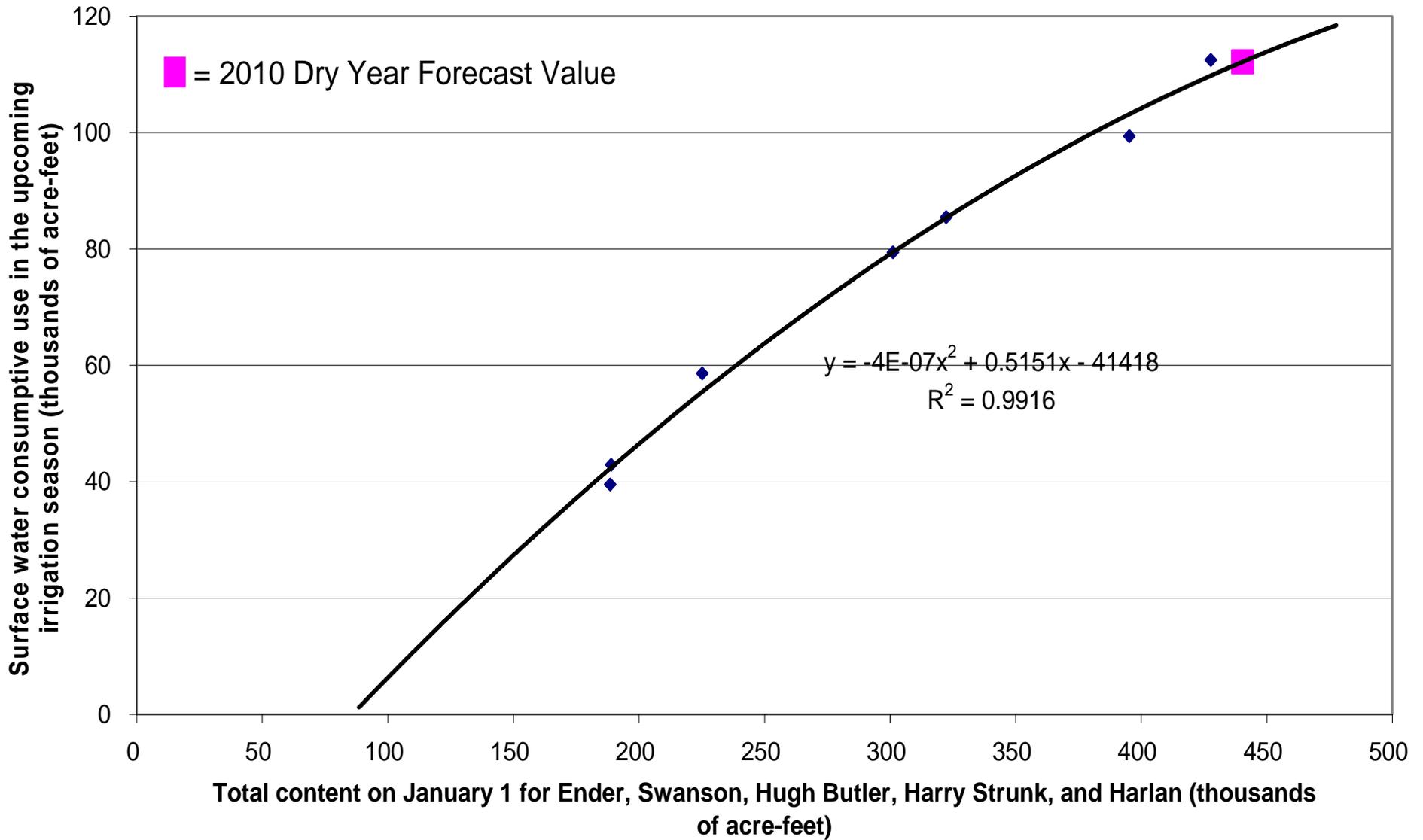
Colorado groundwater CBCU



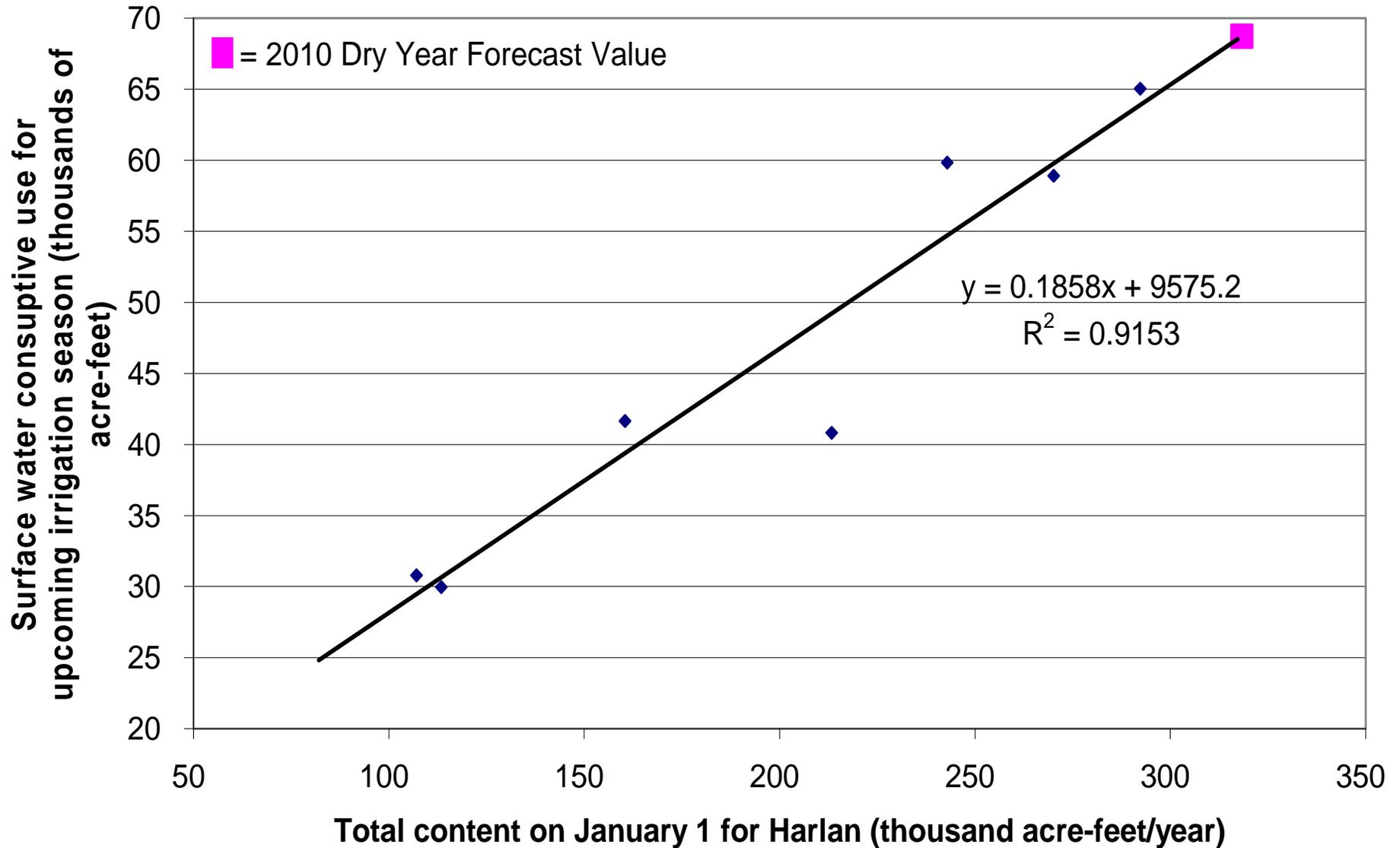
Imported Water Supply Credit



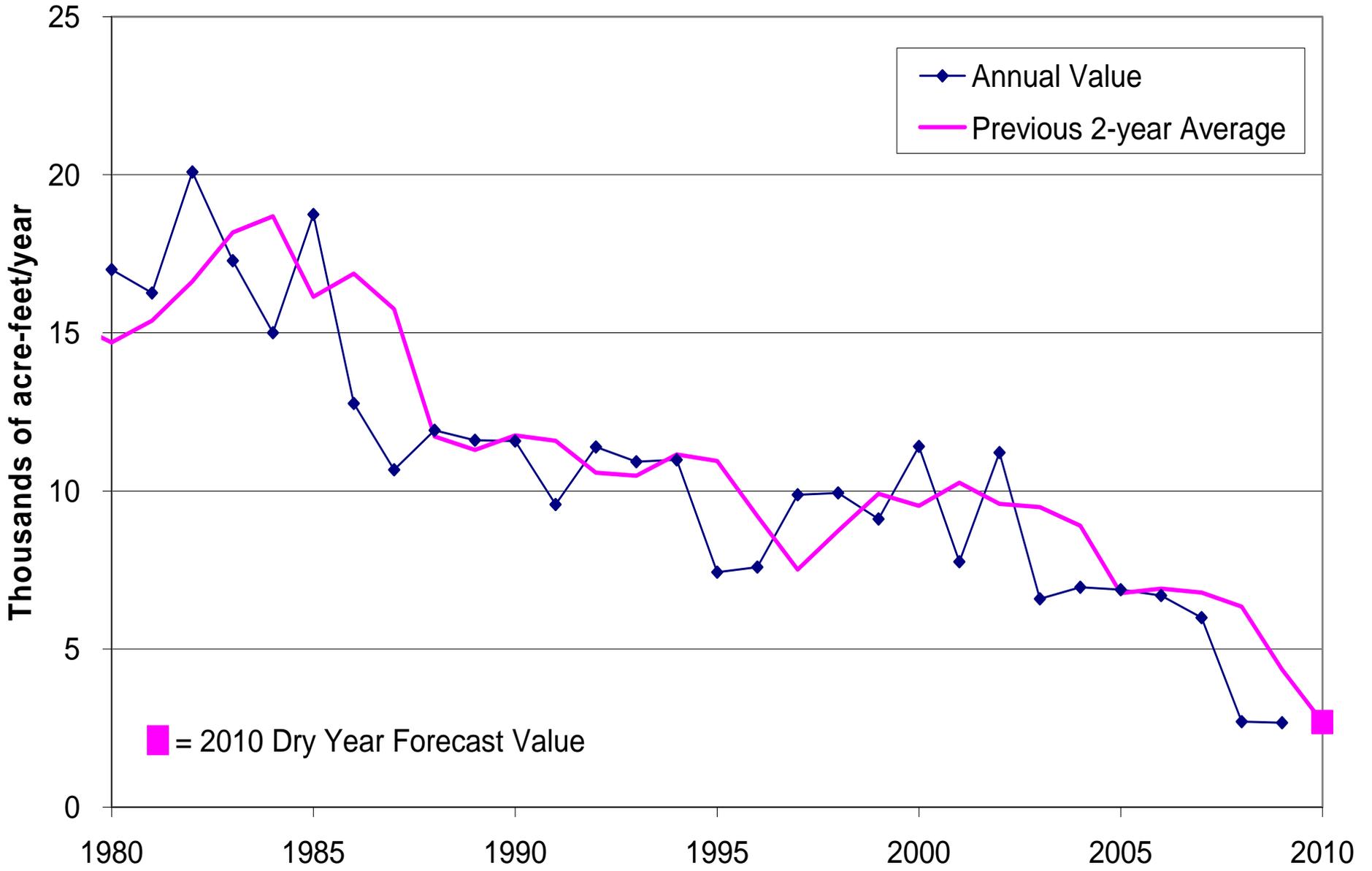
Comparison of Nebraska SW use vs. Nebraska reservoir content, 1999-2005



Comparison of Kansas SW use vs. Harlan County Lake content, 1999-2005



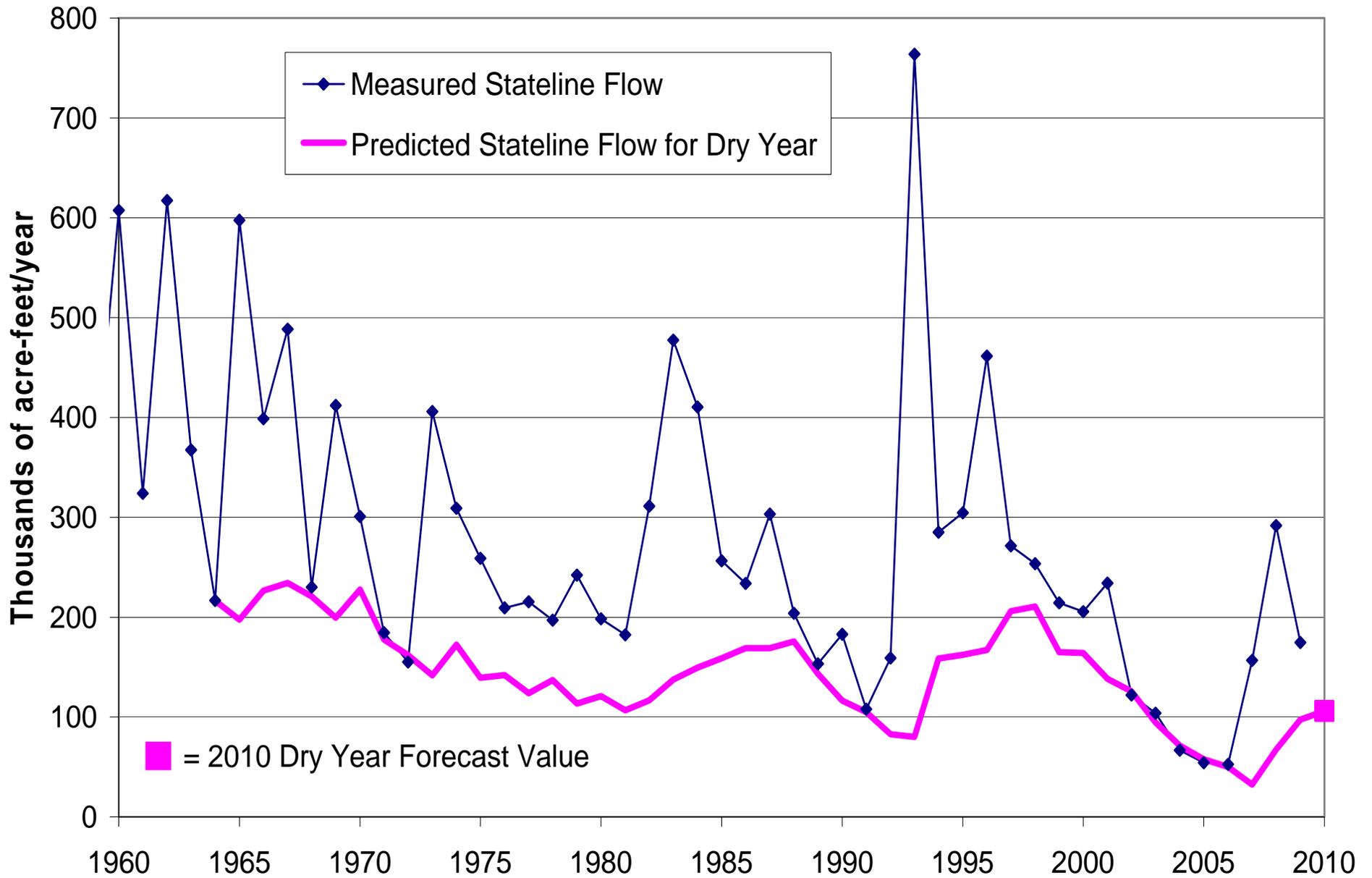
Colorado SW Consumptive Use



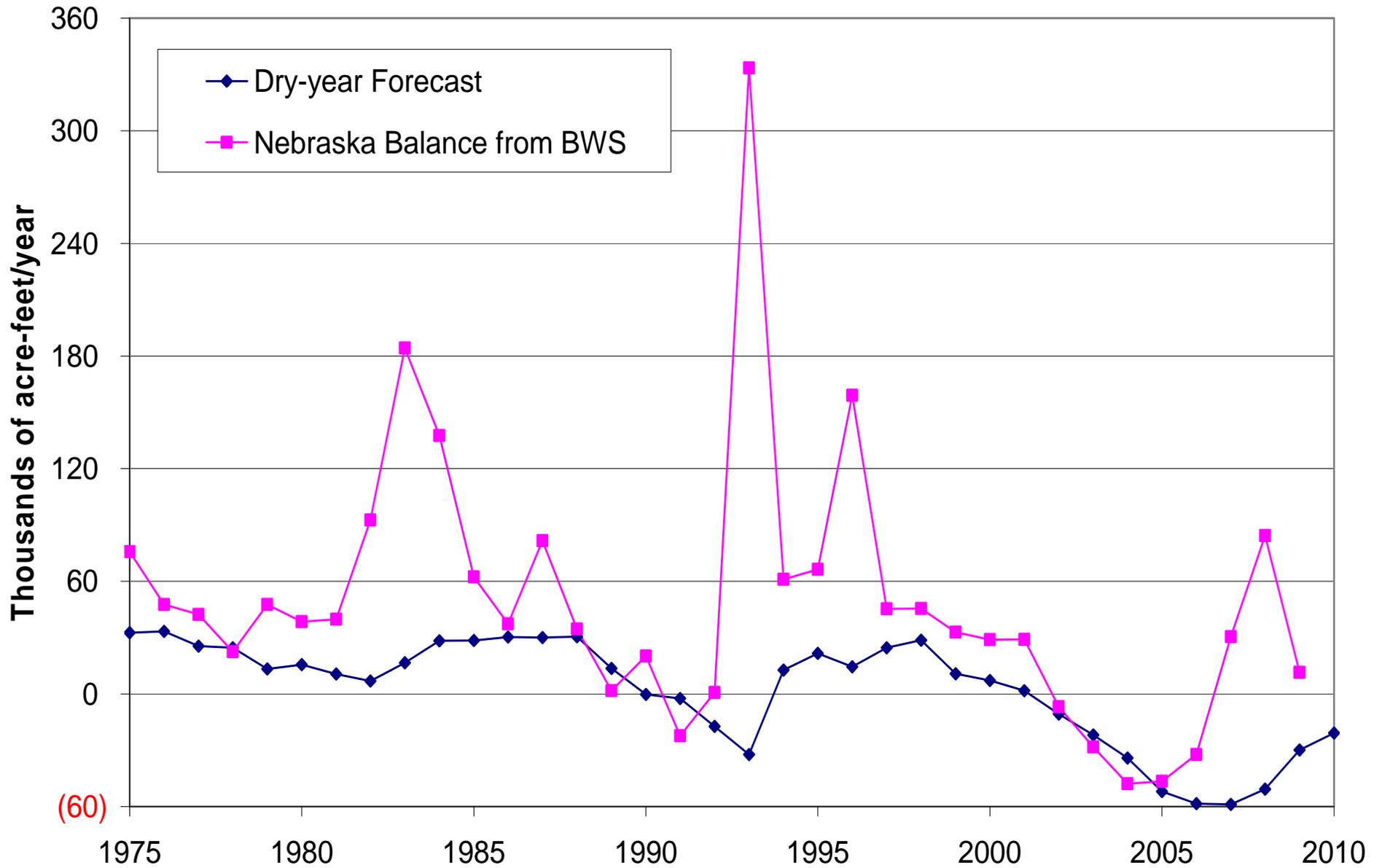
Streamflow

- Need to be able to predict a dry-year streamflow value for the state line from existing data
- Used multiple linear regression with two variables:
 - Previous 5-year average state line flows (0.41)
 - January 1 Harlan County Lake content (0.23)
 - Constant = -27450

Comparison of Actual Stateline Flows vs. Dry Year Predictions



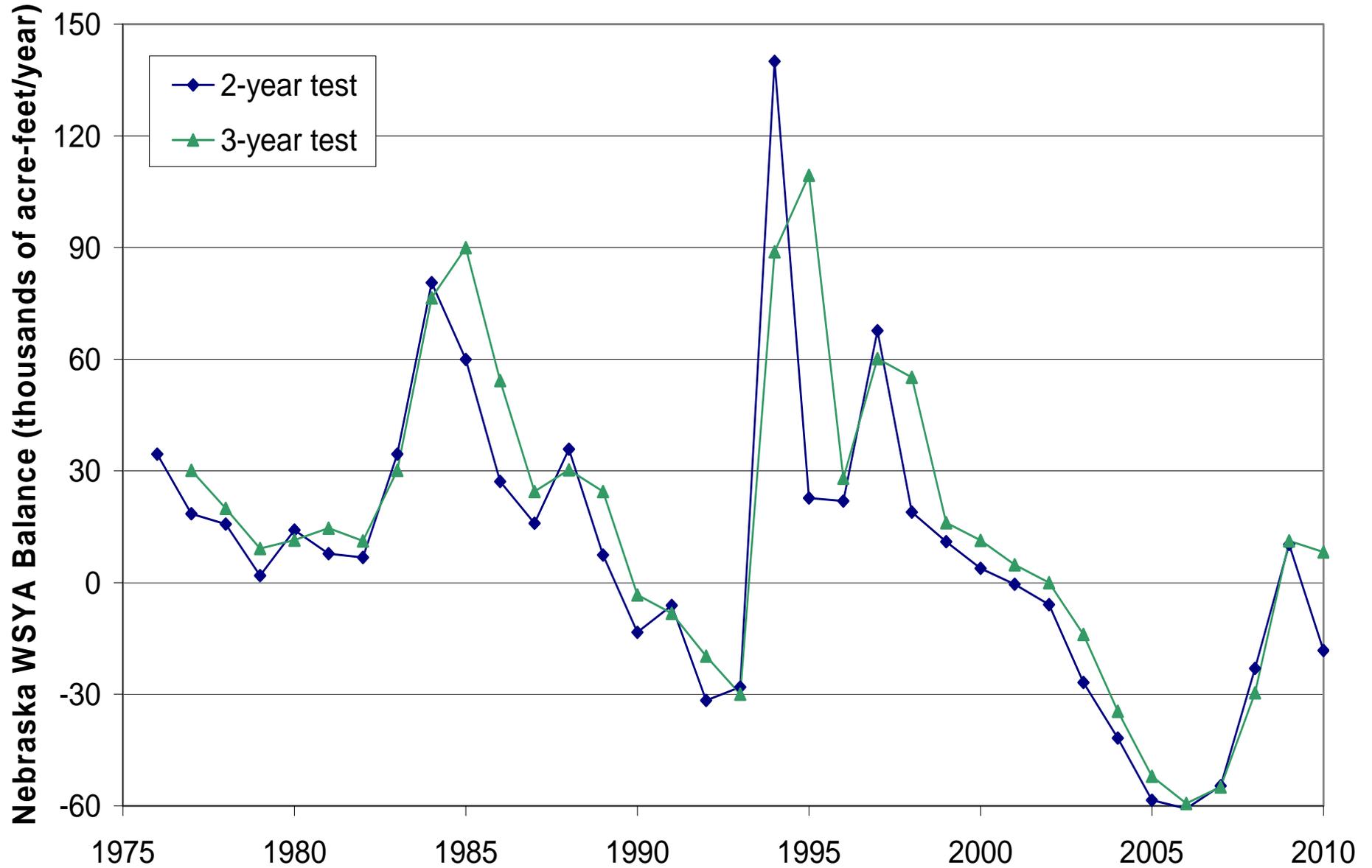
Comparison of Nebraska balance from BWS vs. dry-year forecast



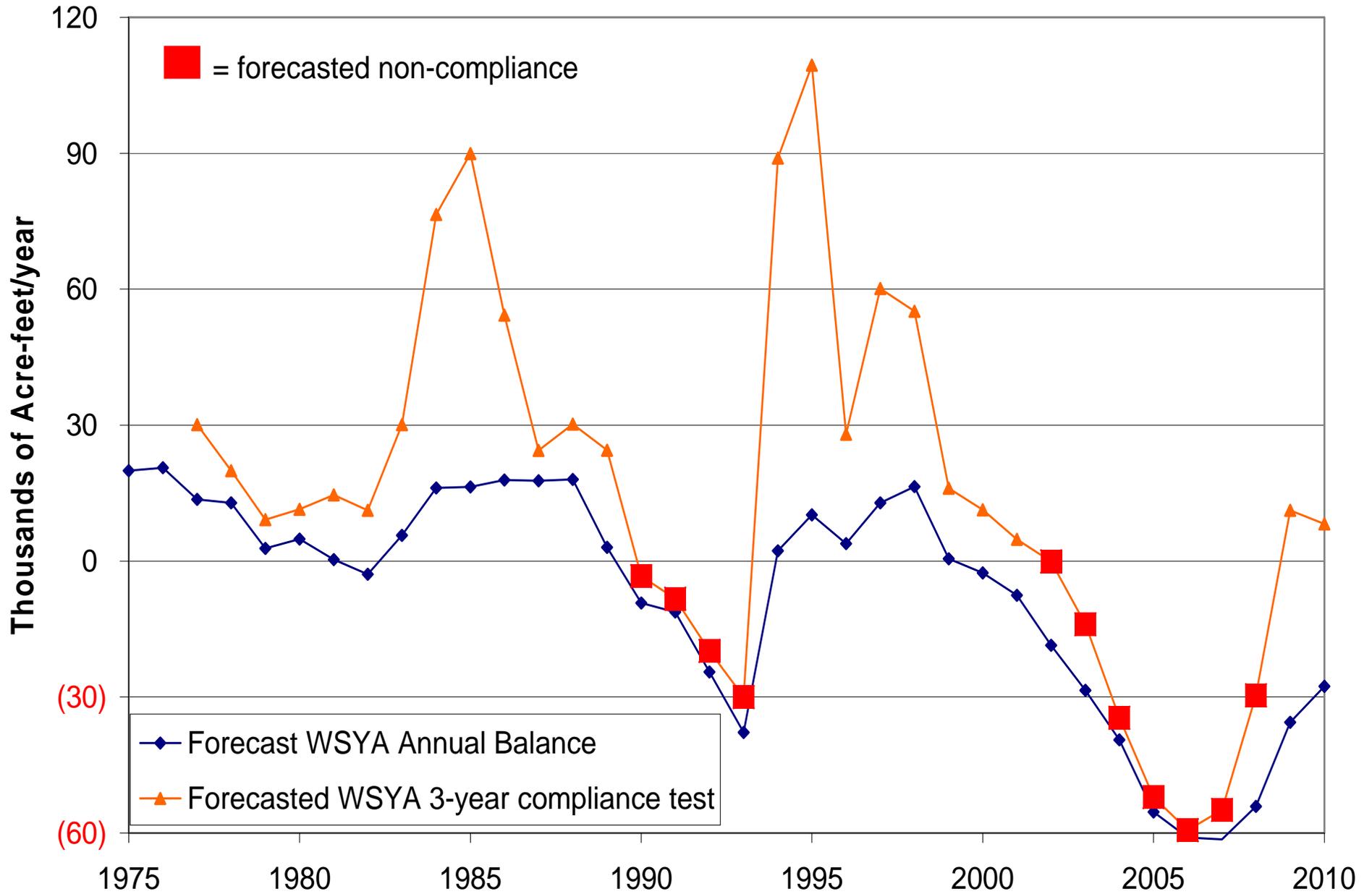
Incorporating this Forecast into the Compact Compliance Flowcharts

- Compliance flowcharts utilize the forecast along with recent accounting results
- Computes a 2-year or 3-year average with the forecast value for the most current year (t-0) and the actual accounting results for the previous years (t-1 and t-2)
- Also builds in a cushion of 5,000 acre-feet per year

Results of dry-year forecast incorporated into WSYA compliance tests



Forecast of WSYA Compact Compliance



Questions?

Preliminary 2009 Republican River Compact Accounting Results and 2010 Forecast

Curtis, Nebraska



Overview

Background-purpose of forecast

Data sources

Preliminary results

Forecast for 2010

Summary

Background—Purpose

46-715 (6): “...the department, in consultation with the affected districts, shall forecast on an annual basis the maximum amount of water that may be available from streamflow for beneficial use in the short term and long term...”

Background—(cont.)

The short-term forecast has been defined as pertaining to the upcoming year

The long-term forecast refers to the next decade

The maximum amount of water available from streamflow has been defined as referring to a dry year

Preliminary 2009 Results

Data sources for early 2009

Groundwater model: power records,
NRD estimates

Streamflow and SW use: data through
November 24 with estimates through the
end of the year

- Hardy + Courtland Canal are critical

Evaporation: based on prior years

Preliminary Results: 1-Year Balance above Guide Rock

Year	Balance
2005	(42,856)
2006	(28,345)
2007	17,300
2008	79,500
2009	(600)

Preliminary Results: 2-Year Average above Guide Rock (2009 not WSYA)

Year	Balance
2005-2006 Ave	(35,600)
2006-2007 Ave	(5,500)
2007-2008 Ave	48,400
2008-2009 Ave	39,440

Preliminary Results above Hardy (Approximate – Numbers Rounded)

Year	Balance
2005	(42,300)
2006	(29,100)
2007	30,800
2008	85,100
2009	5,700
Average	10,000

Looking Forward to 2010 and 2011

Water Short Year Administration

Occurs when $<119,000$ AF available for irrigation in Harlan County Lake

2010 will not be a Water-Short Year

When HCL volume decreases, the decrease averages 16%

It is not likely that 2011 will be Water Short

Forecast: If 2010 is Dry, Then:

One-year balance above Guide Rock –
(-27,600) AF

Two-year average above Guide Rock
(with 10,000 AF cushion) – **(-19,100) AF**

Three-year average above Guide Rock
(with 15,000 AF cushion) – 15,400 AF

Averages do not apply if 2010 not WS

Forecast: If 2010 is Dry, Then:

One-year balance above Hardy –
(-20,900) AF

Five-year average above Hardy –
14,300 AF (greater than 10,000 AF/yr)

Five-year average compliance test
always applies

Long-term Forecast

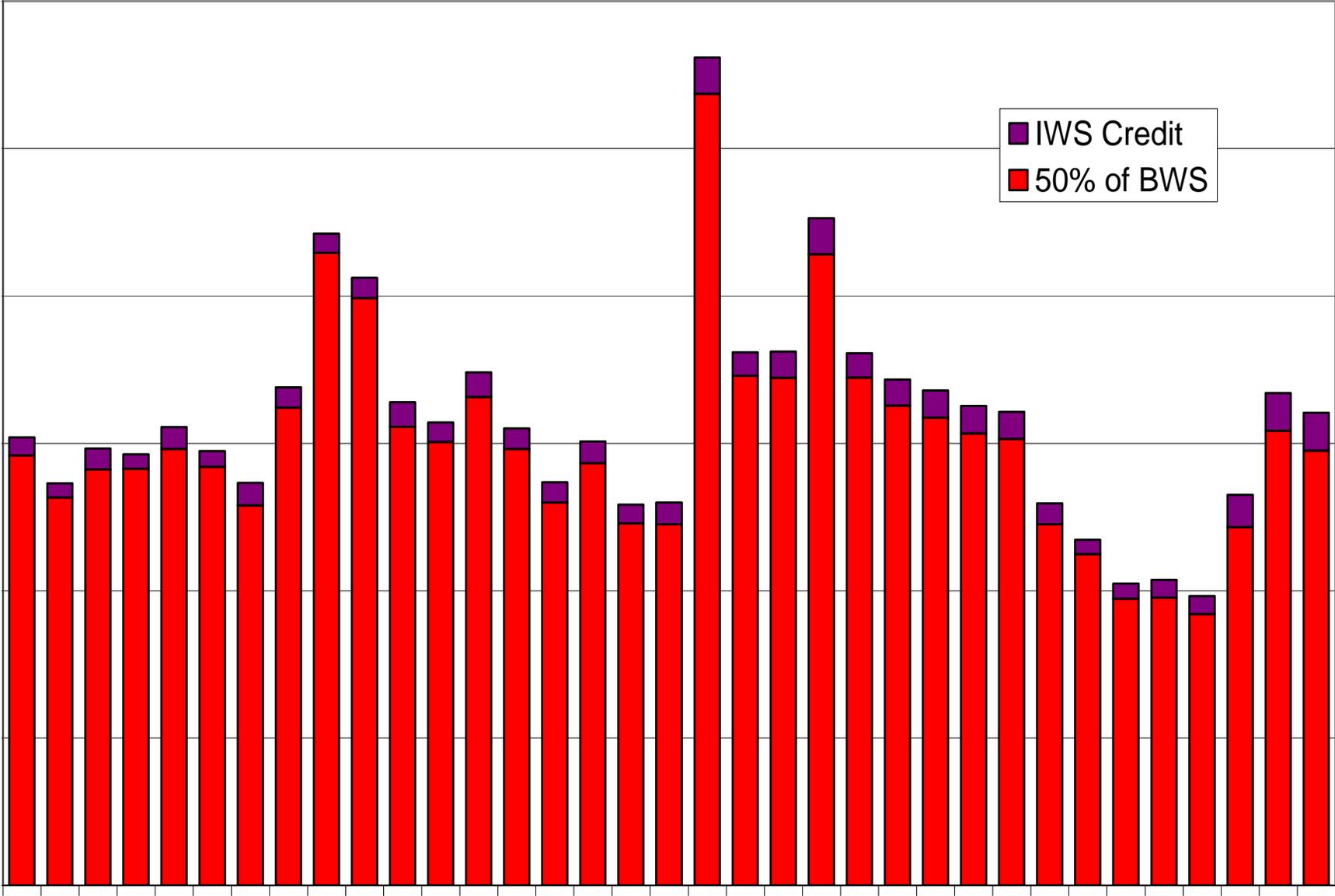
Look at the historical record as an indication of the future water supplies.

Impossible to know if the next ten years will be wet, dry, or average.

In ten years, if it is dry, the water supply may be as low as ~200k AF

Maximum depletions will depend on recent Compact balances and whether or not it is a WSY

Nebraska's Water Supply Above Hardy



Summary

The 2009 balance above Guide Rock will be neutral or slightly negative

The 2009 balance above Hardy will probably be positive

2010 will not be water short

Taking into account a dry year forecast above Hardy, the 2006-2010 5-year average will be positive (probably greater than 10,000 AF/yr)

Questions?

