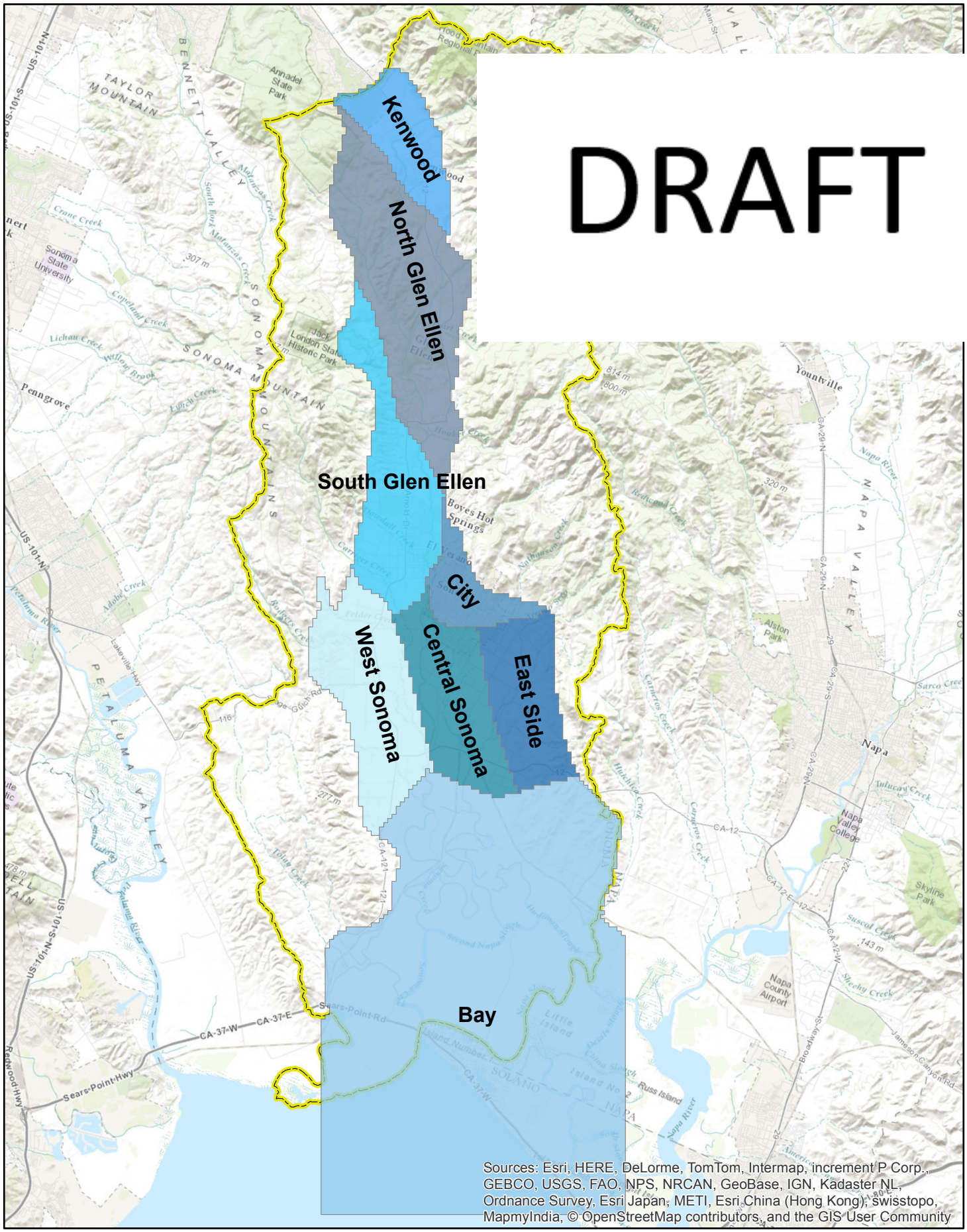


*September 08, 2015*

**Sonoma Valley**
**Groundwater Management Program**

## Model Zone Names

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0 0.5 1 2 3 4 5
Miles

Document Path: C:\Users\arich\Desktop\calib_update_sep\SV_HOBS_HYDROGRAPH LOCATIONS.mxd

*September 08, 2015*

**Sonoma Valley**
**Groundwater Management Program**

## Hydrograph Locations

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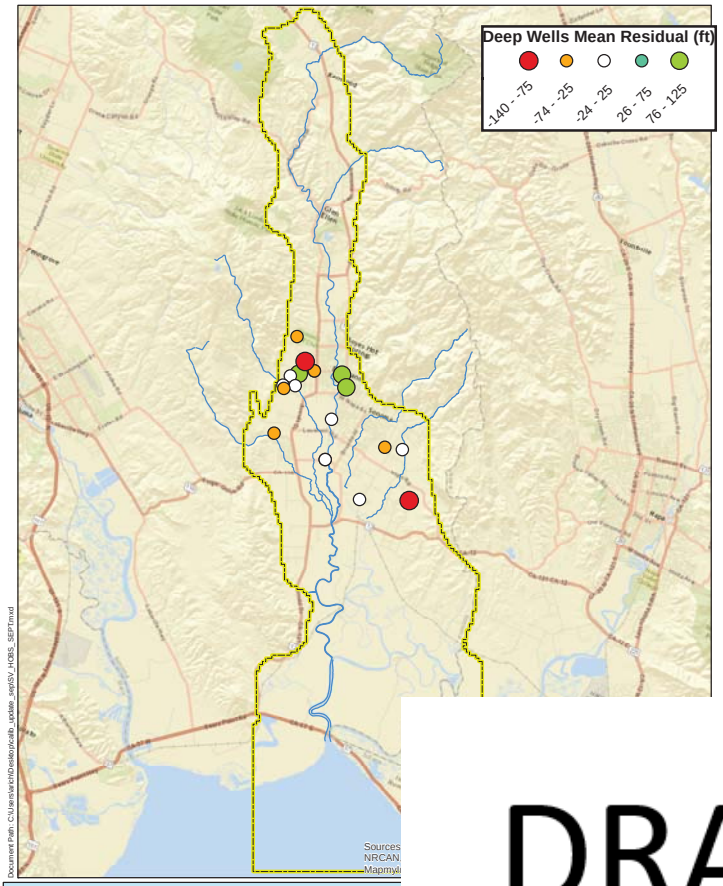
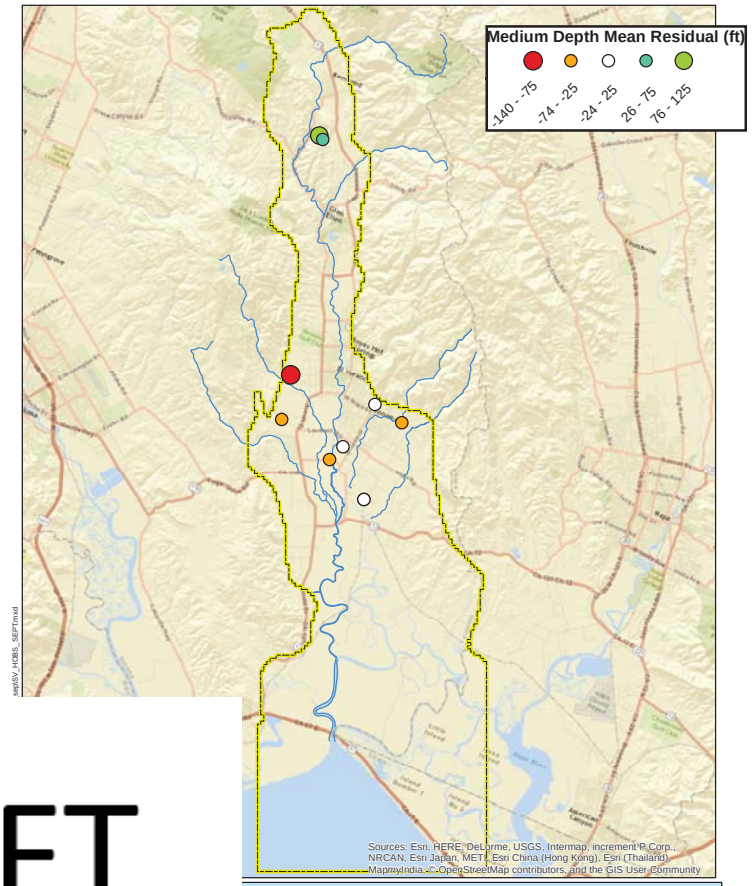



September 08, 2015

**Sonoma Valley**
**Groundwater Management Program**
**Calibration Wells**

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Miles

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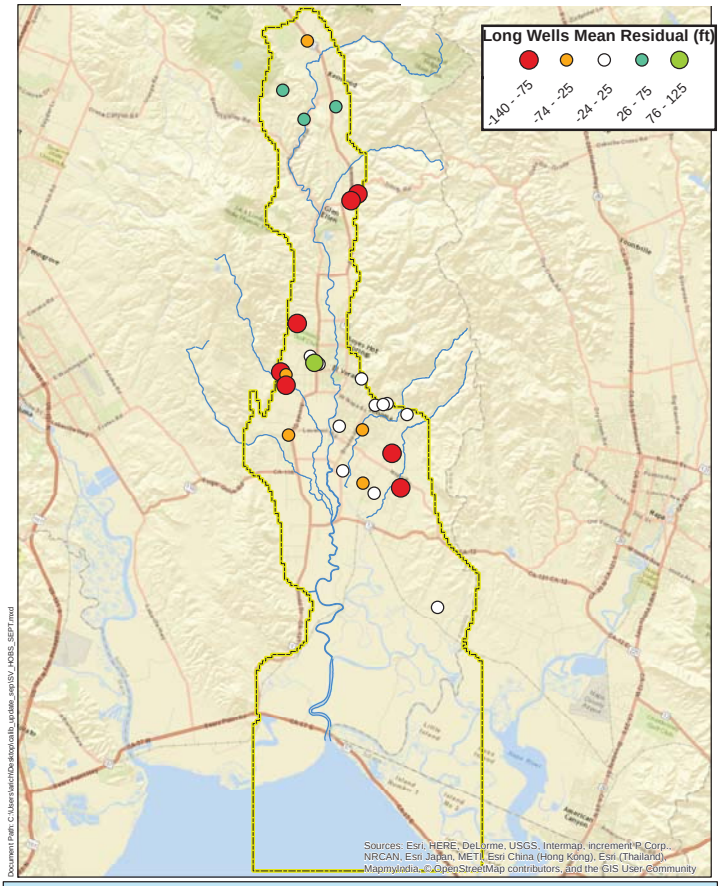


September 08, 2015

**Sonoma Valley**
**Groundwater Management Program**
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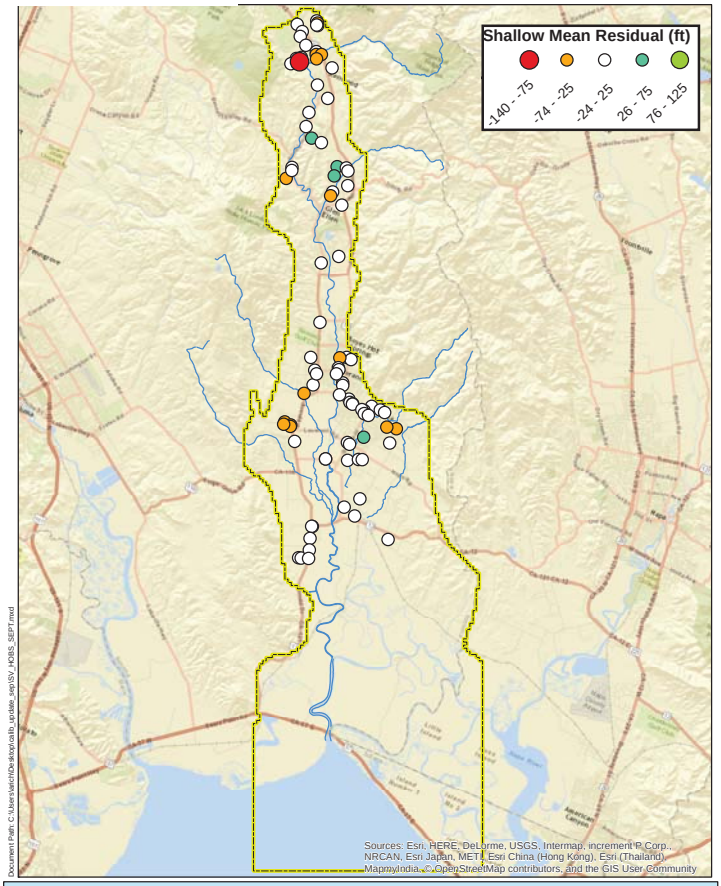


September 08, 2015

**Sonoma Valley**
**Groundwater Management Program**
**Calibration Wells**

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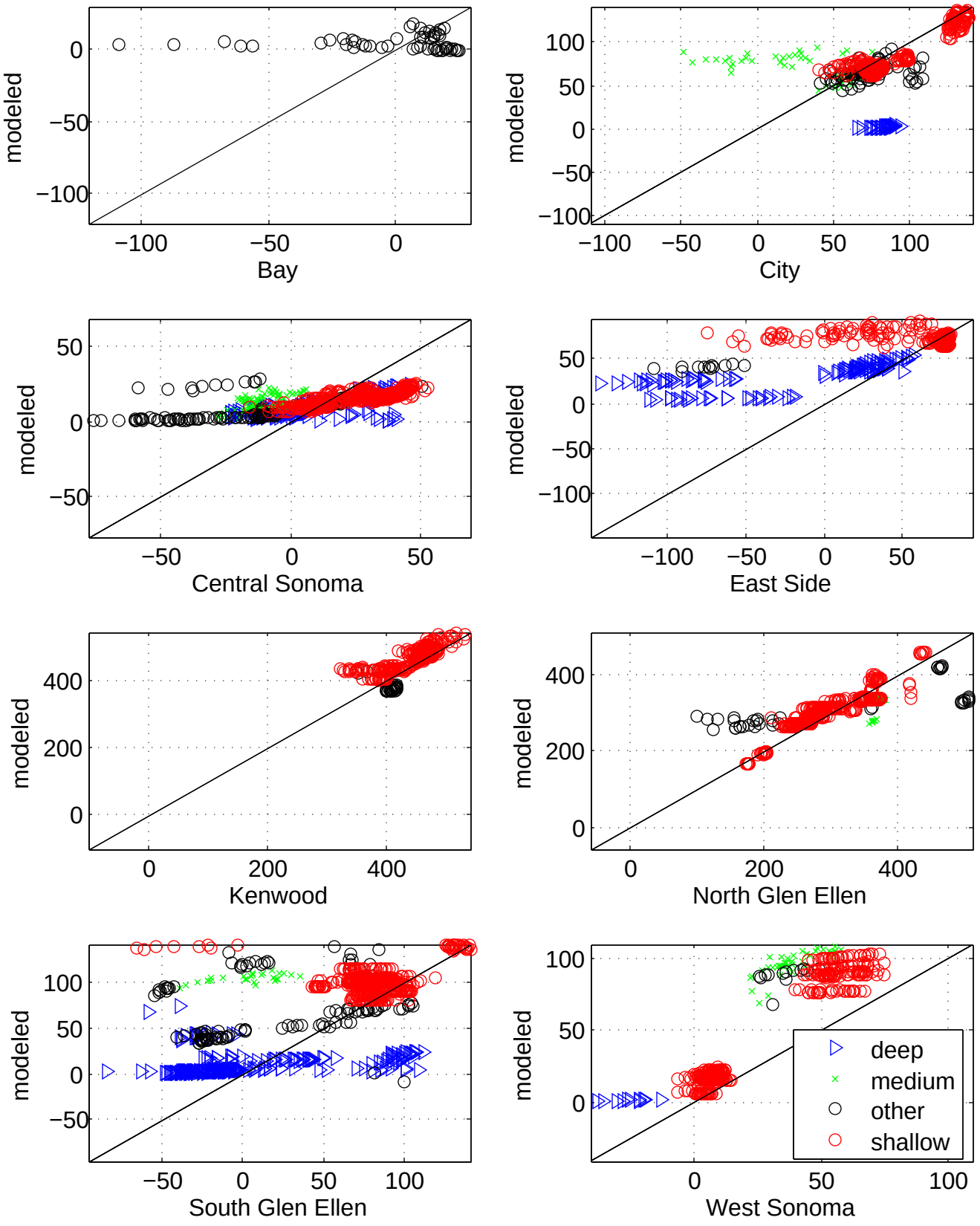
modeled
Bay
City
Central Sonoma
East Side
Kenwood
North Glen Ellen
South Glen Ellen
West Sonoma
deep
medium
other
shallow

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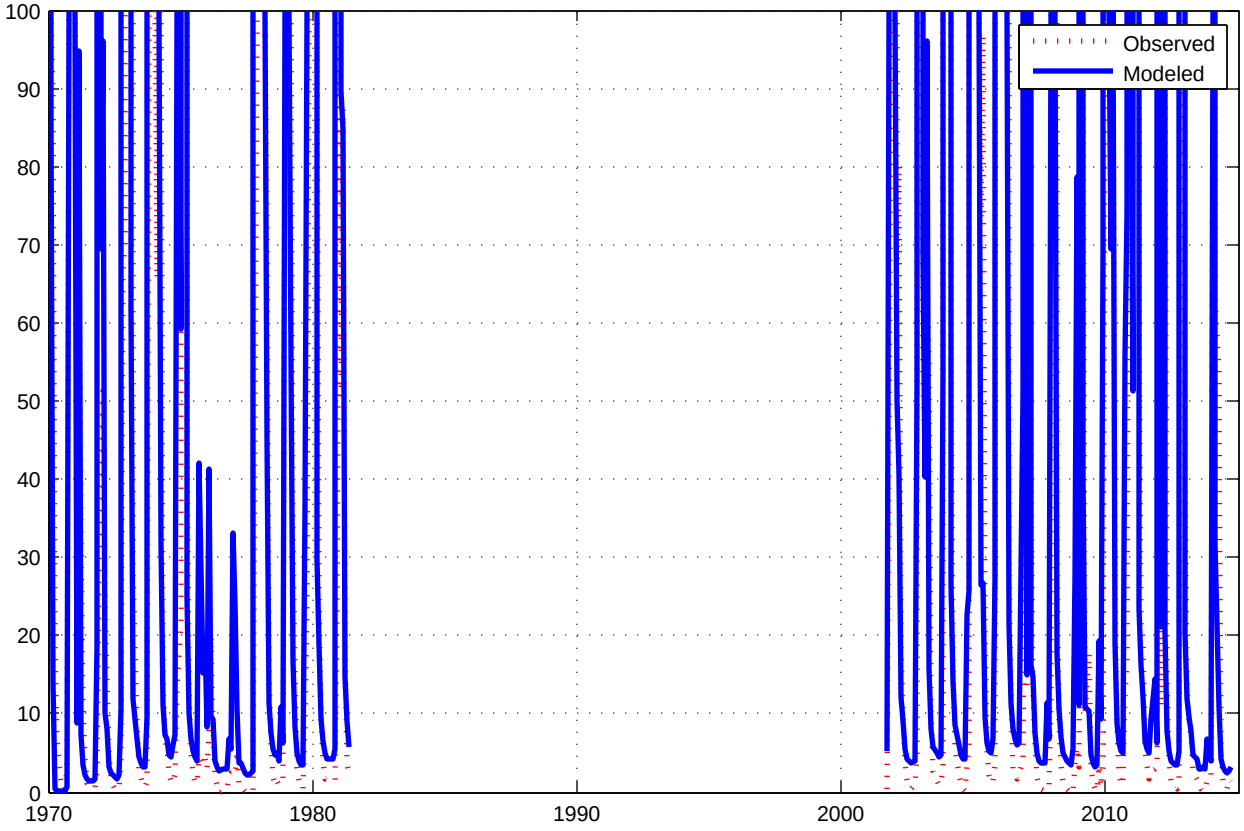
# DRAFT


Observed
Modeled
100
90
80
70
60
50
40
30
20
10
0
1970
1980
1990
2000
2010

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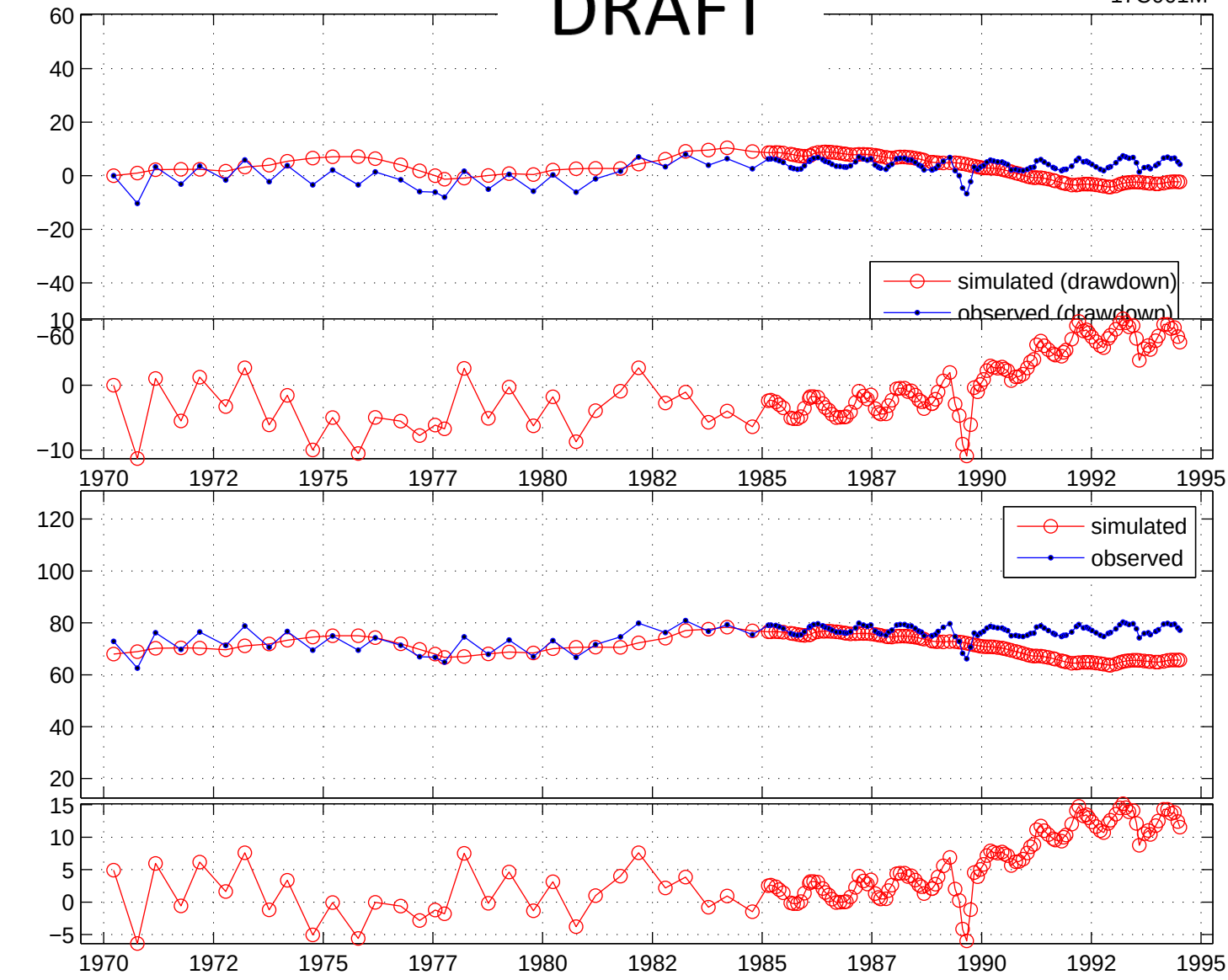
17C001M

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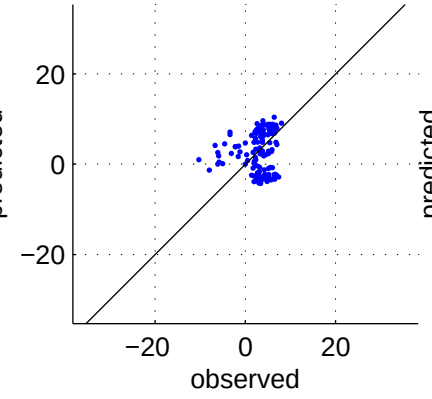
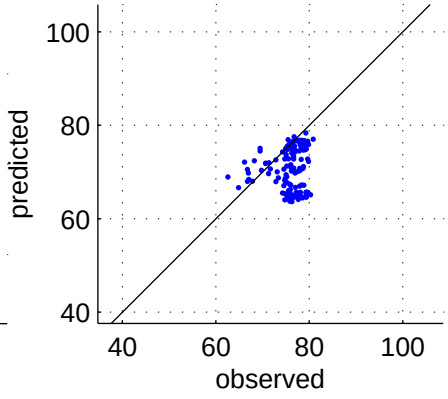
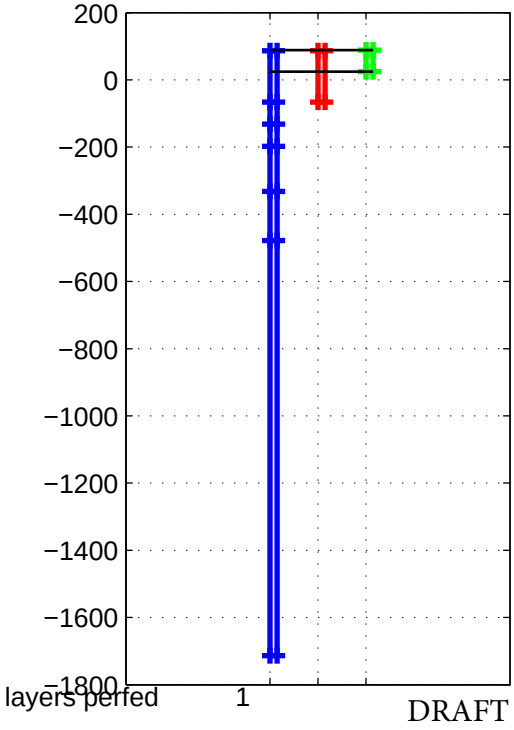
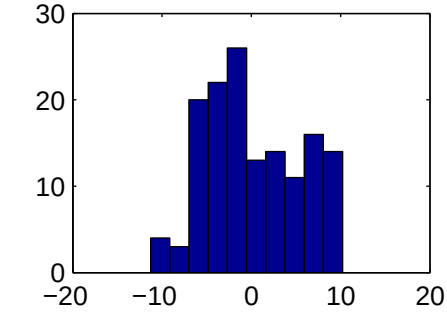
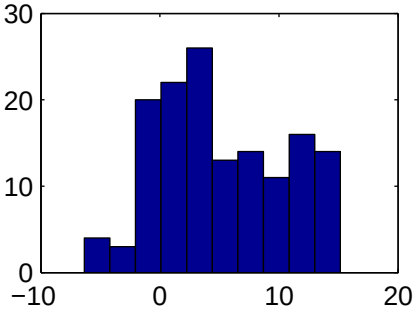
phi = 4015.9915





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G03−03

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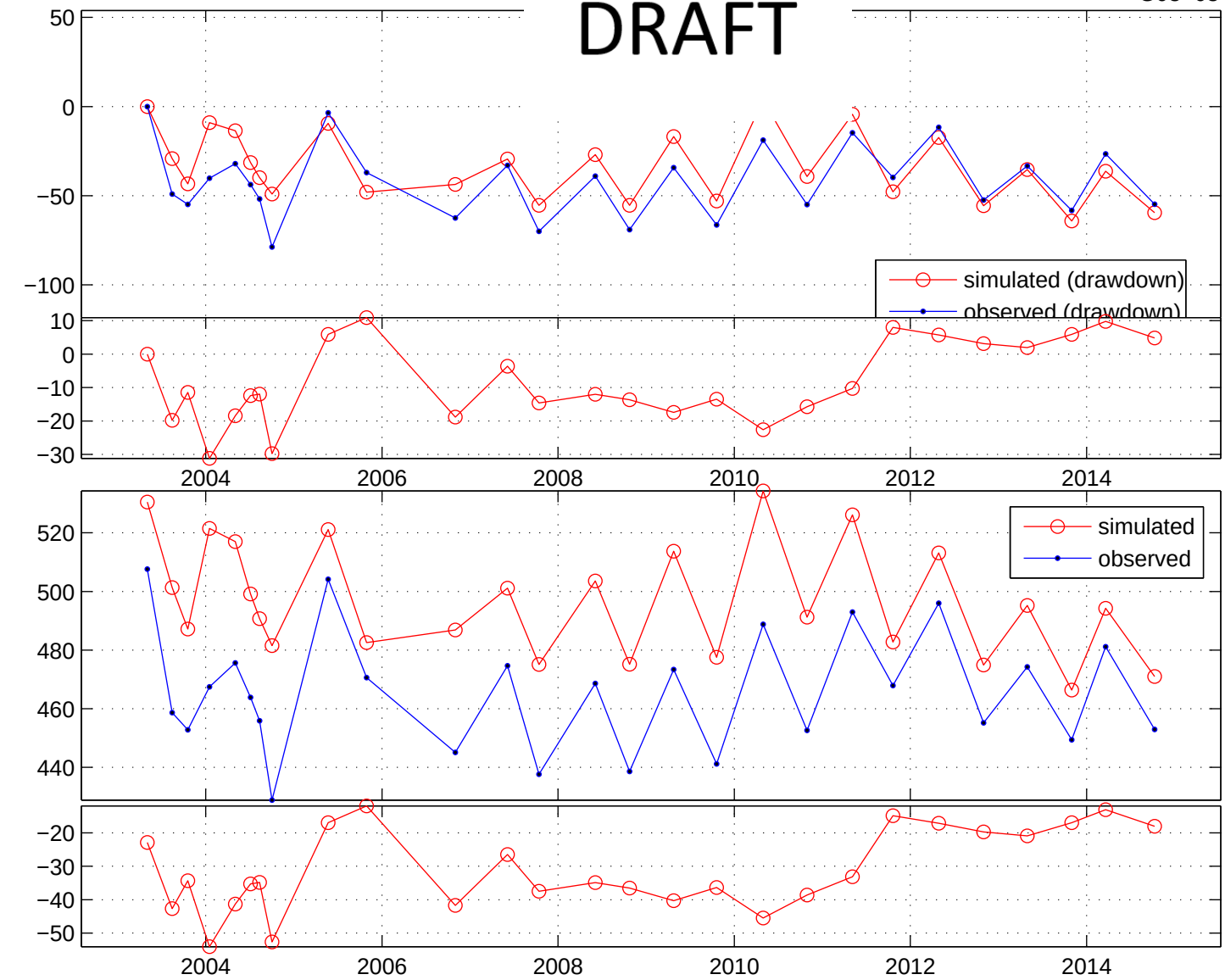


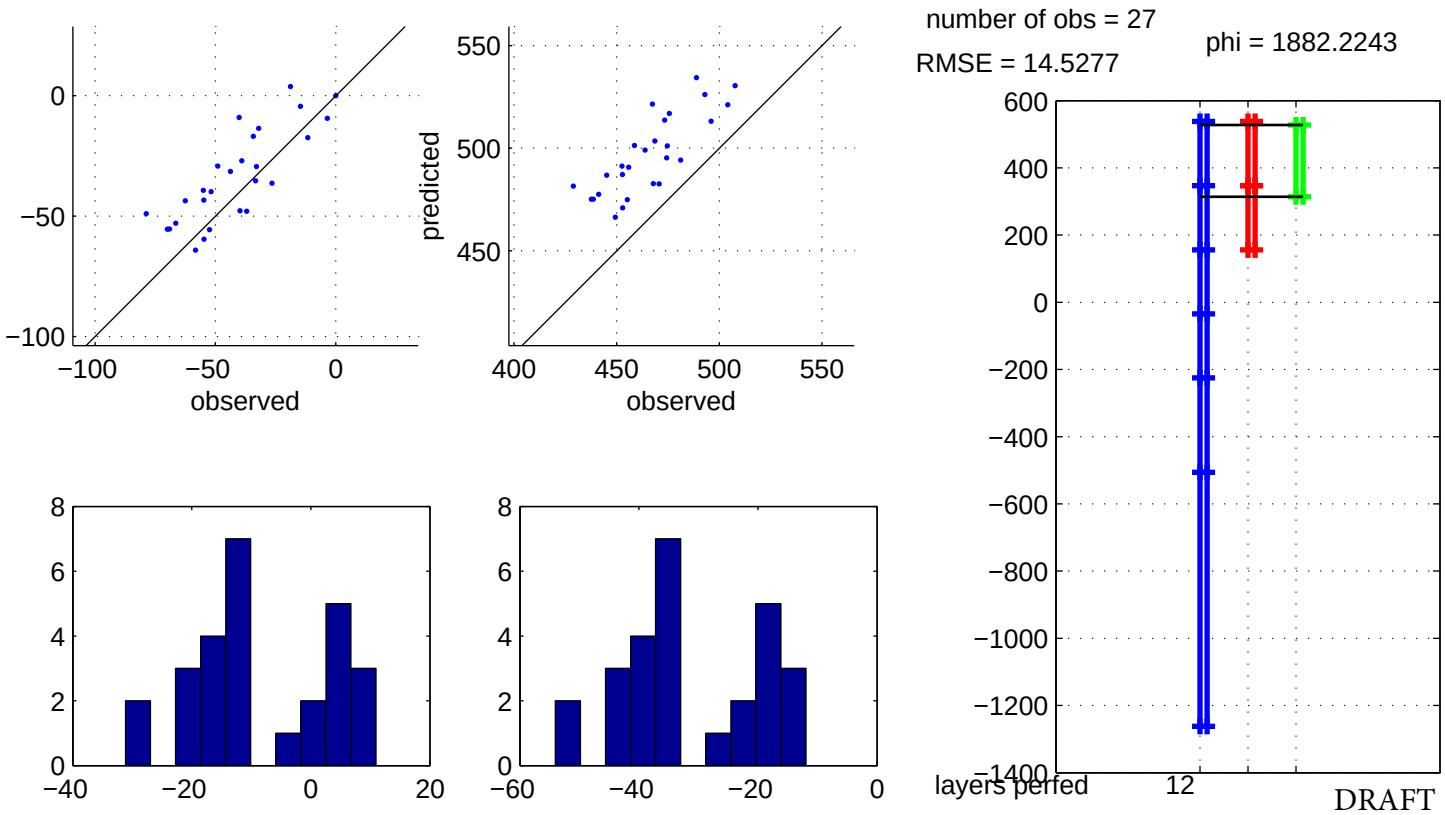


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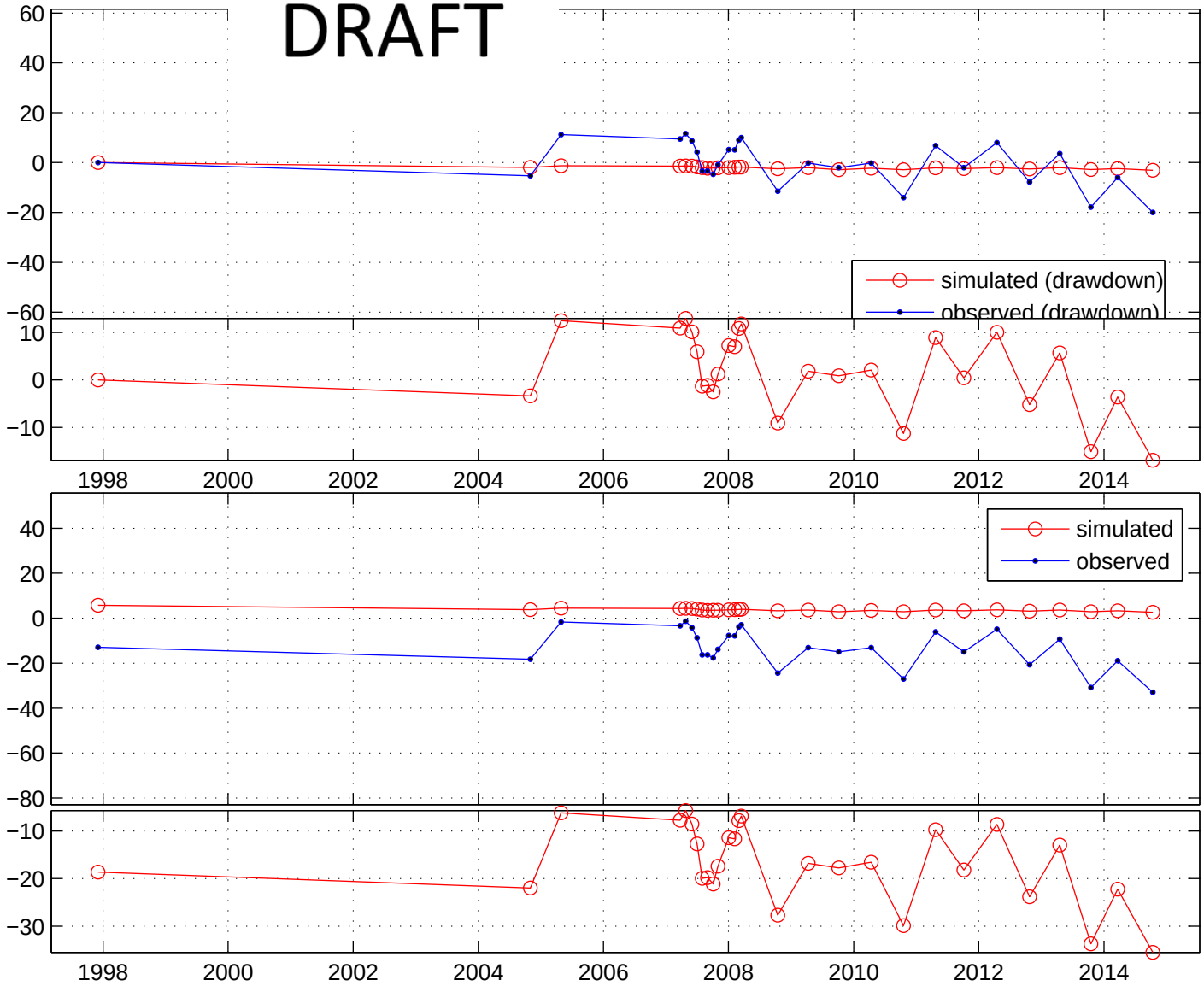


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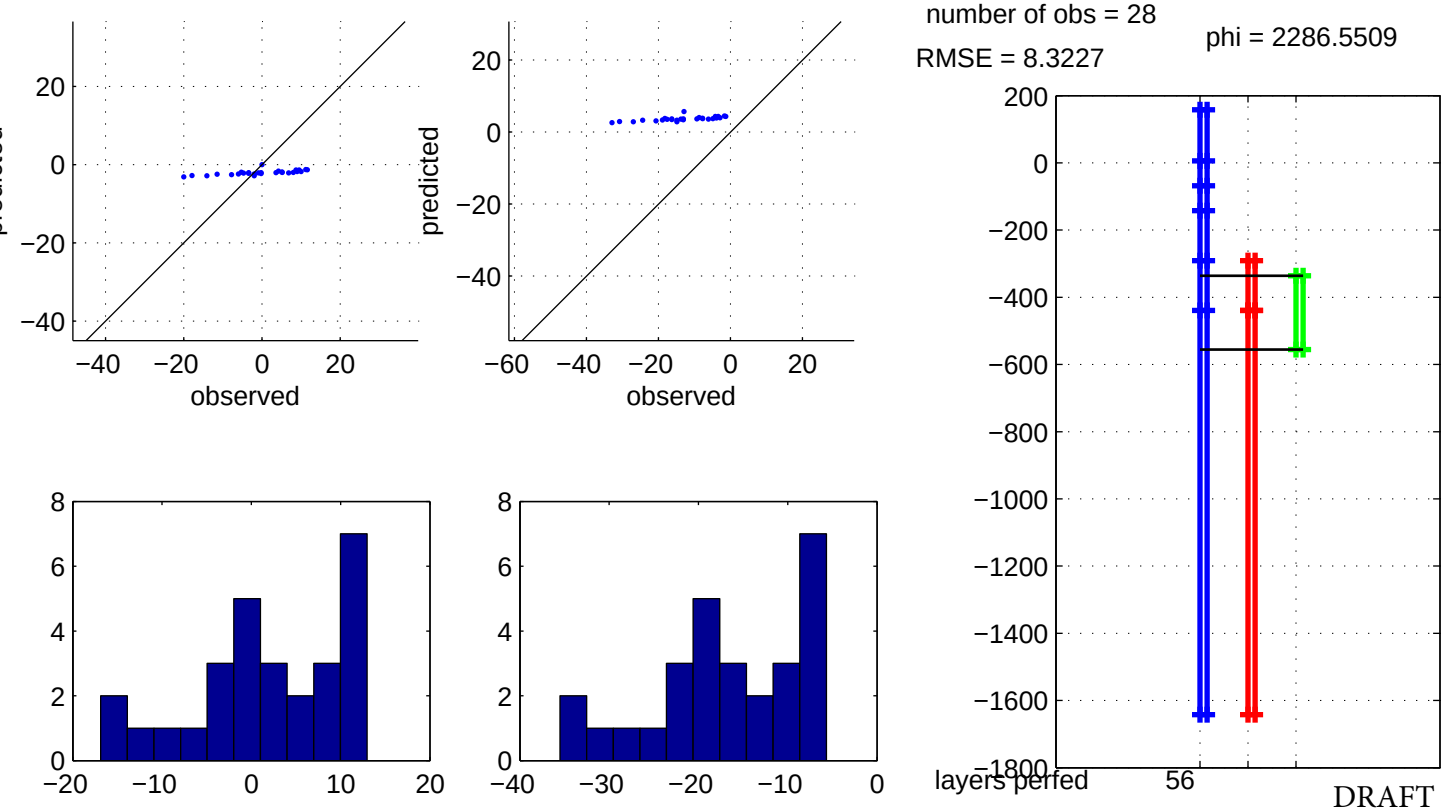
phi = 2286.5509



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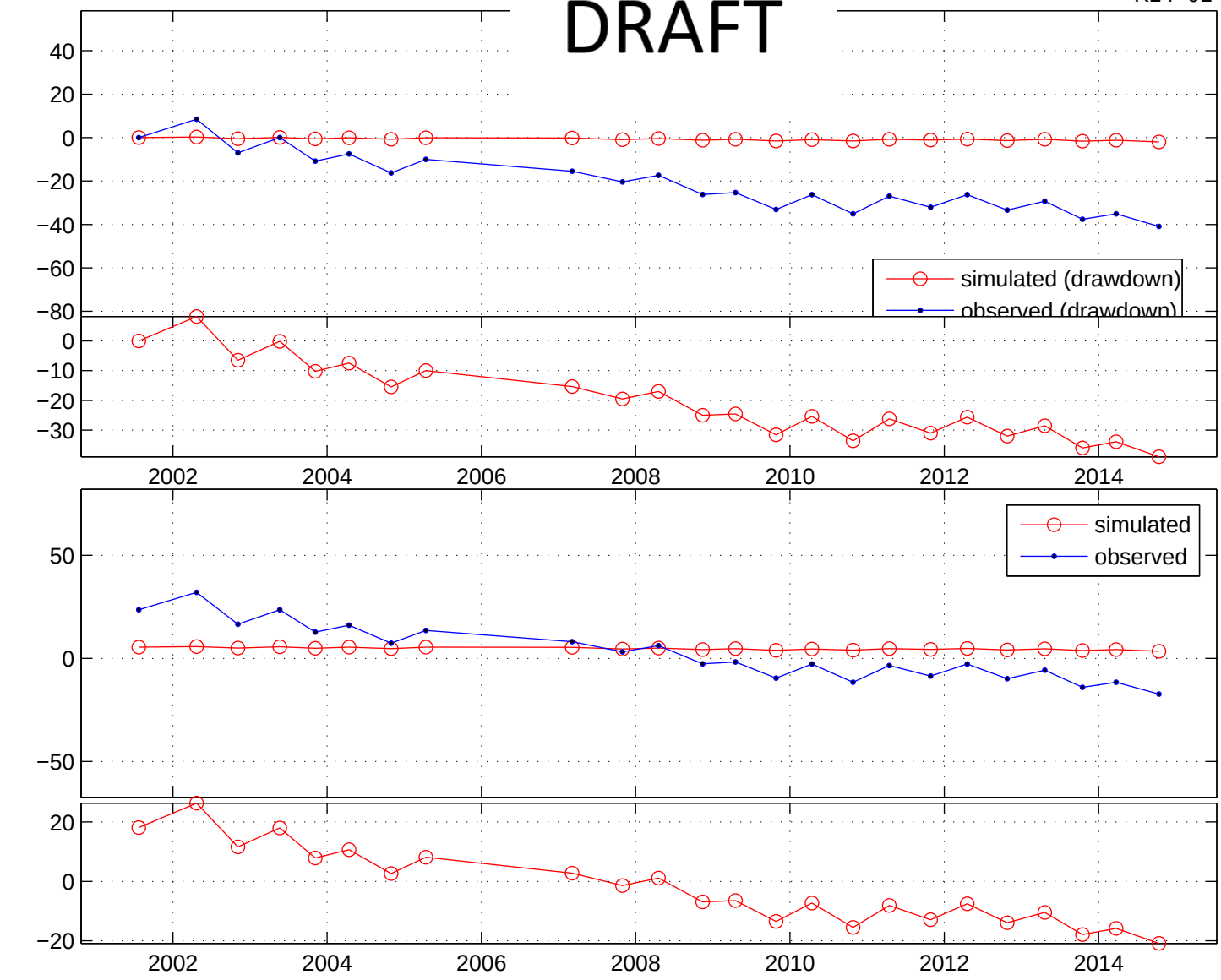


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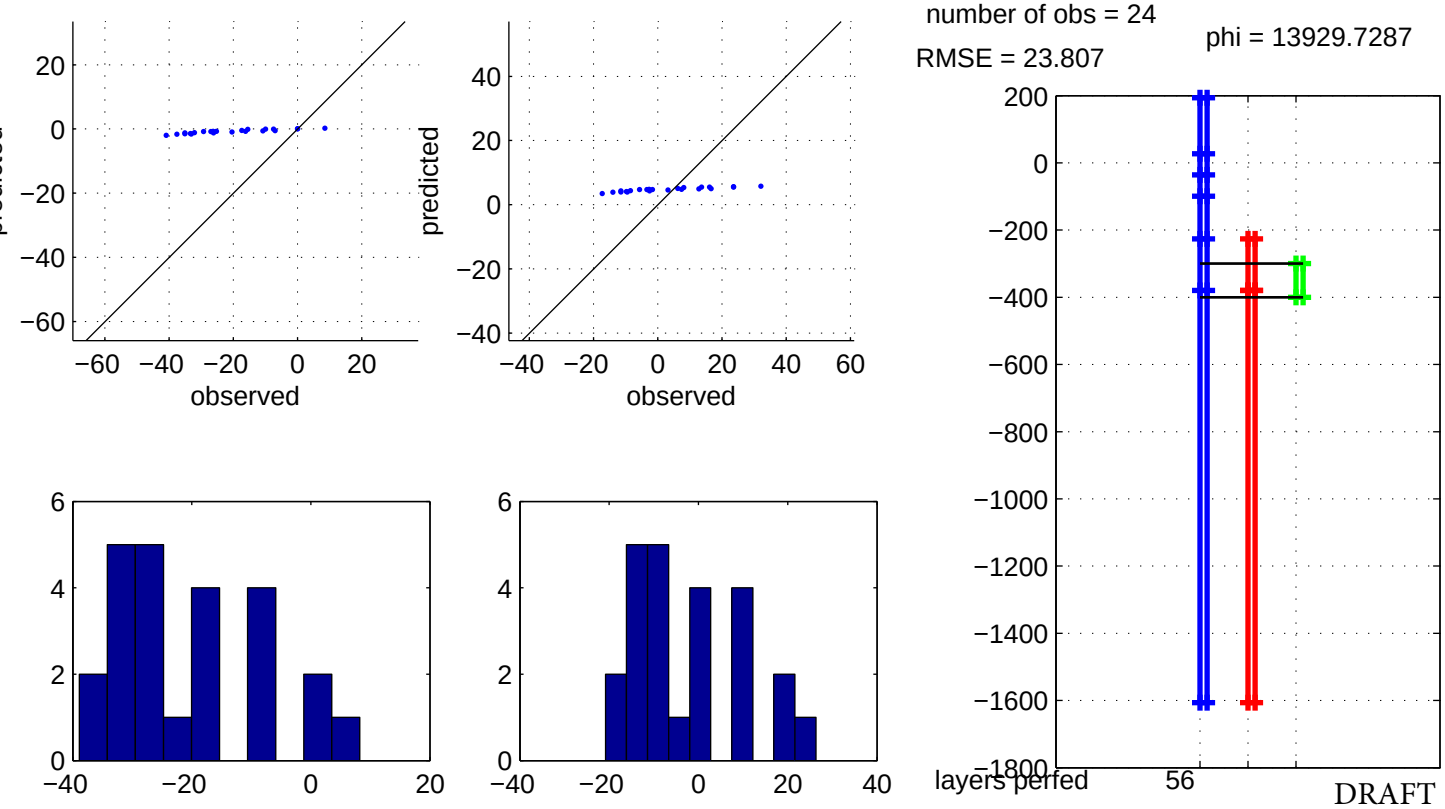

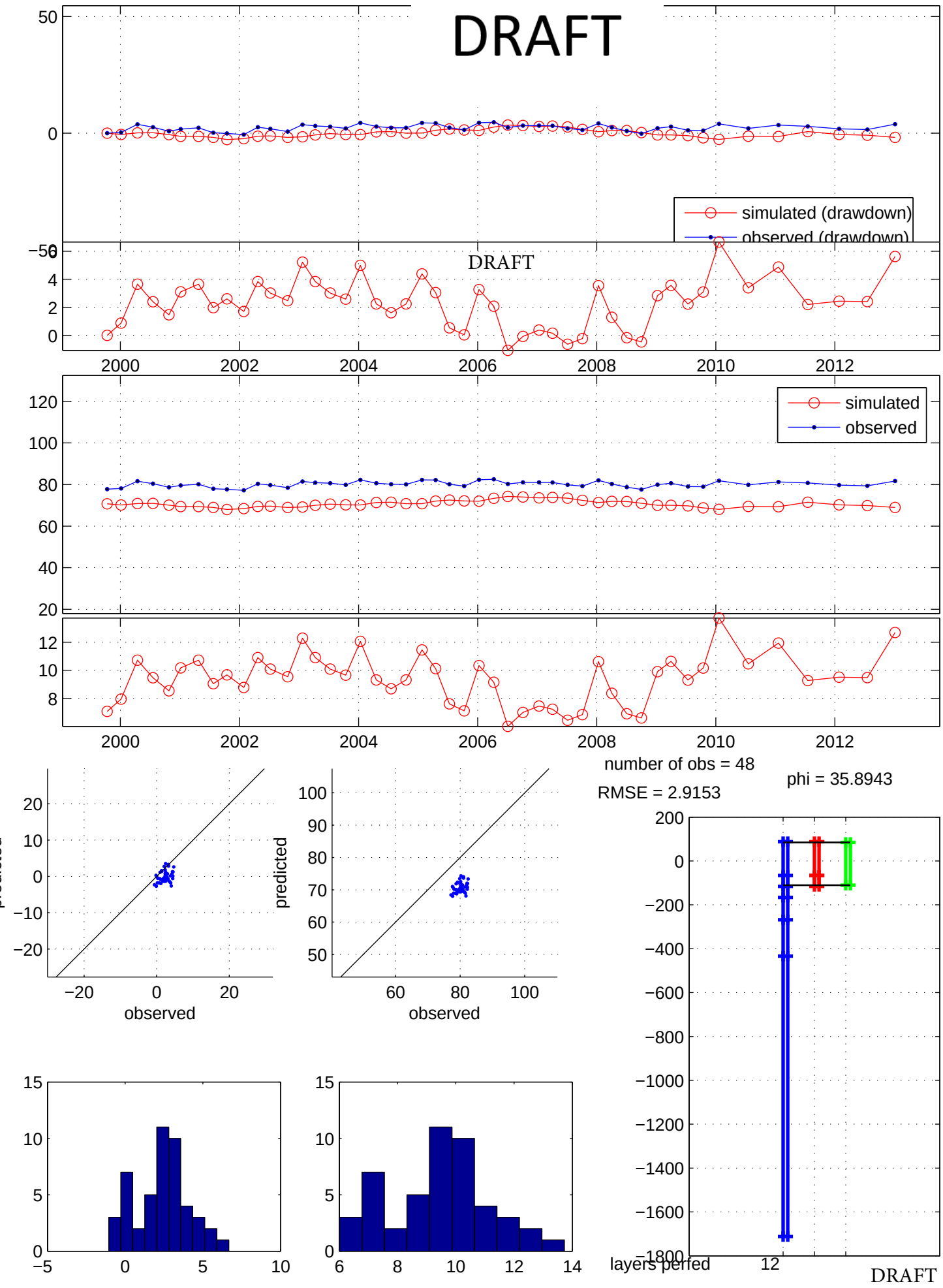
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simulated (drawdown)
observed (drawdown)
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simulated
observed
number of obs = 48
RMSE = 2.9153
phi = 35.8943
predicted
observed
predicted
observed
layers perfed
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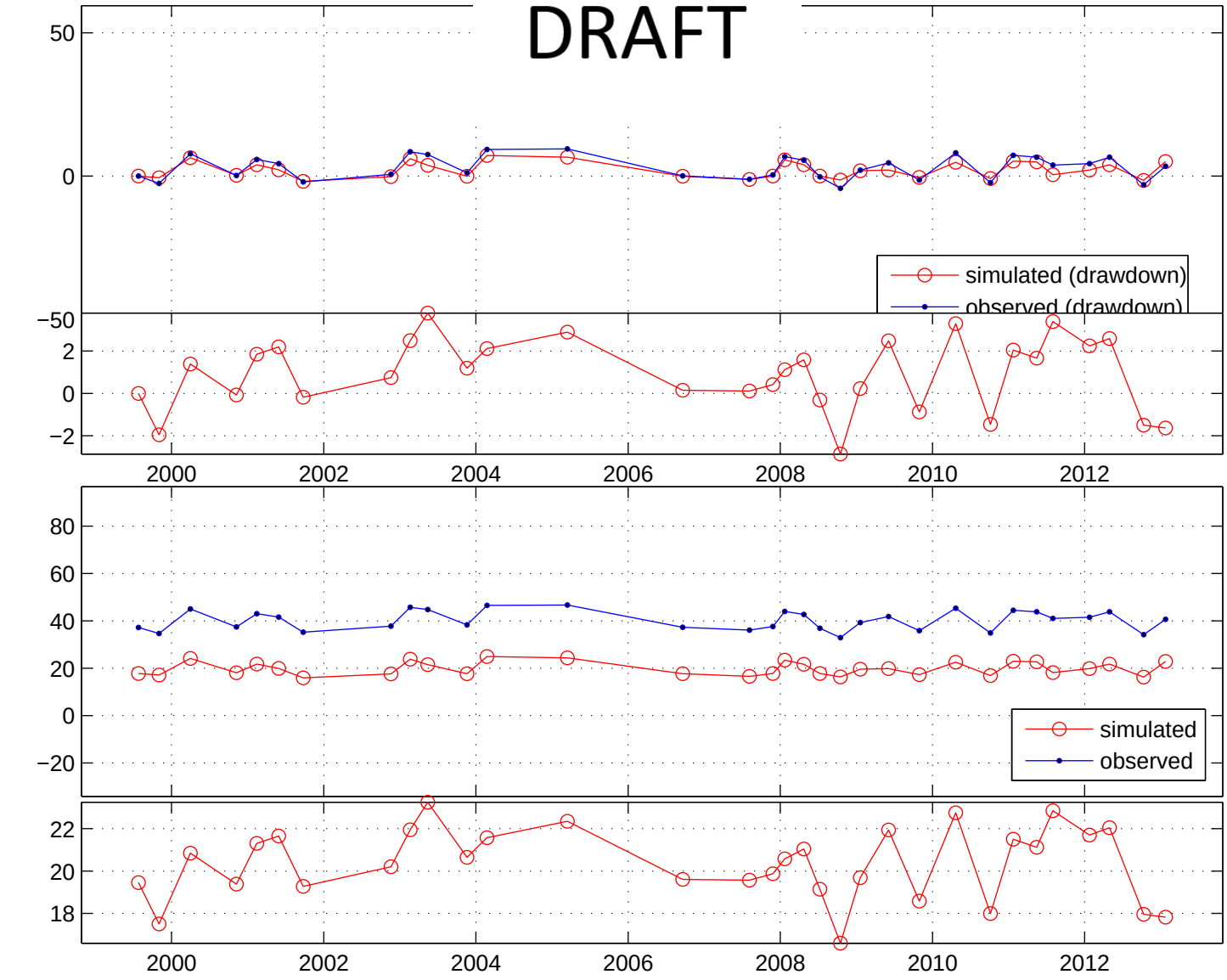


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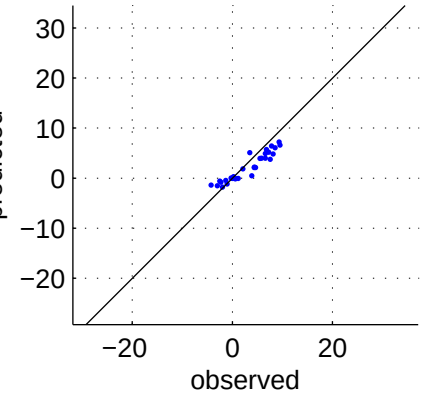
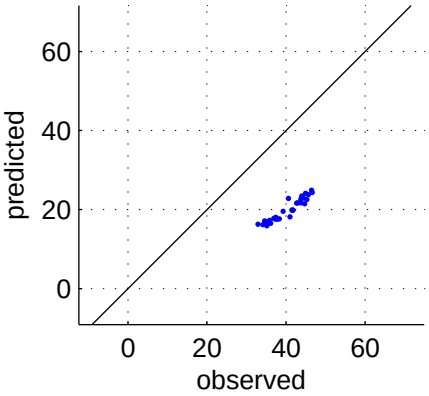
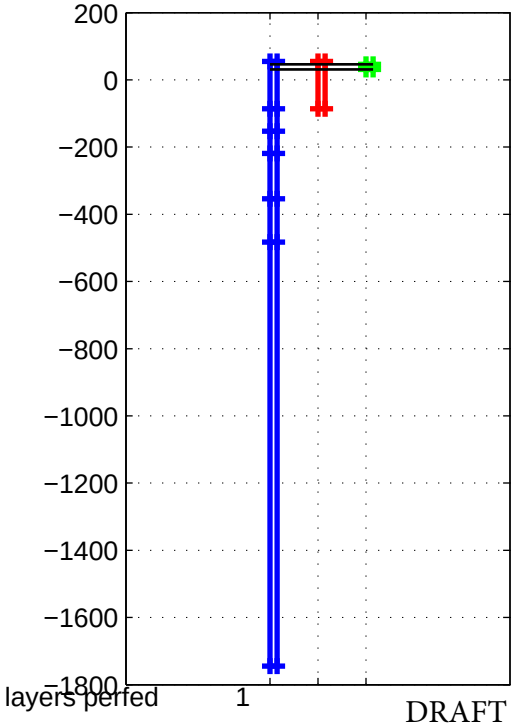
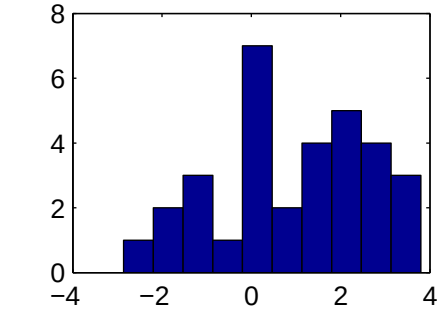
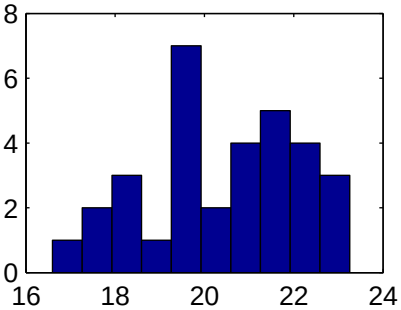
phi = 149.8621





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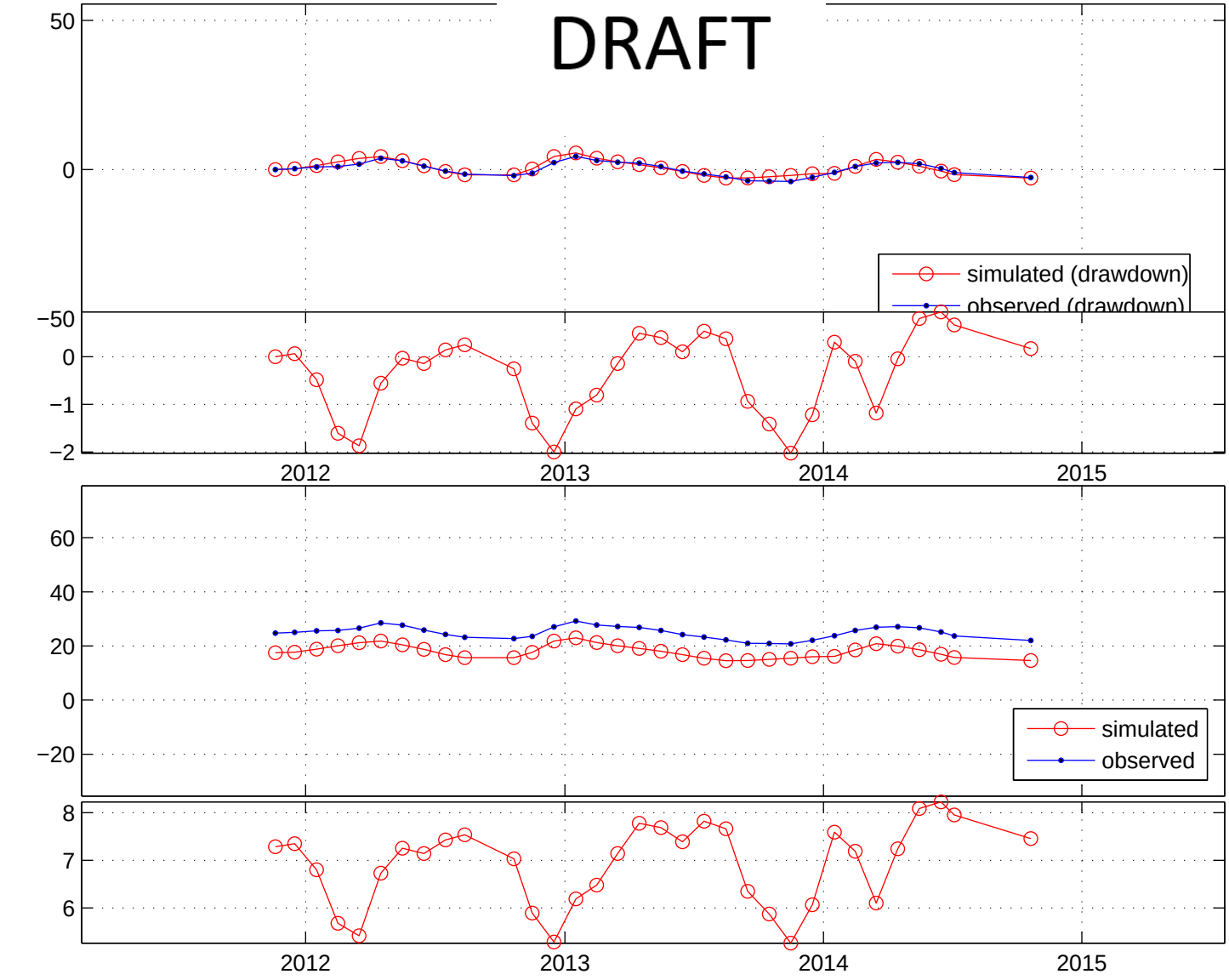


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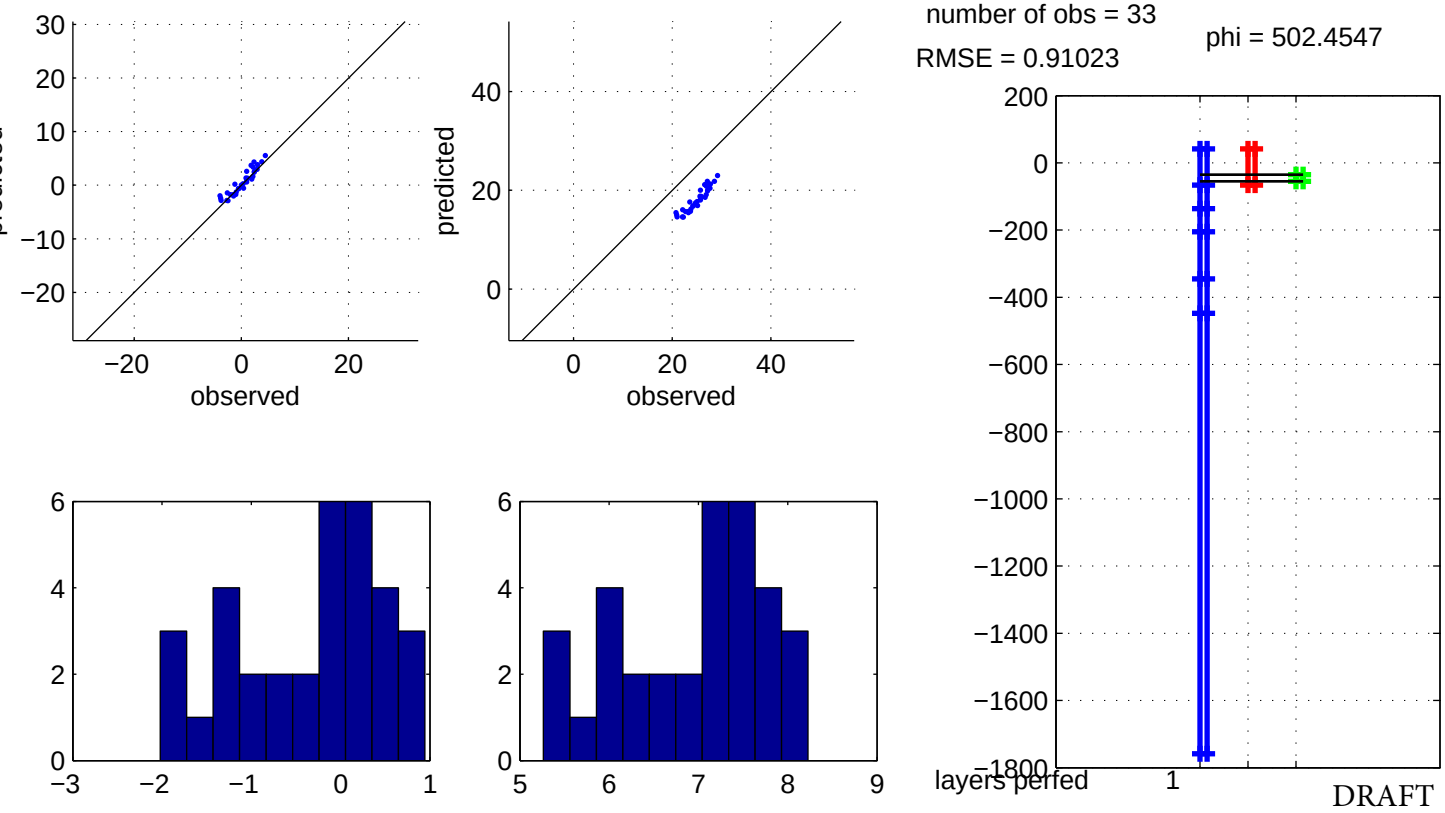
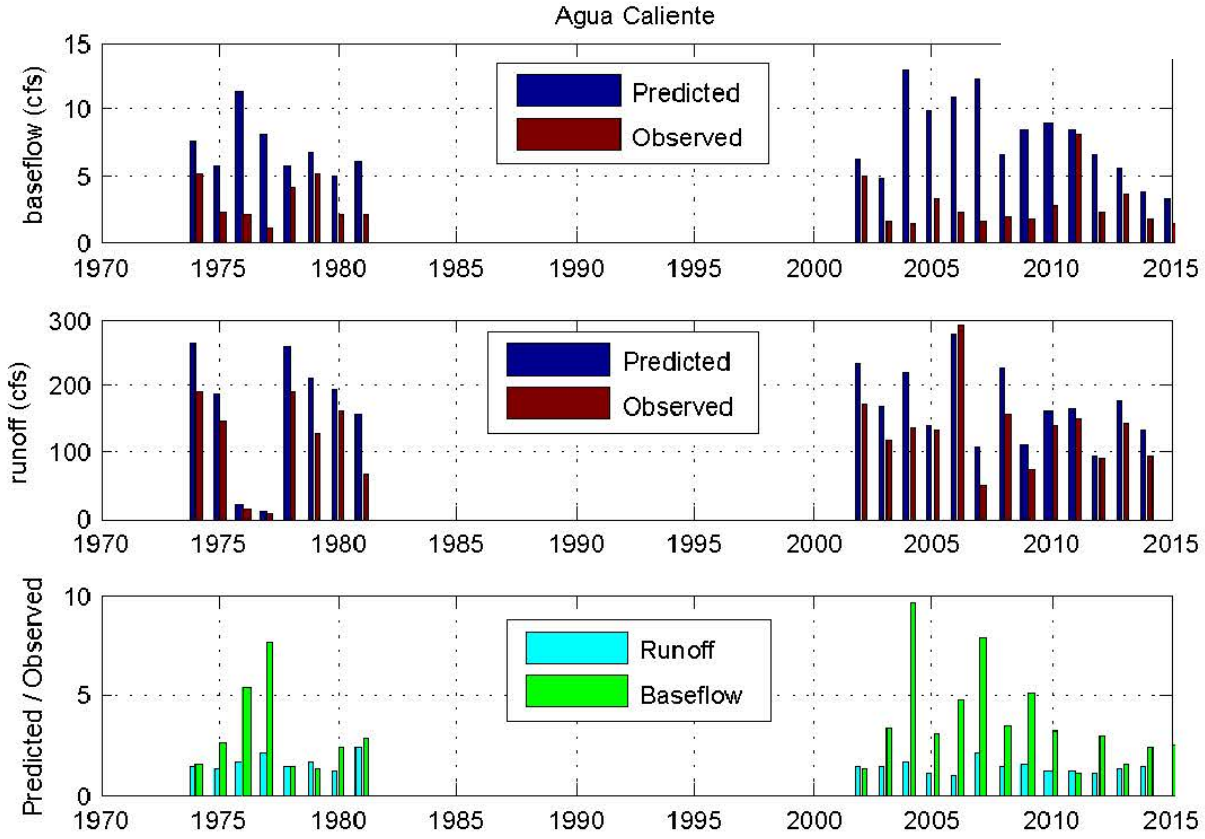
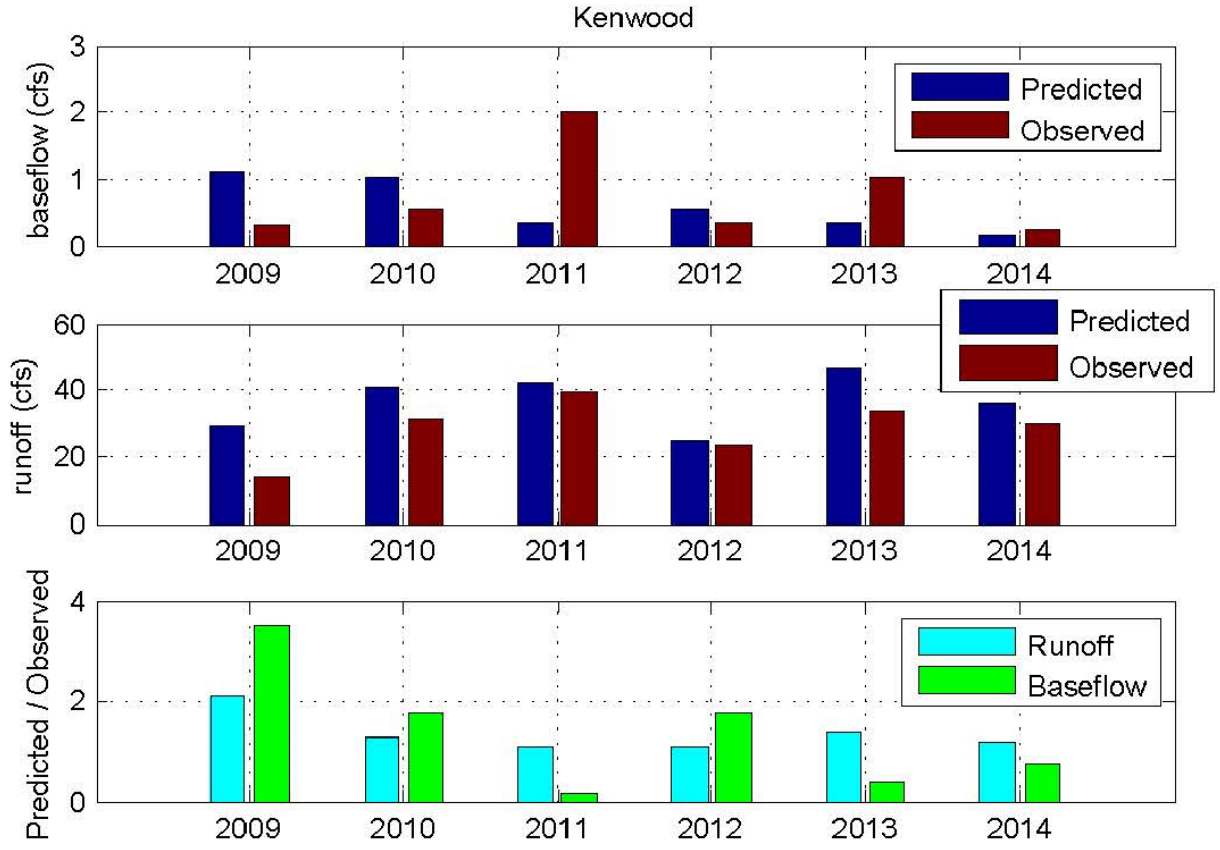
RMSE = 0.91023

phi = 502.4547




Agua Caliente
baseflow (cfs)
Predicted
Observed
runoff (cfs)
Predicted
Observed
Predicted / Observed
Runoff
Baseflow
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015


Kenwood
baseflow (cfs)
Predicted
Observed
runoff (cfs)
Predicted
Observed
Predicted / Observed
Runoff
Baseflow
2009
2010
2011
2012
2013
2014

# *Predicting Vineyard Development in the Sonoma Valley Groundwater Domain*

***Sonoma Valley Groundwater Management Program - 9/8/2015***

## PURPOSE

Develop defensible, empirically based estimates of future vineyard development within Sonoma Valley to be used in the future baseline model scenarios.

## SUMMARY OF METHODOLOGY

We extended recent trends of vineyard development in Sonoma Valley to project potential growth estimates to 2065. We tested a variety of data to produce a range of projections that emphasize a) the recent slow-down in vineyard development (low-growth), b) the long-term trend (high-growth), and c) an average of the low- and high-growth. The geographic distribution of these growth projections is determined using a vineyard expansion model (VEM). The VEM quantitatively ranks the potential for vineyard development by assessing the statistical relationships of topography, slopes, and other factors to observed vineyard distributions.

## APPROACH

### 1. DERIVE VINEYARD DEVELOPMENT GROWTH RATES

Projection estimates were developed by fitting varying trendlines to observed vineyard acreage in the Sonoma Valley groundwater model domain, from 1974 to 2012 (Figure 1). The vineyard acreage data were derived from the Department of Water Resources land use datasets and vineyard mapping by the Sonoma County Water Agency and others. Vineyard development does not appear constant in the last 20 years. There are high growth rates exhibited by the

change in vineyard area from the early 1990's to now, compared with low growth rates in the 2000's. We therefore chose growth rates that encapsulate these varying trends, along with a growth rate that is an average of the two.

### 2. Map Vineyard Projections Using Vineyard Expansion Model

A vineyard expansion model (VEM) was developed by the Sonoma County Water Agency based on the methods developed by the Integrated Hardwood Range Management Program at UC Berkeley (Brooks et al, 2000). Logistic regression was utilized to generate a vineyard probability map by correlating the existence of vineyards to geographic characteristics including slope, elevation, and directional aspect. In essence, the VEM produces a ranking that an area will be converted to a vineyard. To produce spatial projections of vineyard growth, the growth estimates were propagated onto these rankings over 5 year time steps from 2015 until 2065 (Figures 2, 3, and 4). Locations were removed from the projections that are currently urban, water, or are below an elevation threshold of 6 feet. This threshold was identified in the current land use dataset.

## Future Work

1. Further limit vineyard expansion by incorporating VESCO stream and pond setback distances and land zoning compatibility.
2. Incorporate rural development maps to limit vineyard growth.
3. Perform projections and analysis for sub-catchment areas.
4. Vet assumptions and methodology with County of Sonoma Agricultural Commissioner's office and industry representatives.

## Reference

**Brooks, Colin. Heaton, Emily. Newburn, David. Merenlender, Adina. (2000)** "*Modeling vineyard expansion in California's north coast: developing statistical models and evaluating consequences for the surrounding oak woodland landscape.*" http://www.krisweb.com/biblio/ncc_esri_brooksetal_xxxx.htm. Accessed June-August 2015.

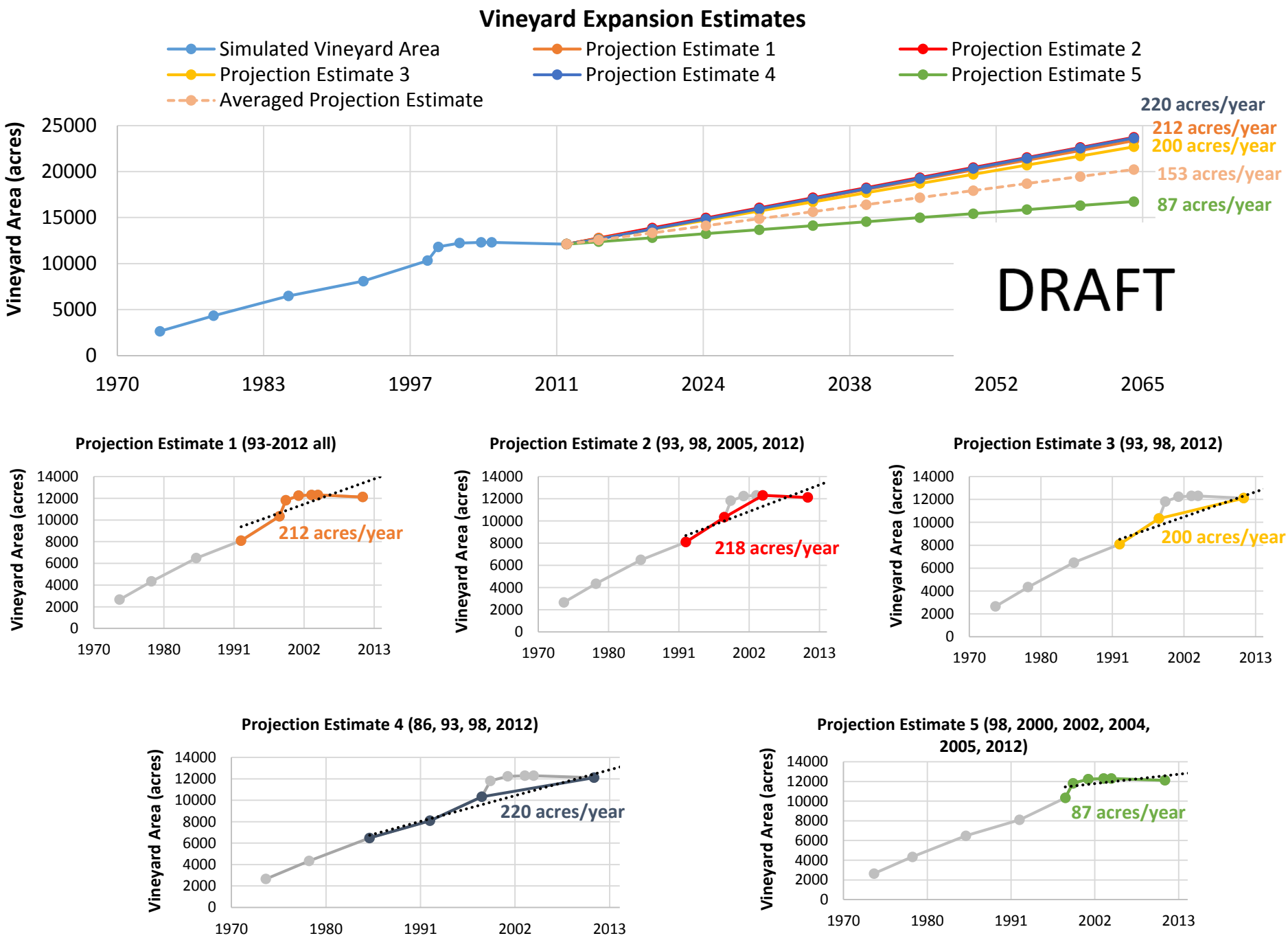



FIGURE 1 – PROJECTION ESTIMATE BASIS

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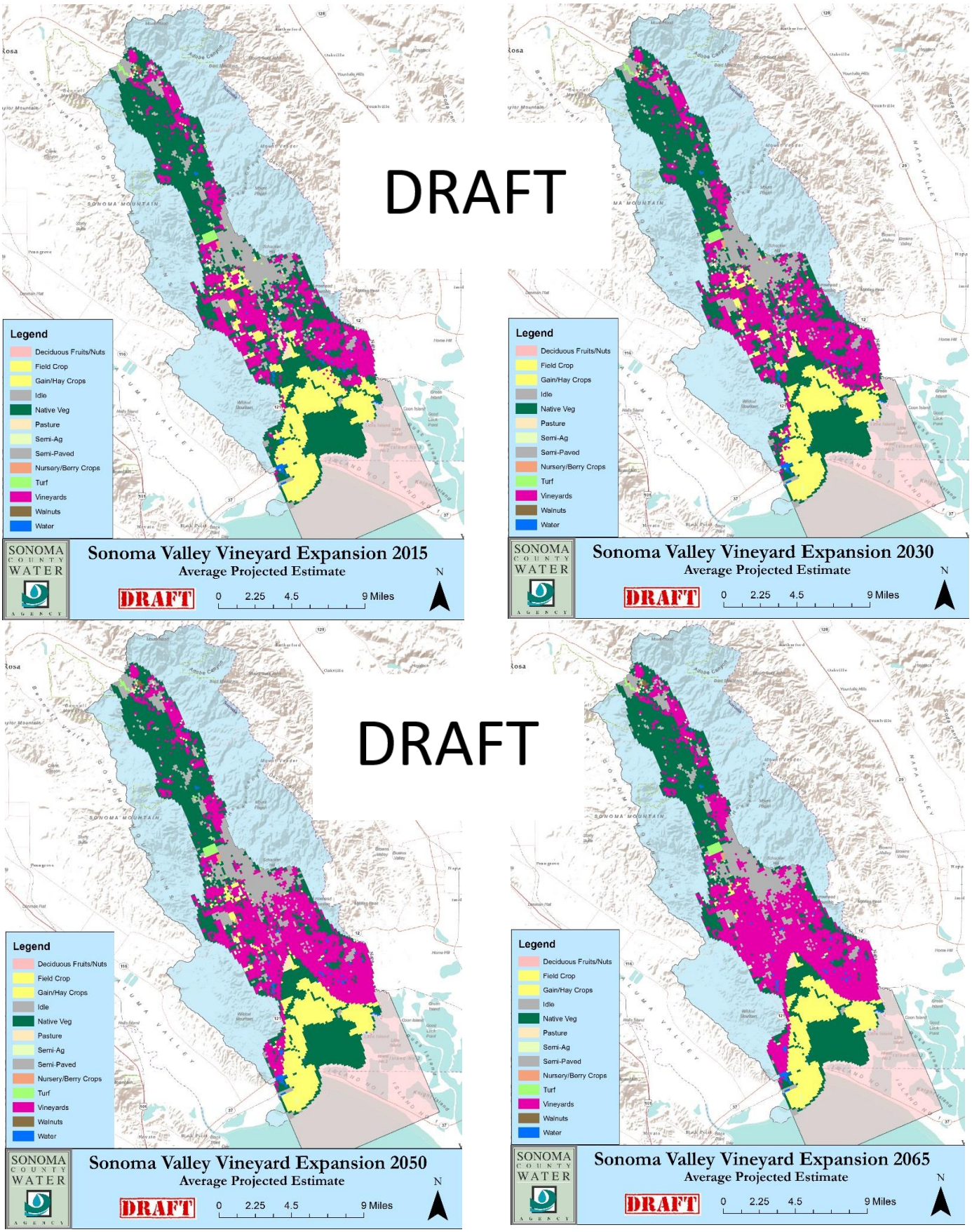


**FIGURE 2 – AVERAGE PROJECTED ESTIMATE OF VINEYARD EXPANSION IN SONOMA VALLEY**

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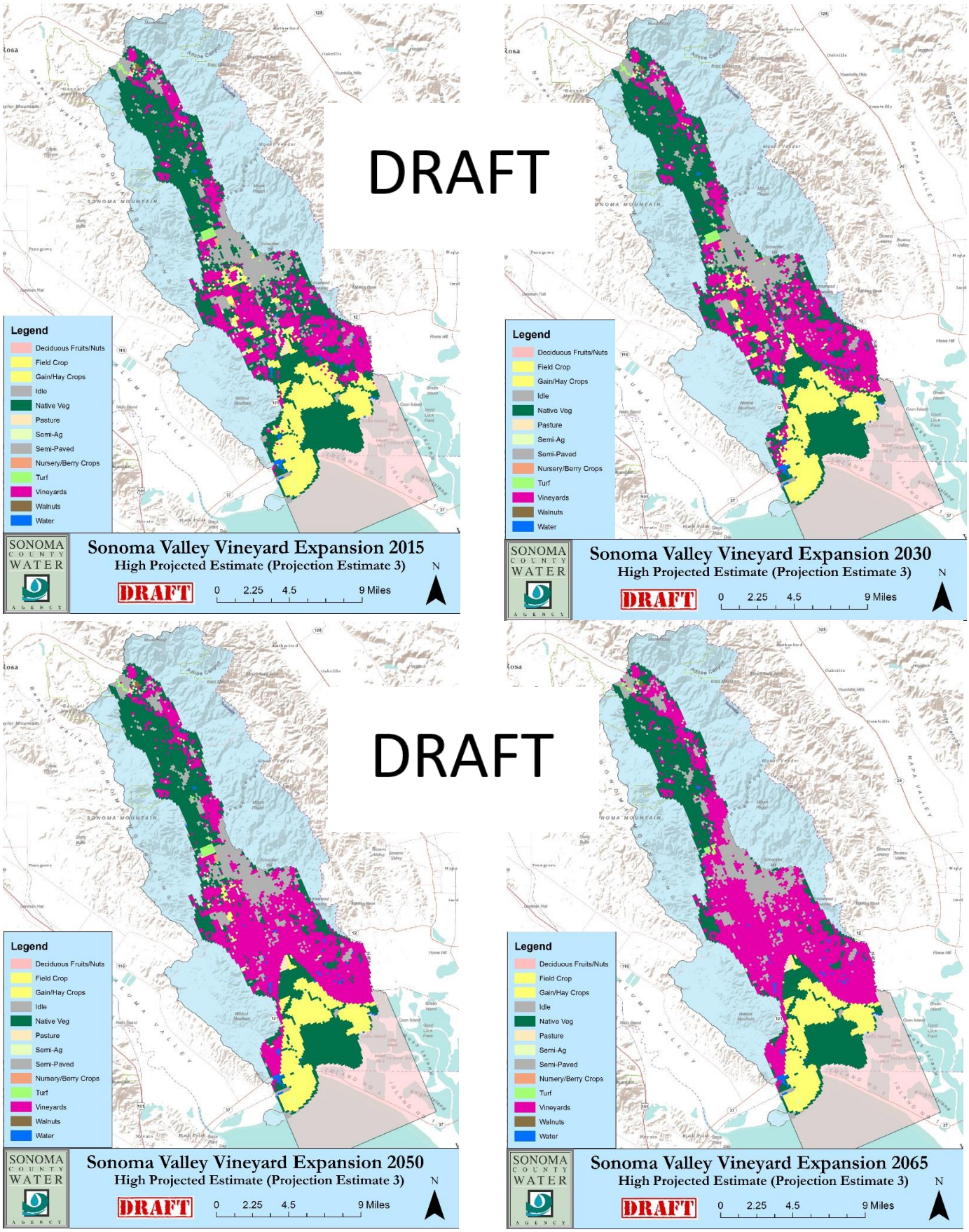


**FIGURE 3 – HIGH PROJECTED ESTIMATE OF VINEYARD EXPANSION IN SONOMA VALLEY**

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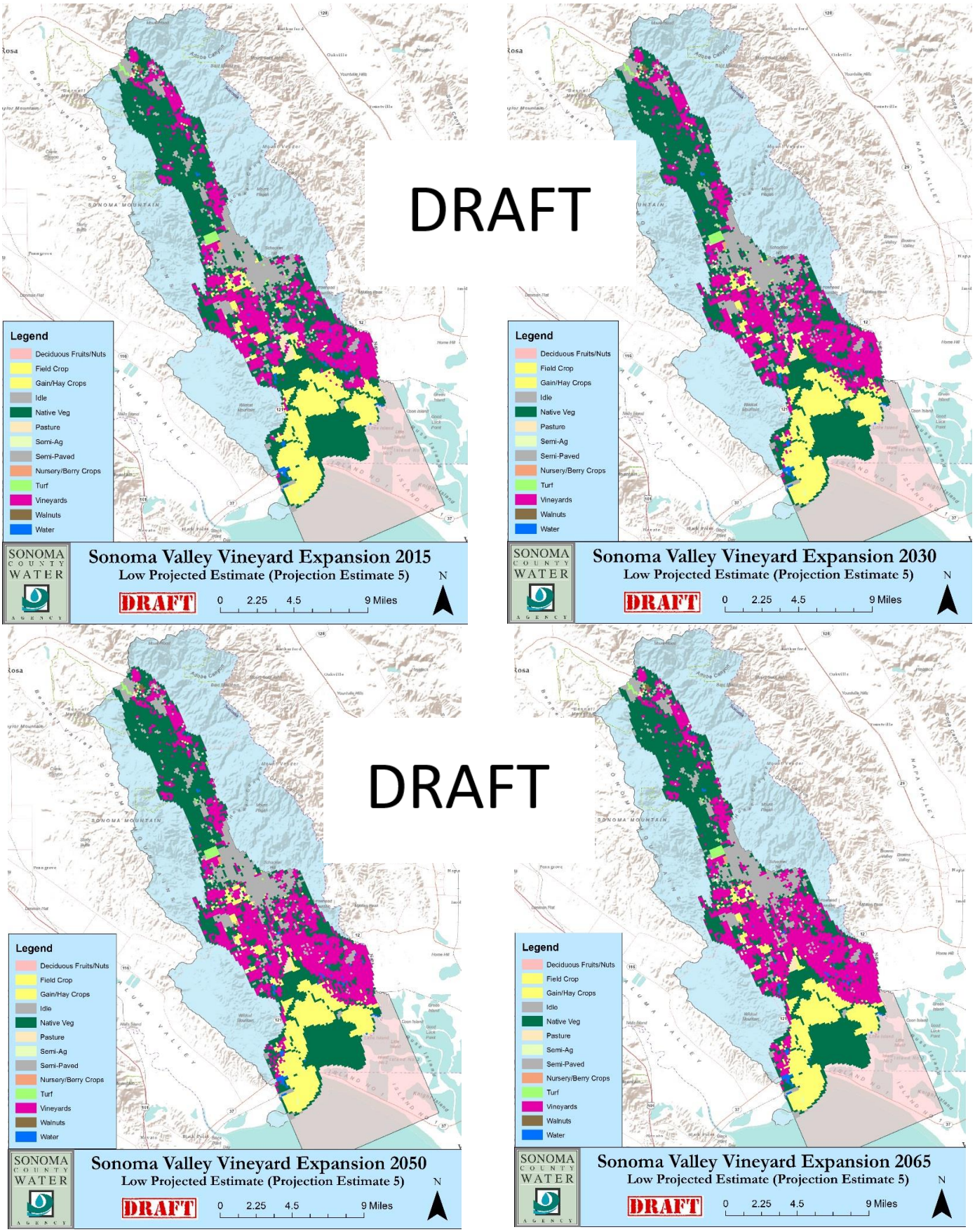


**FIGURE 4 – LOW PROJECTED ESTIMATE OF VINEYARD EXPANSION IN SONOMA VALLEY**

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