

Assessing Water Market : Performance, Growth, and New Market Trends

Our Farms Our Future
April 4, 2018



WestWater Research

- **Economic & Financial Advisory Firm**
 - Nationwide practice in water valuation, water acquisition, water investments, and economic planning
- **Waterlitix – Price Database**
 - The most comprehensive database of water right price and sales information
 - Price data on over 20,000 western water rights transactions
- **Creating Value Through Innovation**
 - Arizona effluent transaction nominated for 2014 “Water Deal of the Year”



Office Locations

Main Office	West Coast	Southwest	Intermountain
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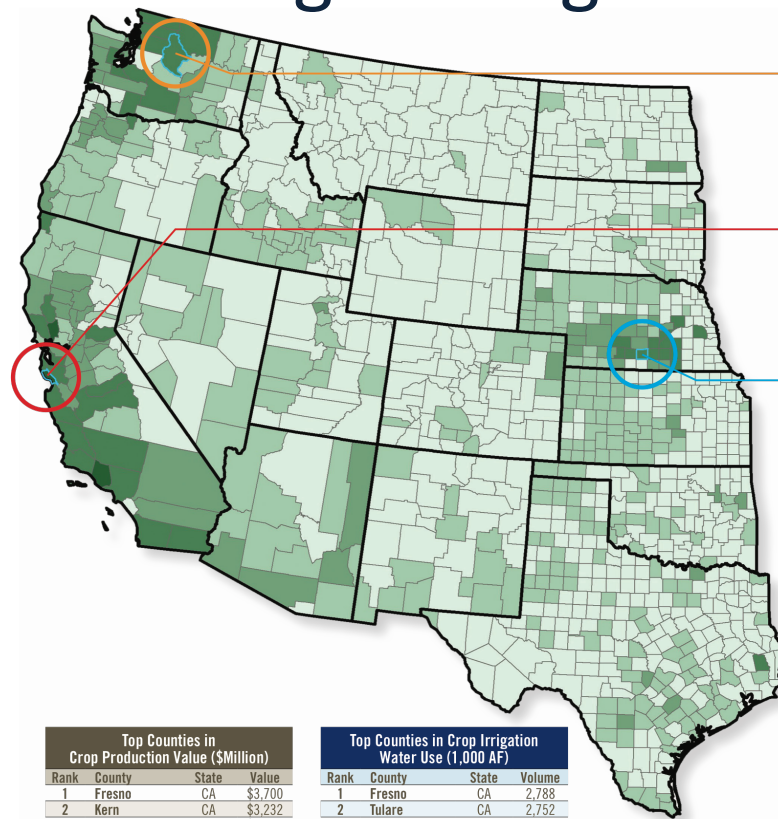
Overview

- Defining the Water Rights Market
- Who's Buying & Selling and Why
- Sizing the Water Market
 - Just How Big is the Market
- Water Rights Price Index
 - How are Water Prices Performing
- Market Trends and Changes on the Horizon

Water Market Outlook

DEFINING THE WATER RIGHTS MARKET

Value of Irrigated Agriculture in the West



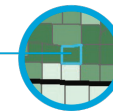
CHELAN COUNTY, WASHINGTON

\$203M in Crop Production Value
72% of cropland is irrigated
Primary crop is fruit trees
41,938 AF of annual irrigation water use
Irrigation Water Revenue: \$3,494 per AF



SANTA CRUZ COUNTY, CALIFORNIA

\$548M in Crop Production Value
70% of cropland is irrigated
Primary crops are fruits & vegetables
36,203 AF of annual irrigation water use
Irrigation Water Revenue: \$10,653 per AF



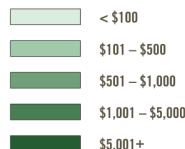
KEARNEY COUNTY, NEBRASKA

\$232M in Crop Production Value
80% of cropland is irrigated
Primary crops are corn & soybeans
112,686 AF of annual irrigation water use
Irrigation Water Revenue: \$1,649 per AF

Top Counties in Crop Production Value (\$Million)			
Rank	County	State	Value
1	Fresno	CA	\$3,700
2	Kern	CA	\$3,232
3	Monterey	CA	\$2,935
4	Tulare	CA	\$1,671
5	San Joaquin	CA	\$1,659
6	Ventura	CA	\$1,430
7	Grant	WA	\$1,333
8	Imperial	CA	\$1,310
9	Merced	CA	\$1,273
10	Madera	CA	\$1,240
11	Santa Barbara	CA	\$1,129
12	Yakima	WA	\$1,069
13	Stanislaus	CA	\$1,063
14	Kings	CA	\$855
15	Riverside	CA	\$745
16	Yuma	AZ	\$697
17	San Diego	CA	\$648
18	San Luis Obispo	CA	\$618
19	Sonoma	CA	\$606
20	Benton	WA	\$582

Top Counties in Crop Irrigation Water Use (1,000 AF)			
Rank	County	State	Volume
1	Fresno	CA	2,788
2	Tulare	CA	2,752
3	Kern	CA	2,014
4	San Joaquin	CA	1,772
5	Stanislaus	CA	1,679
6	Jefferson	ID	1,561
7	Merced	CA	1,539
8	Kings	CA	1,402
9	Jerome	ID	1,347
10	Yuma	AZ	1,252
11	Imperial	CA	1,218
12	Pinal	AZ	1,171
13	Grant	WA	1,152
14	Maricopa Falls	AZ	1,134
15	Twin	ID	1,076
16	Bingham	ID	1,056
17	Colusa	CA	928
18	Cassia	ID	894
19	Ada	ID	839
20	Mesa	CO	830

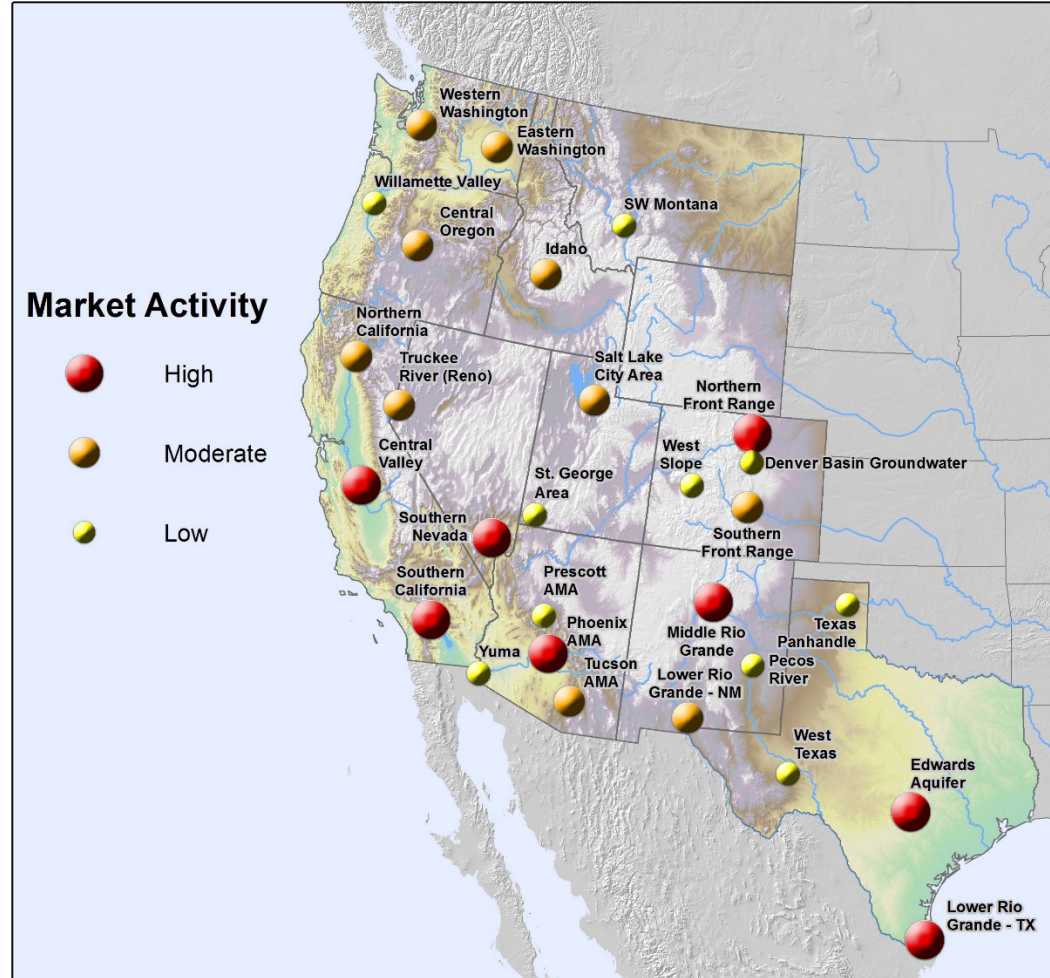
Western Counties Irrigation Water Revenue (\$/AF)



Water carries significant value for agriculture and the West. Agriculture is the largest water user in the region, representing over 80% of total use. The sector is also an important part of the West's economy, generating more than \$90 billion in total farm revenue for the region. One measure of the value of water in agriculture is the revenue generated from each acre-foot water used for irrigation. As the map illustrates, the revenue generated by water use in agriculture varies by county across the West. Counties generating the highest revenue per acre-foot are located in southern and coastal California, central Washington, and southern Nebraska.

Water Markets in the West

- Over 25 Established and Emerging Regional Markets
- Enabling Market Conditions:
 - Supply and Demand: High-growth areas experiencing water scarcity
 - Regulatory/Legal: Defined, transferable water rights
 - Large market entrant often catalyst for early-stage trading



Commonly Traded Water Assets

Asset classes are highly regionalized based on local legal and regulatory institutions

Surface Water Rights

- Direct use of stream flows when in priority.
- Active Markets:
 - California
 - Colorado
 - Nevada
 - New Mexico
 - Utah
 - Washington



Groundwater Rights

- Withdrawal and use of groundwater through wells.
- Active Markets:
 - Arizona
 - California
 - Colorado
 - Texas

Groundwater Storage & Recovery

- Water stored underground in the aquifer to accrue credits authorizing later withdrawal.
- Active Markets:
 - Arizona
 - California



Effluent

- Entitlement to use treated wastewater, generally for irrigation, industrial use, or groundwater recharge.
- Active Markets:
 - Arizona
 - California
 - Colorado

Storage Water Rights

- Entitlement to store water for use at a later time.
- Active Markets:
 - California
 - Colorado



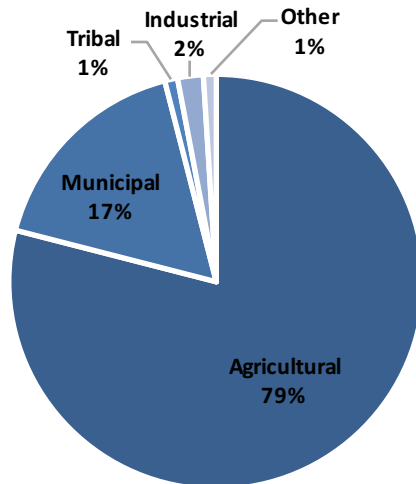
Water Market Outlook

WHO'S BUYING AND SELLING

Market Participants

Supply Sectors

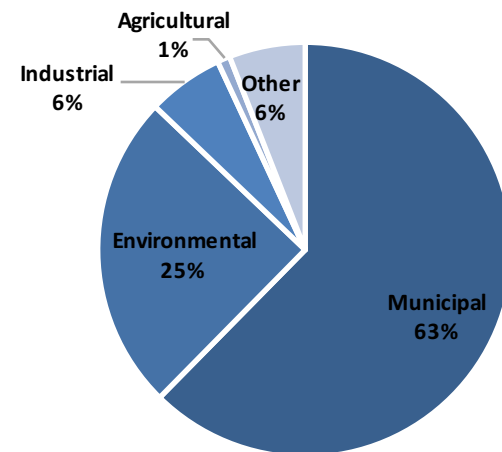
- Agricultural Producers
- Municipalities
- Investment Firms
- Public & Private Water Companies
- Native American Tribes
- Industrial Facilities (often decommissioned)



Volume Traded by Supply Sector

Demand Sectors

- Municipalities
- Public & Private Water Companies
- Investment Firms
- Real Estate Developers
- Federal & State Agencies
- Non-profit Conservation Groups
- Native American Tribes
- Golf Courses
- Agricultural Producers



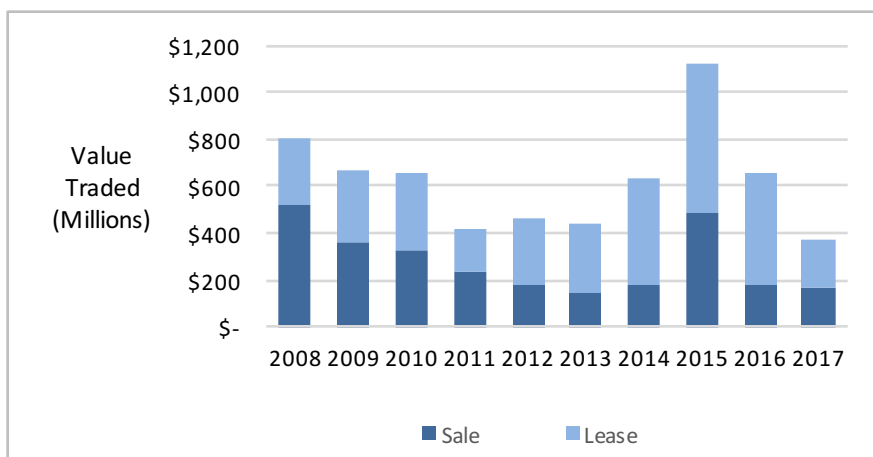
Volume Traded by Demand Sector

Water Market Outlook

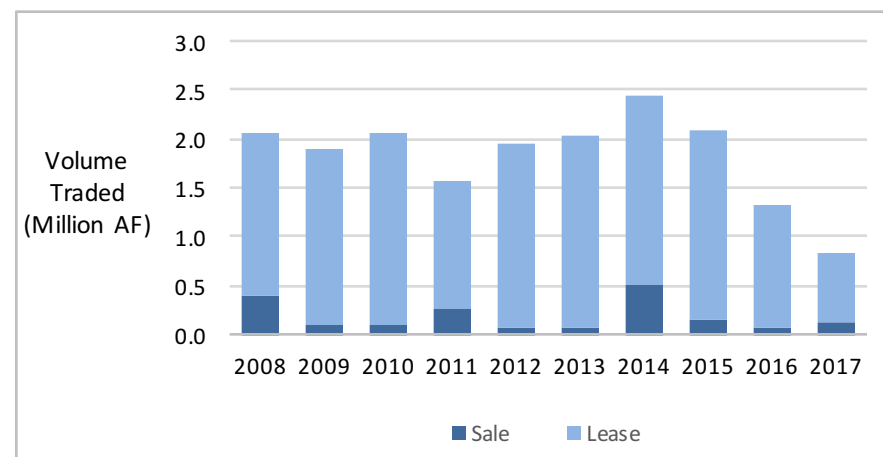
SIZING THE MARKET

Total Market Size

Total Value Traded, 2008-2017



Total Volume Traded, 2008-2017

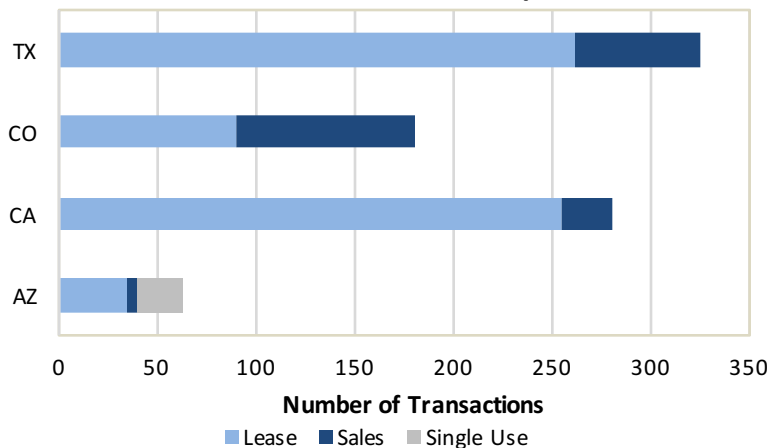


- **2017 Value Traded:** \$371 million.
 - Volume: Leases account for the majority of annual volume traded
 - Value: Evenly divided between sales and leases in 2017
 - Primarily driven by increased trading activity in California

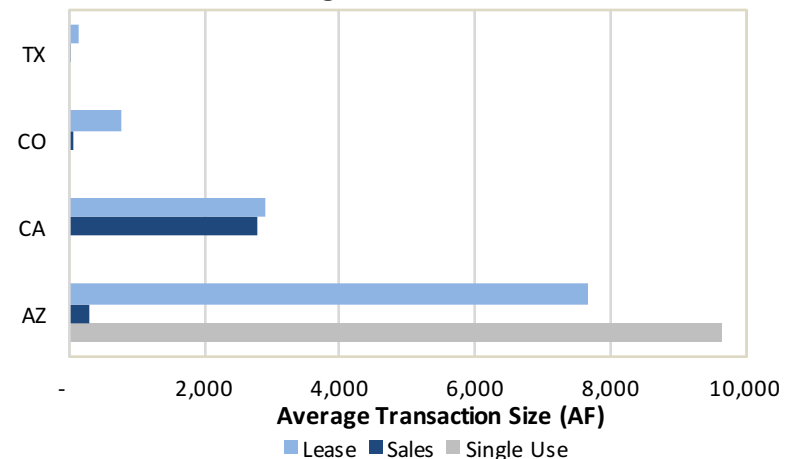
Primary Markets

Transaction Size and Frequency

Number of Transactions Completed



Average Transaction Size



- **Arizona**

- Mix of sales, leases, and storage & recovery credit sales
- Native American tribes active in the leasing market (sell side and buy side)

- **Colorado**

- Active sale market, growing lease market

- **California**

- Leasing accounts for the majority of trading
- Leases are generally large

- **Texas**

- Active sale and lease market
- Generally small sales, larger leases

Water Market Outlook

WATER RIGHTS PRICE INDEX

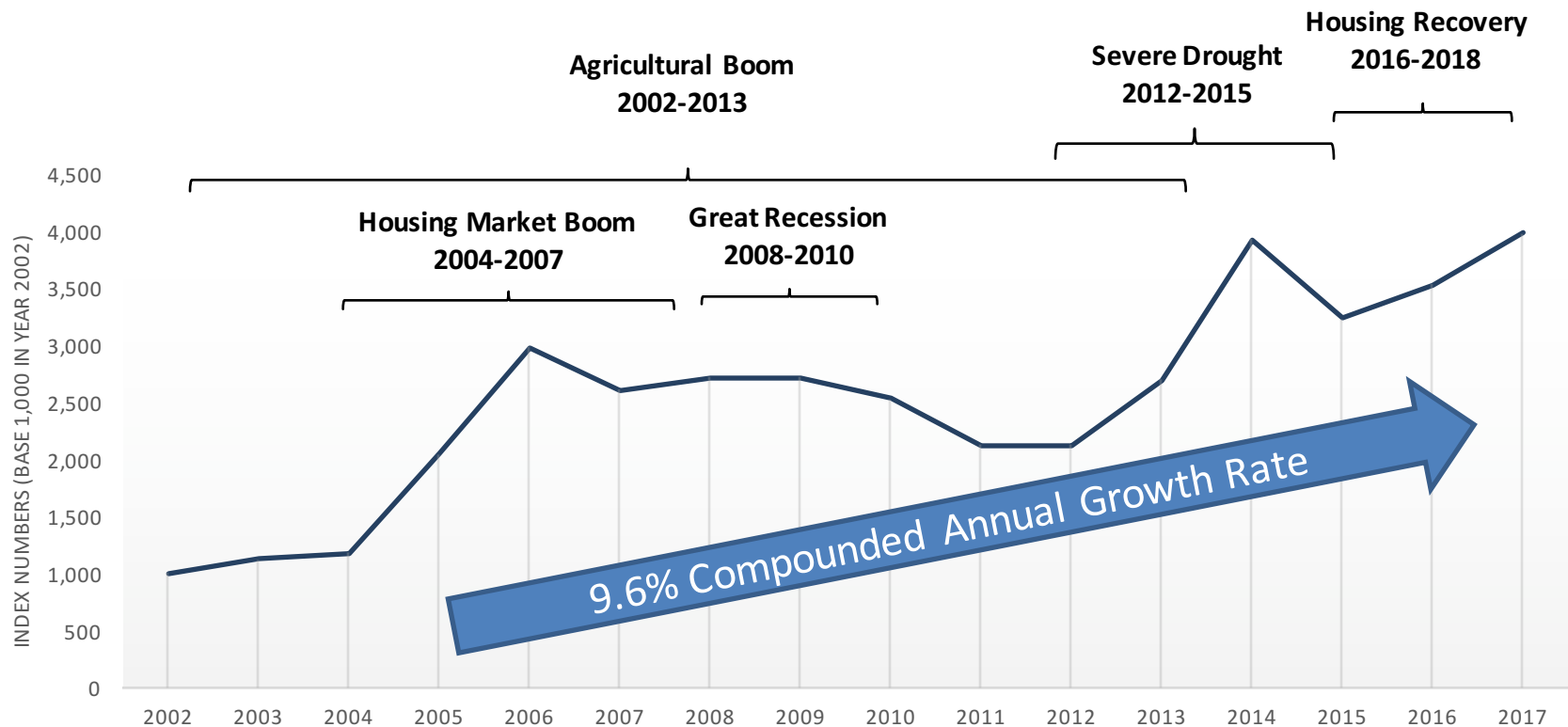
Water Rights Price Index (WRPIx)



- Tracks annual performance of water rights prices in the western United States
- Base year: 2002
- Composite price index using transactions from 14 regional markets
- Includes more than 4,500 individual transactions
 - 1,194 leases
 - 3,312 sales

Western US Water Price Trends

Water Rights Price Index (WRPIx)



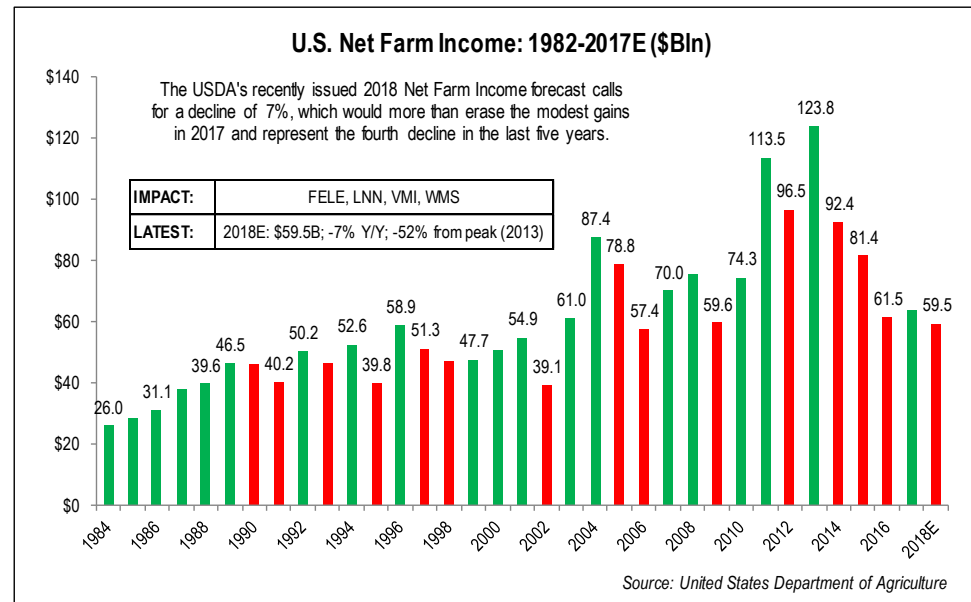
Market Developments- Macro Factors

Decline Agricultural Market

- Falling agricultural commodity prices
- Fall farm Income
- Rising interest rates

Drought and Supply Diversification

- Move toward managed water portfolios with short and long term supplies
- Seeking “optional” supplies for dry year and demand management
- Price premiums for callable supplies



Water Market Outlook

EMERGING TRENDS

5 Emerging Water Market Trends

1

Rotational Farm Fallowing for Water

- Provides high value for ag water without “Buy and Dry” of farmland
- Integrates well with rotational and cover crop practices

2

Buy-side Participation by Agriculture

- Water demand by expansion of high valued specialty crops
- Water leasing to manage drought risk

3

Expansion in Groundwater Banking

- Provides water firming and revenue opportunities for Ag
- Will require further development of ASR laws and regulations

4

Growth in Enviro Water Trading

- Creates outside and stable revenue opportunities for farms outside of high growth areas.
- Transaction structures that integrate with existing ag operations.

5

Smart Market E- Trading

- Streamline regulatory process - reduce transaction costs
- Facilitating temporary water transfers within Irrigation Districts

QUESTIONS