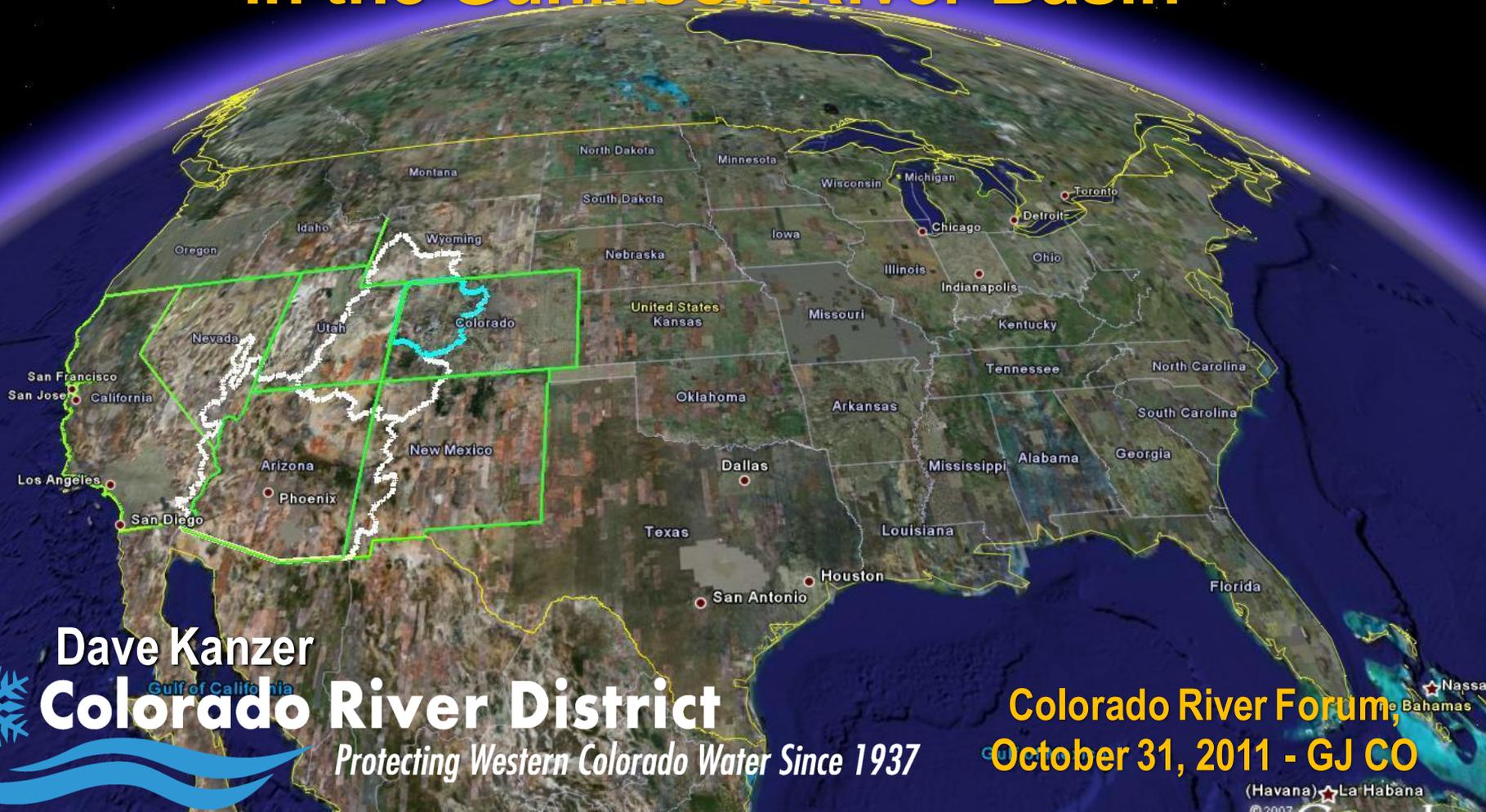


Where There's a Problem, There's a Solution : Selenium Management in the Gunnison River Basin



Dave Kanzer

Colorado River District

Protecting Western Colorado Water Since 1937

**Colorado River Forum,
October 31, 2011 - GJ CO**

(Havana) La Habana

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***Balancing multiple demands on a
finite supply***

Or

***A story of scarcity, conflict and
cooperation***

Or

***Meeting competing demands and
emerging issues through innovation
today***

Or

***Selenium: an unintended
consequence of water use in Western
Colorado***



Land and Water Use Makes Western Colorado Habitable

Settlers moved water great
distances from rivers and
streams to irrigate the desert



Grand Valley early 1900s



*Grand Valley
today*

Without water...



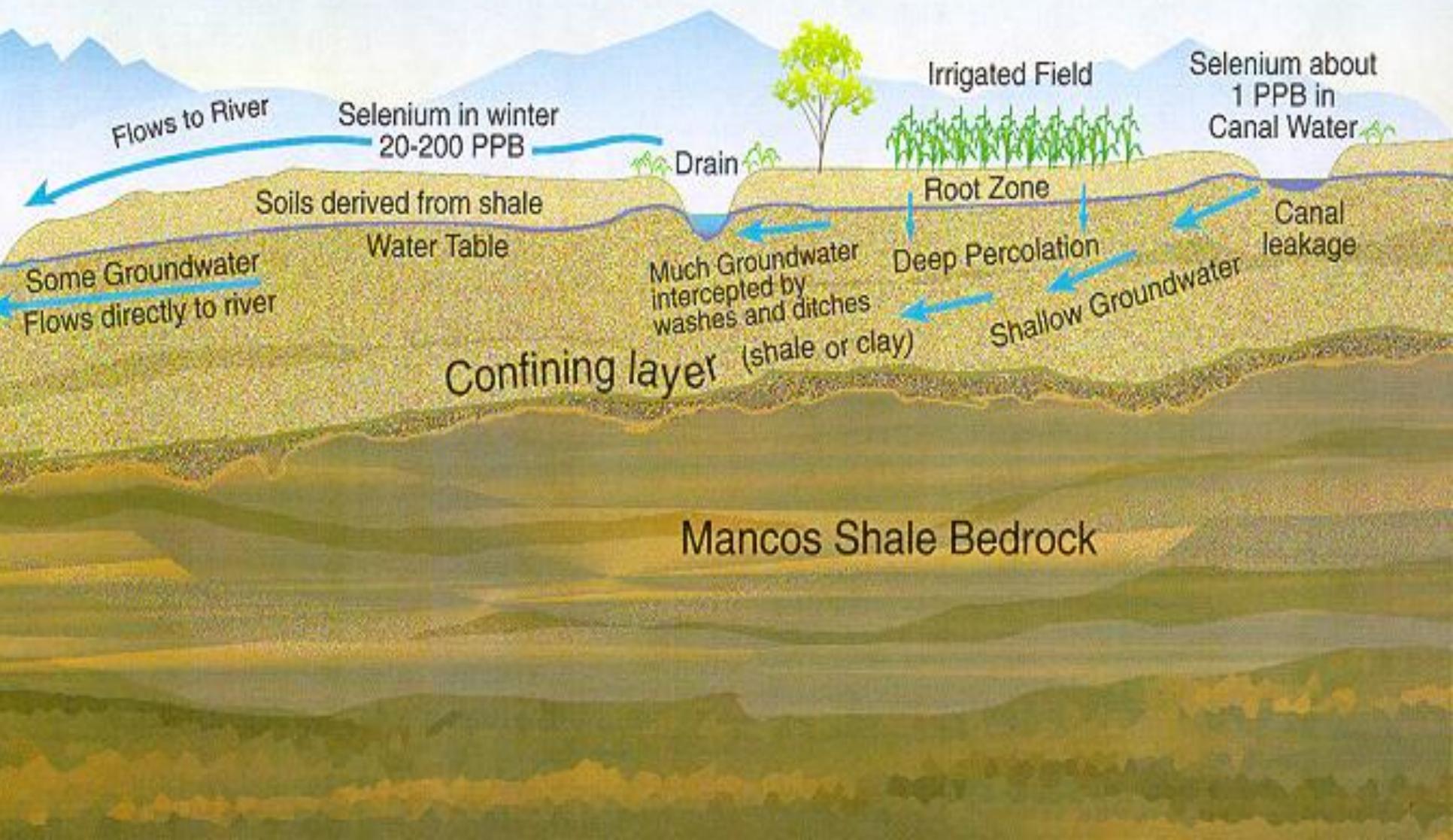
With water...



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Schematic of Selenium Pickup in Irrigation Water





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Selenium in Western Colorado

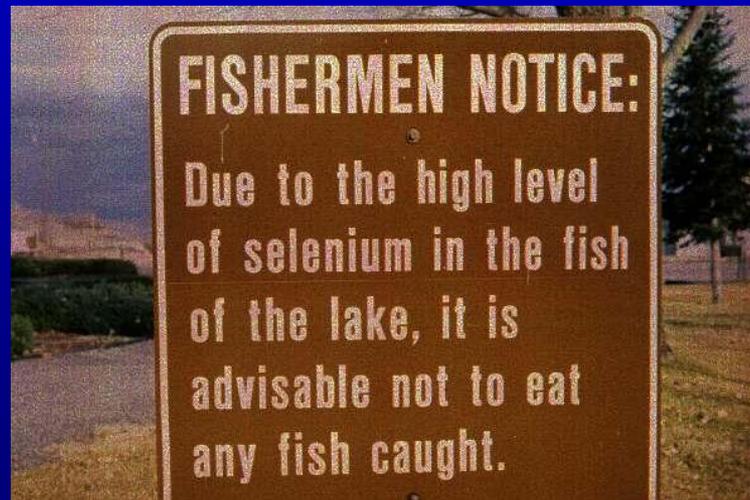


**Adobe Hills with Mancos
Shale**



**Prince's Plume in high
selenium soils**

**Fish at
Sweitzer
Lake**



The Culprit (Infinite Supply?):

Mancos (and other) Shales



Typical knife-edge ridges, Caineville Badlands
View southwest from the base of North Caineville Mesa



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Human Induced Impacts



- Irrigation
- Ponds and water features
- Surface disturbance

Selenium (and Salt) Policy Story

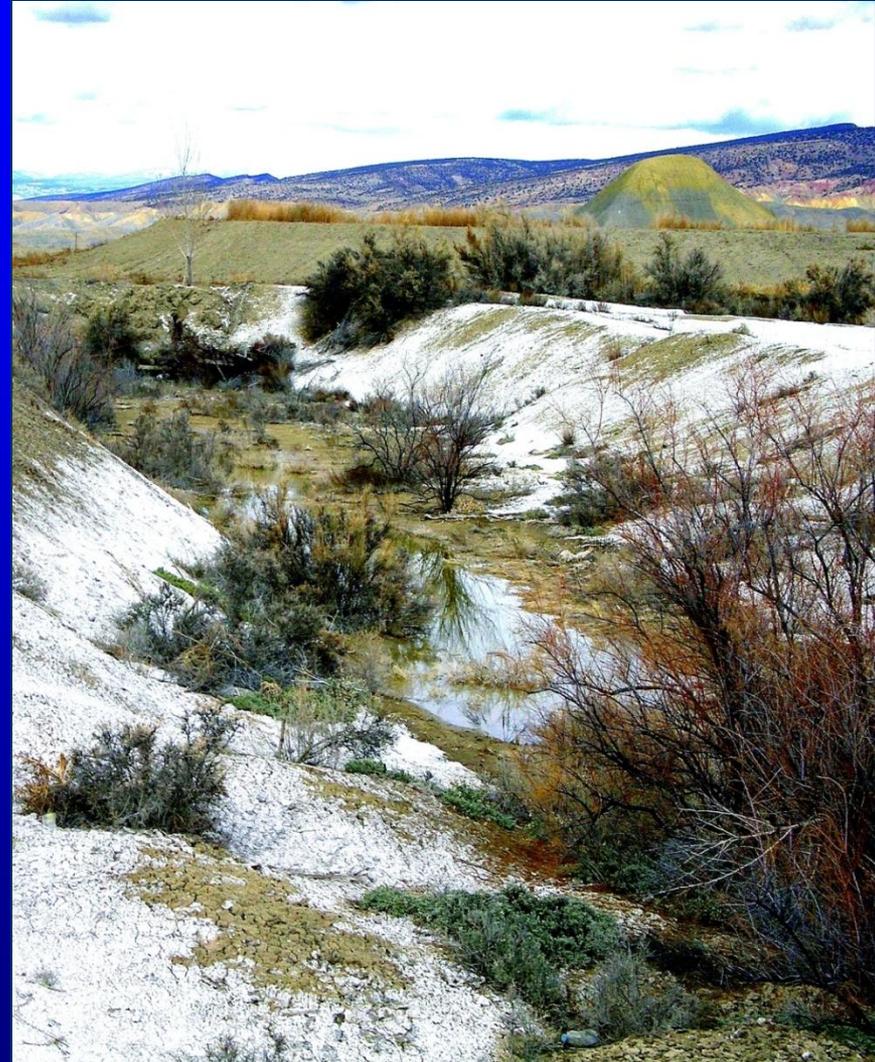
Selenium (trace element)

Regulatory concerns:

- Clean water act
- Endangered species act

Salt (total dissolved solids, major ions)

- Economic impacts
- Aesthetics, taste, odor
- Water availability



Who Cares and Why?

- **Selenium Task Forces**

GOAL: maintain local and regional lifestyle, agricultural heritage & economy

- **US Bureau of Reclamation and other water users**

GOAL: continuation of federal reservoir and interrelated project operations & depletions (Aspinall Unit EIS)

- **US Fish and Wildlife**

GOAL: endangered species act compliance; recovery and delisting of 4 endangered fishes in basin (Gunnison Basin Programmatic Biological Opinion – PBO)

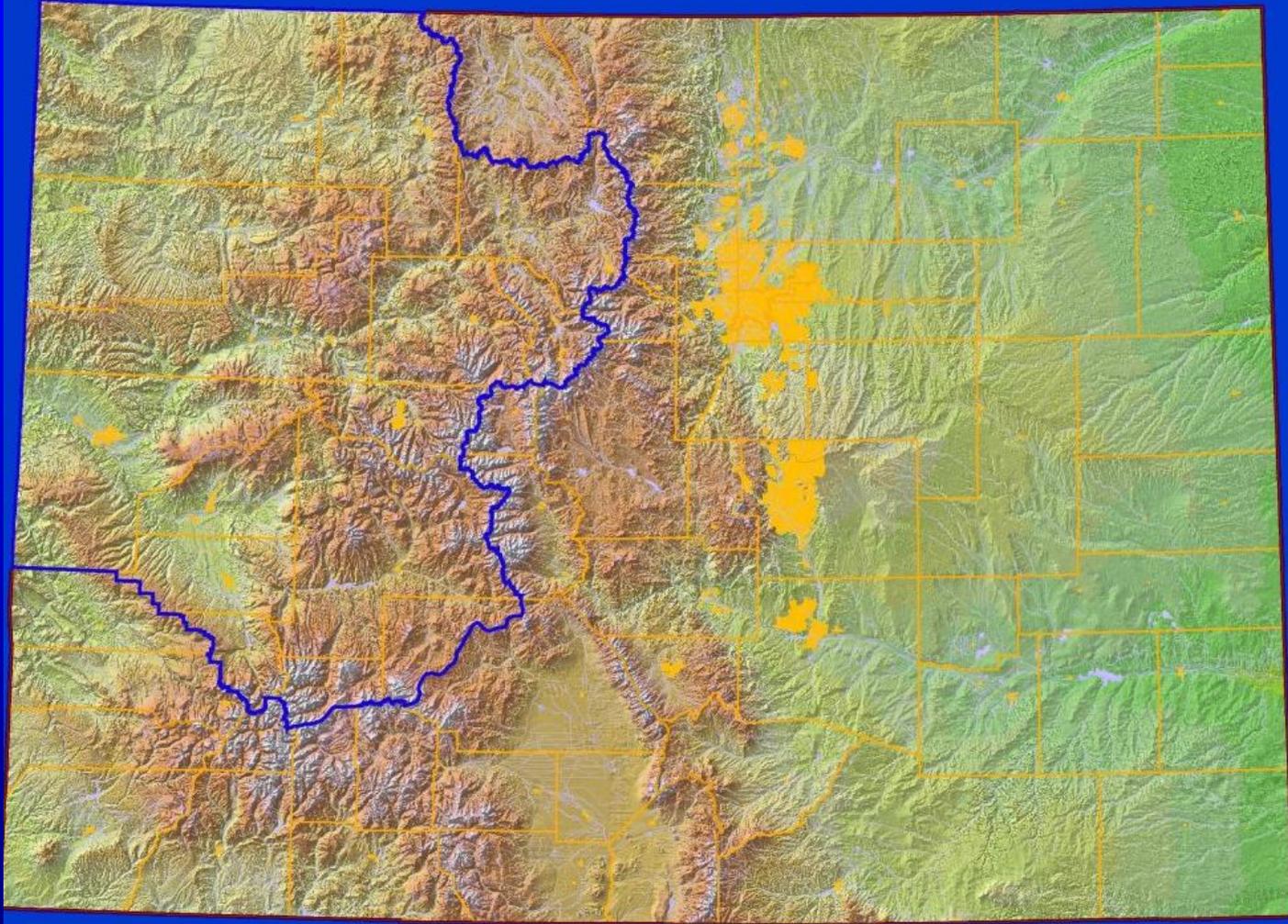
- **EPA/ Water Quality Control Division**

GOAL: clean water act compliance; meeting in-stream standards

- **Colorado / River District**

GOAL: protection of historical and future water uses and all of the above

Mission: To lead in the protection, conservation, use and development of the water resources of the Colorado River basin for the welfare of the District, and to safeguard for Colorado all waters of the Colorado River to which the state is entitled.



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Selenium Management Program

Draft --Program Formulation Document Gunnison River Basin, Colorado

Prepared by Selenium Management Team
Compiled by Bureau of Reclamation



South Canal - Uncompangre Valley
Draft October-2011

<http://www.usbr.gov/uc/wcao/progact/smp/>

Keys of Selenium Management Program (SMP)

- **Reduce seepage and deep percolation into soils high in selenium and salts**
- **Use methods that have proven effective**
- **Monitoring, research, involvement of all water users and stakeholders**

What is the Risk?

- **Without a Selenium Management Program**
 - Increased chance of conflict
 - Historical water use at risk
 - Future water development at risk

- **With a Selenium Management Program**
 - Decreased likelihood of conflict
 - Increased local economic development
 - System modernization and increased water efficiency
 - Piping and lining canals (off-farm); Irrigation improvements (on-farm)

What is being done?

- **Finalizing Selenium Management Action Plan**
- **Mapping and analyzing**
- **Monitoring soils and water**
- **Targeting and prioritizing seleniferous areas for efficiency improvements:**
 - **Piping and lining canals** (off-farm)
 - **Irrigation improvements** (on-farm)
- **Investigating point source control and new treatment options** (e.g., bio-reactor, new technologies)

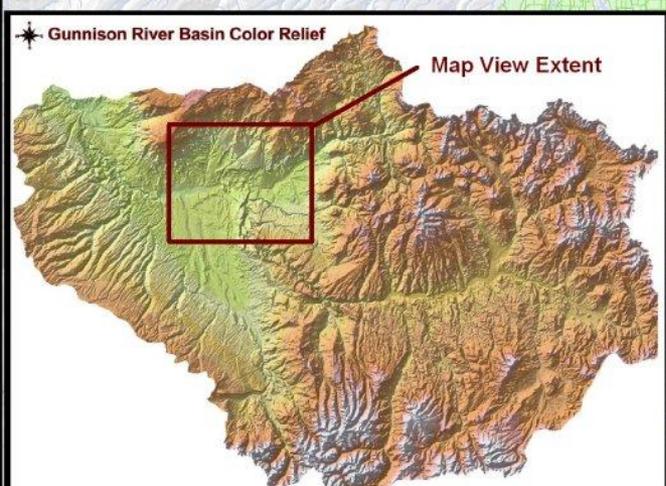
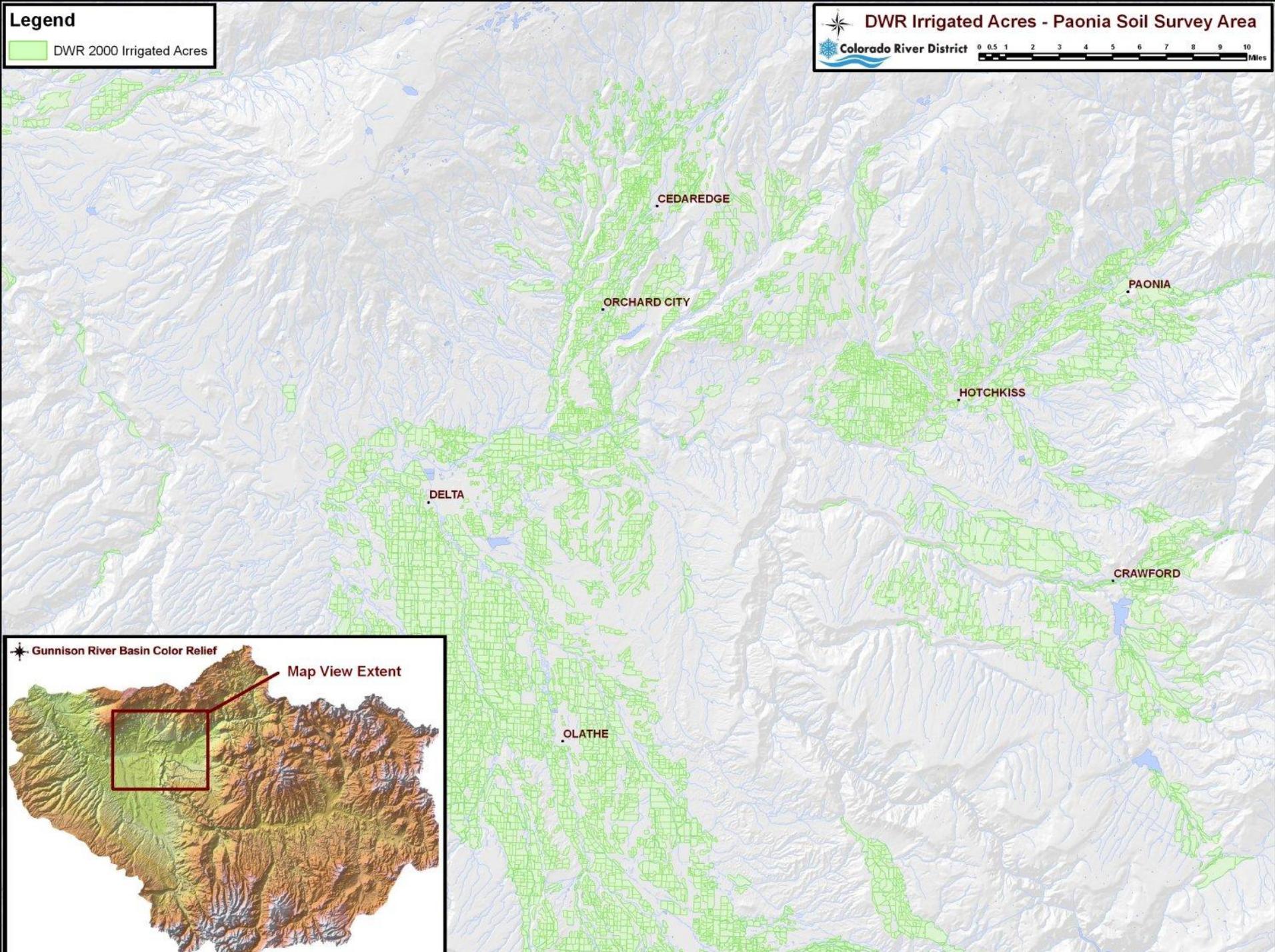
Legend

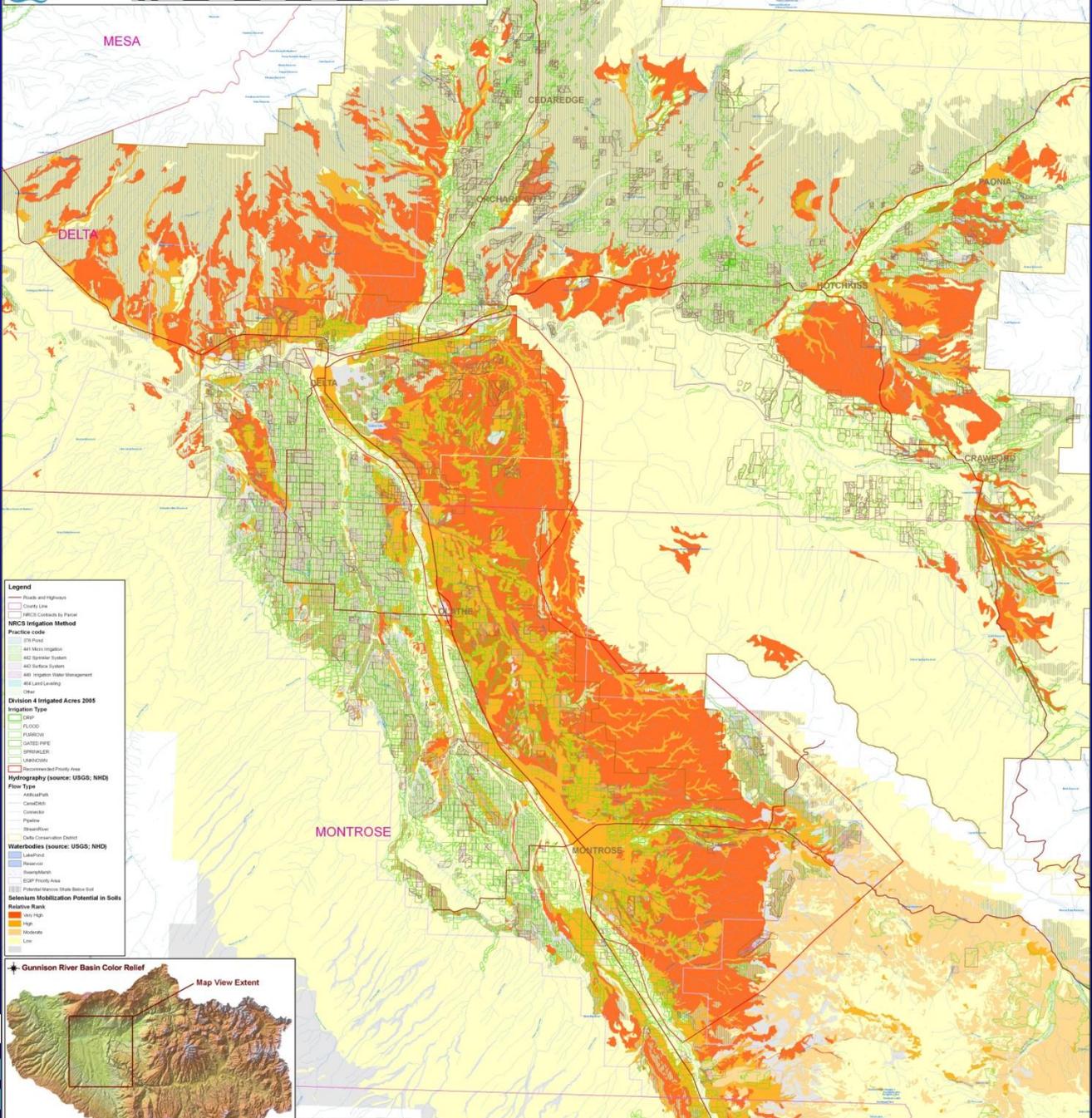
 DWR 2000 Irrigated Acres

DWR Irrigated Acres - Paonia Soil Survey Area

 Colorado River District

 0 0.5 1 2 3 4 5 6 7 8 9 10 Miles





Legend

- Roads and Highways
- County Line
- Tribal Lands to State

NRCS Irrigation Method

Practice code

- 000 Flood
- 401 Micro Irrigation
- 402 Sprinkler System
- 403 Surface System
- 408 Irrigation Water Management
- 404 Lateral Leveeing
- Other

Division 4 Irrigated Acres 2005

Irrigation Type

- Canal
- FLOOD
- PIPERICH
- WATER PIPE
- SPRINKLER
- WATERWHEEL
- Non-irrigated Priority Area

Hydrography (source: USGS; NHD)

Flow Type

- Artesian Well
- Canal/Ditch
- Conduit
- Pipeline
- Stream/Flow
- Ditch/Conveyance Duct

Waterbodies (source: USGS; NHD)

- Lake/Pond
- Reservoir
- Swamp/Marsh
- EGP Priority Area
- Priority Watershed Basin

Selenium Mobilization Potential in Soils

Relative Rank

- Very High
- High
- Moderate
- Low



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Structural Approaches

- Pipe open earthen laterals
- Line canals
- Combine / realign delivery system to minimize seepage losses
- Reduce winter stock open water deliveries
- Improve on-farm water use efficiencies: e.g., gated pipe, sprinklers, land leveling
- Line ponds where appropriate

Non-Structural Approaches

- **Treat canals/laterals with sealant**
- **Active management in selenium-rich areas**
- **Erosion control on public Mancos shale lands**
- **Reduce municipal sources; reduce septic leaching through regional sewer systems**
- **Encourage low water landscapes**
- **Minimize new unlined ponds**
- **Education and incentives to reduce excess water use and deep percolation**
- **Healthy soils initiative (e.g., reduce fertilizer use)**



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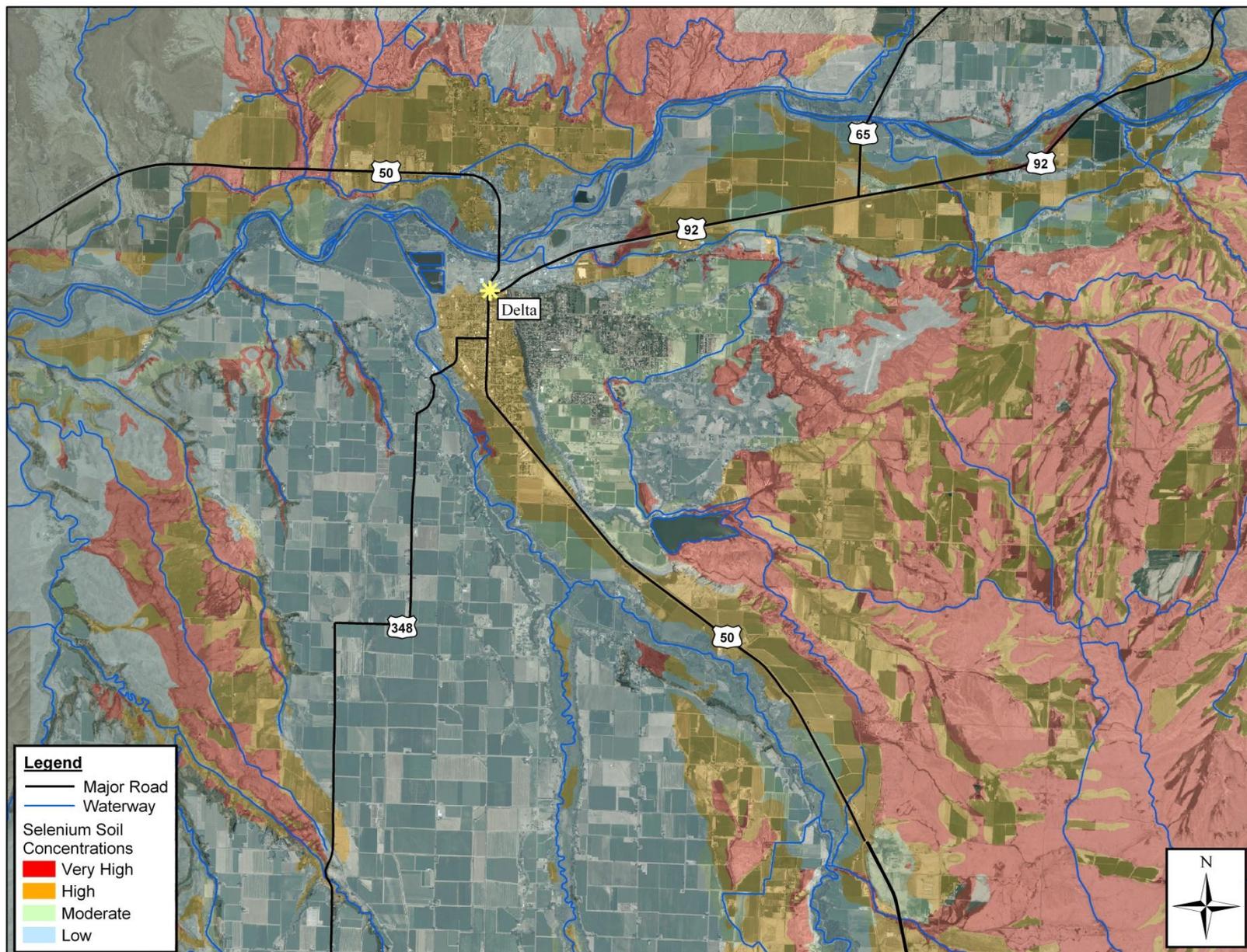
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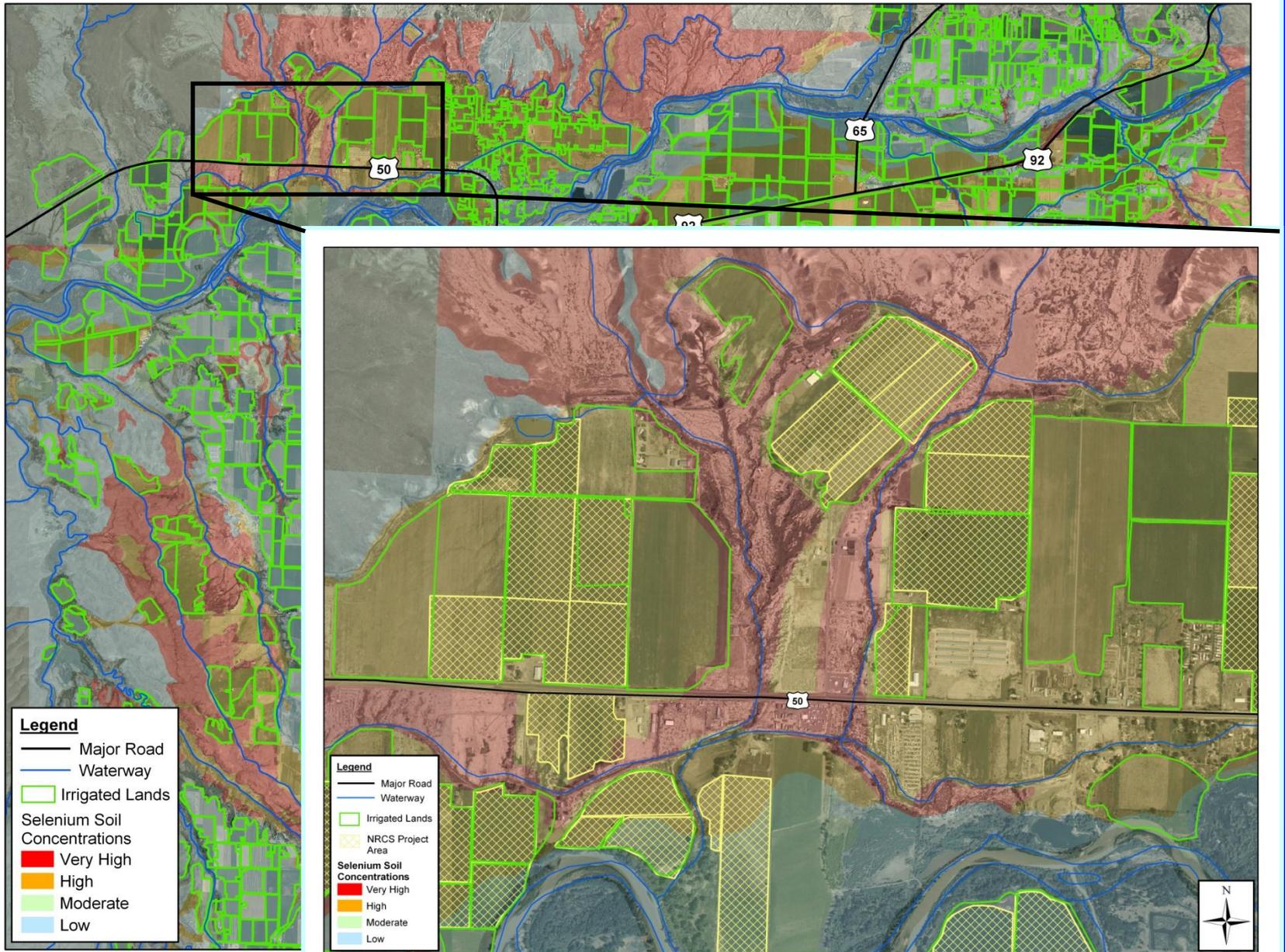
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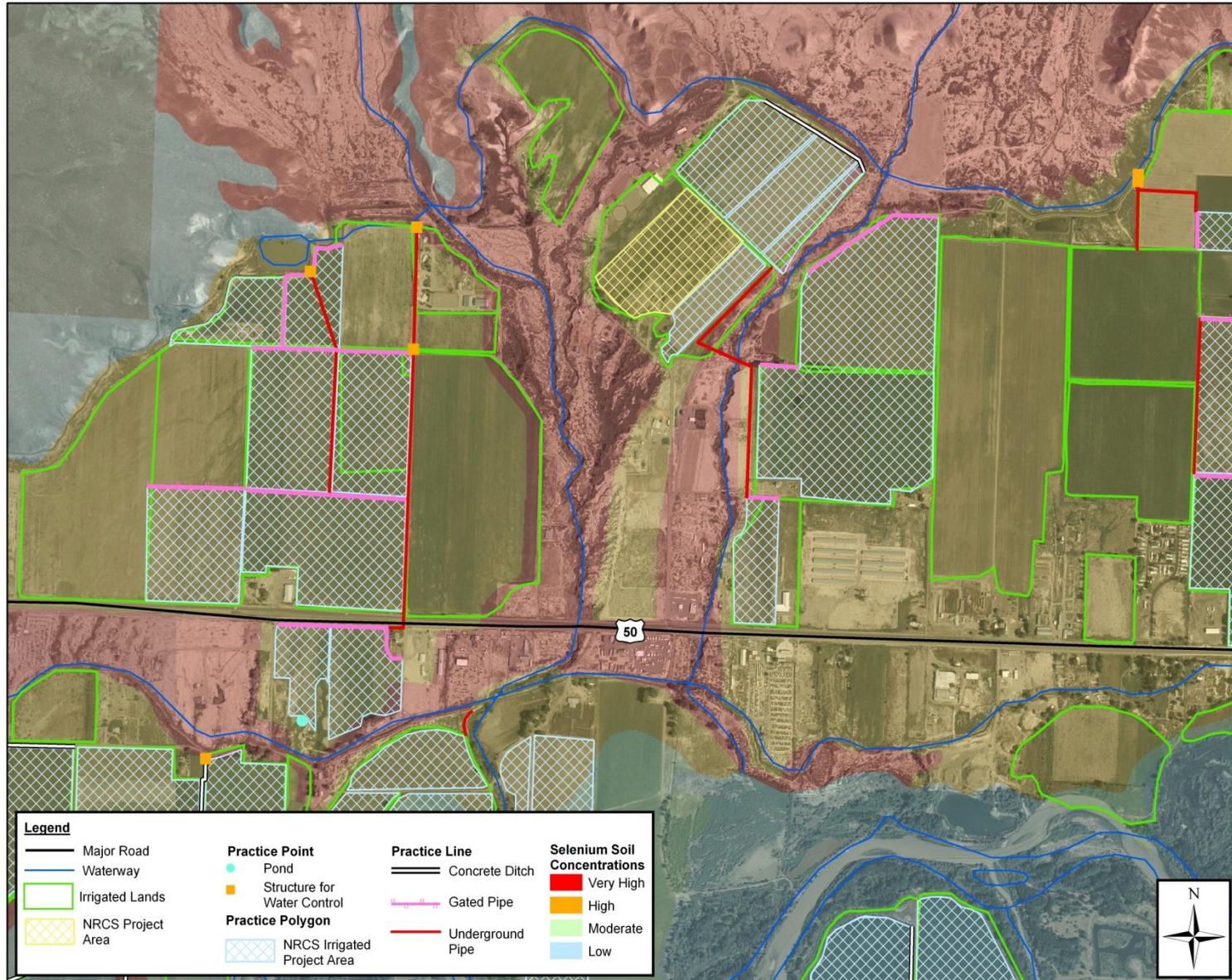
Delta Area Soil Selenium Levels



A Closer Look At Water Conservation Projects



Water Conservation Practices Applied



Significant Opportunities

Basin	Total Acres	Irrigated Acres	Potentially Inefficiently Irrigated Acres*	% Inefficient Irrigated	Irrigated Land, Selenium Mobilization Potential			
					Very High	%	Very High + High	%
Uncompahgre Total	606,717.62	81,270.77	73,641.81	91%	3539.67	4.36%	23,984.60	30%
Lower Gunnison Total	468,943.05	44,817.99	36,527.53	82%	1,840.4	4.11%	9,801.46	22%
North Fork Total	414,349.97	34,716.17	23,881.63	68.79%	1301.43	3.75%	1,744.92	5%
Lower Gunnison Tributary Total	282,927.26	22,734.02	14,369.83	63.21%	1461.34	6.43%	1,593.07	7%
CUMULATIVE TOTAL:	1,772,937.90	183,538.95	148,420.80	80.87%	8,142.91	4.44%	37,124.05	20.23%

The Good News

- We have learned a lot
- Long term water quality monitoring data base
- Quantified spatial characteristics, loading dynamics and...
- Quantified a decreasing trend in dissolved selenium:

There is approximately 30-40 per cent less selenium in the river since 1986 (USGS, 2012; in press)

Other Considerations

- Population predicted to continue to increase in the Gunnison Basin
- Changes in land use will result from population growth.
- The location of development is important where selenium (and salinity are concerned)
- The cumulative effects of development in the basin are uncertain
- **Therefore behavioral change required**

Conclusions / Realities

- **Water is the cause and the solution**
- **Selenium related issues pose significant challenges to traditional water uses**
- **Still a lot more to do**
- **Water efficiency and modernization are key to preserving irrigated agriculture, economy and heritage in the Lower Gunnison River Basin, western Colorado and US**

More info:

- www.seleniumtaskforce.org
- www.usbr.gov/uc/wcao/progact/smp
- www.co.nrcs.usda.gov