Precipitation Harvesting Progress Update

September 26, 2018

DWSD

COLORADO
Division of Water Resources
Department of Natural Resources

LeonardRice
ENGINEERS, INC.

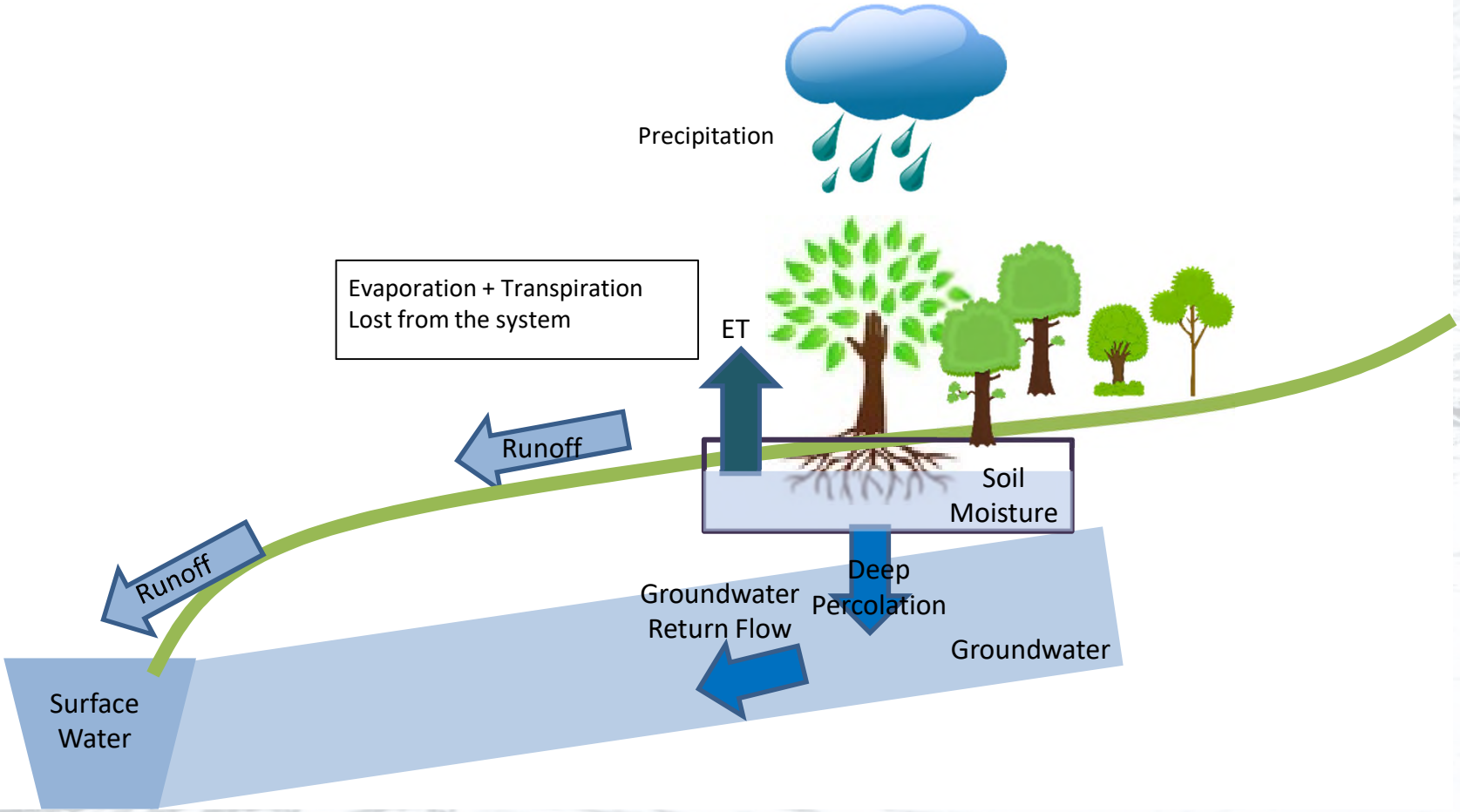
Background & Legislation
Tracy Kosloff, State Engineer's Office

Pilot Project and Regional Factors
Mark Mitisek, Leonard Rice Engineers

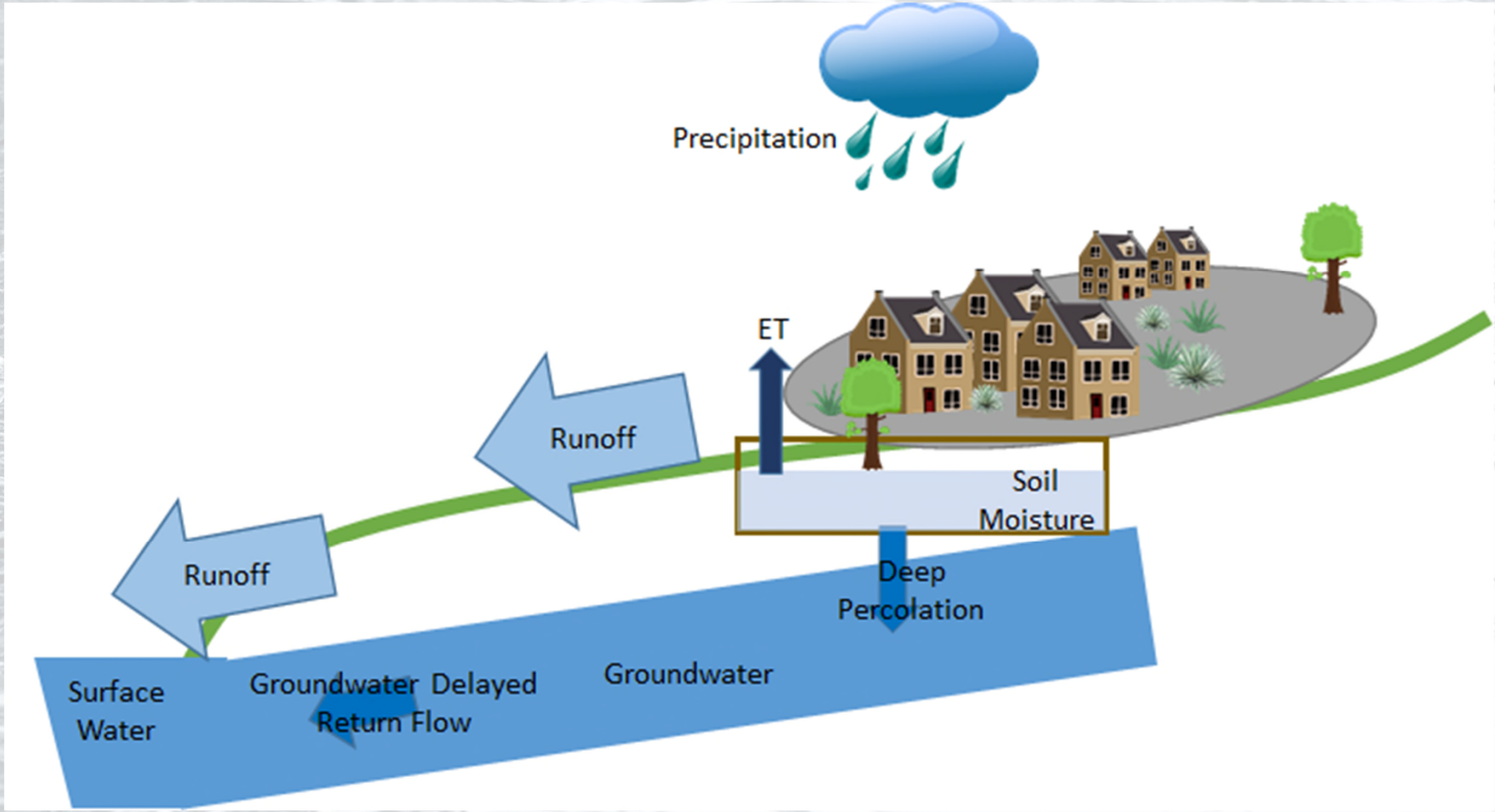
Questions?

COLORADO
Division of Water Resources
Department of Natural Resources

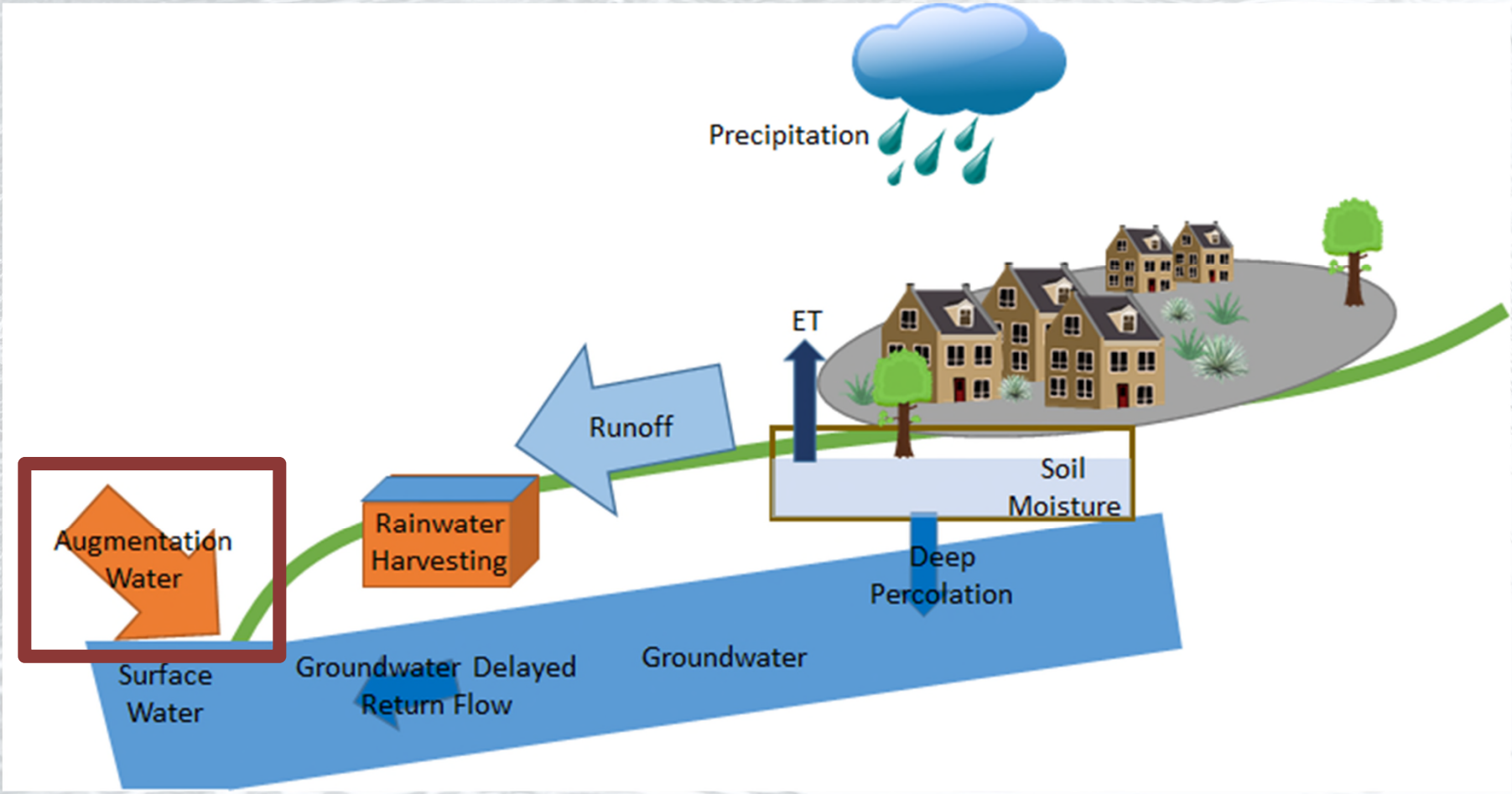
Water Balance - Undeveloped



Water Balance - Developed



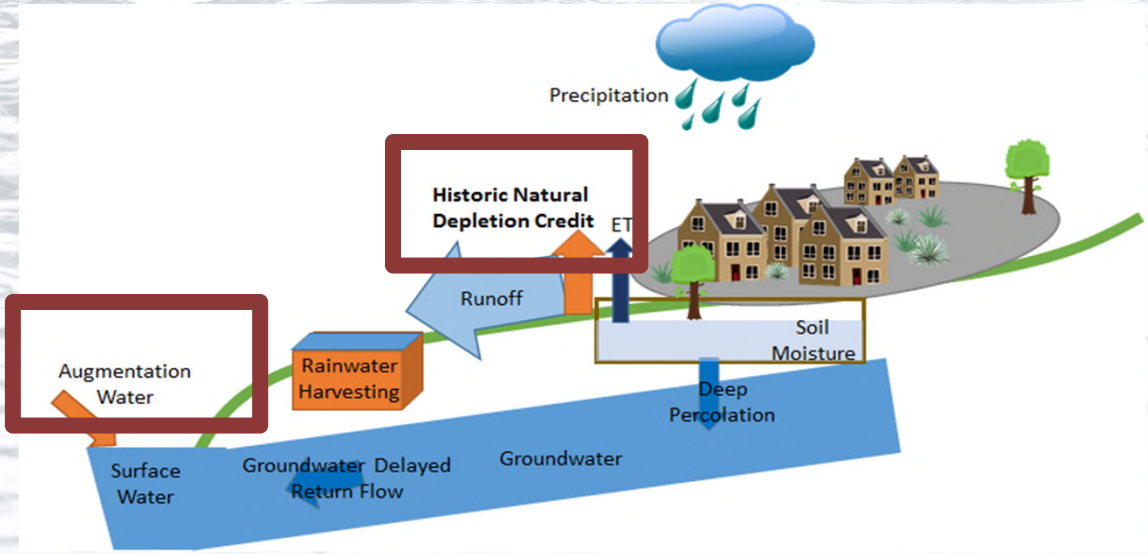
Water Balanced - Developed with Precipitation Harvesting



Precipitation Harvesting Pilot Projects

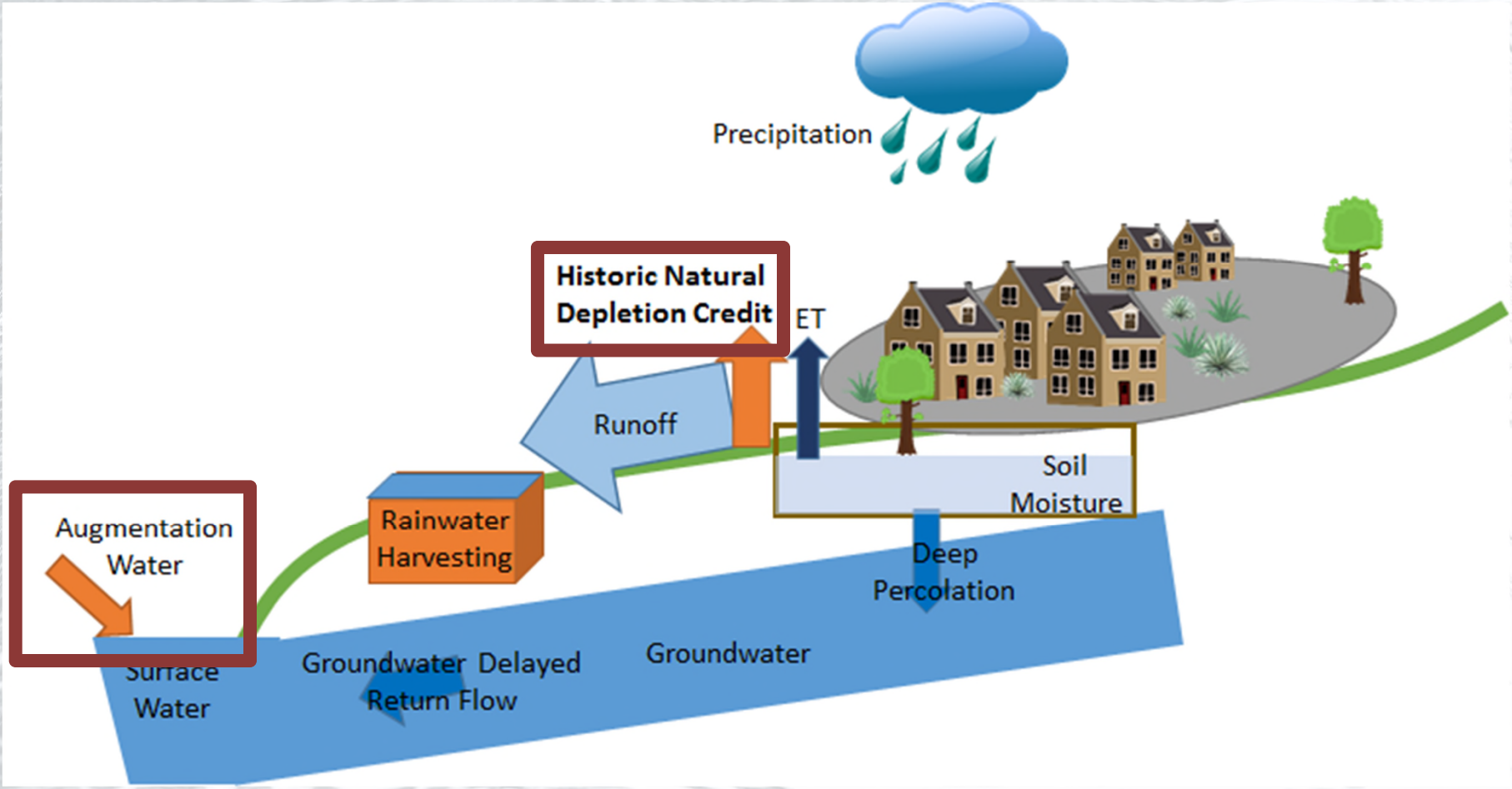
HB09-1129

- Reduce the need for new water supply in new development
  - **Credit for water consumed by historical vegetation [ET] (historic natural depletion)**
    - **Reduced augmentation / replacement requirement**
  - Authorized up to 10 Pilot Projects
  - Use precipitation for non-potable purposes
  - Combine with water conservation



COLORADO
Division of Water Resources
Department of Natural Resources

Precipitation Harvesting with Historical Natural Depletion Credit



How much is the Historic Natural Depletion Credit?

Data & Infrastructure Needed!

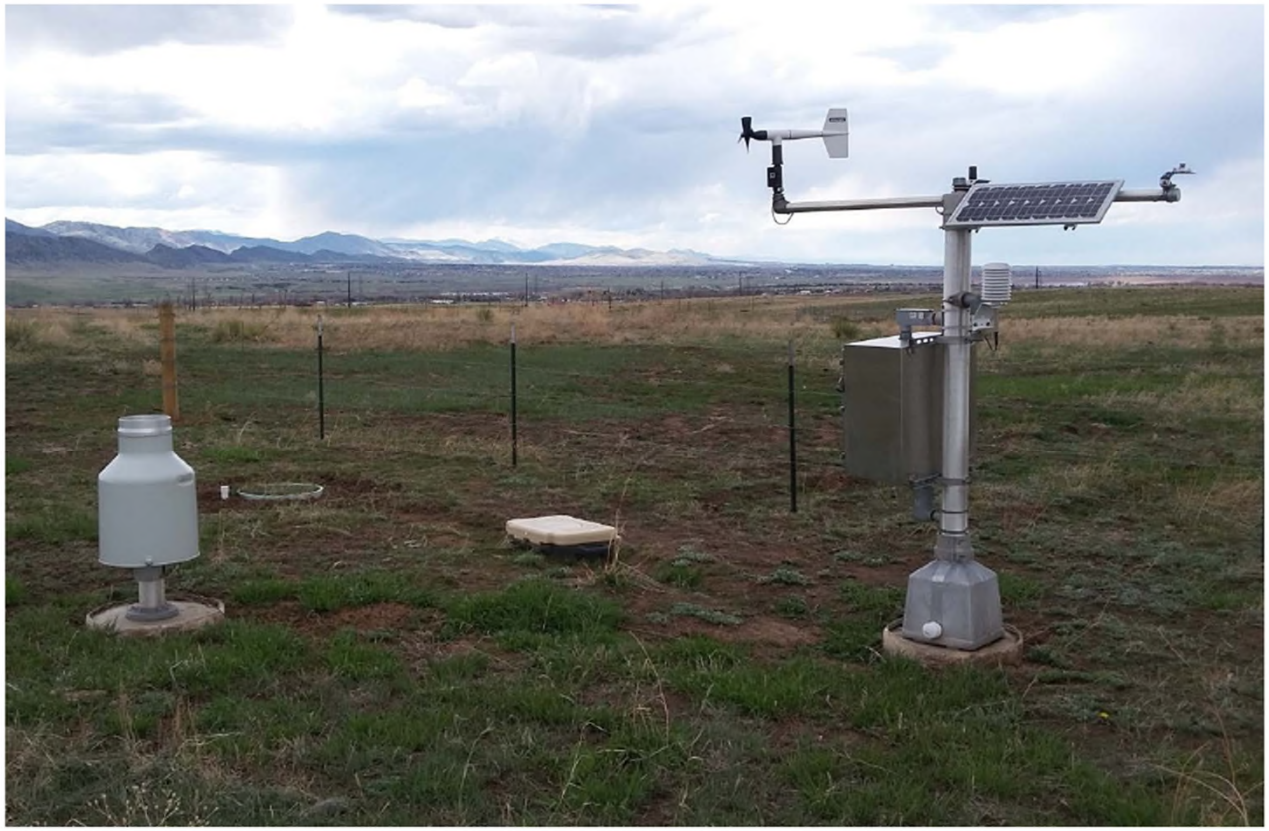
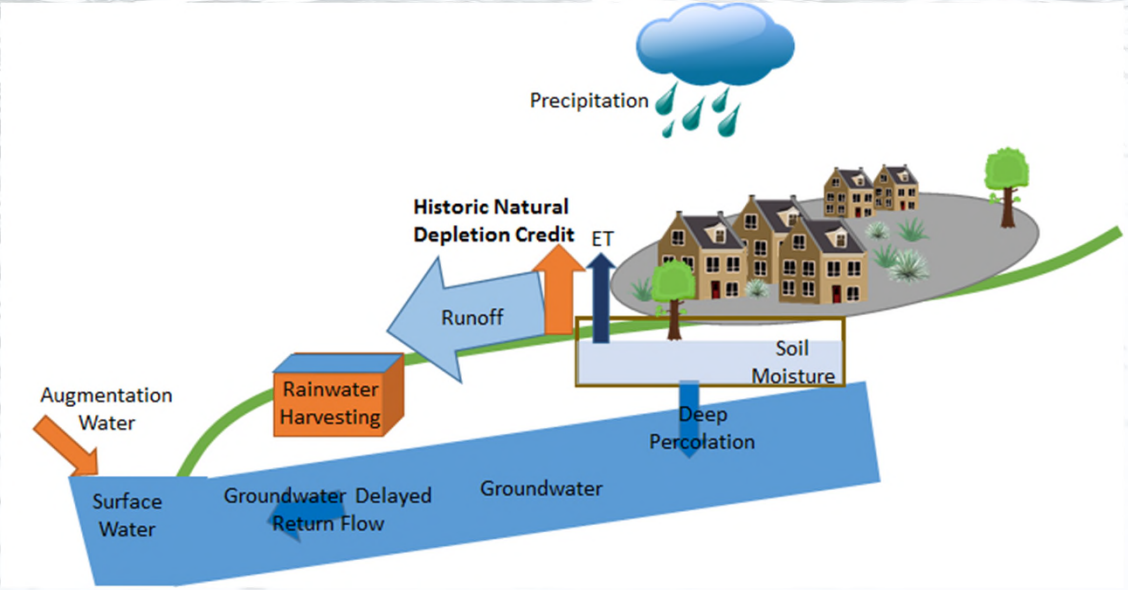


Figure 2 – Sterling Ranch Climate Station (April 2016)

Precipitation Harvesting Pilot Projects

HB09-1129 & HB15-1016 - Concerning Incentives for Precipitation Harvesting

- Credit for water consumed by historical vegetation (historic natural depletion)
  - Reduced augmentation / replacement requirement
- **Establish regional factors for vegetation credit**
  - Easy to use for new pilot project developments
  - Use in SWSP (1 year approvals by State Engineer)
- Extended pilot program by 6 years to 2025



COLORADO
Division of Water Resources
Department of Natural Resources

Water Plan Grant - Dominion Water Regional Factor Development

- Use Sterling Ranch data to develop regional factors
- Develop regional factor methodology for use elsewhere
- Clarify the legal & administrative framework for operation & use of Regional Factors
  - One year substitute water supply plans, Regional Factors are presumptively correct
  - For a permanent augmentation plan in water court, no such presumption

- Grant Project Completion – December 2018

Pilot Project and Regional Factors Agenda

01 What is Precipitation Harvesting?

02 Background and History

03 Who is Dominion and why are they pursuing precipitation harvesting?

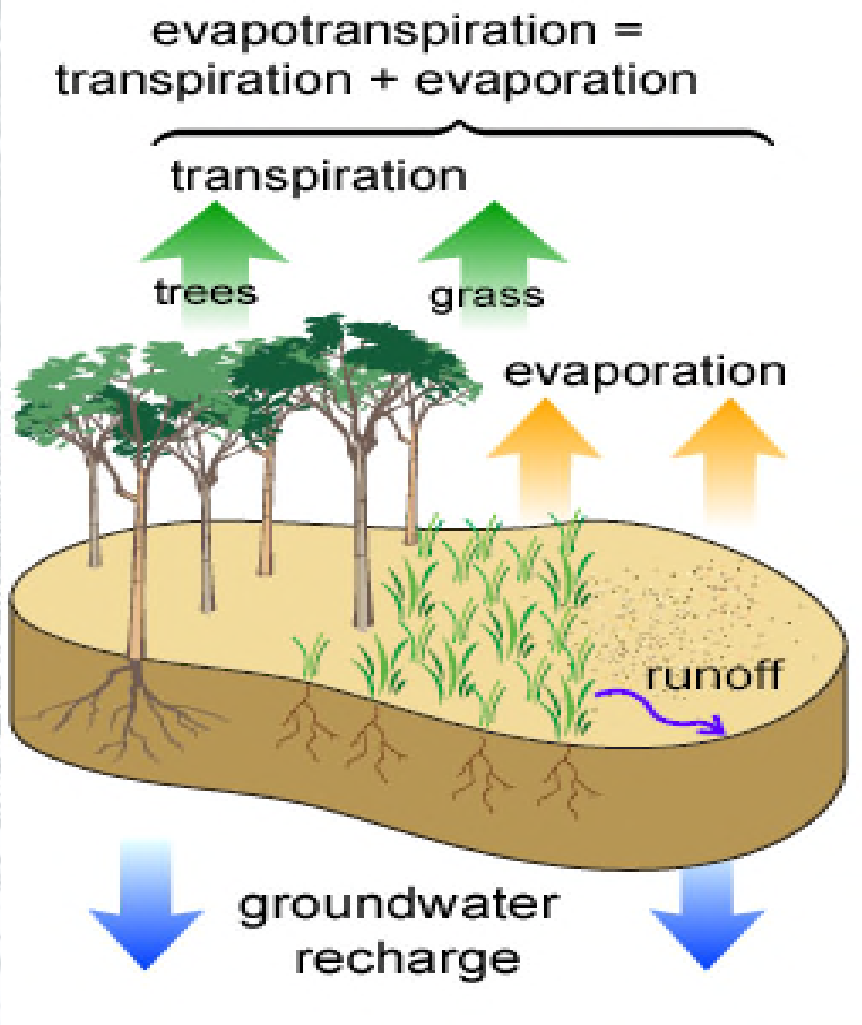
04 What is the Precipitation Pilot Program?

05 What are Regional Factors?

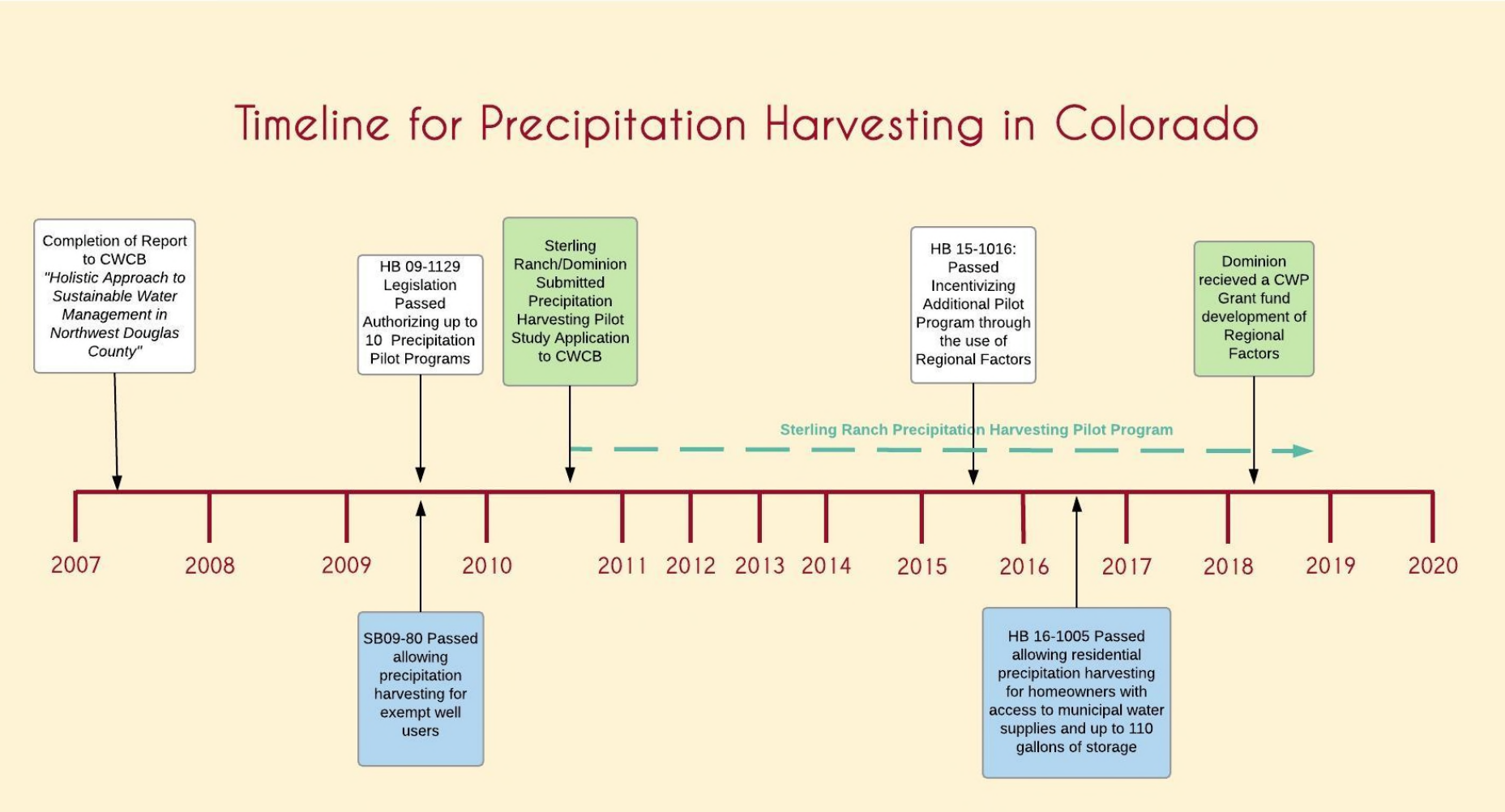
06 What is the Basis for Regional Factors?

What is Precipitation Harvesting?

Precipitation harvesting *is the* ***collection and storage*** *of precipitation run-off from developed impervious structures (roads, roof tops, etc.) that historically never reached the streams or aquifers because it either evaporated or was consumed by native plants.*



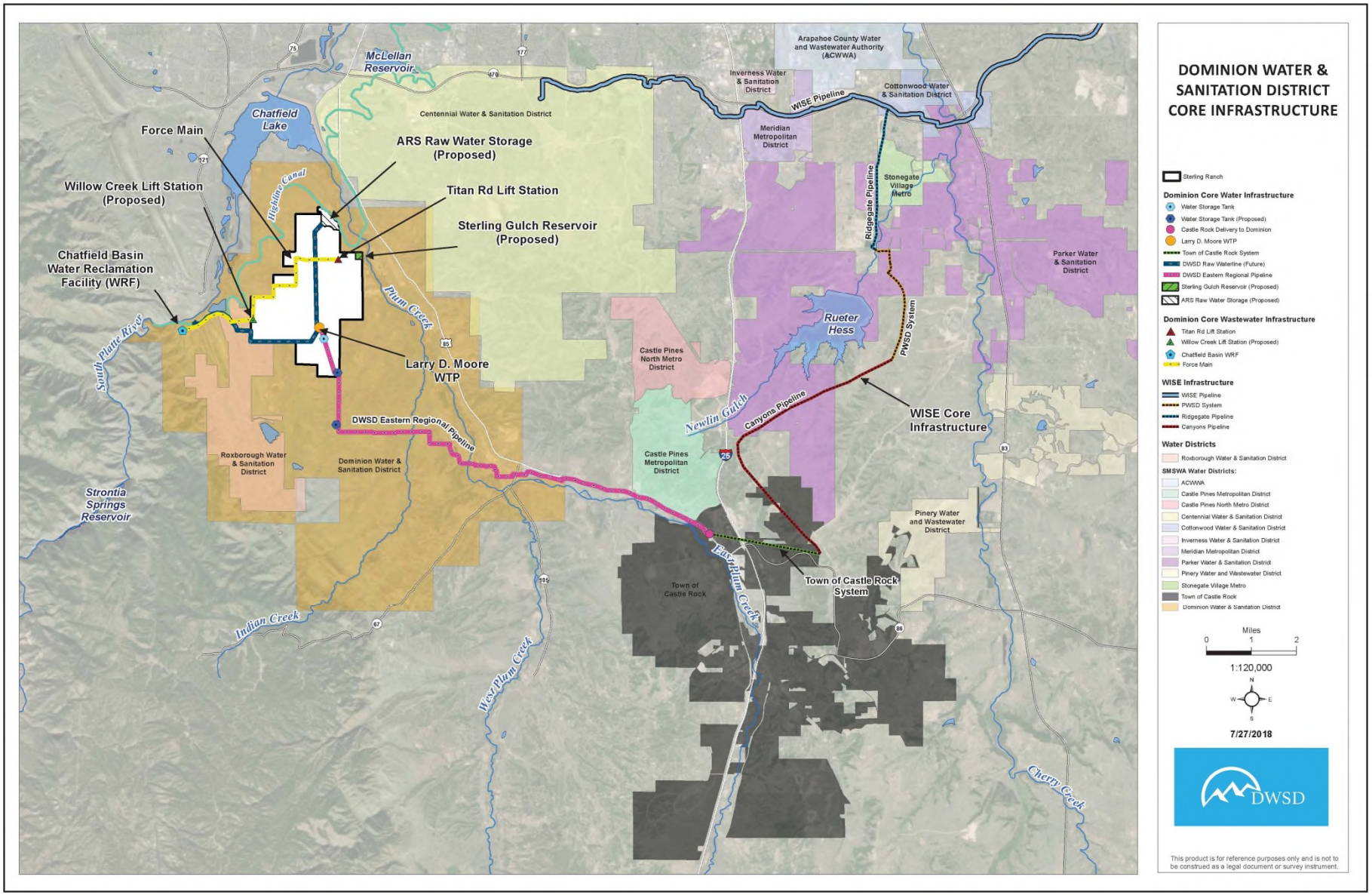
Background and History



Who is Dominion and why are they Pursuing Precipitation Harvesting?

Source : Denver Post (7/18/2017)

Getting Water To Sterling Ranch



What is the Precipitation Pilot Program?

ELEMENTS OF THE STERLING RANCH PILOT PROGRAM

WATER RIGHT

- **Natural Conditions Data Collection/Analysis**
- **SWSP**
  - Regional factors?
- **Water Court**
- **Admin/operations**

IMPLEMENTATION

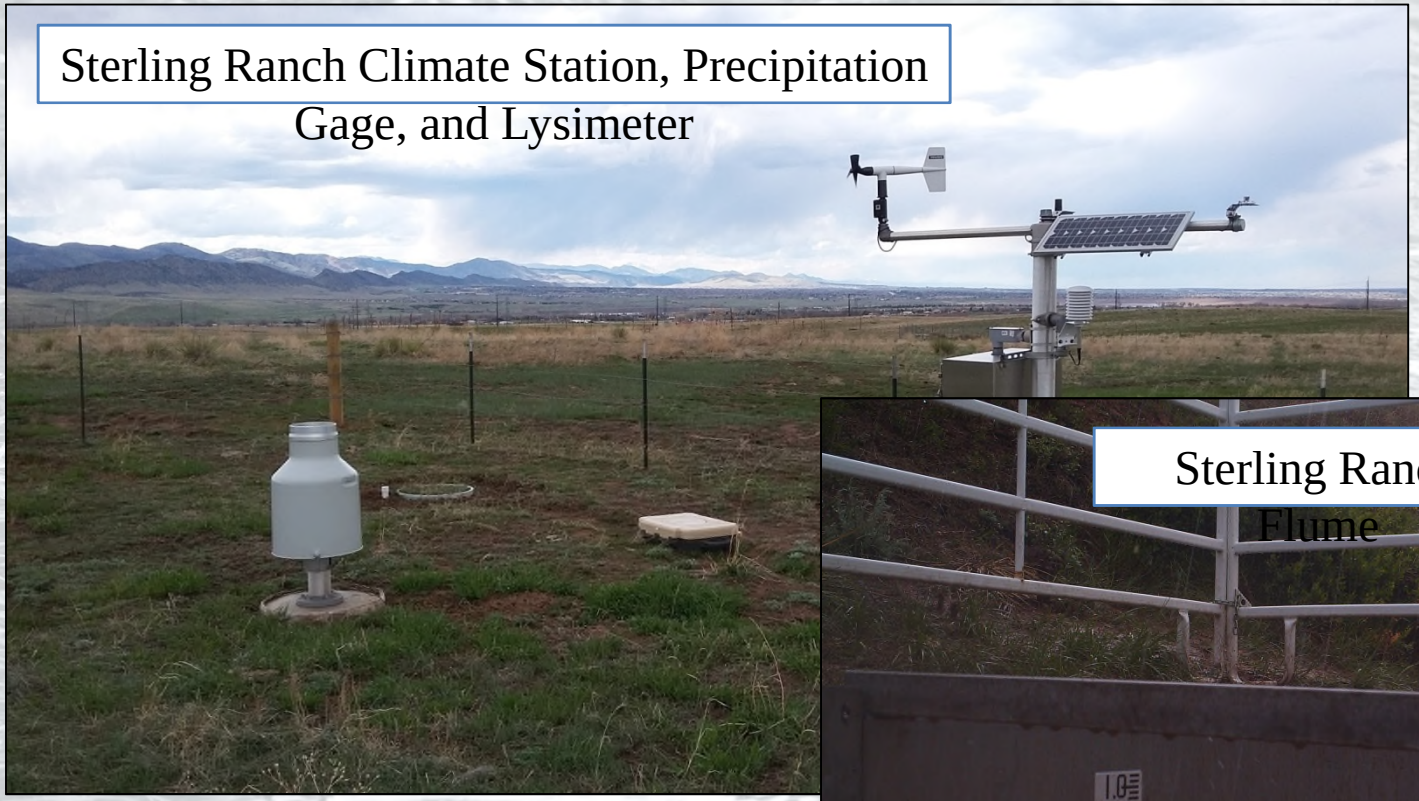
- **Developed Conditions Data Collection/Analysis**
- **System Evaluation/Design**
  - System types?
  - Yield/Capture efficiencies?
- **Infrastructure Integration**

CONSERVATION

- **Water Use Data Collection/Analysis**
- **Pairing of water conservation and precipitation harvesting**
- **Water Demand Management**
  - Water demand standards
  - Metering
  - Technology

Sterling Ranch is the only authorized Pilot Project in the State

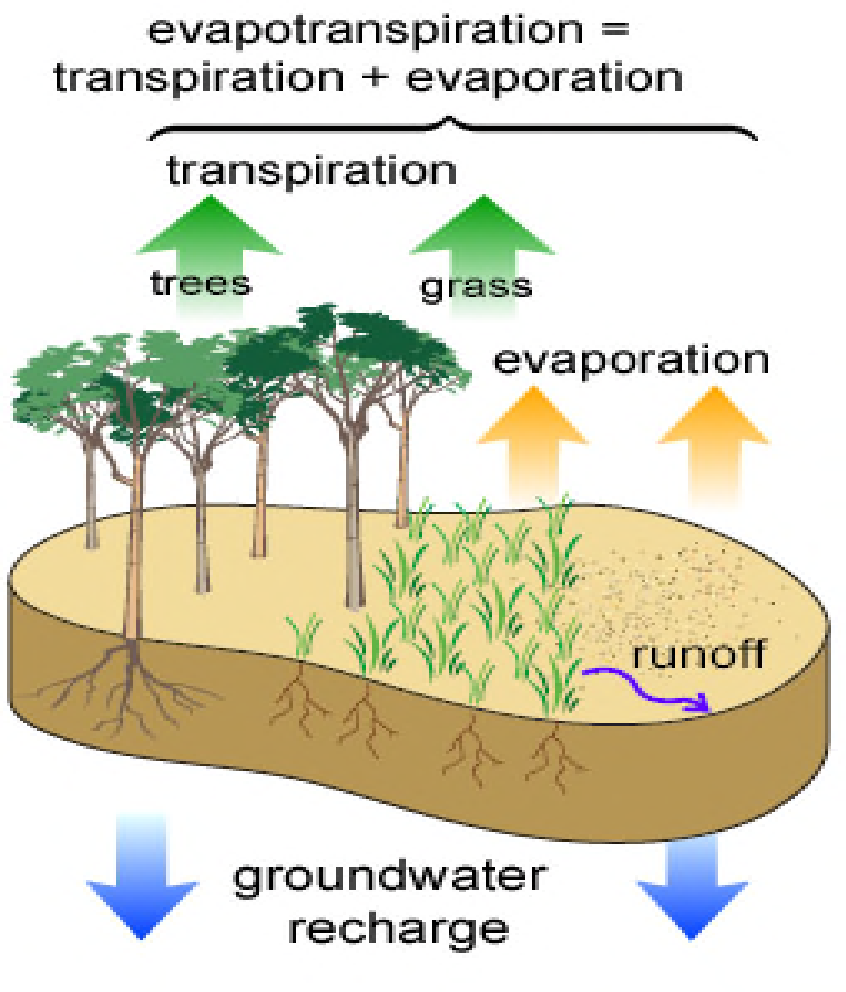
Natural Conditions Monitoring Program



Sterling Ranch Climate Station, Precipitation Gage, and Lysimeter

Sterling Ranch Flume

Guiding Principles Learned from Pilot



1. The amount of precip that enters the soil depends on:
   - the intensity, and duration of storm events, and
   - the infiltration rate of soil types.
2. Only during very limited periods when the soil is saturated does ground water recharge (deep percolation) occur.

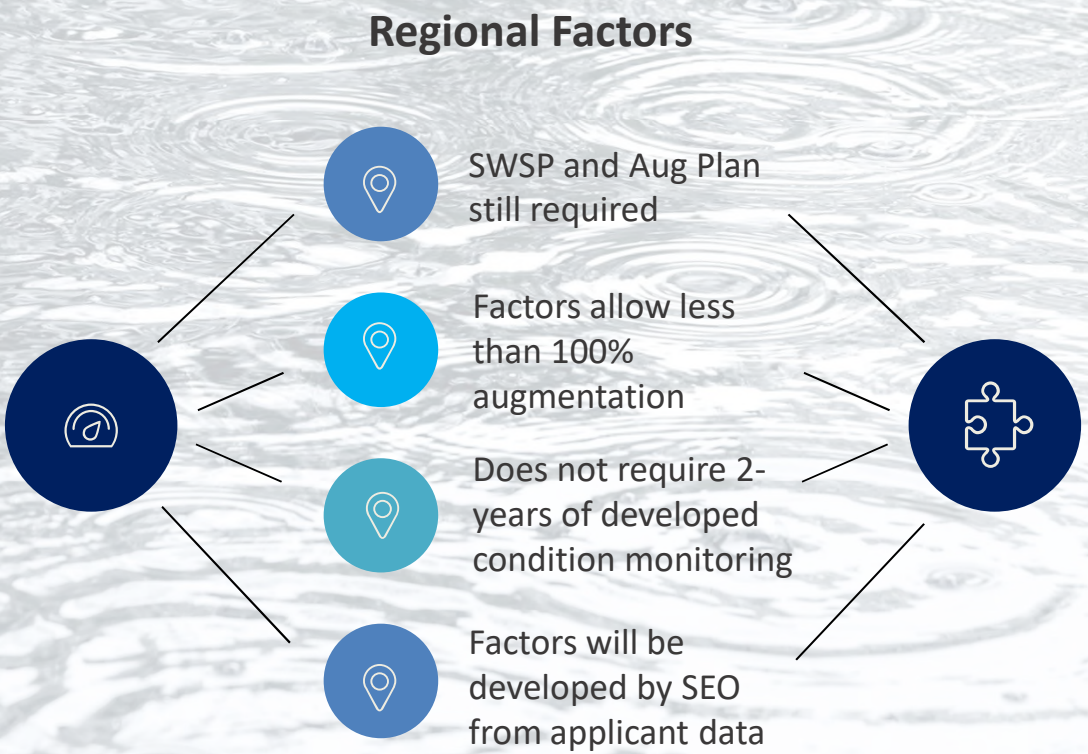
Native CU = Precipitation - SW Returns – GW Returns

What are Regional Factors?

Regional Factors *are presumptive factors that can be used during a temporary SWSP allowing applicants to receive benefit from their precipitation harvesting project.*

Purpose of HB15-1016

To incentivize additional pilot programs.



Benefit

Allows pilot program applicants to use presumptive regional factors for SWSP immediately with less than 100% augmentation requirement

Basis of Regional Factors?

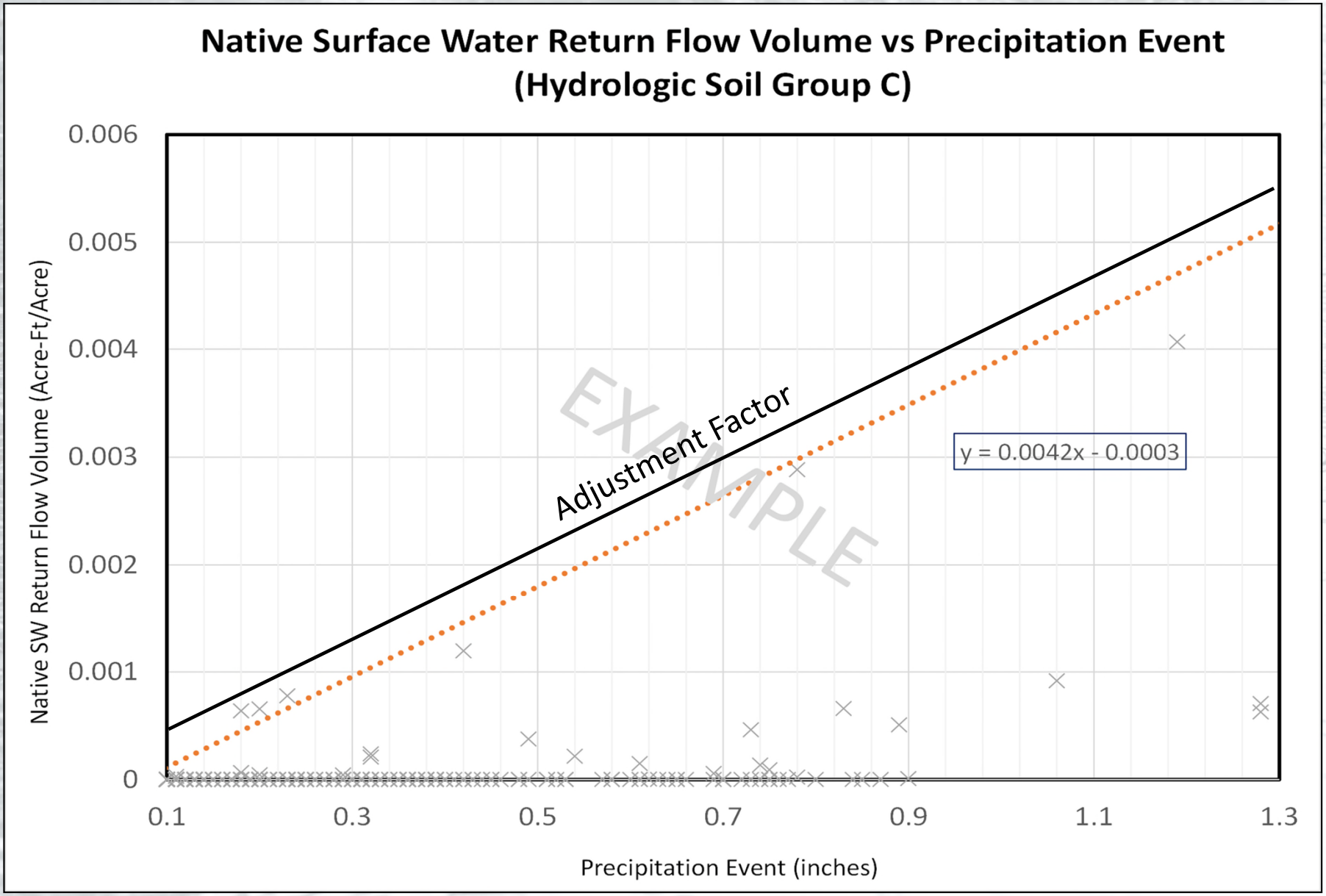
Native CU = Precipitation - SW Returns – GW Returns

Precipitation: *Measured real-time*

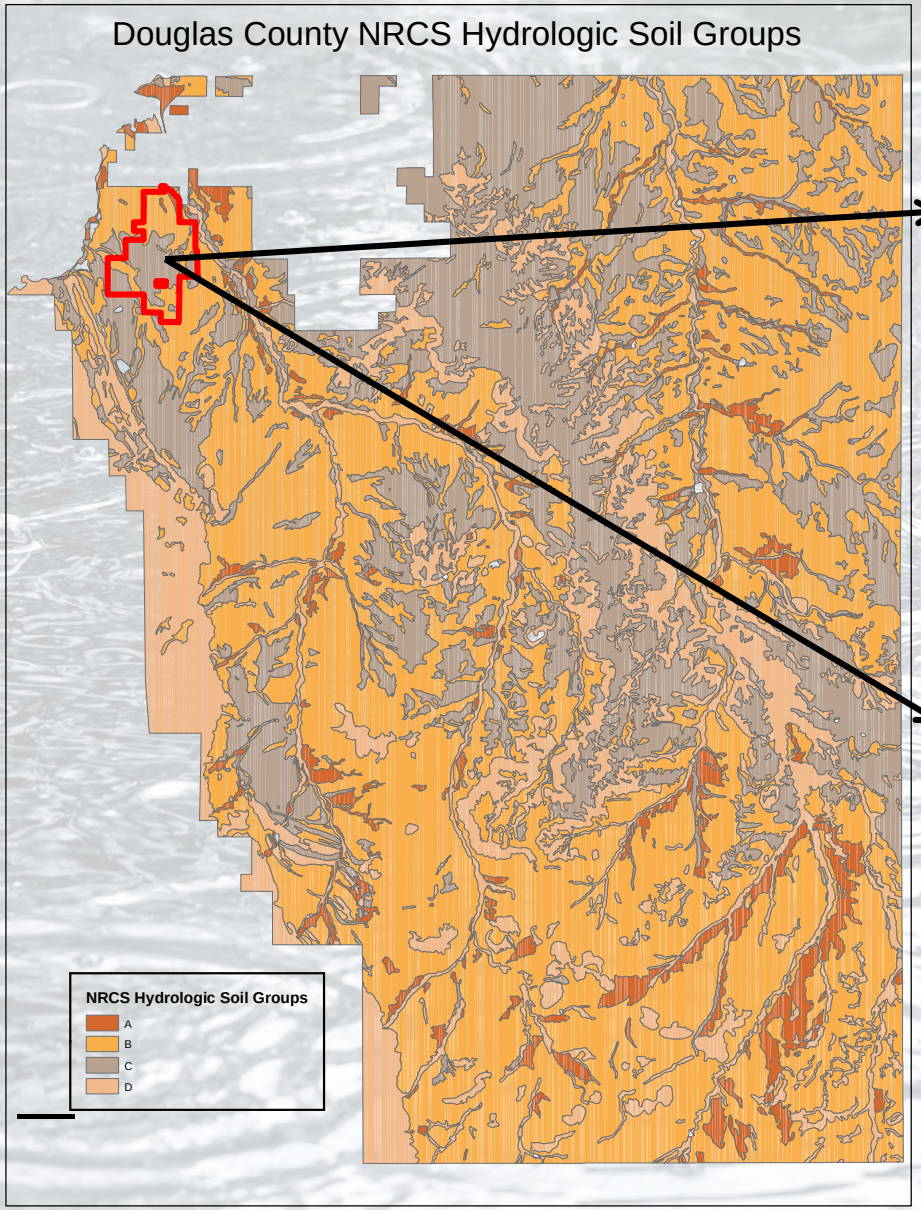
SW Returns: *Surface returns calculated for each precipitation event from soil specific curves developed based on infiltration rates*

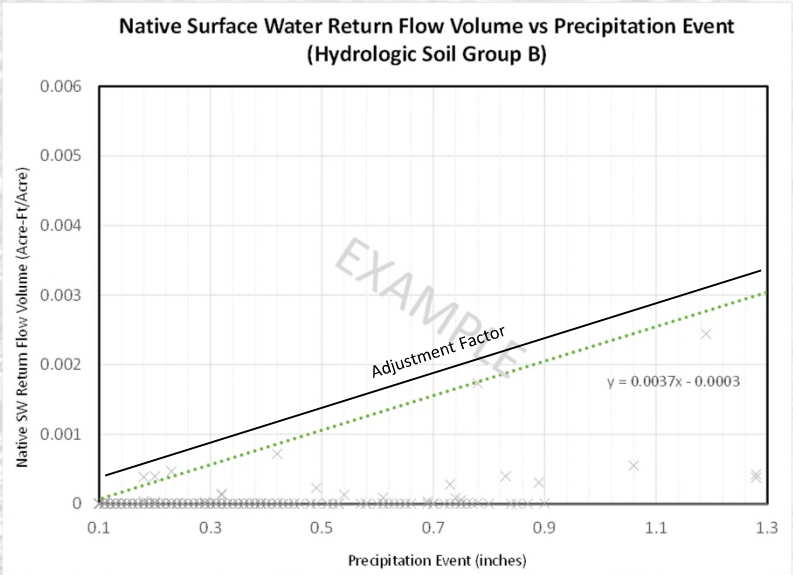
GW Returns: *Deep percolation rates based on percentage of annual precipitation*

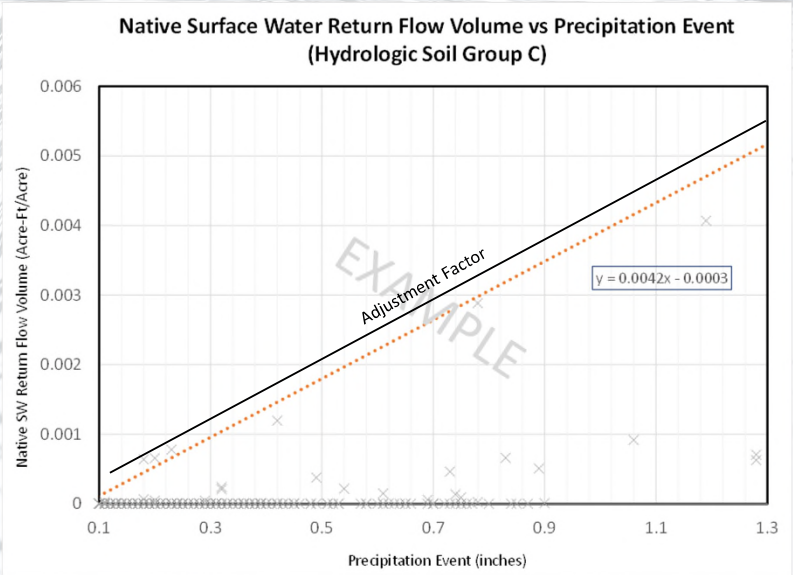
Native Surface Water Return Flows



Native Surface Water Return Flows







Native Groundwater Return Flows

GW Returns: *Deep percolation rates based on percentage of annual precipitation*

Pilot Study Observations:

- *Average observed deep percolation at the lysimeter (8 Year Average ~2%)*

Regional Studies Suggest:

- *3-4% of annual precipitation*[1]
- *Sandy soils maybe higher*

**Fixed percentage applied to all events*

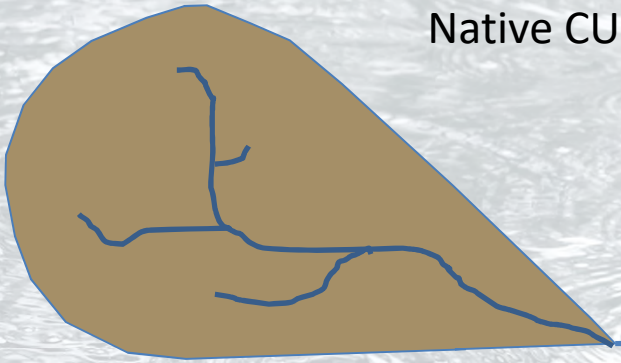
**All groundwater return flows are to be lagged using standard practices*

1 Brown and Caldwell, 2017. *South Platte Decision Support System Alluvial Groundwater Model Update Documentation*
Leonard Rice Engineers, 2000. *Rio Grande Decision Support System Final Memorandum, Recharge from Precipitation*

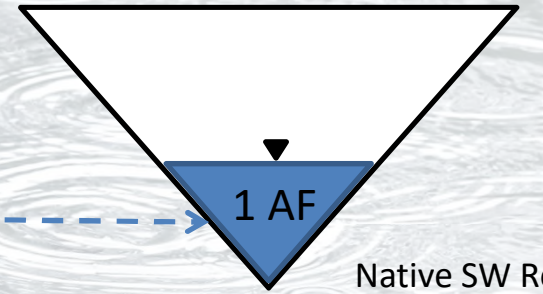
How is a Regional Factor Used?

Native
(0% impervious)

Native CU = Precipitation - SW Returns – GW Returns

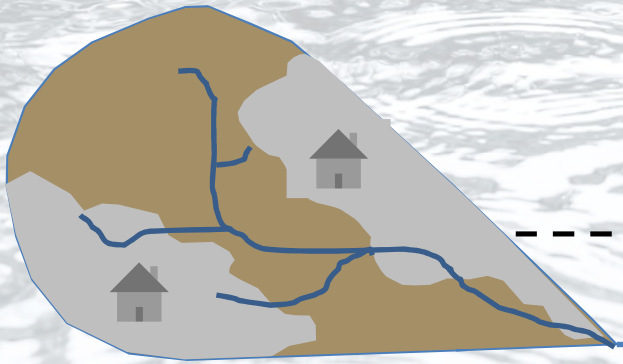


Native GW Return Flow = 5%

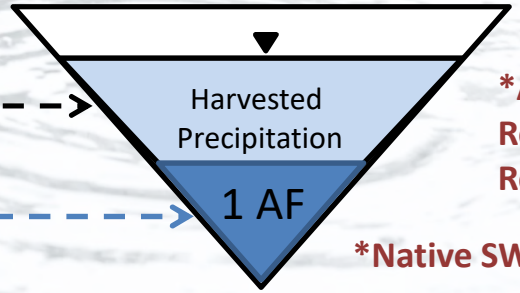


Native SW Return Flow = 1.0 AF
(From a soil specific curve)

Developed
(45% Impervious)
Out-of-Priority



***Native GW Return Flow = 5%**



***Augmentation Requirement OR Release**

***Native SW Return Flow = 1.0 AF**

Conclusions

- Precipitation harvesting is a viable renewable water supply and is important to Colorado's future. Especially, to communities reliant on non-tributary water supplies.
- Regional Factors allow applicants to receive immediate benefit from their precipitation harvesting project during a temporary SWSP.
- The Sterling Ranch Precipitation Pilot Program has collected the necessary data to develop site specific factors that will be used to validate factors regionally.
- The basis for Regional Factors are soil specific curves for determining SW returns and a fixed percent for determining GW returns. These methods are transferrable statewide and protect downstream vested water rights.

Thank you!

MARY KAY PROVAZNIK
MARYK@DOMINIONWSD.COM
303-202-6800

MARK MITISEK
MARK.MITISEK@LREWATER.COM
303-455-9589