

What's going down in the Lower Gunnison?



Selenium, Salinity & Even Some Diversion Dams

Sustaining Colorado Watersheds - 2012

October 10, 2012

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Colorado River District

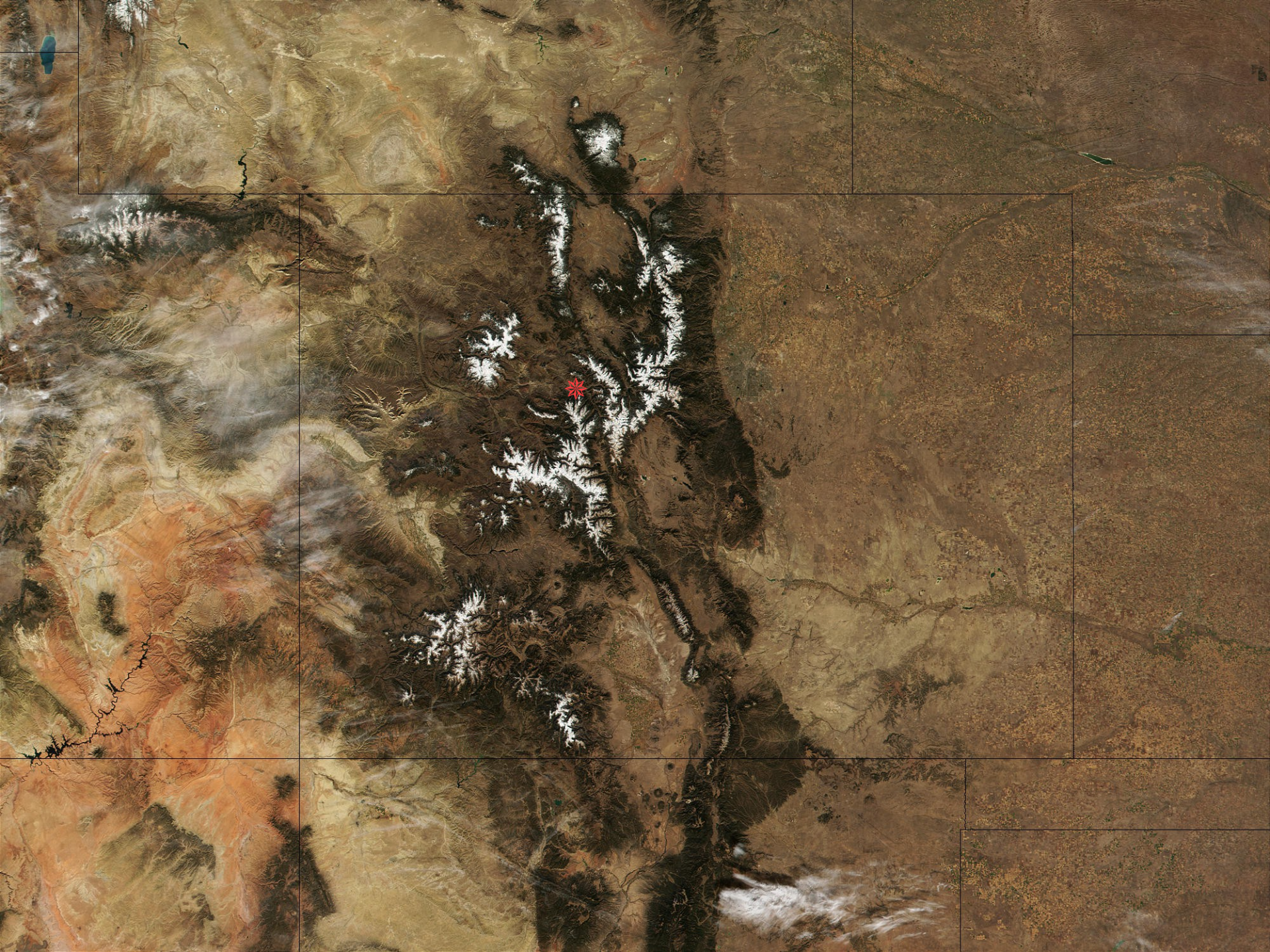
Colorado River District

75 Years

Protecting Western Colorado Water



2012





Colorado River Basin

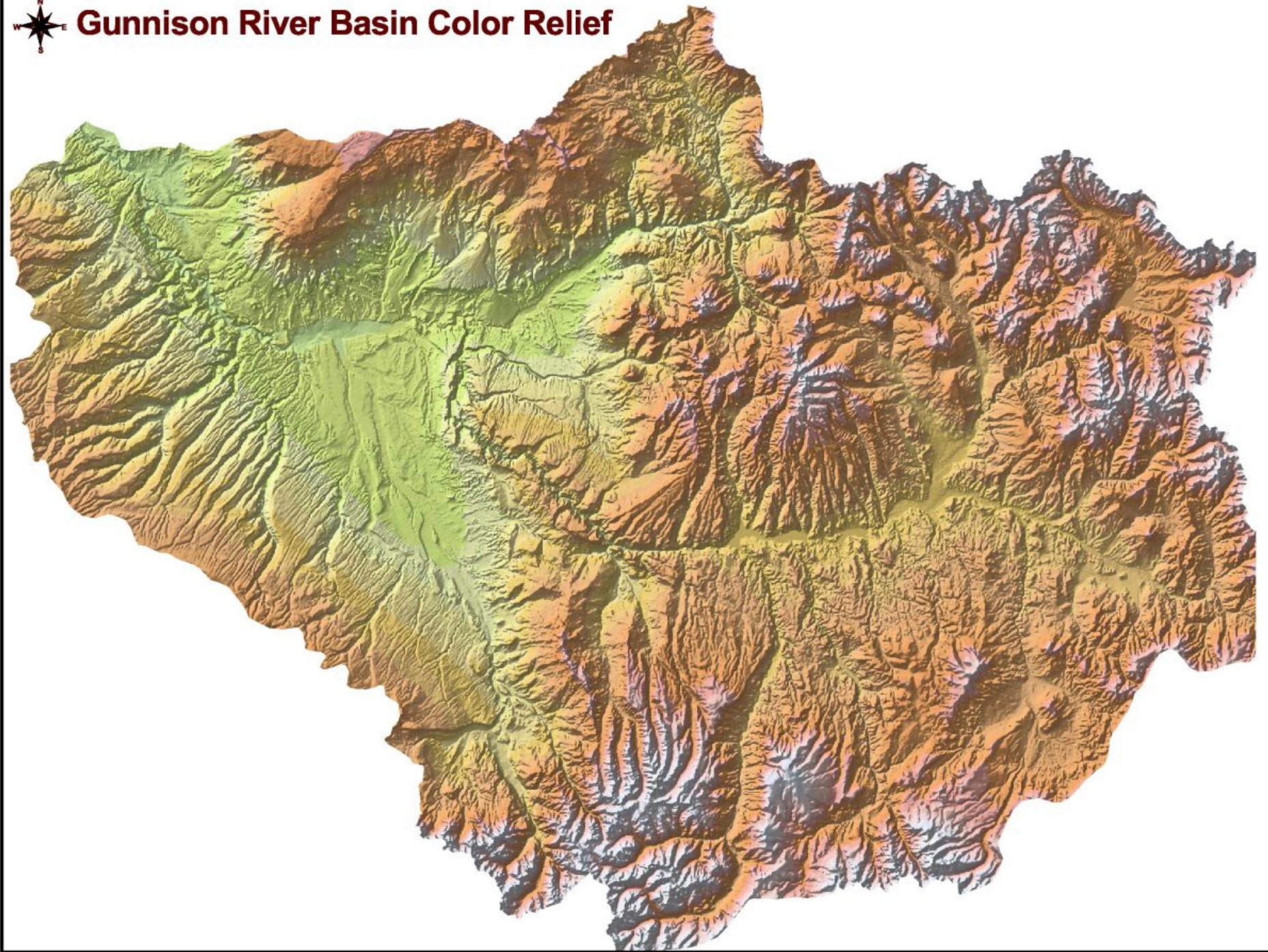
- Seven Basin States
- Almost 300,000 square miles
- <15 MAF annual average natural flow
- 35 Million People
- Up to 4.5 Million Irrigated Acres
- 10 Autonomous / Sovereign Tribes
- 2 Countries

Gunnison River Basin

- Largest Colorado River tributary in state
- Approximately 8000 square miles
- Almost 2 MAF average annual flow
- Less than 0.24 million people
- Up to 233,000 irrigated acres
- No autonomous / sovereign tribes
- 7 counties, 6 conservancy districts



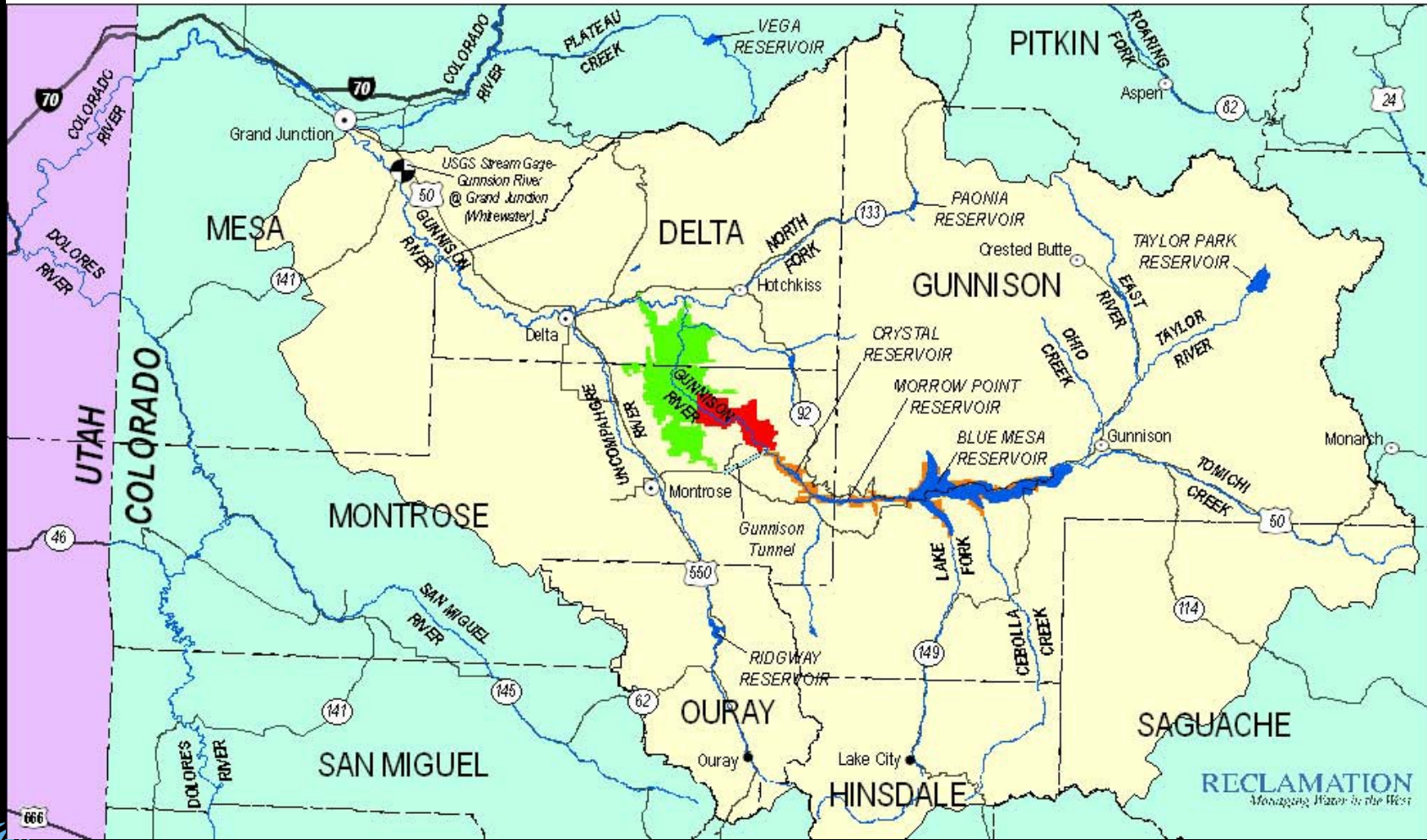
Gunnison River Basin Color Relief



Legend

- RIVERS AND TRIBUTARIES
- Highways
- INTERSTATE
- COUNTIES
- CURECANTINRA
- GUNNISON GORGE NCA
- BLACK CANYON OF THE GUNNISON NP
- COLORADO
- UTAH
- GUNNISON RIVER BASIN

GUNNISON RIVER General Map



Who would have guessed?



Water from here...



Could flow though here...





Oats that Make a Fat Pocketbook—Uncompahgre Valley, Colo.

to end up here...



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...to make the desert bloom and to create a whole new life in “a desert unfit for cultivation”

Without water...



With water...



But with water...

Water Quality Challenges - Salt & Selenium



Significant water-quality
issues in western US

Widespread natural
occurrence of source
material

Human activities can induce
impacts

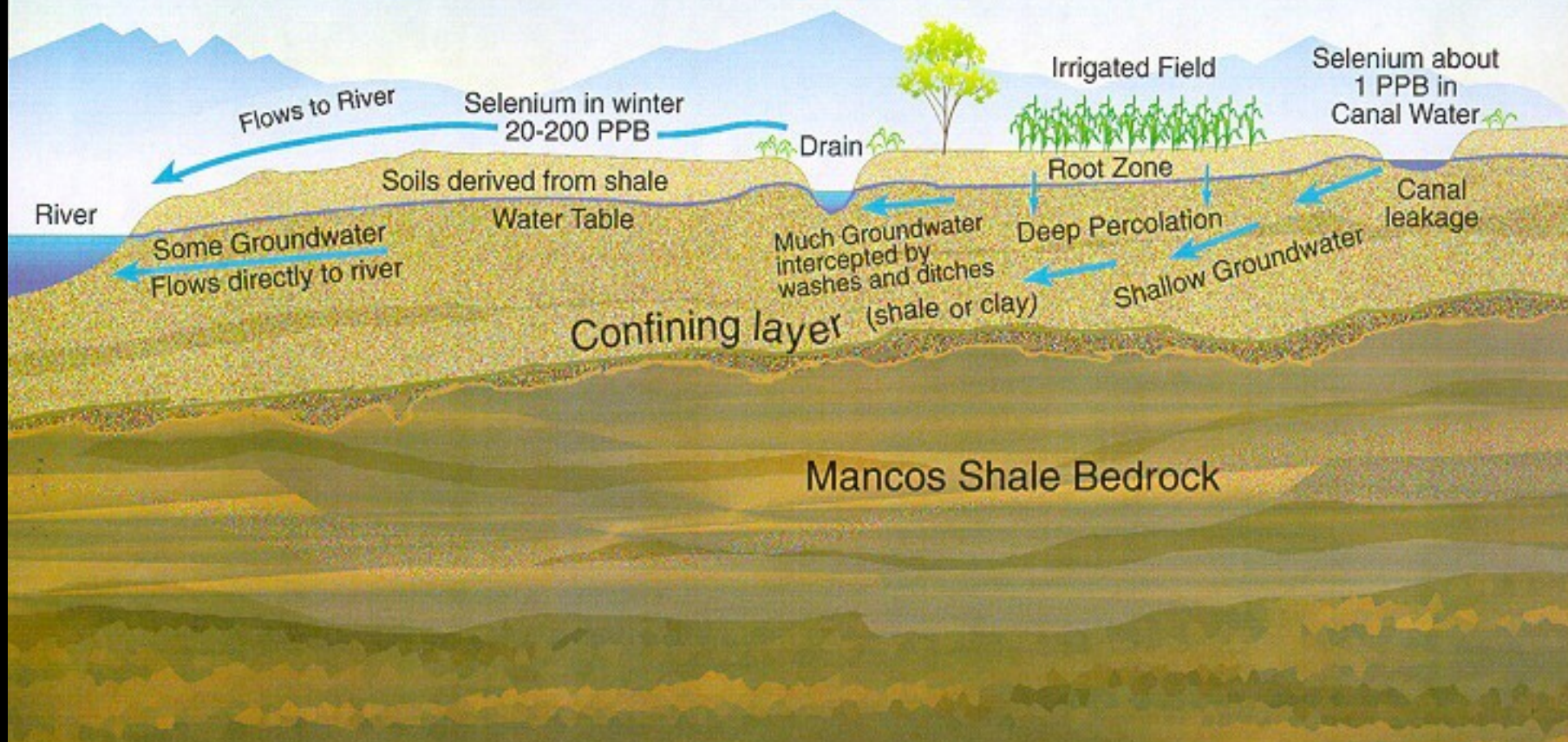


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Schematic of Selenium Pickup in Irrigation Water







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The Culprit (Infinite Supply?):

Mancos (and other) Shales



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

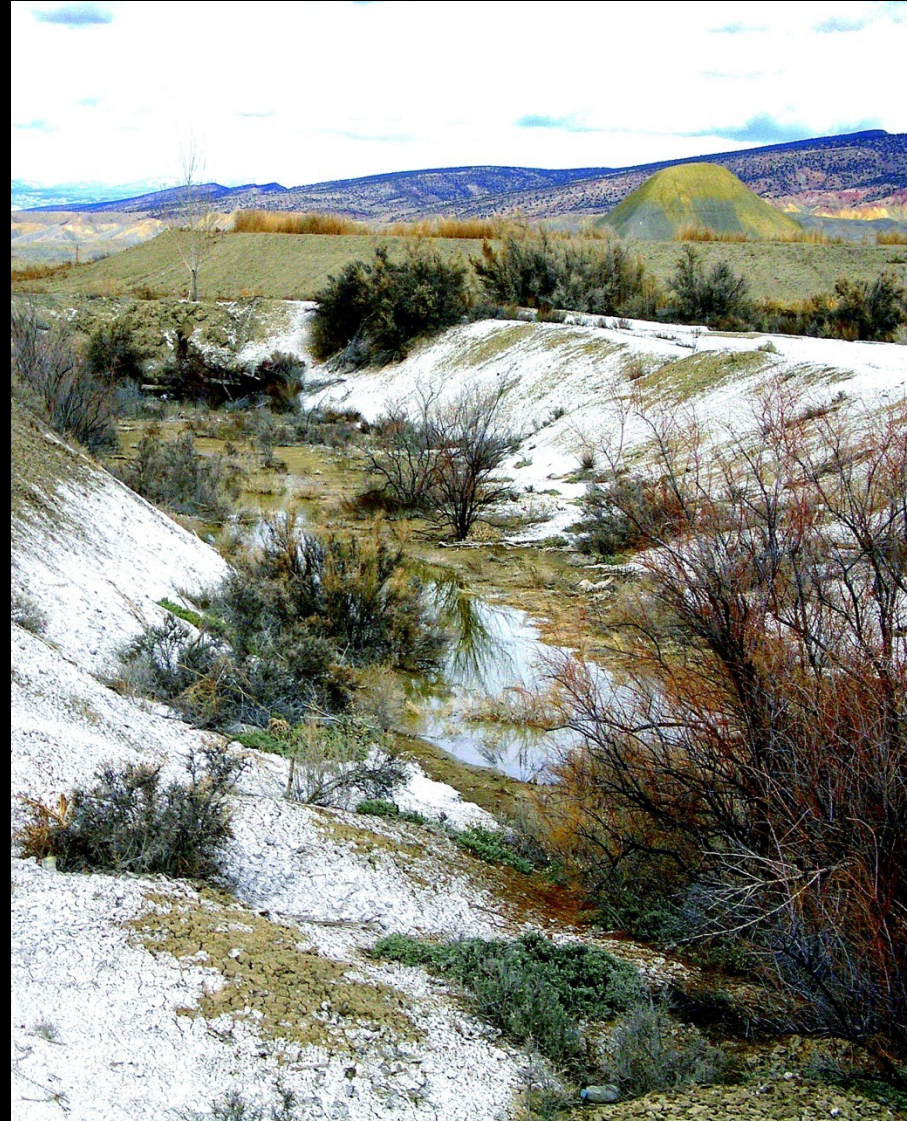
The Salt and Selenium Story

Salt (total dissolved solids,
major ions)

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

Selenium (trace element)

- Regulatory concerns
- Endangered species



More to the Salt and Selenium Story

- Found together in marine shales, and silts
- Highly mobile (just add water)
- Behave similarly (but different)

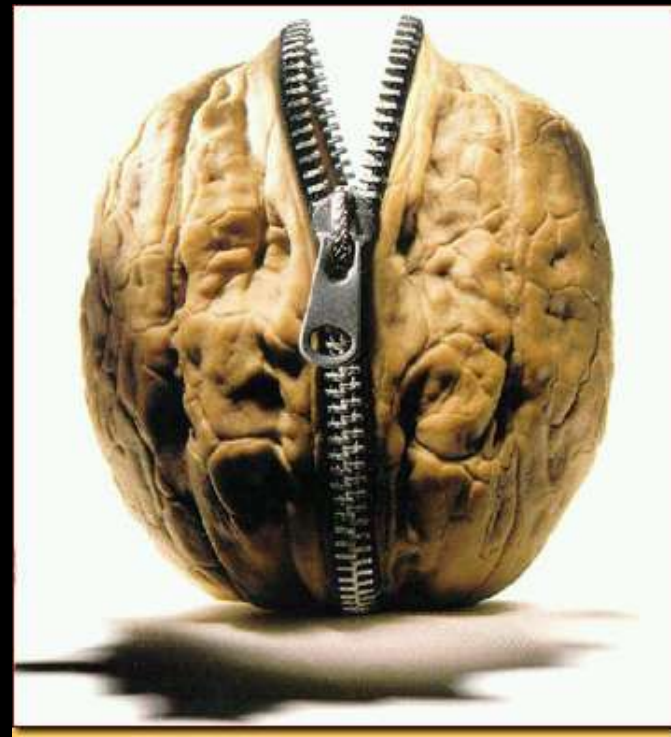
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- ▣ Second level
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 - Fourth level
 - Fifth level



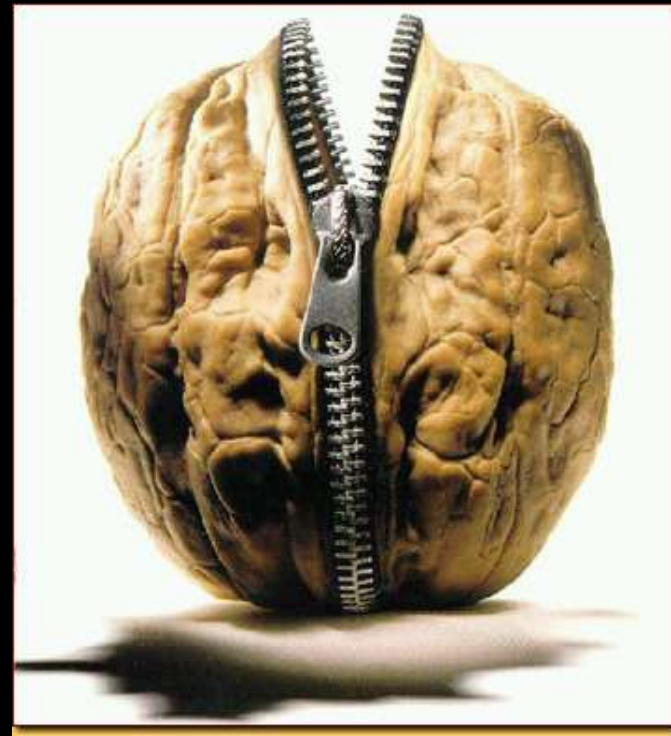
Salinity Issues in a Nutshell

- In-stream “standards” do NOT exist
- In-stream compliance covered by Colorado Basin Salinity Control Forum
- Not a human nor environmental health issue
- Impacts human water uses



Selenium Issues in a Nutshell

- In-stream standard = 4.6 ppb
- In-stream compliance regulated by Clean Water Act (CDPHE and EPA)
- Not typically a human health issue
- Can be an environmental health issue



Salinity – a National Concern

- Downstream users can incur negative impacts
- Negative impact on agricultural production
- Drinking water quality: taste and odor
- Corrosion
- Cumulative economic impacts
(i.e., treatment costs, decreased agricultural production)

Selenium – a Regional Concern

- Downstream aquatic habitats can be impacted
- Can negatively impact populations of sensitive aquatic (egg-laying) wildlife, (esp. reproduction and recruitment of endangered fishes)
- Cumulative regulatory impacts
(i.e., reuse and evapo-concentration can lead to elevated levels downstream, far from source)

Significant Success Stories

Colorado River Basin Salinity Control Program

- 7 Basin States
- Numerous Federal Agencies
- Congressionally Authorized
- Funded by Power Revenues and Appropriations

Selenium Management Program

- Mandated by USFWS (Programmatic Biological Opinion)
- Facilitated by USBOR
- Private / Public Cooperative Program
- Funded through federal, state grants

Salinity Control Successes

Have put measures in place that:

- Reduced 207,000 – 247,000 tons of salt in Lower Gunnison since 1989 (USGS, 2012)
- Reduced 1.2 M tons of salt per year; a reduction of 90-100 mg/L at Imperial Dam in Lower Colorado River Basin
- Reduced quantified damages by several hundred \$ Million per year
- However, salinity levels are projected to increase by 100 mg/L by 2030 without expansion of the program

“(Possibly) the greatest water quality improvement effort in the history of the world”



Selenium Control Successes

- Increased understanding of sources, sinks, geochemical processes
- Long term water quality monitoring data base
- Quantified spatial characteristics, loading dynamics, and
- Quantified a decreasing trend in dissolved selenium:

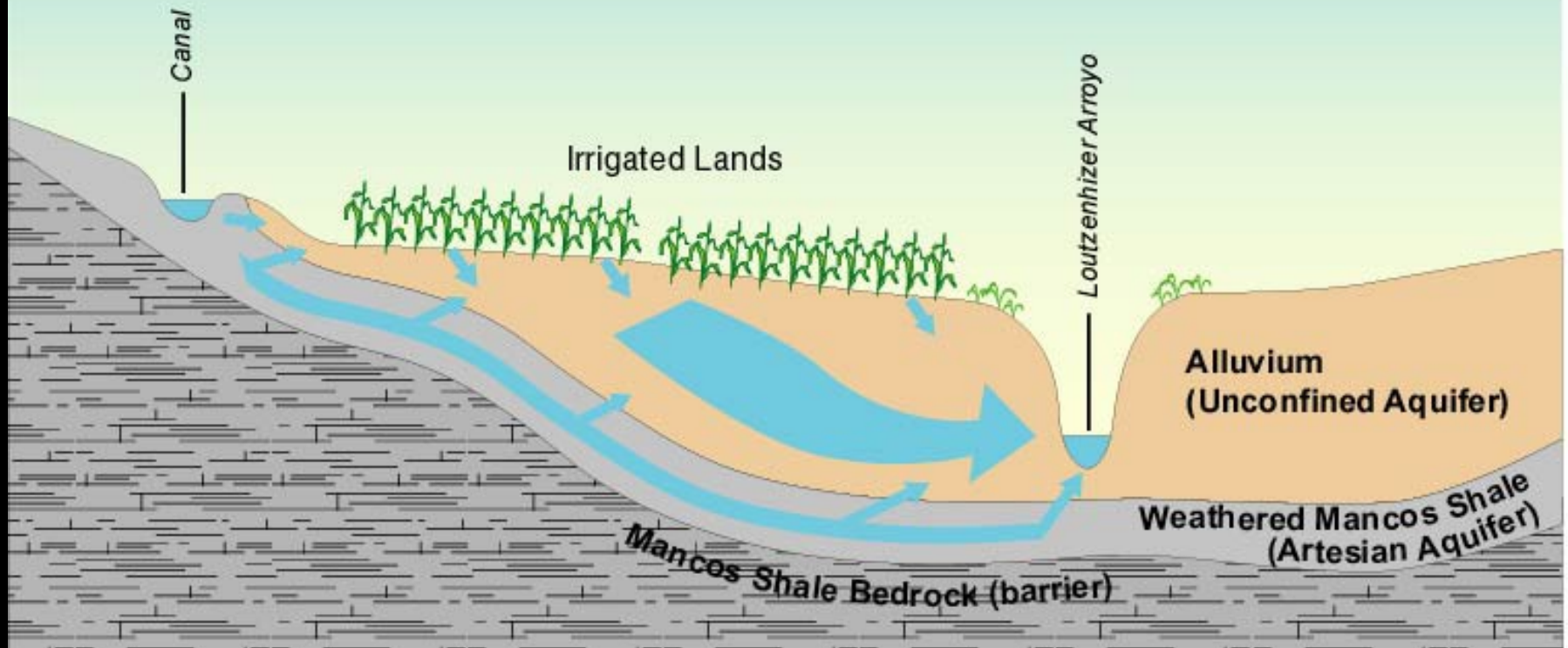
There is approximately 30–40 per cent less selenium in the river since 1986 (USGS, 2012)

What's being done?

- Identifying highly saline and seleniferous areas
- Targeting and prioritizing such areas for efficiency improvements
- Optimizing delivery systems
- Piping and lining canals, laterals and ponds
- Increasing on-farm irrigation efficiencies
- Point source control, where feasible
- Education

Non-point source transport

GROUND WATER MOVEMENT - UNCOMPAHGRE VALLEY



Case Study: Effects of Increased Efficiency



Sprinklers can eliminate up to 85 percent of induced deep percolation and associated salt loading



Selenium in Western Colorado

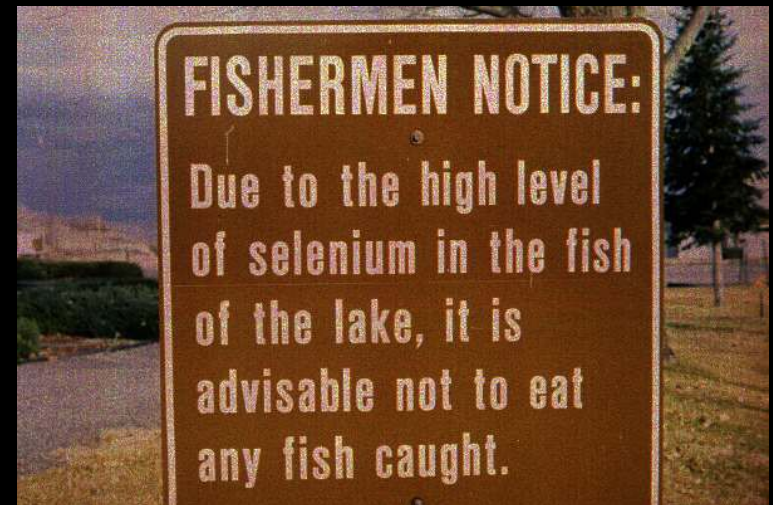


Adobe Hills with Mancos Shale



Prince's Plume in high selenium soils

Fish at Sweitzer Lake



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

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/>

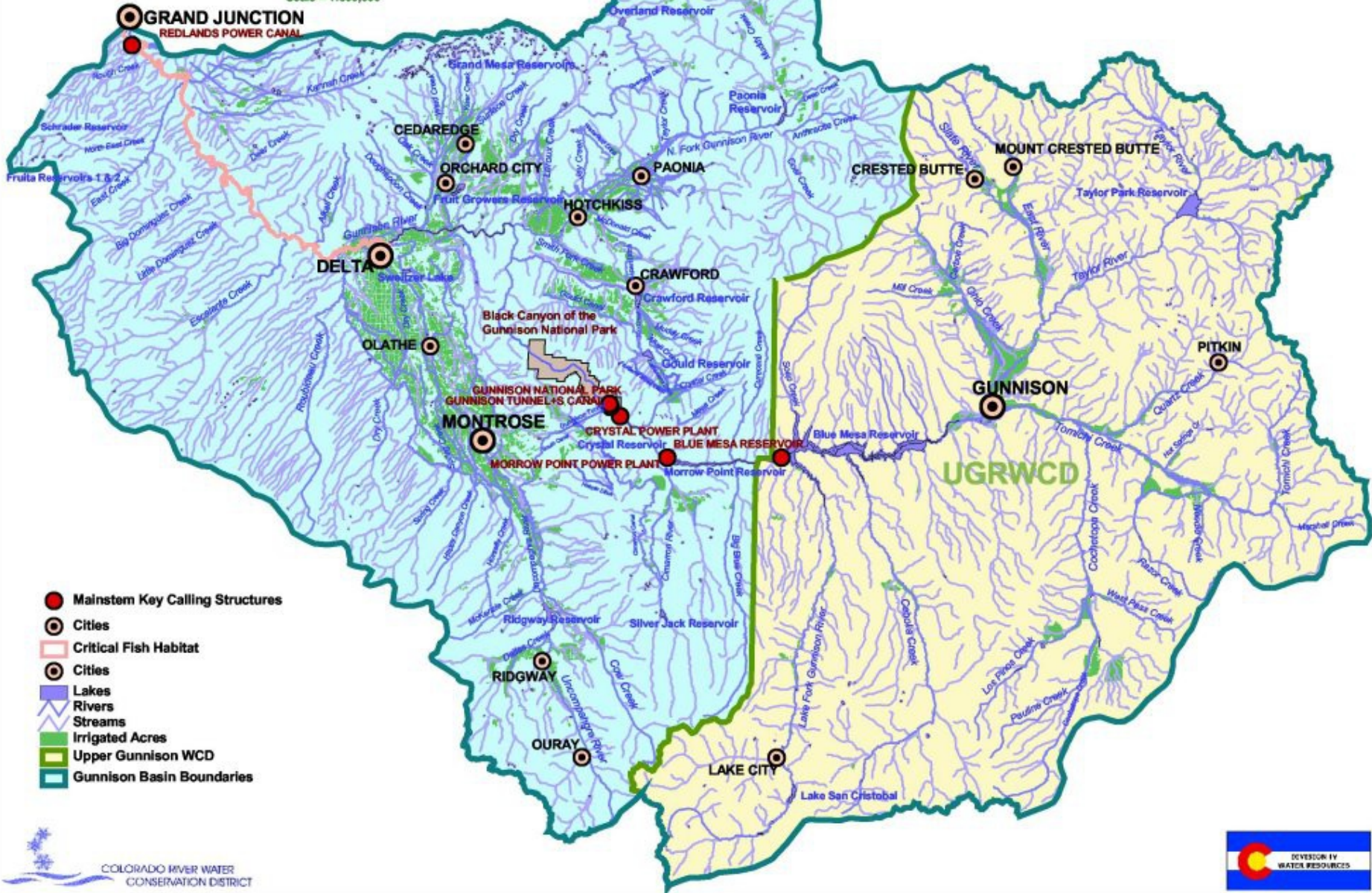
Gunnison River Basin

Rivers, Lakes, Irrigated Acres, Water Rights



10 0 10 20 Miles

Scale = 1:800,000



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.*, reduced fertilizer use, increased carbon content in soils)

Aspinall Unit Consists of 3 Dams and Reservoirs





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Morrow Point Reservoir



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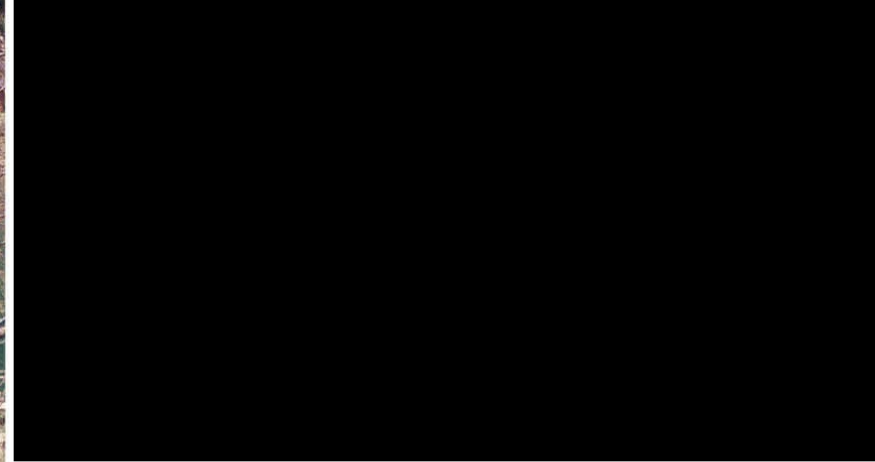
Morrow Point Dam and Reservoir



Crystal Dam and Reservoir



Gunnison Tunnel Diversion Dam and Intake



Gunnison Tunnel Access



Tongue Creek, tributary to Lower Gunnison River



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Escalante / Dominguez Canyons



Redlands Dam; looking upstream, low flow conditions

Private Water Uses

- Close to 1000 of private ditch and reservoir companies and direct diverters
- Limited water resources and competing demands pose risk to in stream resources
- Emerging issues (*e.g.*, selenium, threatened and endangered species, climate change, non-consumptive demands) pose significant challenges to the status quo
- Approach – reoperations and redesign diversion structures and increase efficiency of water use

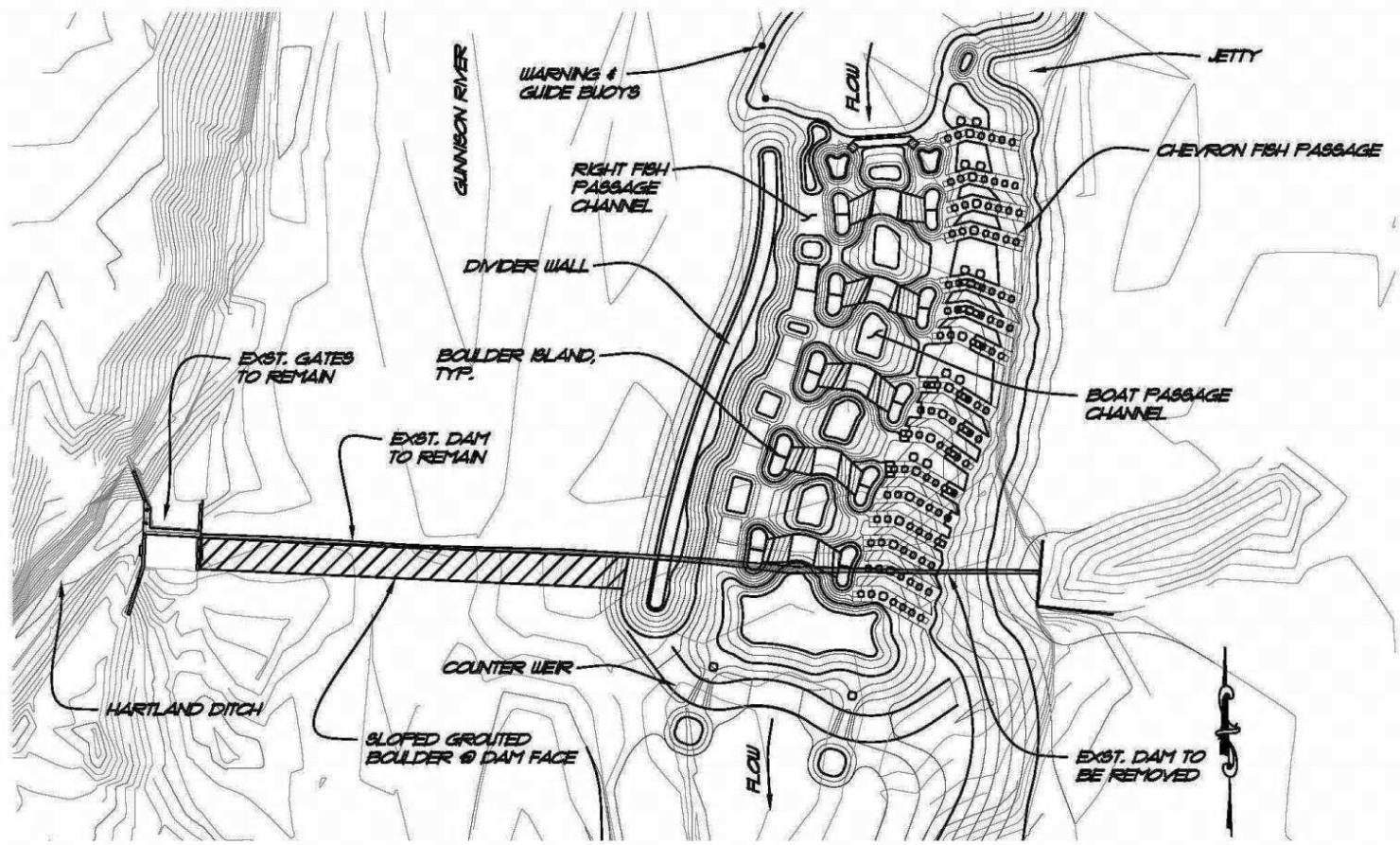


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Important Considerations

- Population predicted to double in the Gunnison River Basin
- Changes in land and water use will result from population growth
- Location and type of development is important where selenium and salinity are concerned
- Cumulative effects of development in the basin are uncertain
- **Therefore behavioral change required**

Conclusions / Realities

- Selenium, salinity and aquatic habitat related issues pose significant challenges to traditional water uses
- Water efficiency and modernization are keys to preserving irrigated agriculture, environmental health, economy and heritage in the Gunnison and Colorado River Basins

More info:

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



**Drink to the
year of water!**

**Here's to the next
75 Years – may
they be even
better!**