



**Utah Farm Bureau Federation  
Water Academy Meeting Agenda**

**May 18, 2026**

**11:30 a.m. – 1:30 p.m.**

**The meeting will be virtual only at this link:**

<https://us06web.zoom.us/j/84551317045?pwd=rKpvg8xrHmaa0svzVxir1J3FOaGHoT.1> Passcode: 960510

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**11:30 – 11:35 a.m. | Welcome & Opening Remarks – ValJay Rigby, President, Utah Farm Bureau Federation**

**11:35 a.m. – 12:05 p.m. | Laura Vernon, Great Salt Lake Basin Planner & Cody Lutz, Senior Planning Project Manager, Envision Utah**

**Topic:**

- Interactive discussion on water management in the Great Salt Lake Basin

**12:05 – 12:35 p.m. | Jim Reese, P.E., Assistant State Engineer, Utah Department of Natural Resources Division of Water Rights**

**Topic:**

- Groundwater Management Plans
- Monitoring groundwater use in over-appropriated areas

**12:35 – 1:05 p.m. | Dr. Ryan Larsen, Associate Professor, Agribusiness; Farm Management; Risk Analysis**

**Topic:**

- Drought management decisions
- Risk analysis and farm management considerations

**1:05 – 1:30 p.m. | Warren Peterson, Water Policy Advisor, Utah Farm Bureau Federation**

**Topic:**

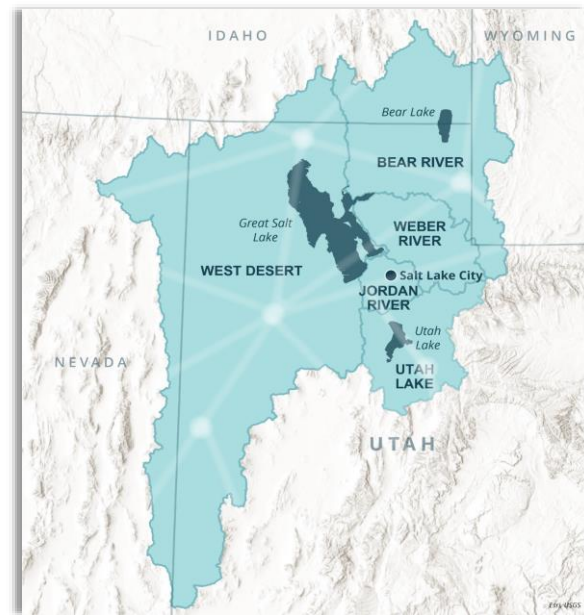
- Canal companies and preventing speculative transfer of shares for residential development

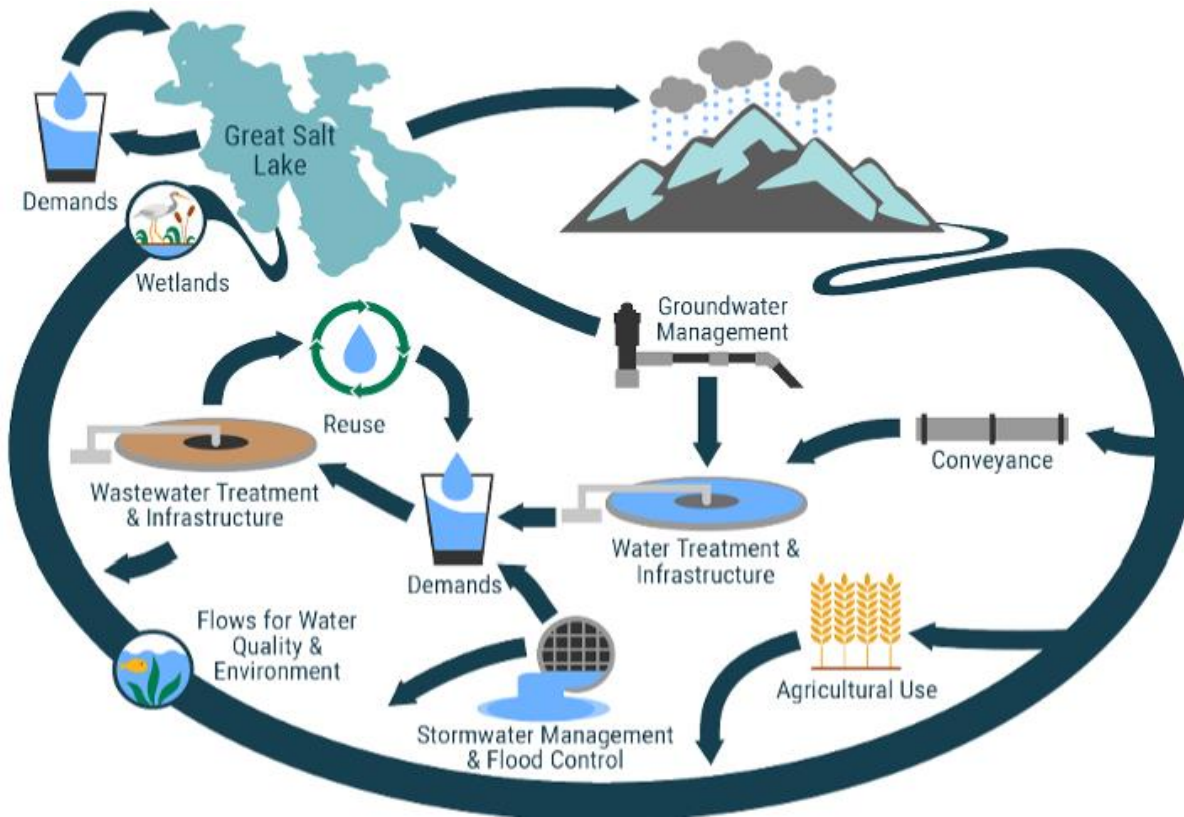
**1:30 p.m. Topics for future Water Academy Events | Adjourn**

May 22, 2026

# Great Salt Lake Basin Integrated Plan

*Utah Division of Water Resources*





# What is the Great Salt Lake Basin Integrated Plan?

A roadmap for **managing water** in ways that promote a **healthy lake** and a **high quality of life** in the basin.

It ties into these:

**GSL 2034**



**Great Salt Lake**  
Strategic Plan



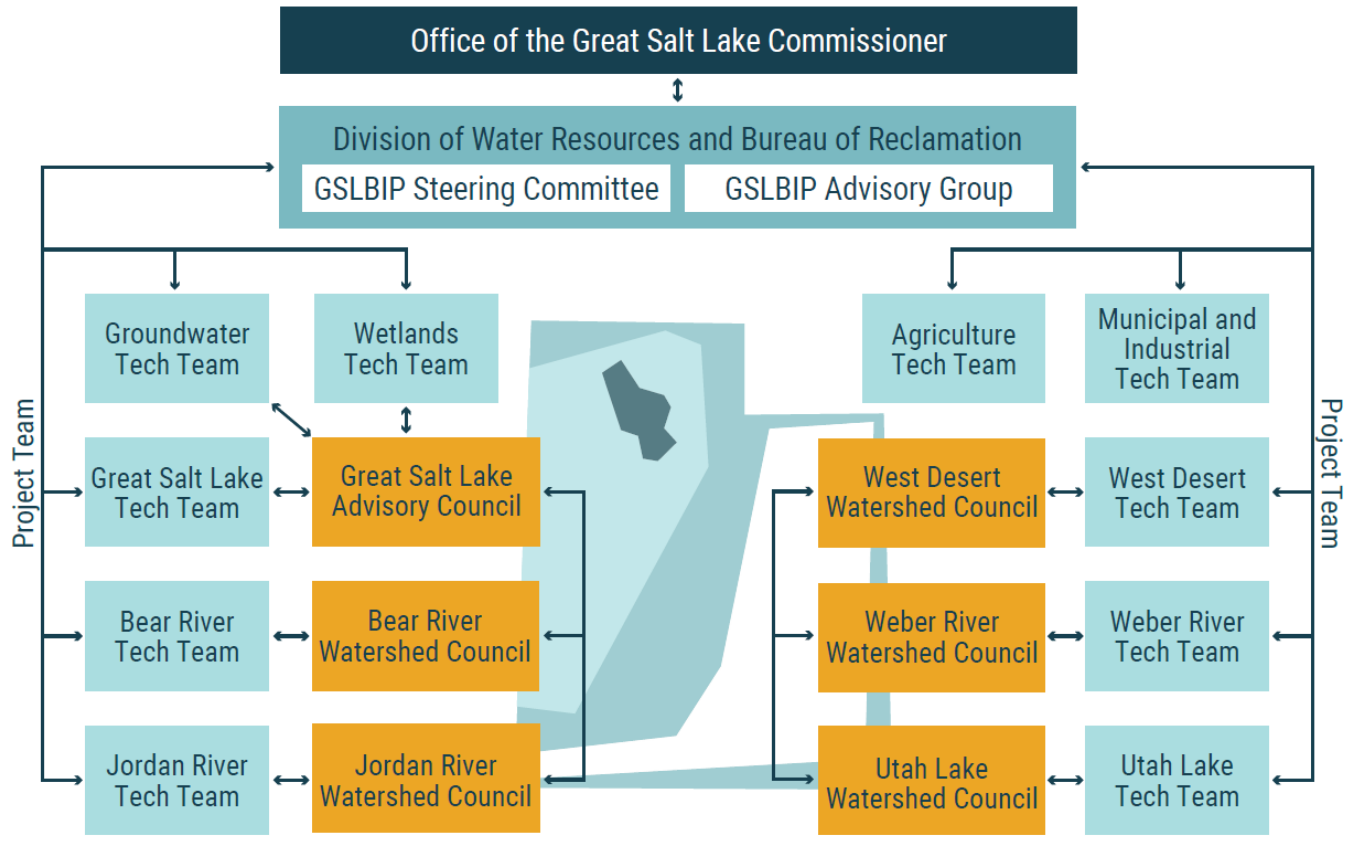
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RECLAMATION

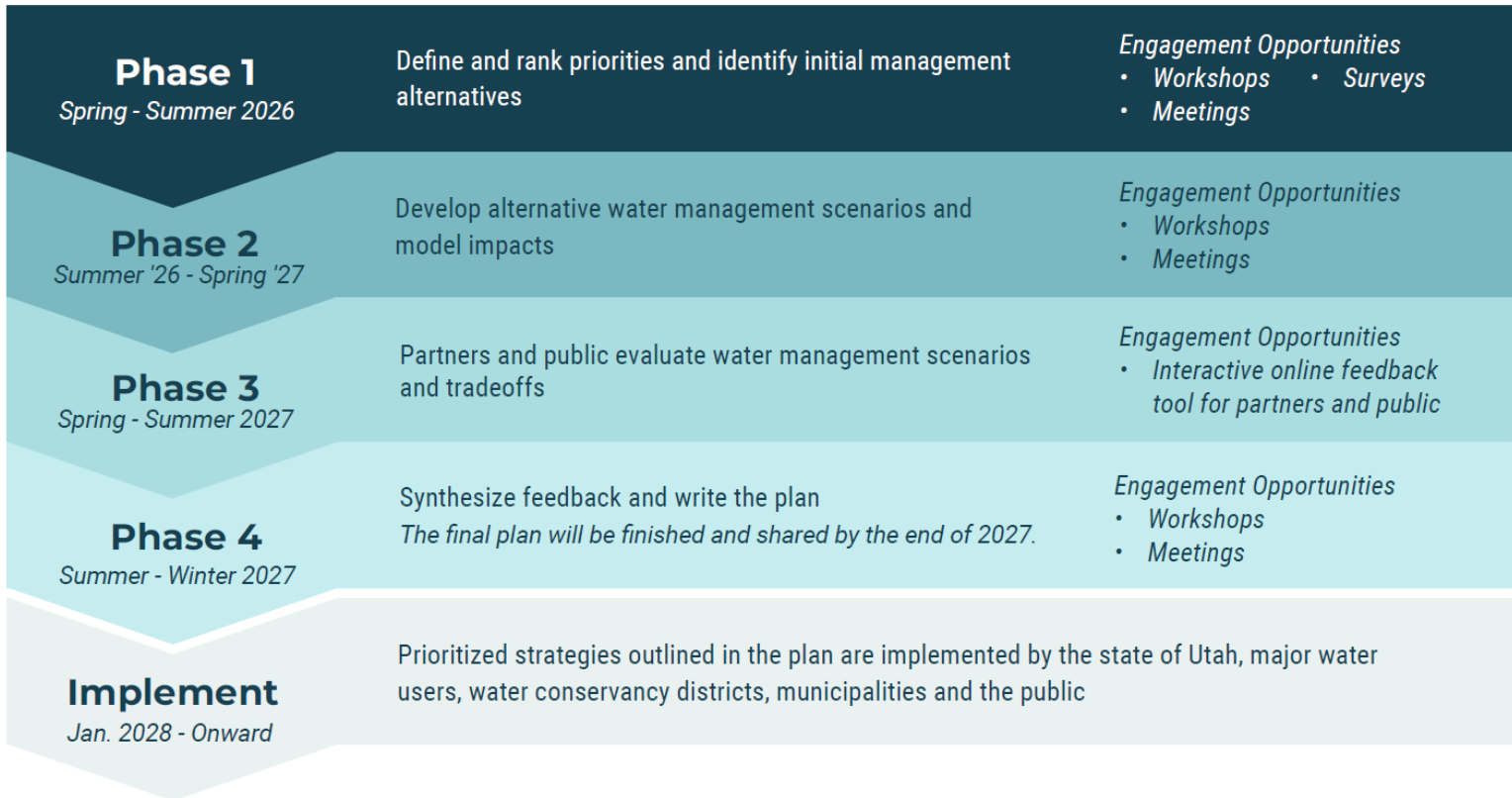


Learn more

[GSLBasinPlan.utah.gov](https://GSLBasinPlan.utah.gov) | [GSLBasinPlanning@utah.gov](mailto:GSLBasinPlanning@utah.gov)

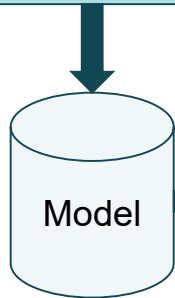
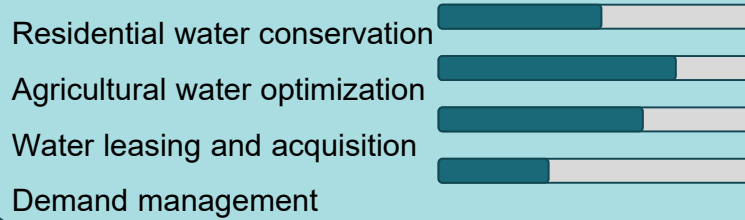




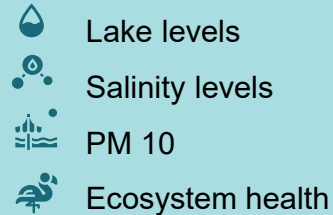


## Scenario A

### Alternative strategies:



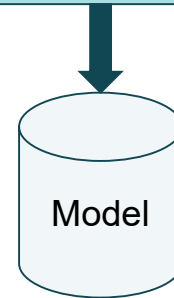
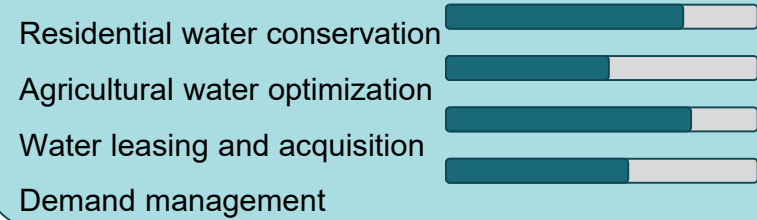
### Metrics:



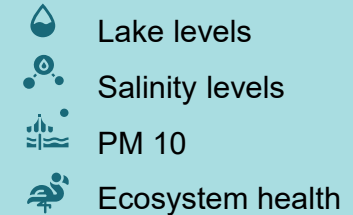
VS.

## Scenario B

### Alternative strategies:



### Metrics:



**\*ILLUSTRATIVE STRAWMAN ONLY\***



# What we've heard so far - metrics



Ecosystem health (GSL and upstream)



Air quality & pollution



Human health



Agricultural productivity & locally produced food



Community resilience, pride & quality of life



Sustaining economic & population growth



Salinity & brine shrimp



Recreation & 2034 Olympics



Legacy & identity





# What we've heard so far - strategies



Limit & replace useless grass in urban areas



Agricultural optimization-  
irrigation efficiency & crops



Water rights acquisition,  
dedication, leasing



Water pricing strategies &  
tiered rates



Improving water  
measurement & tracking



Dust mitigation



Wetland management



Supply development &  
trans-basin distribution



# SCAN TO JOIN

You will be asked to enter your name and email to begin the activity. You may provide false information if you prefer.

**Regardless of what you enter, your responses will be used anonymously.**



Or use this link:  
<https://utah.startconverge.com/conference>

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## Conference ID: 2022

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Utah Division of Water Rights

# Groundwater Management Plans

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Jim Reese, P.E. | Assistant State Engineer, Tech Services  
Farm Bureau Water Academy | May 18, 2026



# Prior Appropriation - Priority Date

## Prior Appropriation Doctrine

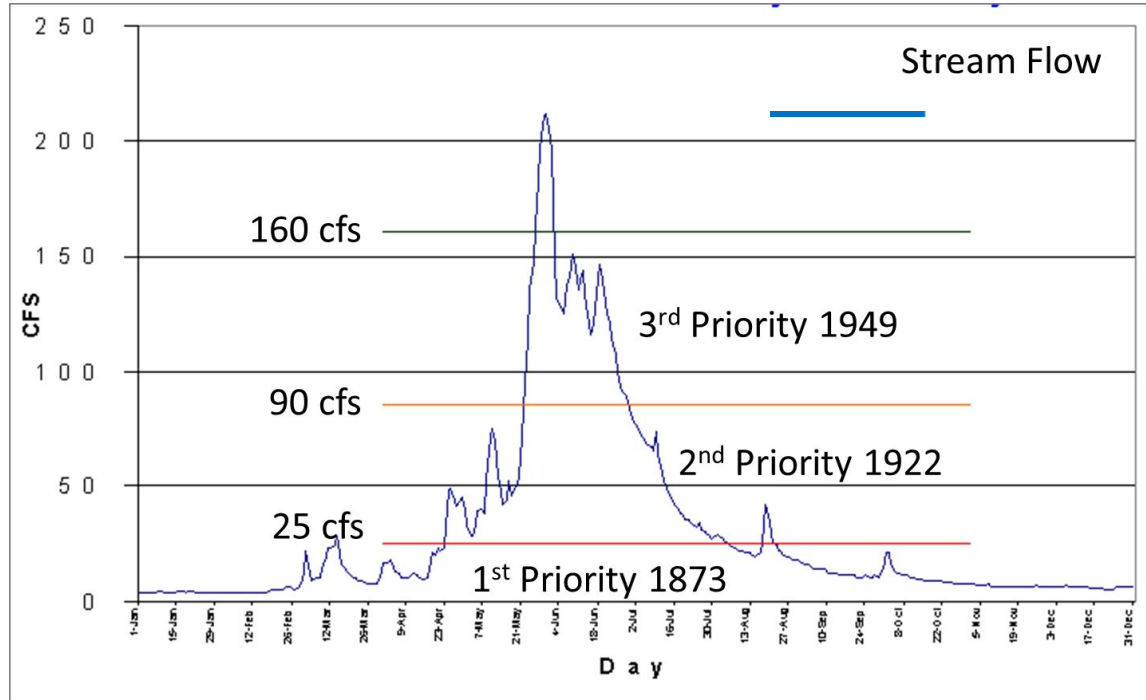
- Divert water to beneficial use
- Priority date
- First in time, first in right
- Loss of right if not used

## How Priority Date is determined

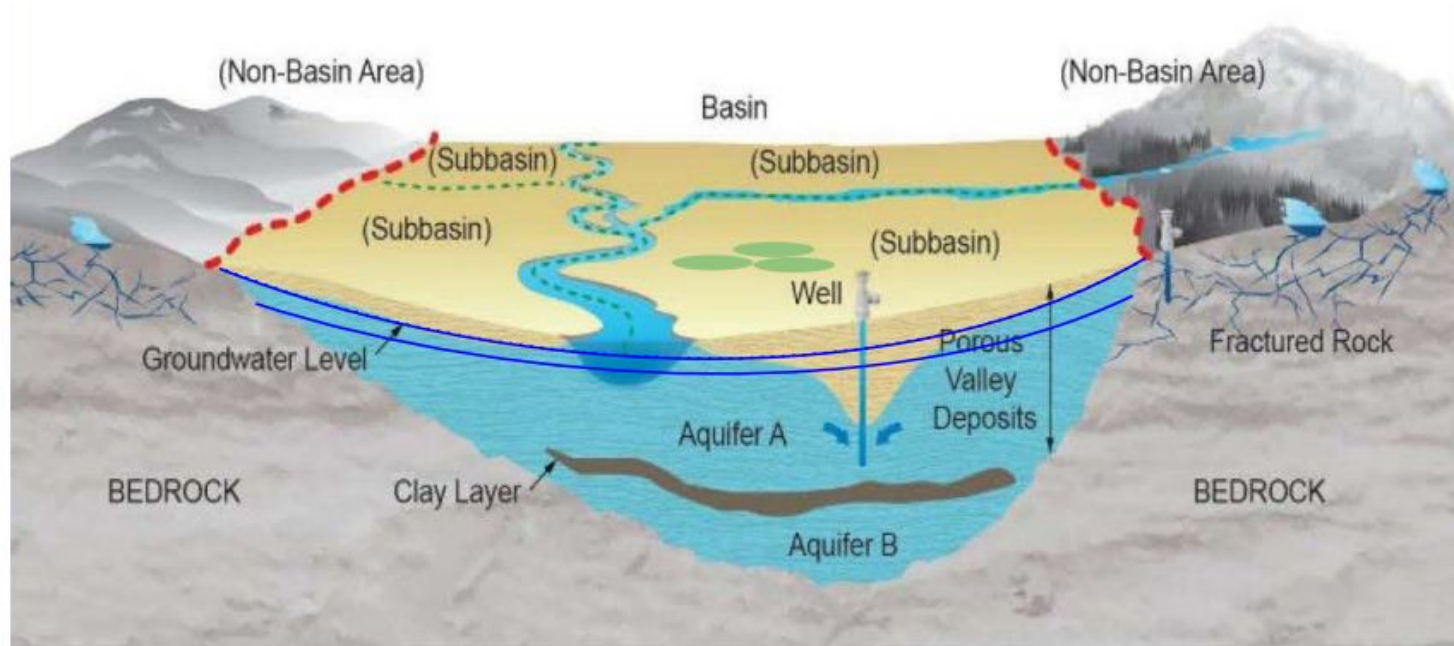
- **Date of filing** (Application);
- **Date of first use** (Diligence & UGW Claims); or
- **Date of first use or date set by decree** or decree issue date (Decrees)

- **Surface rights** are regulated by priority
- **Groundwater Rights** are generally regulated by priority in conjunction with a Groundwater Management Plan

# Surface Water Distribution by Priority Date



# Groundwater



# Groundwater Management Plans

- Legislation enacted in 2006
- Established Section 73-5-15 of Utah Code
- Tool to help the State Engineer distribute groundwater

# Section 73-5-15

(2)

(a) The state engineer may regulate groundwater withdrawals within a specific groundwater basin by adopting a groundwater management plan in accordance with this section for any groundwater basin or aquifer or combination of hydrologically connected groundwater basins or aquifers.



# Section 73-5-15

(3)(b) The state engineer shall base the provisions of a groundwater management plan on the principles of prior appropriation

(4)(c) but may consider voluntary arrangements

# Section 73-5-15

(2)

(b) The objectives of a groundwater management plan are to:

- (i) limit groundwater withdrawals to safe yield;
- (ii) protect physical integrity of the aquifer; and
- (iii) protect water quality

# Section 73-5-15

(1) As used in this section:

(a) “Critical management area” means a groundwater basin in which the groundwater withdrawals consistently exceed the safe yield.

(b) “Safe yield” means the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin’s physical and chemical integrity.



# Safe Yield

- Recharge is a starting point
- May be less than recharge to protect physical integrity of the aquifer and water quality
- Recharge is verified from a water budget
  - $\text{Inflows (recharge)} = \text{Outflows (discharge)} + \text{Change in storage}$

# Section 73-5-15

(3)(a) In developing a groundwater management plan, the state engineer may consider:

...

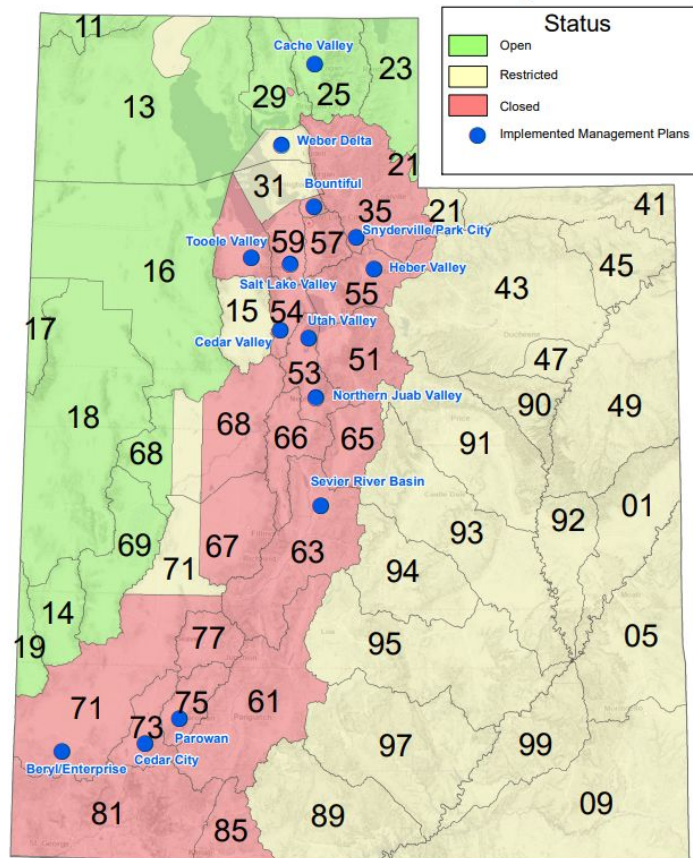
(iii) the relationship between surface water and groundwater, including whether the groundwater should be managed in conjunction with hydrologically connected surface waters;

...

# Implementing A Groundwater Management Plan

- Requires Significant Scientific Research and Reporting
- Requires Meetings and Notice
- Open to Comments and Suggestions
- Respect all Existing Water Rights and Uses
- Subject to Judicial Review

# Ground-Water Policy



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# Thank you

Jim Reese, P.E., Assistant State Engineer, Technical Services

[jreese@utah.gov](mailto:jreese@utah.gov)





Map released: Thurs. May 14, 2026

Data valid: May 12, 2026 at 8 a.m. EDT

### Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

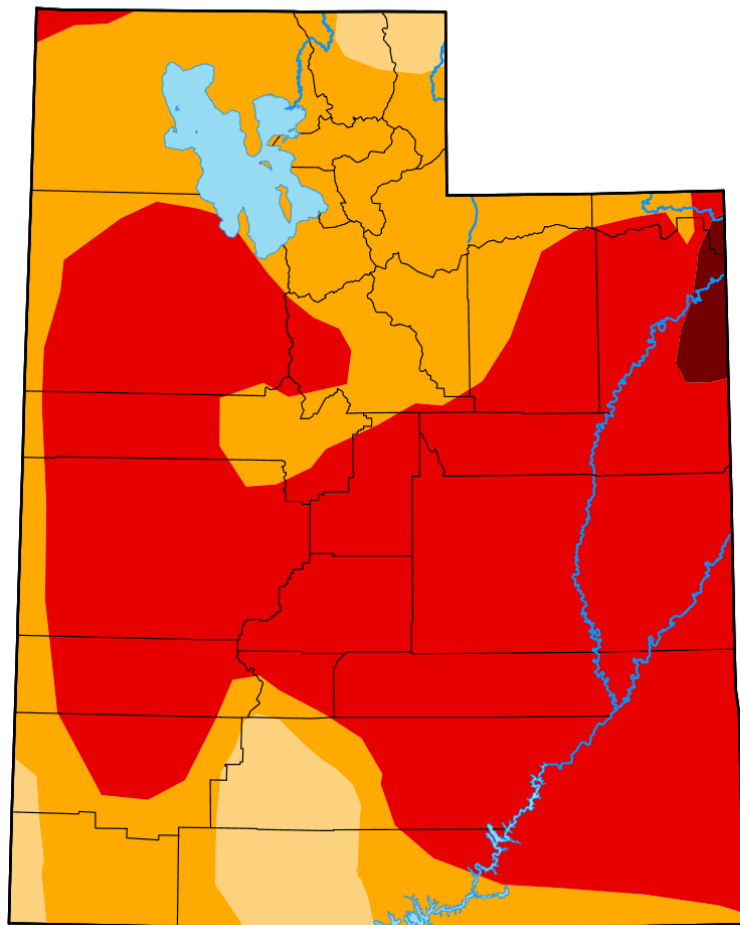
### Authors

United States and Puerto Rico Author(s):

[Rocky Bilotta](#), NOAA/NCEI

Pacific Islands and Virgin Islands Author(s):

[Tsegaye Tadesse](#), National Drought Mitigation Center



# Utah Farm Bureau Water Academy

May 18, 2026

Managing Water Company  
Share Transfers



# U.S Now a Net Food Importer

Pulling water out of the ground made it possible for America to become an agricultural superpower . . . Groundwater depletion is threatening that status.

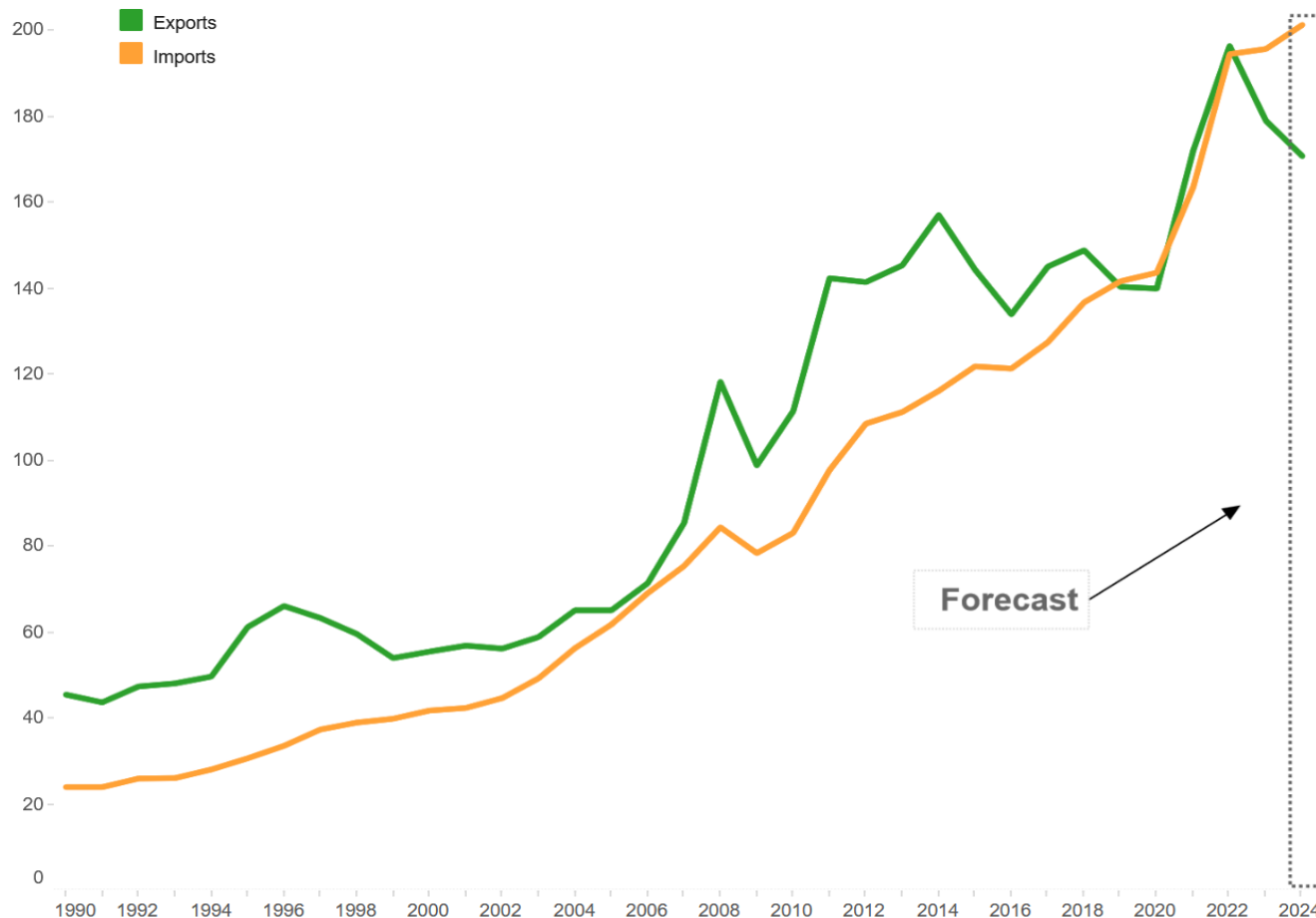
*NY Times, Aug. 29, 2023*

## Outlook for U.S. Agricultural Trade: February 2024



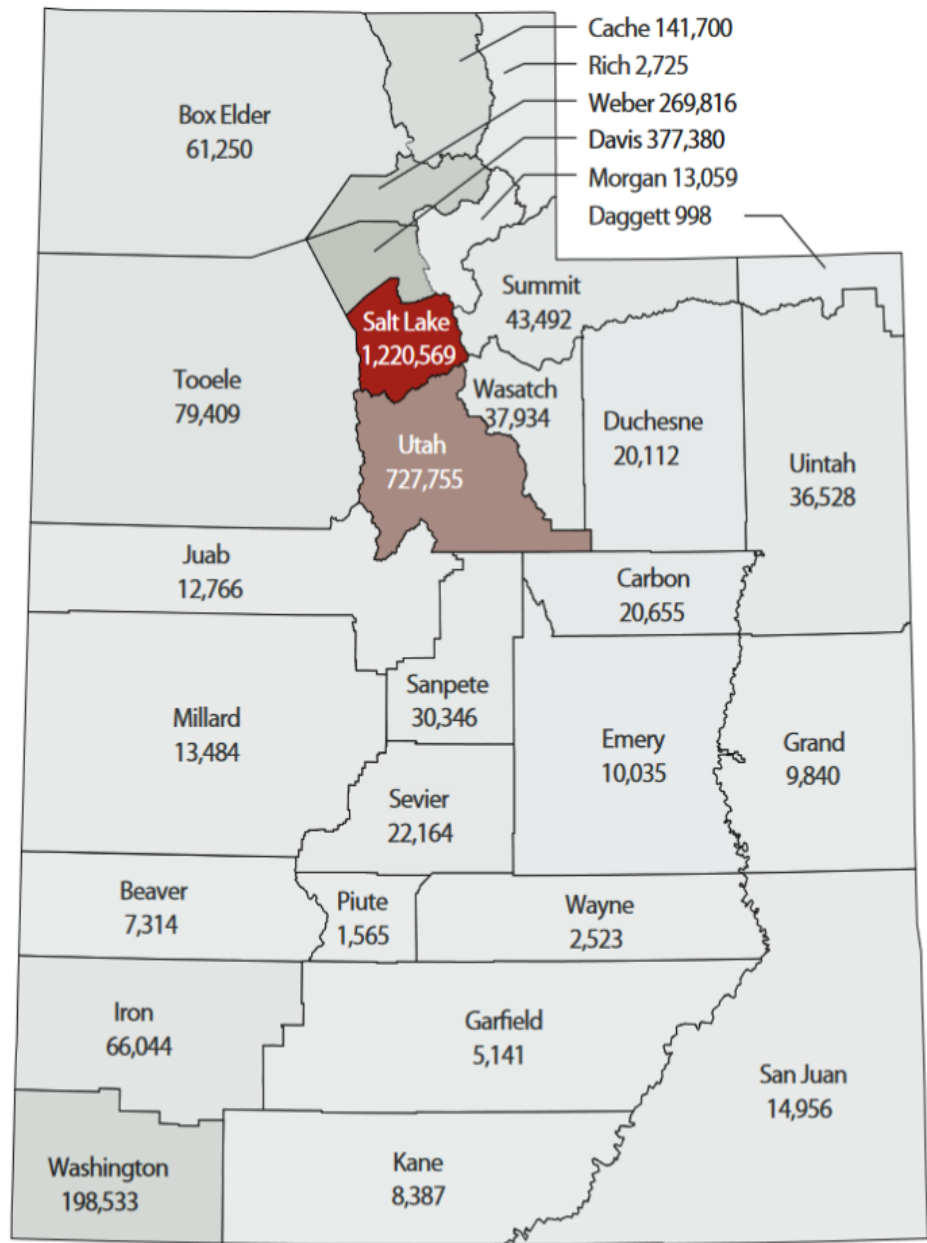
### U.S. agricultural trade

Value, billion dollars



Source: USDA, Economic Research Service and USDA, Foreign Agricultural Service analysis and forecasts using data from U.S. Department of Commerce, Bureau of the Census.

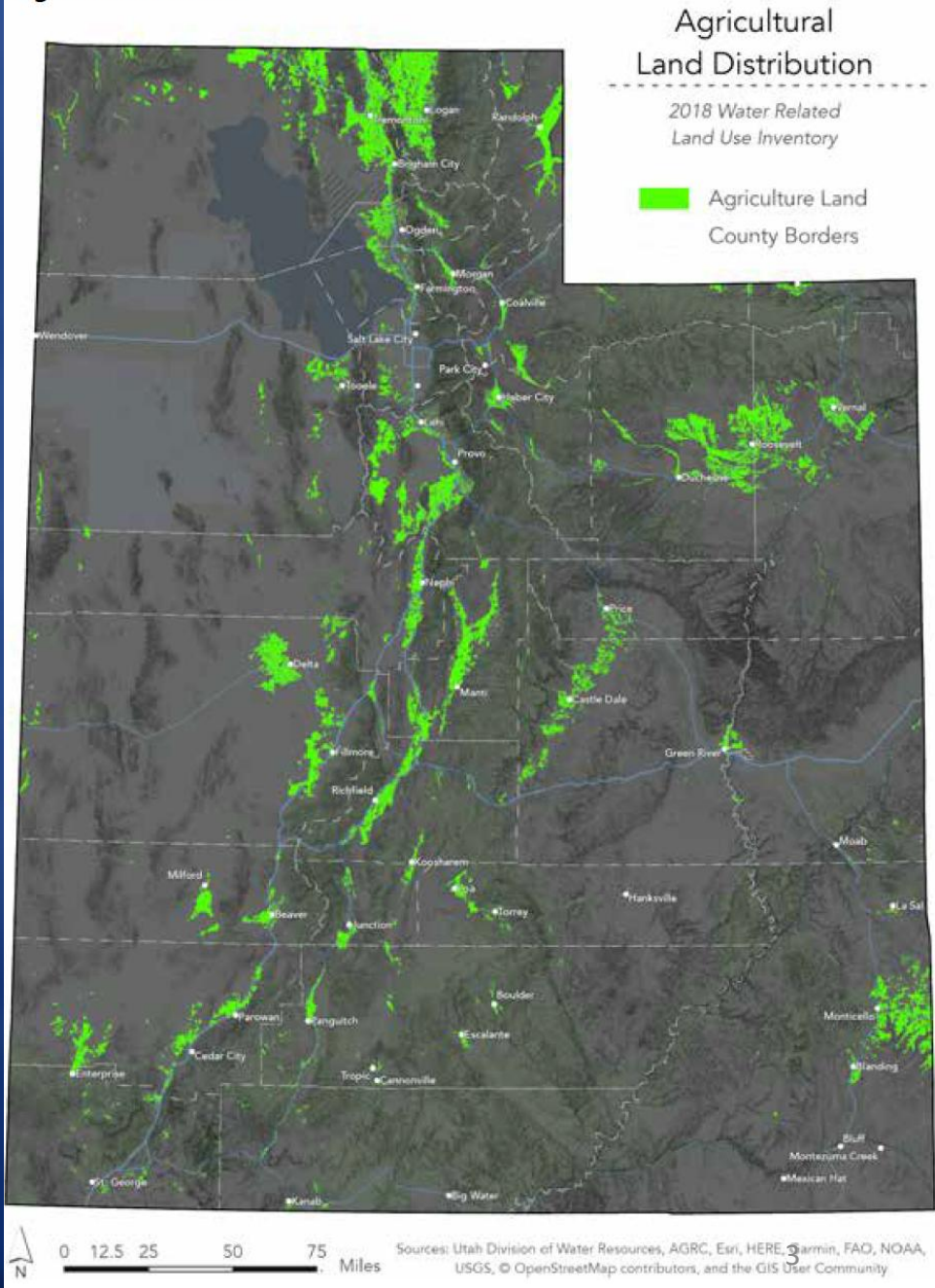
Figure 1: Utah Population Estimates, 2023



Source: Utah Population Committee, Kem C. Gardner Policy Institute

People  
v.  
Farmland  
  
0.97%

Agriculture Land





# Prior Appropriation

## 73-3-1. Appropriation -- Manner of acquiring water rights.

(1) A person may acquire a right to the use of the unappropriated public waters in this state **only as provided for in this title**. [As of for surface water, March 13, 1935 for groundwater]

...

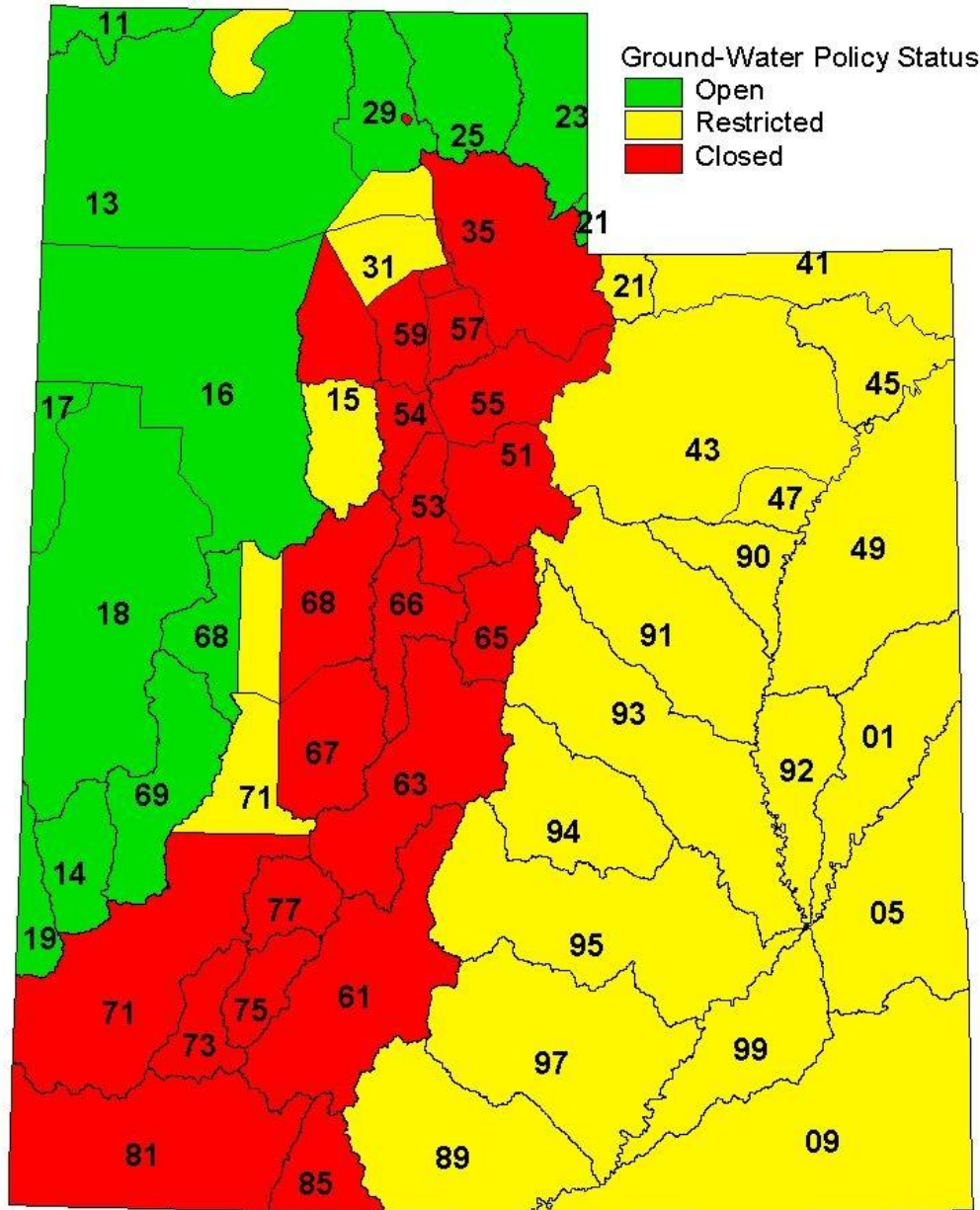
(4) An appropriation may be made only for a **useful and beneficial purpose**.

(5)(a) Between appropriators, the one **first in time is first in rights**.

## 73-3-21.1. Priorities between appropriators.

**Appropriators shall have priority among themselves according to the dates of their respective appropriations**, so that each appropriator is entitled to receive the appropriator's whole supply before any subsequent appropriator has any right.





# Water Appropriation Policy





# Acquiring a Water Supply in Utah

- Water Rights
  - Appropriation (§73-3-1)
  - Court decree (§73-4-12, 15)
  - Pre-statutory claims (§73-5-13)
    - Surface diversion before March 12, 1903
    - Groundwater before March 13, 1935
- Water Rights Derivatives
  - Contract to use water rights
  - Shares in a water company
- Federal Reserved Water Rights
- Theft



# Supervision of Waters of the State

## Utah Code 73-2-1

(3)(a) The state engineer shall be responsible for the general administrative supervision of the waters of the state and the measurement, appropriation, apportionment, and distribution of those waters.



# Utah Change Applications Approval





# What are Water Shares?

- (Stock in Water Companies)

# Hybrid Vigor

Utah Code  
Title 16,  
Corporations



Wow!

meets



Title 73,  
Irrigation and  
Water

# Water Company

- Hybrid of nonprofit corporate and water law:
  - Neither horse nor donkey
  - Useful & resilient
  - Sometimes cantankerous
  - Sterile – they do not create new water or water rights



Share Assessment Act, Section 16-4-102. Definitions.  
(5) "Water company" means a corporation in which a shareholder has the right, based on the shareholder's shares, to receive a proportionate share of water delivered by the corporation.

# Corporate Governance

- **Company articles of incorporation and bylaws:**
  - Govern corporate affairs within limits of state law
  - Form a contract between the company and shareholders
- **Shareholders (“members”):**
  - Adopt the **articles of incorporation and amend as needed**
  - **Own a proportionate interest in the corporation, but not the water rights, water system, or other assets**
  - Elect board of directors, who represent ALL shareholders
- **Board of directors usually:**
  - Appoint and supervise the *officers*, delegate specific duties
  - Adopt bylaws and amend as needed
  - Set company policies, delegate specific duties to officers
- **Officers manage:**
  - staff
  - funds
  - routine operations







# Shareholder Property Rights

16-6a-611. Property rights.

(1) A **member** has no right relating to management, control, purpose, or duration of the nonprofit corporation, except as provided by:

- (a) the articles of incorporation or the bylaws of a mutual benefit corporation; or
- (b) other applicable law.

(2) Unless otherwise provided by agreement, articles of incorporation, or the bylaws of a water company, and subject to the general liabilities and obligations of the water company, a shareholder in a water company has:

- (a) an equitable, beneficial interest in the use of the water supply of the water company, proportionate to the shareholder's shares in the water company, which is an interest in real property; and
- (b) the right to have the shareholder's proportionate share of the water delivered through a diversion structure, ditch, canal, storage and distribution facility, or other appurtenance of the water company, in accordance with:
  - (i) the distribution method of the water company; or
  - (ii) an approved change application under Section 73-3-3.5.



# Change Application Scenarios and Questions

## Company Project

- Do articles need amendment?
- Do bylaws need amendment?
- How are benefits allocated?
- Does it affect the 85% limit?
- How are impacts to shareholders managed?
- How are risks evaluated and mitigated?

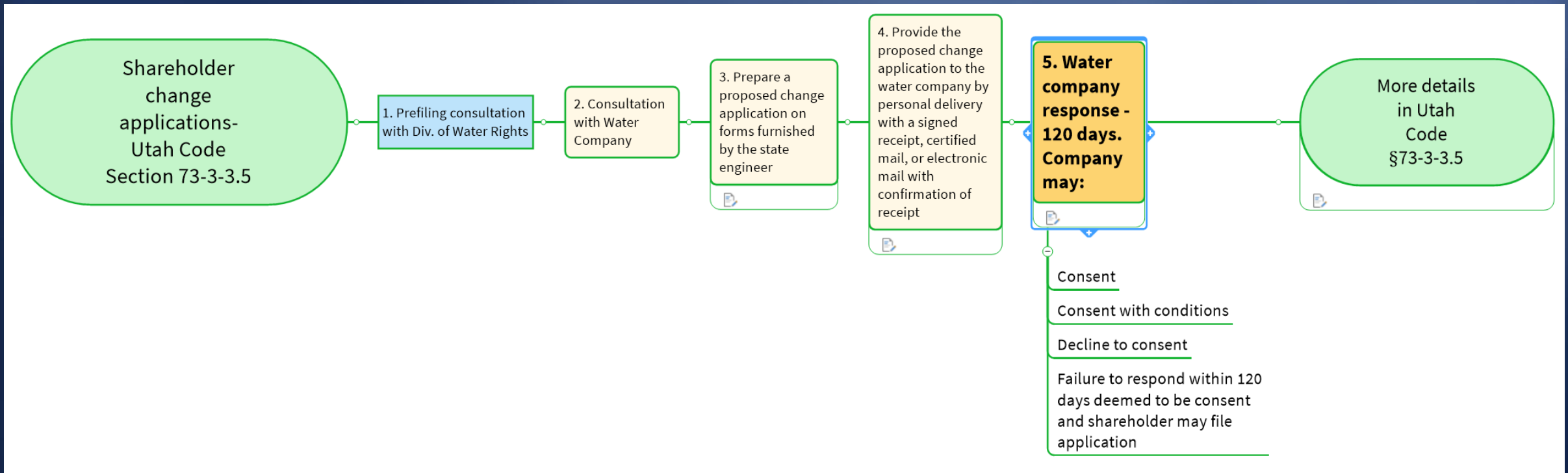
## Shareholder Project

- Do articles need amendment?
- Do bylaws need amendment?
- How are impacts to other shareholders managed?
- Which company water rights or contracts will be affected?
- Who bears costs?
- Who receives benefits?
- How are risks evaluated and mitigated?

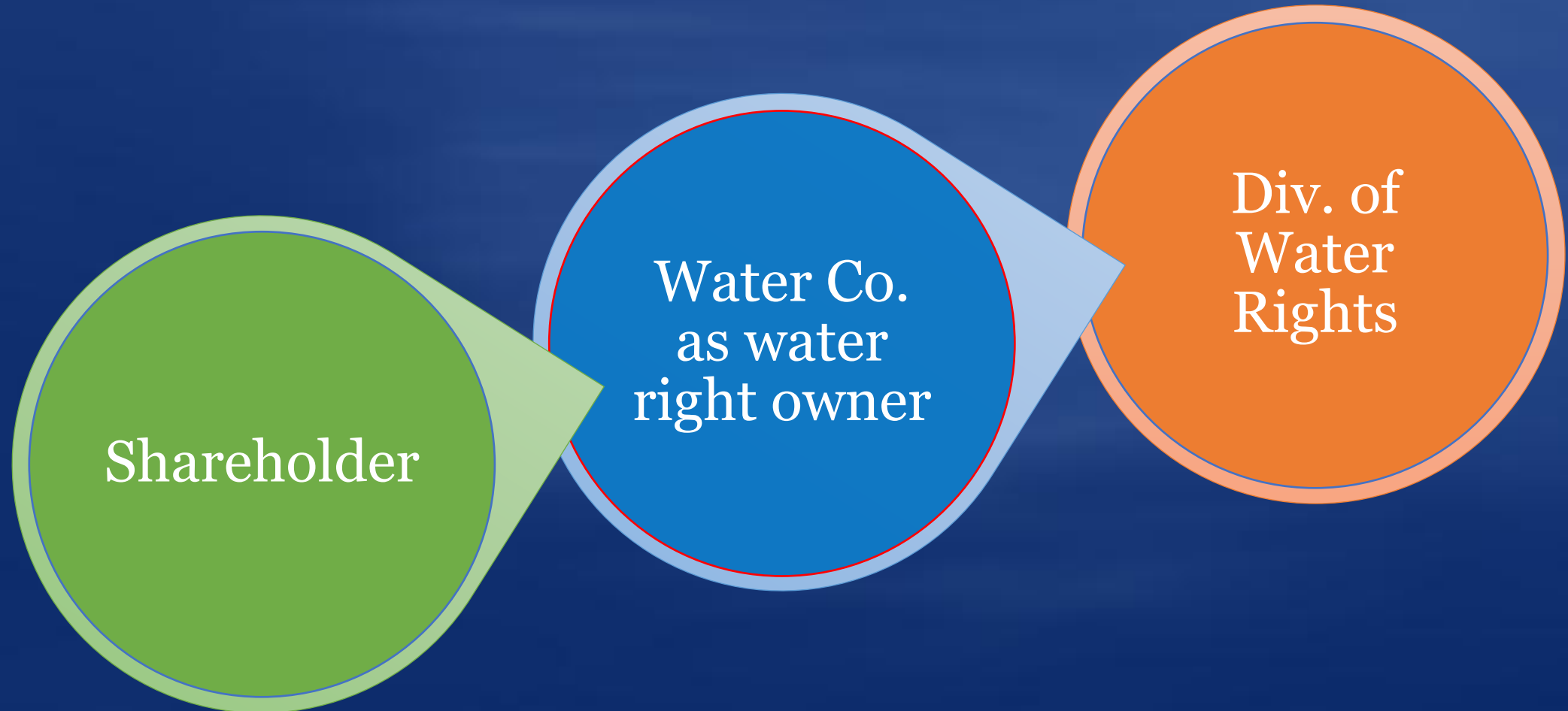


# Shareholder Change Applications

## 73-3-3.5. Application for a change of point of diversion, place of use, or purpose of use of water in a water company made by a shareholder.

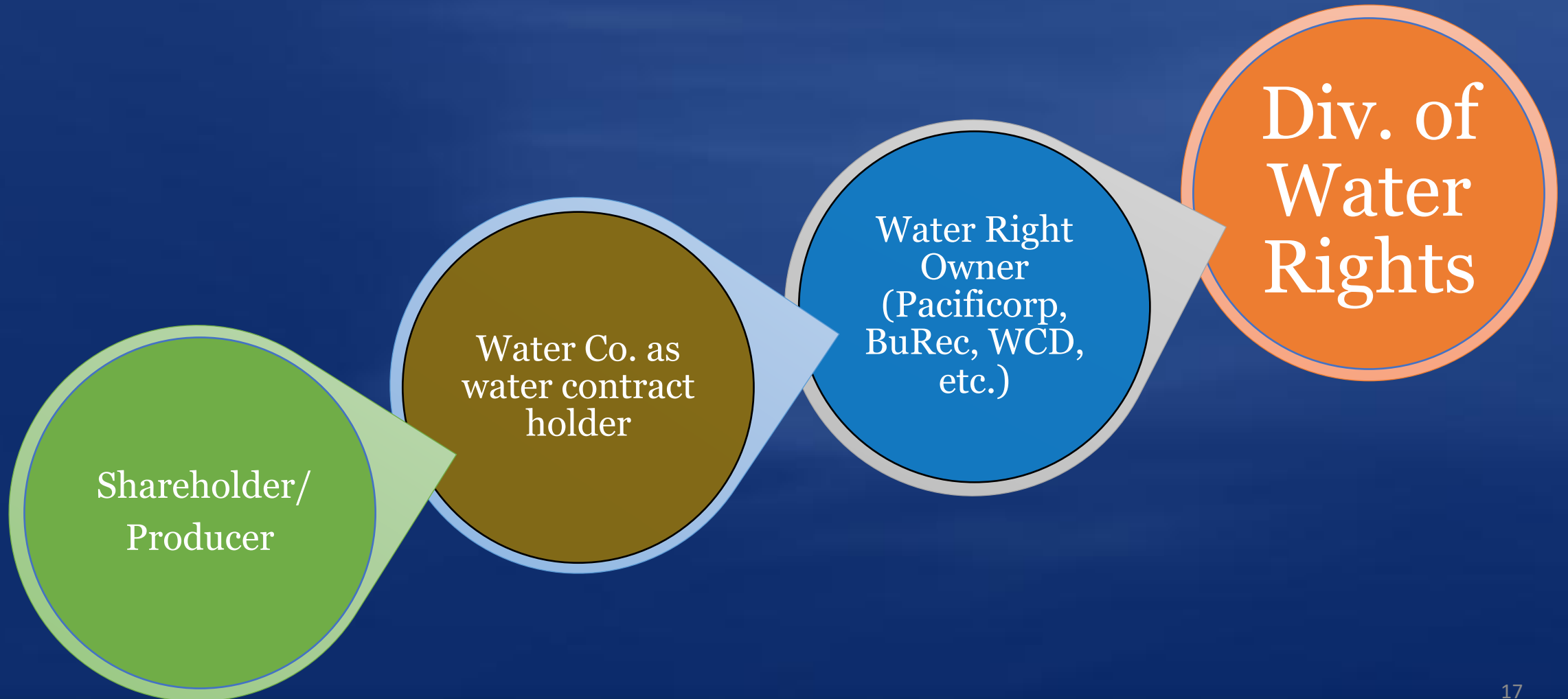


# Utah “Saved Water” Change Application - Water Company Owned Water Rights

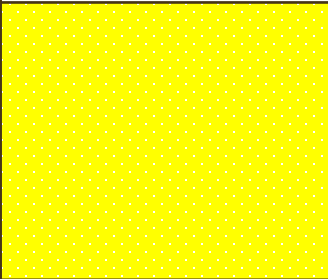
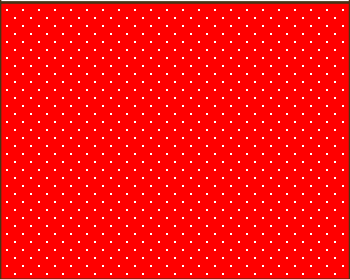


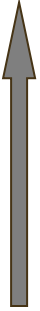


# Change Applications - Water Company Contracts Part of Water Supply



# Risk Evaluation Matrix

|        | Probability  |                                                                                      |                                                                                       |
|--------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|        | Low                                                                                             | Medium                                                                               | High                                                                                  |
| High   |              |   |    |
| Medium |                                                                                                 |  |   |
| Low    |                                                                                                 |                                                                                      |  |

 Severity



# Articles of Incorporation – Classes of Stock

## A. Membership.

Membership in the Company shall be evidenced by the issuance of membership shares. Owners of membership shares in the Company shall be referred to as members or shareholders.

## B. Issuance of Stock.

Shares of Company stock may be issued in one or more classes, and the Company Board of Directors (“Board”) will not issue certificates on a prospective basis for less than one (1) full share of stock. Initially, there shall be two (2) classes of membership in the Company designated as Class A and Class B. The Company shall have the authority to issue up to XXXX class membership shares. Each membership share in the Company shall have a par value of \$10.00, subject to increases at the discretion of the Board pertaining to the needs of each class membership. All membership shares shall be issued as both book-entry shares and certificates. The two (2) classes of membership are defined as follows:



# Articles of Inc. – Voting Rights

**CLASS A Voting /** These are membership shares used for Agricultural Irrigation use from the Company system and also including, for shares, which prior to the effective date of these Articles, were converted to Commercial/ Industrial/ Domestic/ Municipal/or other use through a permanent change application and are not delivered from Company system.

**CLASS B Non-voting /** Company shares acquired by or surrendered to the Company, after the effective date of these Articles (1) by condemnation or (2) converted to Commercial/ Industrial/ Domestic/ Municipal/or other non-irrigation use or not provided from Company system pursuant to an approved fixed-time or permanent shareholder change application that changes at least two of the following: point of diversion, delivery of water, or place of use, outside the Company system; place of use; or nature of use.





# Recommendations

1. Review your company articles of incorporation and bylaws.
2. If you want to changes them, engage an attorney who actually knows about water companies.
3. Plan in advance using Utah Code § 73-3-3.5 as your planning guide.
4. Should you have pre-prepared letters for water companies that say “No, but let’s talk” for response to change applications within 120 days?

With about 1,200 water companies in the state, can the water companies pool resources to help each other?



# Farmers:

Lead  
Innovate  
Adapt  
Survive

And feed the world.

# Drought Management Decisions

*When to buy feed, lease grass, or sell the cows*

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An economic framework for cow-calf producers: using capital asset pricing and net present value to guide culling and retention decisions during drought.

# Drought response continuum.

*A step-wise decision-making process. Plan early so you respond from a framework — not a crisis.*

## KEY INDICATORS ON YOUR RANCH

- **Cumulative precipitation**  
*by specified dates*
- **Irrigation water cuts**  
*from irrigation districts*
- **Permit reductions**  
*on BLM or USFS allotments*
- **Other triggers**  
*reservoir levels, snowpack, forage condition*

## GRADUATED RESPONSE

- 1 **Sell open cows**
- 2 **Sell dry cows**
- 3 **Early weaning**
- 4 **Purchase feed / pasture**
- 5 **Sell cows**

# Variable costs per cow.

**Variable cost** = costs directly associated with the level of production. Each cow you keep (or cull) changes these proportionally.

01

**Feed**

02

**Labor**

03

**Vet & Med**

04

**Breeding / bull  
cost**

05

**Freight**  
-Cattle  
-Water

# Variables to consider: carrying capacity.

## NORMAL CARRYING CAPACITY

### Based on grazing capacity

**AUD** = days grazing × number of cows

**AU** = grazing months × number of cows

*Break capacity down by season: spring, summer, fall, winter.*

## DROUGHT-INFLUENCED CAPACITY

### What the drought actually takes from you

- Permit cuts
- Private-land forage reduction including hay
- Range, pasture, and crop aftermath losses

*Evaluate by season — the deficit may concentrate in summer or fall.*

## THE GAP YOU NEED TO CLOSE

**Normal capacity** – **Drought capacity** = **AUD deficit**



WORKED EXAMPLE

# Normal carrying capacity — 400 cows.

| SPRING PERMIT                                                                                            | SUMMER PERMIT                                                    | FALL AFTERMATH                                                                     |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>3 months</b><br><i>400 hd × 90 days</i>                                                               | <b>4 months</b><br><i>400 hd × 120 days</i>                      | <b>2 months</b><br><i>400 hd × 60 days</i>                                         |
| <b>36,000 AUD</b><br><b>1,200 AU</b>                                                                     | <b>48,000 AUD</b><br><b>1,600 AU</b>                             | <b>24,000 AUD</b><br><b>800 AU</b>                                                 |
| <b>RANCH TOTALS</b><br><br><b>108,000</b><br><b>TOTAL AUD</b><br><i>across all three grazing seasons</i> | <b>4,800</b><br><b>TOTAL AU</b><br><i>animal-unit equivalent</i> | <b>570</b><br><b>TONS HAY</b><br><i>95 days × 400 head × 30 lbs/head (Dec–Feb)</i> |

SAME 400 COWS — DROUGHT YEAR

# Drought carrying capacity — 50% cuts

|                                                                                                                     |                                                                                                                  |                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <div>SPRING PERMIT</div> <div>UNCHANGED</div> <div>400 hd × 90 days</div> <div>36,000 AUD</div> <div>1,200 AU</div> | <div>SUMMER PERMIT</div> <div>50% CUT</div> <div>200 hd × 120 days</div> <div>24,000 AUD</div> <div>800 AU</div> | <div>FALL AFTERMATH</div> <div>50% CUT</div> <div>200 hd × 60 days</div> <div>12,000 AUD</div> <div>400 AU</div> |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

|                                                                                                      |                                                                        |                                                                              |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <div>DROUGHT TOTALS</div> <div>72,000</div> <div>TOTAL AUD</div> <div>down from 108,000 normal</div> | <div>2,400</div> <div>TOTAL AU</div> <div>down from 4,800 normal</div> | <div>285</div> <div>TONS HAY</div> <div>irrigation cuts hay production</div> |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|

# The shortfall. Now what?

**24,000**

AUD short (summer)  
*= 800 AU*

**12,000**

AUD short (fall)  
*= 400 AU*

**285**

Tons hay short  
half of normal production

**1**

## Buy hay

Offset the hay shortfall by purchasing from outside the ranch. Works when prices aren't sky-high.

**2**

## Rent pasture

Move cows to leased pasture to cover the AUD gap. Adds transport, labor, and lease cost.

**3**

## Sell cows

Cull down to drought capacity. Locks in revenue, but rebuilding the herd is expensive later.

# Three options. One hard decision.

*When forage is scarce and feed prices spike, every cow-calf operator faces the same choice. This model helps make it systematically rather than emotionally.*

1

## Buy Feed

Purchase hay or supplemental feed to carry the herd through drought. Works when feed costs stay below the cow's NPV erosion.

2

## Lease Grass

Move cattle to leased pasture elsewhere. Preserves the herd, but adds transport, labor, and lease costs.

3

## Sell Cows

Cull early, ahead of forced sales. Locks in value, but rebuilding a herd when prices are high is expensive.

# A cow is a capital asset.

## The analogy.

In a cow-calf operation, a cow converts inputs — feed, water, genetics, health care, management — into calves. Treat each cow as a calf-producing machine, and the ranch as the factory that houses it.

## The pricing rule.

Capital asset pricing theory says the value of any asset equals the net present value (NPV) of its expected future returns. For a cow, that means the discounted stream of net returns from calf sales over her remaining productive life — plus her terminal cull value at the end.

### WHAT DRIVES NPV

- **Calf prices**  
*expected market \$/lb*
- **Weaning weights**  
*lbs of calf at sale*
- **Weaning probability**  
*pregnancy × calving × survival*
- **Annual carrying cost**  
*feed, health, labor per cow*
- **Terminal cull value**  
*market price at the end*

# Retain or sell? Compare NPV to the effective market value.

**Cow NPV** vs. **Market Value – PV(Replacement Cost – Replacement NPV)**

*Retain the cow if the left side exceeds the right. Sell otherwise.*

## RETAIN

**If NPV > Market Value – Replacement Penalty**

She will earn more in the factory than you'd get at the salebarn, even after accounting for the cost of eventually replacing her.

## SELL

**If NPV < Market Value – Replacement Penalty**

The cash in hand today, net of what it'll cost to rebuild the herd later, exceeds what she's worth as a going concern.



# Drought costs shrink NPV. The equation shifts.

NORMAL YEAR

$$\text{Cow NPV} \rightleftharpoons \text{Market} - \text{PV(Premium)}$$



DROUGHT YEAR

$$\text{Cow NPV} - \text{Drought Costs} \rightleftharpoons \text{Market} - \text{PV(Premium)}$$

*Drought costs come from two places:*

## Herd-wide costs

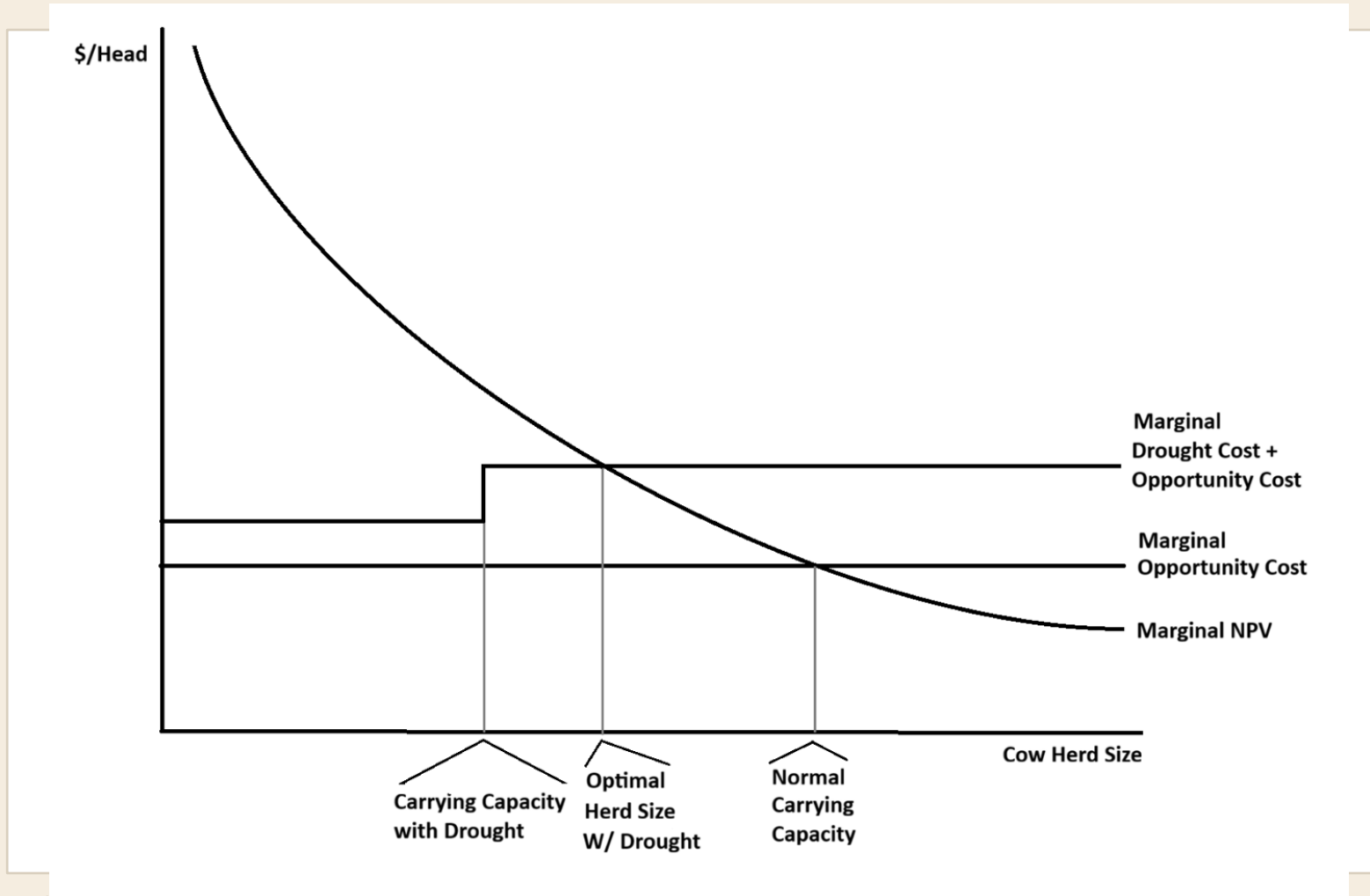
Higher hay prices, hauled water, extra labor — these hit every cow in the herd during a drought year, whether the ranch is overstocked or not.

## Over-capacity costs

Supplemental feed for every cow retained above the ranch's reduced drought carrying capacity. These kick in only when  $H > CC$ .

FIGURE 1

# Optimal herd size during drought.



## HOW TO READ IT

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Slopes down: the next cow added is less valuable than the last.

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Flat line: the normal market-value-plus-premium hurdle.

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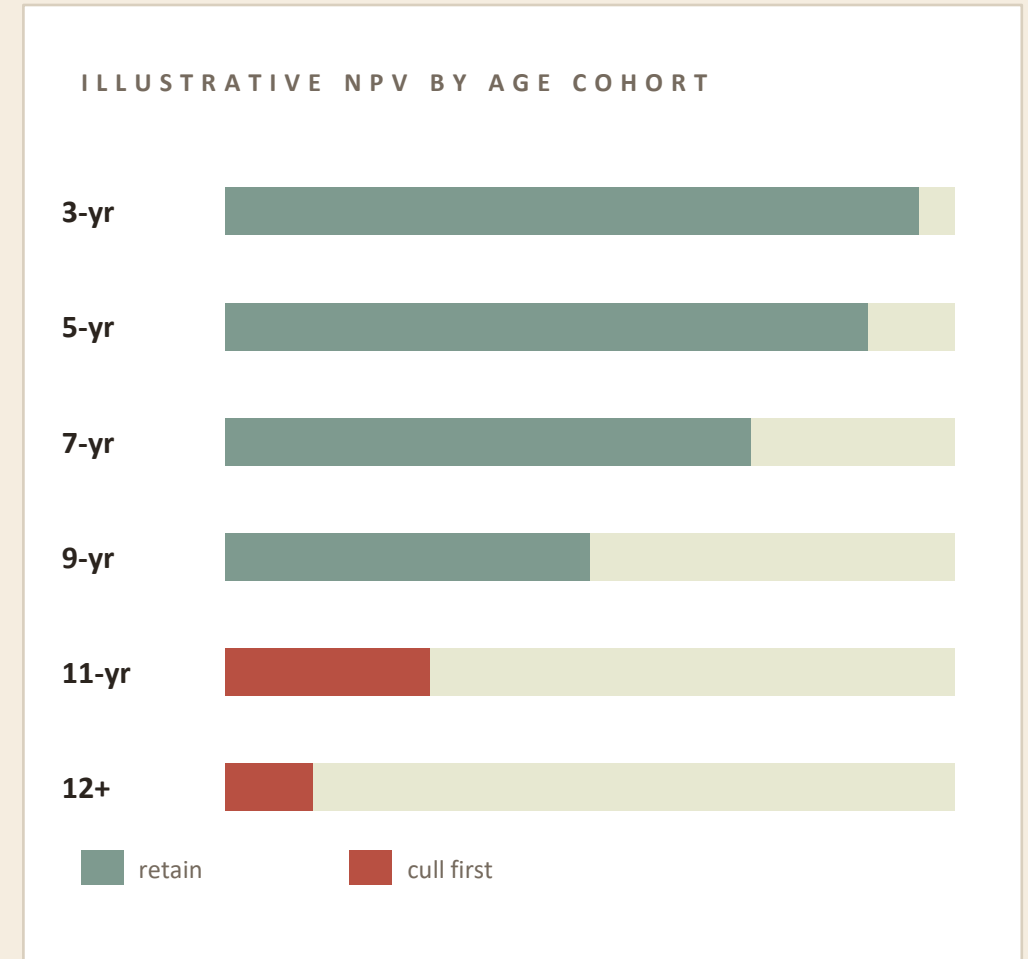
Where the new (higher) cost line crosses the NPV curve. Smaller than normal.

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**In practice, age is a strong proxy for both.**

Evaluating NPV by age cohort (e.g., 3-year-olds, 8-year-olds, 11-year-olds) captures most of the signal without demanding individual records. When cuts are needed, oldest and least-productive cohorts go first.



# What to carry home from this framework

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## CONTACT

# Get in touch.

*Utah State University // Questions, feedback, or collaboration welcome.*



**David Secrist**

EMAIL

david.secris@usu.edu



**Ryan Larsen**

EMAIL

ryan.larsen@usu.edu

# Drought Management Decisions

*When to buy feed, lease grass, or sell the cows*

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An economic framework for cow-calf producers: using capital asset pricing and net present value to guide culling and retention decisions during drought.



# Drought response continuum.

*A step-wise decision-making process. Plan early so you respond from a framework — not a crisis.*

## KEY INDICATORS ON YOUR RANCH

- **Cumulative precipitation**  
*by specified dates*
- **Irrigation water cuts**  
*from irrigation districts*
- **Permit reductions**  
*on BLM or USFS allotments*
- **Other triggers**  
*reservoir levels, snowpack, forage condition*

## GRADUATED RESPONSE

- 1 **Sell open cows**
- 2 **Sell dry cows**
- 3 **Early weaning**
- 4 **Purchase feed / pasture**
- 5 **Sell cows**

# Variable costs per cow.

**Variable cost** = costs directly associated with the level of production. Each cow you keep (or cull) changes these proportionally.

01

**Feed**

02

**Labor**

03

**Vet & Med**

04

**Breeding / bull  
cost**

05

**Freight**  
-Cattle  
-Water

# Variables to consider: carrying capacity.

## NORMAL CARRYING CAPACITY

### Based on grazing capacity

**AUD** = days grazing × number of cows

**AU** = grazing months × number of cows

*Break capacity down by season: spring, summer, fall, winter.*

## DROUGHT-INFLUENCED CAPACITY

### What the drought actually takes from you

- Permit cuts
- Private-land forage reduction including hay
- Range, pasture, and crop aftermath losses

*Evaluate by season — the deficit may concentrate in summer or fall.*

## THE GAP YOU NEED TO CLOSE

**Normal capacity** – **Drought capacity** = **AUD deficit**

WORKED EXAMPLE

# Normal carrying capacity — 400 cows.

| SPRING PERMIT                                                                                            | SUMMER PERMIT                                                    | FALL AFTERMATH                                                                     |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>3 months</b><br><i>400 hd × 90 days</i>                                                               | <b>4 months</b><br><i>400 hd × 120 days</i>                      | <b>2 months</b><br><i>400 hd × 60 days</i>                                         |
| <b>36,000 AUD</b><br><b>1,200 AU</b>                                                                     | <b>48,000 AUD</b><br><b>1,600 AU</b>                             | <b>24,000 AUD</b><br><b>800 AU</b>                                                 |
| <b>RANCH TOTALS</b><br><br><b>108,000</b><br><b>TOTAL AUD</b><br><i>across all three grazing seasons</i> | <b>4,800</b><br><b>TOTAL AU</b><br><i>animal-unit equivalent</i> | <b>570</b><br><b>TONS HAY</b><br><i>95 days × 400 head × 30 lbs/head (Dec–Feb)</i> |

SAME 400 COWS — DROUGHT YEAR

# Drought carrying capacity — 50% cuts

|                                                                                                                     |                                                                                                                  |                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <div>SPRING PERMIT</div> <div>UNCHANGED</div> <div>400 hd × 90 days</div> <div>36,000 AUD</div> <div>1,200 AU</div> | <div>SUMMER PERMIT</div> <div>50% CUT</div> <div>200 hd × 120 days</div> <div>24,000 AUD</div> <div>800 AU</div> | <div>FALL AFTERMATH</div> <div>50% CUT</div> <div>200 hd × 60 days</div> <div>12,000 AUD</div> <div>400 AU</div> |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

|                                                                                                      |                                                                        |                                                                              |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <div>DROUGHT TOTALS</div> <div>72,000</div> <div>TOTAL AUD</div> <div>down from 108,000 normal</div> | <div>2,400</div> <div>TOTAL AU</div> <div>down from 4,800 normal</div> | <div>285</div> <div>TONS HAY</div> <div>irrigation cuts hay production</div> |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|

# The shortfall. Now what?

**24,000**

AUD short (summer)  
= 800 AU

**12,000**

AUD short (fall)  
= 400 AU

**285**

Tons hay short  
half of normal production

**1**

## Buy hay

Offset the hay shortfall by purchasing from outside the ranch. Works when prices aren't sky-high.

**2**

## Rent pasture

Move cows to leased pasture to cover the AUD gap. Adds transport, labor, and lease cost.

**3**

## Sell cows

Cull down to drought capacity. Locks in revenue, but rebuilding the herd is expensive later.

# Three options. One hard decision.

*When forage is scarce and feed prices spike, every cow-calf operator faces the same choice. This model helps make it systematically rather than emotionally.*

1

## Buy Feed

Purchase hay or supplemental feed to carry the herd through drought. Works when feed costs stay below the cow's NPV erosion.

2

## Lease Grass

Move cattle to leased pasture elsewhere. Preserves the herd, but adds transport, labor, and lease costs.

3

## Sell Cows

Cull early, ahead of forced sales. Locks in value, but rebuilding a herd when prices are high is expensive.



# A cow is a capital asset.

## The analogy.

In a cow-calf operation, a cow converts inputs — feed, water, genetics, health care, management — into calves. Treat each cow as a calf-producing machine, and the ranch as the factory that houses it.

## The pricing rule.

Capital asset pricing theory says the value of any asset equals the net present value (NPV) of its expected future returns. For a cow, that means the discounted stream of net returns from calf sales over her remaining productive life — plus her terminal cull value at the end.

### WHAT DRIVES NPV

- **Calf prices**  
*expected market \$/lb*
- **Weaning weights**  
*lbs of calf at sale*
- **Weaning probability**  
*pregnancy × calving × survival*
- **Annual carrying cost**  
*feed, health, labor per cow*
- **Terminal cull value**  
*market price at the end*

# Retain or sell? Compare NPV to the effective market value.

**Cow NPV** vs. **Market Value – PV(Replacement Cost – Replacement NPV)**

*Retain the cow if the left side exceeds the right. Sell otherwise.*

## RETAIN

**If NPV > Market Value – Replacement Penalty**

She will earn more in the factory than you'd get at the salebarn, even after accounting for the cost of eventually replacing her.

## SELL

**If NPV < Market Value – Replacement Penalty**

The cash in hand today, net of what it'll cost to rebuild the herd later, exceeds what she's worth as a going concern.

# Drought costs shrink NPV. The equation shifts.

NORMAL YEAR

$$\text{Cow NPV} \rightleftharpoons \text{Market} - \text{PV(Premium)}$$

DROUGHT YEAR

$$\text{Cow NPV} - \text{Drought Costs} \rightleftharpoons \text{Market} - \text{PV(Premium)}$$

*Drought costs come from two places:*

## Herd-wide costs

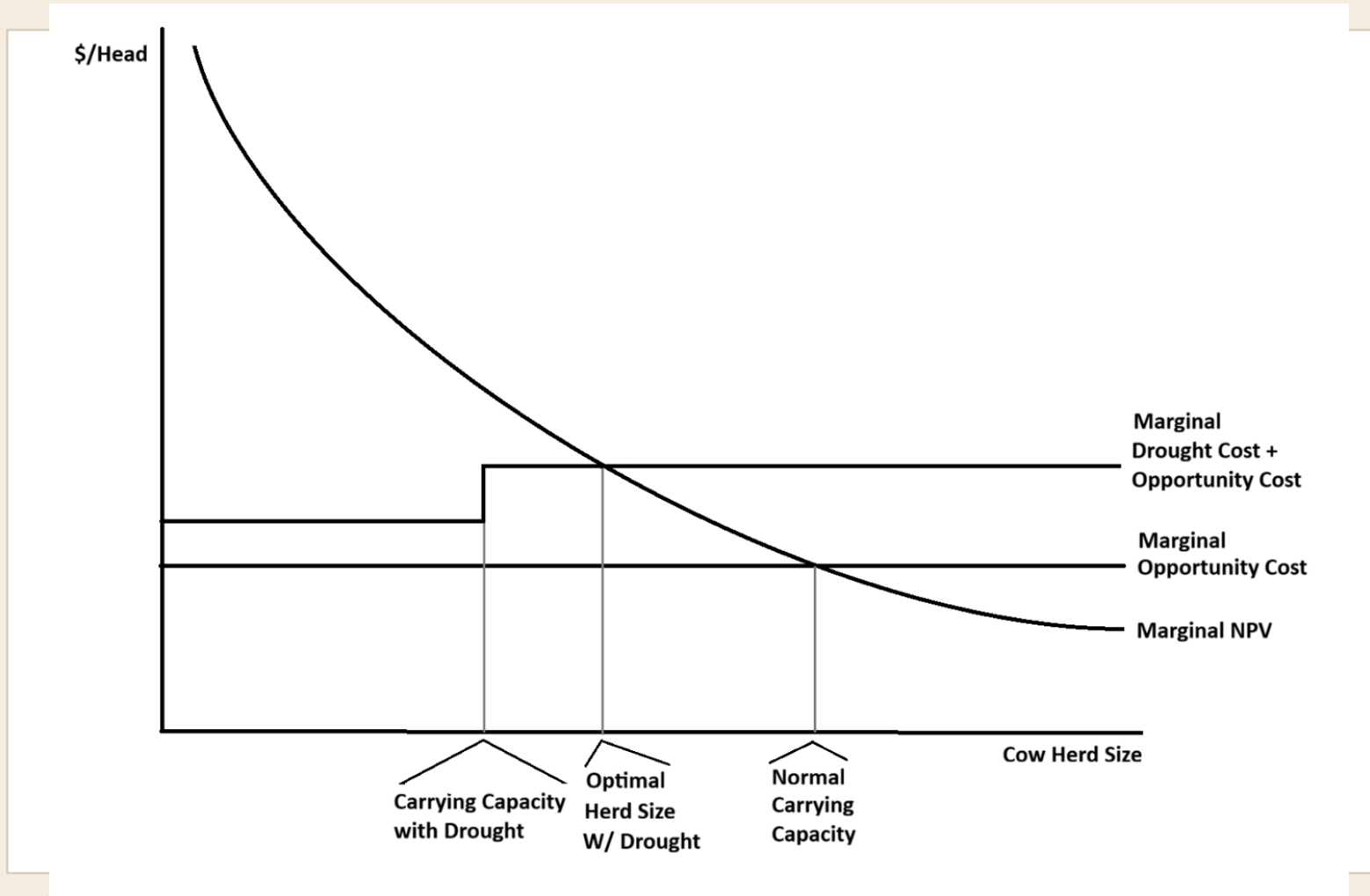
Higher hay prices, hauled water, extra labor — these hit every cow in the herd during a drought year, whether the ranch is overstocked or not.

## Over-capacity costs

Supplemental feed for every cow retained above the ranch's reduced drought carrying capacity. These kick in only when  $H > CC$ .

FIGURE 1

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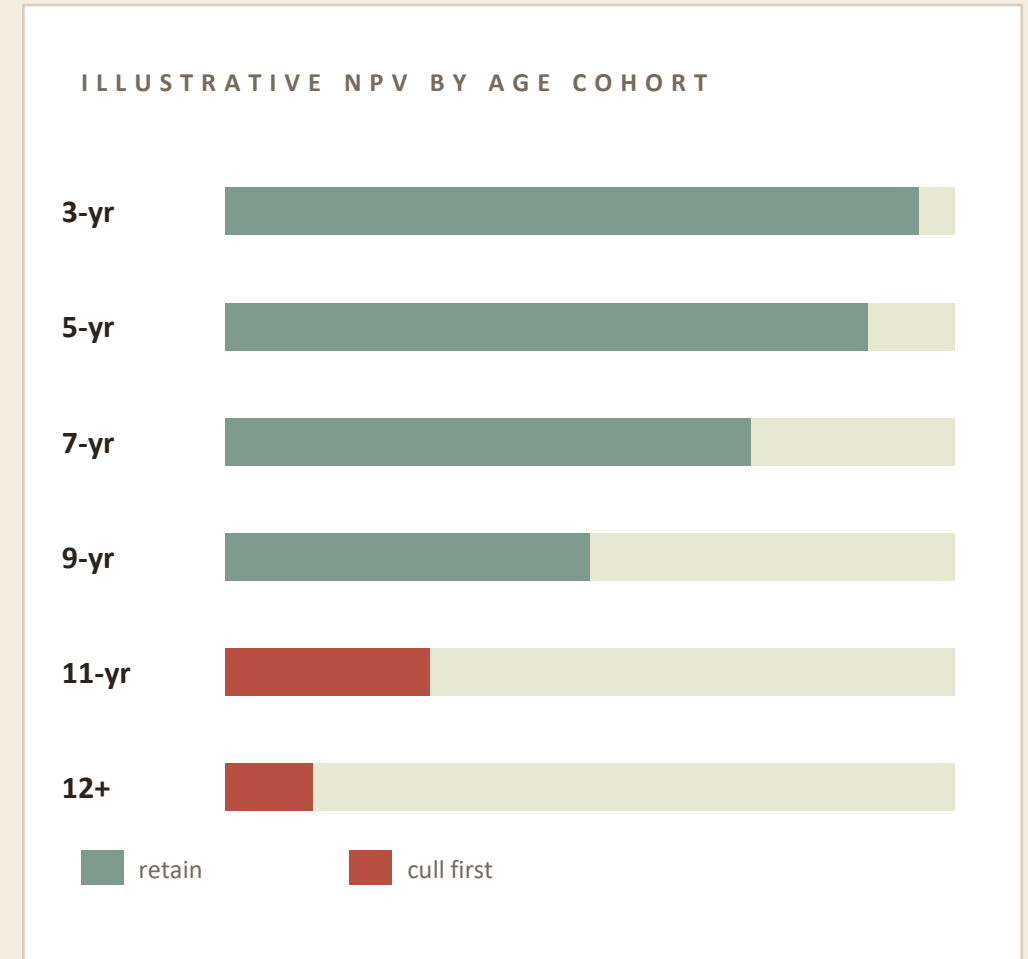
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