

WESTERN MORA COUNTY: OBSERVATIONS OF POST-FIRE GROUNDWATER CONDITIONS

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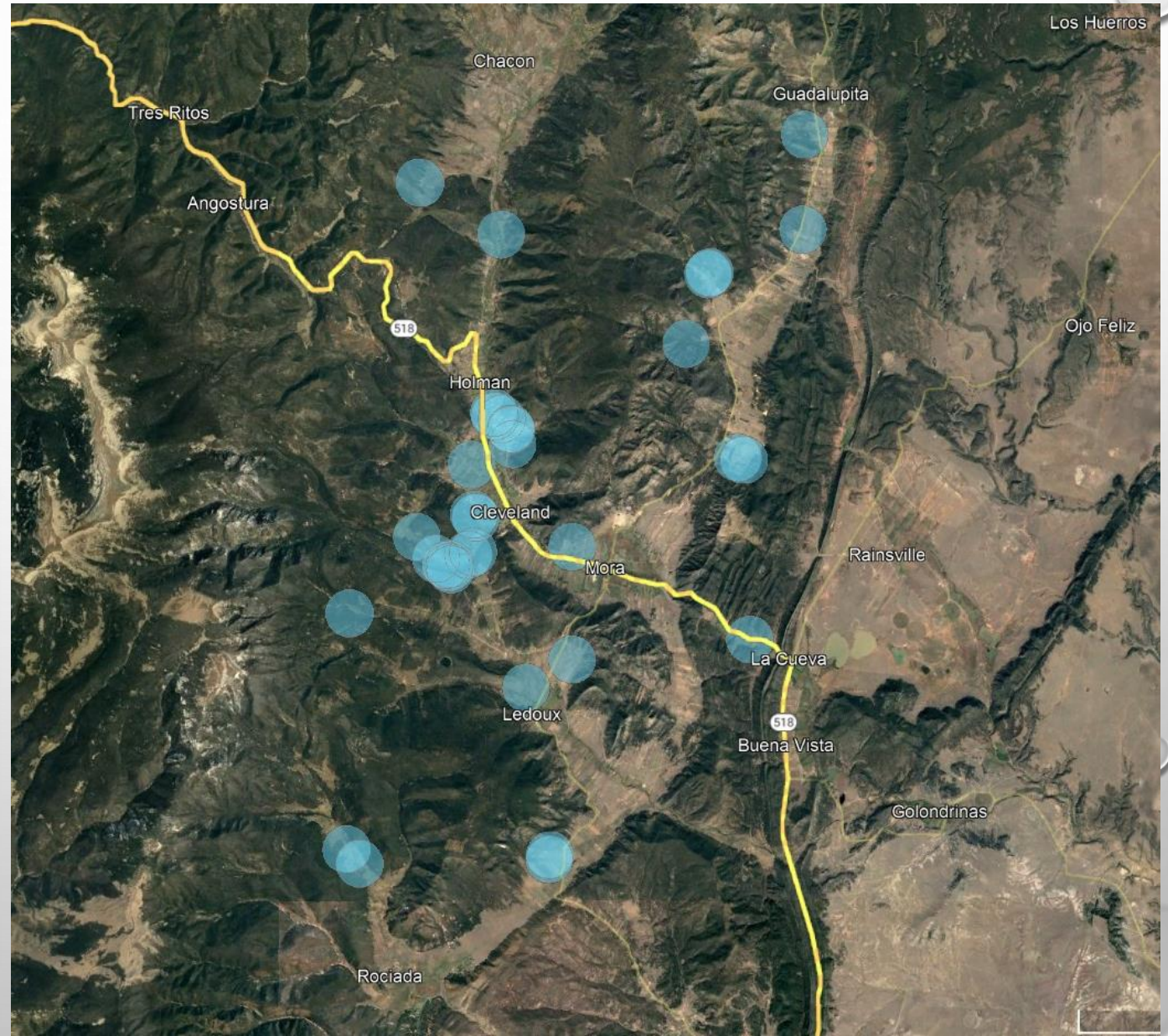
WESTERN MORA GROUNDWATER MONITORING

- BEGAN JULY 2023 WITH FUNDING FROM MORA COUNTY AND GUIDANCE FROM THE MORA COUNTY COMMISSION AND PLANNING & ZONING COMMISSION
 - 18 PARTICIPANTS IN 2023
 - 22 WELLS IN 2023
 - 31 PARTICIPANTS IN 2024
 - 35 WELLS IN 2024
 - DATA GATHERED:
 - STATIC WATER LEVEL (MEASURED JULY AND DECEMBER)
 - TOTAL DEPTH
 - GENERAL CHEMISTRY + TRACE METALS SAMPLES
 - (TRITIUM SAMPLES AS APPLICABLE)

MONITORING WELL LOCATIONS

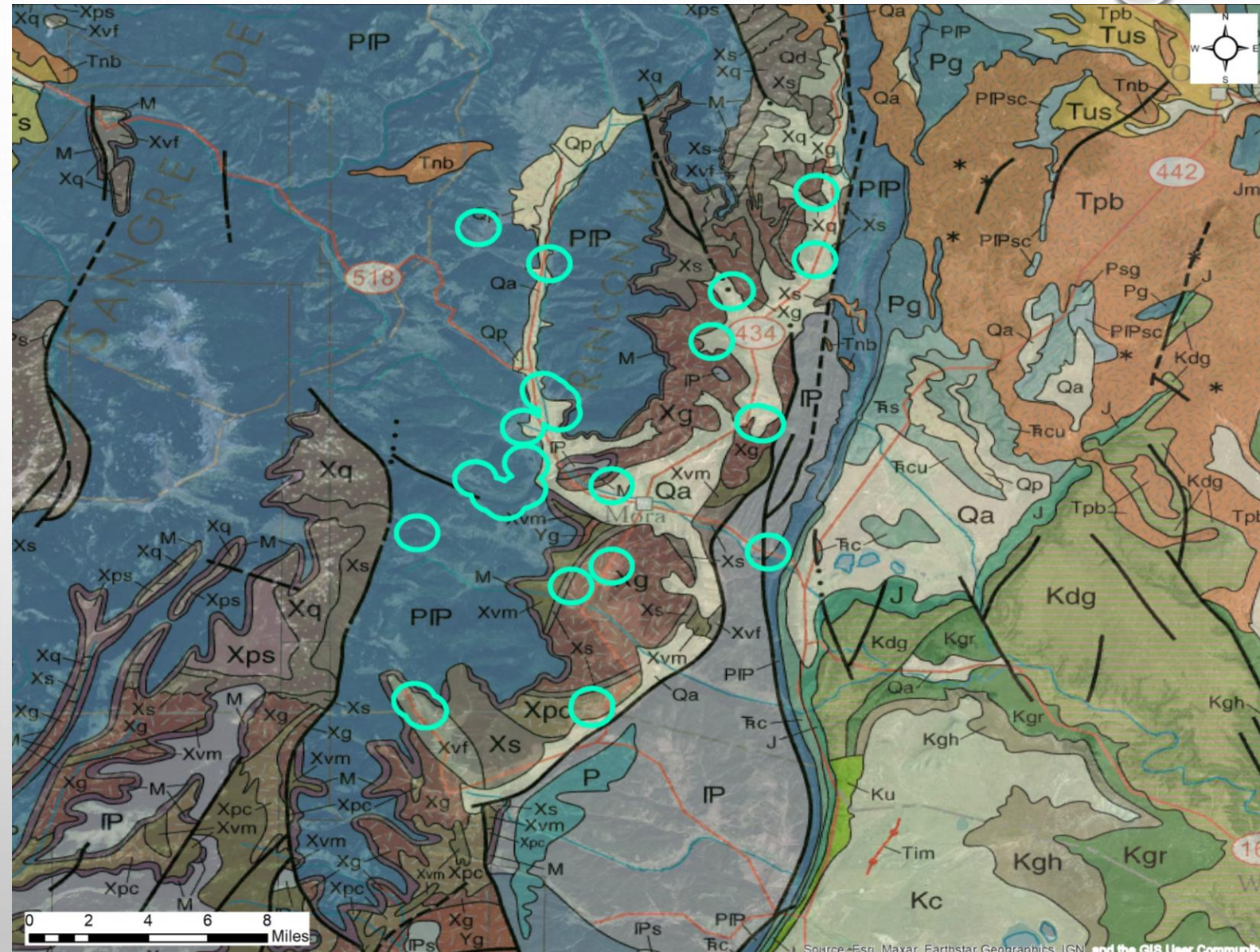
“Gatekeeper” wells:

- Where the Rio Mora exits the mountain front
- On the valley floor at Chupaderos
- Deeper wells at Ledoux, North Cleveland
- For comparison with wells in or immediately adjacent to burn scar and/or areas of substantial flooding
- Repeated sampling of wells for basic chemistry over many years



Geologic Context

- Permian Sangre de Cristo Formation
 - Red shale and coarse-grained sandstone, conglomerates
- Pennsylvanian Madera Group: Porvenir Formation
 - Limestone and gray shale
- Precambrian granite and metamorphic rocks
- → Minerals in these rock units contribute to the chemistry of the groundwater
 - Sulfate, nitrate
 - Uranium



WATER LEVEL DATA

- WATER LEVELS RANGE FROM 2 FEET BELOW GROUND SURFACE (BGS) TO 120 FEET BGS
 - TOTAL DEPTHS ARE VARIABLE: 70 FEET TO 300 FEET
 - AVERAGE WATER LEVELS ARE 30-50 FEET BGS
- JULY VERSUS DECEMBER MEASUREMENTS IN 2023
 - MOST WELLS DECLINED, SOME SIGNIFICANTLY (UP TO 10 FEET)
 - LACK OF RECHARGE FROM NON-FUNCTIONING ACEQUIAS
 - INHIBITED INFILTRATION DUE TO ASH-LADEN SOIL & ASH-LINED ACEQUIAS
 - PROLONGED DROUGHT
- JULY 2024 SWL DATA: MOST WELLS RECOVERED
 - GOOD WINTER SNOWPACK
 - MAIN ACEQUIAS CLEANED OUT*
- TRITIUM DATA: 16 WELLS SAMPLED
 - ALL BUT ONE INDICATING RECHARGE POTENTIAL

Cascading impacts:
Repeated clogging of
acequias as material is shed
out of the watershed over many
years/decade.

WATER CHEMISTRY DATA

- 19 WELLS SAMPLED FOR CHEMISTRY + TRACE METALS IN 2023
 - USING ANALYTES SUCH AS NITRATE AND PHOSPHATE AS PROXY MARKERS FOR WATER INTERACTING WITH THE BURN SCAR
 - 17 TESTED NEGATIVE FOR ANALYTES OF CONCERN
 - 2 SAMPLES: MEASURABLE ORTHOPHOSPHATE
 - 5 SAMPLES: ELEVATED NITRATE (BEYOND EXPECTED LEVELS FOR GEOLOGIC CONDITIONS)
- NITRATE AND PHOSPHATE AS PRODUCTS OF BURNED VEGETATION
 - SOIL AND ROCK ADSORPTION THRESHOLDS
 - WELLS BEING OVERTOPPED DURING FLOODING

WATER CHEMISTRY DATA

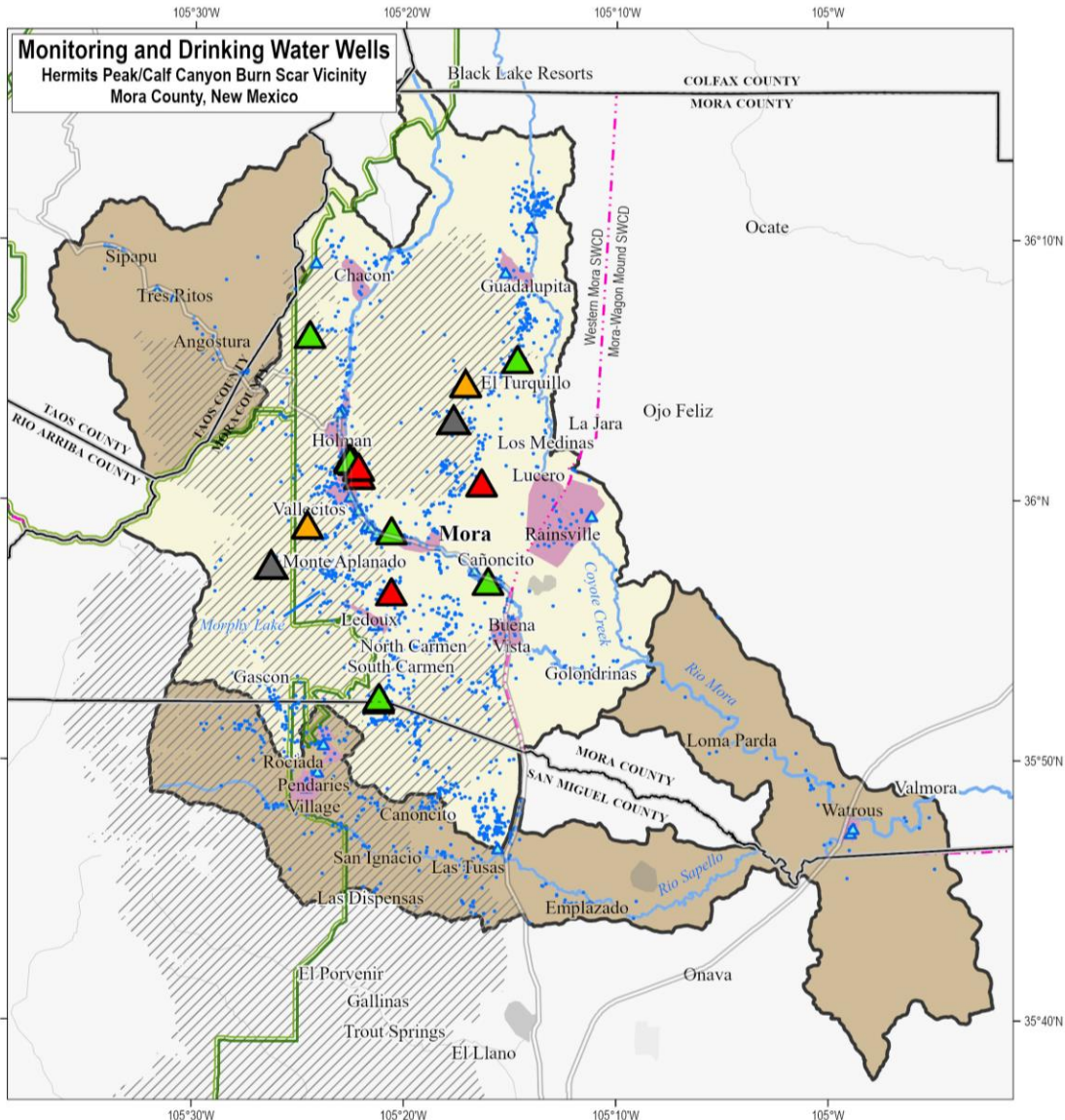
- 33 WELLS SAMPLED IN 2024
 - THE ORIGINAL 19 WELLS WERE RE-SAMPLED FOR CATIONS AND ANIONS ONLY
 - NEW WELLS SAMPLED FOR CATIONS, ANIONS, TRACE METALS
- ELEVATED NITRATE AND PHOSPHATE LEVELS NOT OBSERVED IN SUMMER OF 2024
 - FLUSHING OF AQUIFERS WITH FUNCTIONING ACEQUIAS AND INCREASED PRECIPITATION?
 - NO SIGNIFICANT CHANGES IN OTHER ANALYTES

Cascading Impacts:

During drier years or when acequias are clogged, will we observe detrimental changes in chemistry?

Cascading Impacts:

Other analytes of concern working through the subscape?



- 2023 HIGH PHOSPHATE OCCURRENCES:

- CANADA DEL CARRO (FLOODING = OVERTOPPING OF WELL?)
- VALLECITOS

- 2023 HIGH NITRATE OCCURRENCES:

- TURQUILLO
- CLEVELAND-HOLMAN
 - ONE WELL SAMPLED 2021: 5X INCREASE
- SOUTH CARMEN

LOCAL STAKEHOLDER OBSERVATIONS

- CHANGES IN COLOR AND ODOR
 - COLOR: MURKY GRAY
 - ODOR: “BAD” ODOR (NOT QUITE SULFUR)
 - THICK YELLOW-GRAY SLIME SETTLING IN BUCKETS
- SUNKEN WELL HOUSES FLOODED – FILLED WITH WATER AND/OR MUD & DEBRIS
- WELL CASINGS ABOVE LAND SURFACE – POTENTIAL FOR OVERTOPPING DURING MAJOR FLOOD EVENTS



DOWNSTREAM OBSERVATIONS

- MORA-WAGON MOUND SWCD WELL MONITORING NETWORK (STARTED FEB 2015)
- COYOTE CREEK-RIO MORA CONFLUENCE NEAR GOLONDRINAS
 - “BLACK SLUDGE” ENTERING THE DITCH SYSTEM AS THEY PREPARED TO IRRIGATE IN SPRING/EARLY SUMMER OF 2024
- TIPTON DITCH EAST OF WATROUS
 - DOWNSTREAM OF THE CONFLUENCE OF THE RIO MORA AND RIO SAPELLO
 - “BLACK SLUDGE” IN DITCH SYSTEM (LAND OWNER COLLECTED GALLON BAG OF MATERIAL REMOVED FROM DITCH)
- SAMPLES FROM SHALLOW WELLS ADJACENT TO THE RIO MORA
 - RESULTS PENDING

DOWNSTREAM OBSERVATIONS



FUTURE WORK

- CONTINUING STATIC WATER LEVEL MEASUREMENTS IN DEC 2024
 - ADD IN ADDITIONAL WELLS AS FUNDING ALLOWS
- DOCUMENTING OBSERVATIONS FROM MONITORING NETWORK PARTICIPANTS (ODORS, COLORS, ETC)
 - DOWNSTREAM OBSERVATIONS FROM PRODUCERS IN EASTERN MORA COUNTY
 - MONITOR WATER QUALITY IN WELLS ALONG THE RIO MORA
- ASSIST OUR LANDOWNERS WITH ADDRESSING WELL ISSUES
- ENGAGE IN DIALOGUE WHERE NEEDED WITH FEMA & DHSEM
- BEGIN PARTNERSHIP WITH USGS UNDER DIRECTION OF DR. JOHANNA BLAKE FOR BURN SCAR-WIDE SAMPLING OF SURFACE WATER + GROUNDWATER

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- Mora County for FY 23-24 funding.
- Mora County Commission and P&Z Commission for their guidance and recruiting.
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- Mora-Wagon Mound SWCD for funding to monitor Rio Mora wells.
- And a huge thanks to our community participants for engaging in this work!



In Memoriam

