Be Careful of What You Wish For… Climate-Responsive Water Management From the Ground Up Goes Big-time? … Following the Problem

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Presentation for CPASW 4 - edited for posting
Note: Oral only used Nos.1-34;
see speaker's notes for additional material
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Has the water marketing problem been addressed already here?

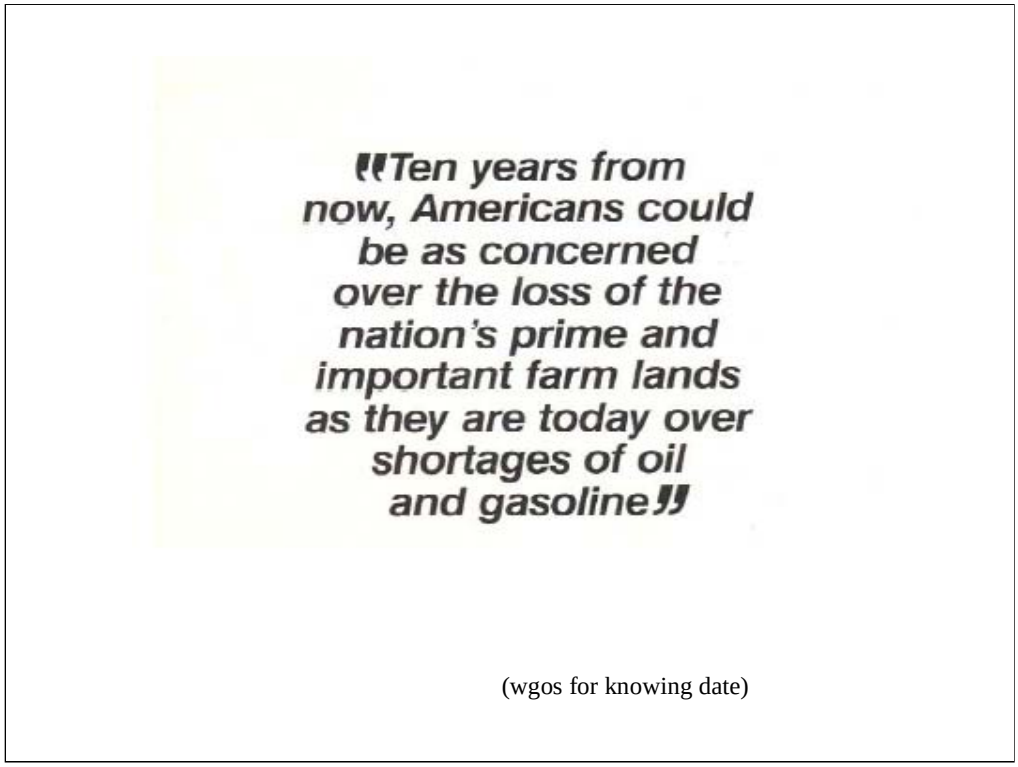
- Bonnie Colby and Katie Pittenger just did a great job, with Dustin Garrick (see those presentations)
- Presentation will just go ahead from there
- Note: “Demand hardening” - not a closed topic. No public report yet from the SWSI group.
- Colorado market they mentioned is legally unique - closest to the BOR-supplied Imperial ID in California (NCWCD)
- Profitability and investment: legal doctrines against “speculation” (Howe, D Post, 18MAR06)

This is a last-minute cross-reference to some very good papers given in the same session and the same conference.

The presentation did not go into extent of marketing underway, etc. since it was well covered.

The idea of “demand hardening” is that cities which encourage conservation successfully will “use up the slack” and then be unable to respond later in a drought; the demand that remains will be “hard” and can’t be reduced. The idea has been used to support relaxing conservation and efficiency when not as badly needed, and city officials and water providers have sometimes expressed fear that they need that “slack” in the system. The argument to the contrary has been well articulated in Statewide Water Supply Initiative discussions which are not yet public, but the point is that saving now does not make you worse off later, and system efficiency is a good thing. Saving may avoid the situation feared (e.g. reaching a triggering level of storage on hand). Mind what you relate to what, of course; efficiency is an adjective, not a noun!)

The Colorado market is in the Northern Colorado Water Conservancy District, a BOR client which has relinquished second uses to holders of first use, so that the particular water can be freely transferred, and is, at very low cost, and within an area of especially good plumbing. See Howe, C.W. and C. Goemans, 2003, Water Transfers and their Impacts: Lessons from Three Colorado Water Markets. Journal of the American Water Resources Association 39(5): 1055-1065. Hence it can work easily, but there are some conditions in the California cases that are not like those in Colorado, though that is a long story. The Howe 2006 citation is a Guest Commentary in the Denver Post, arguing for relaxation of anti-speculation doctrine.



(wgos for knowing date)

NALS -- 1981, 1979

"Where Have the Farmlands Gone?" Brochure reporting results of the National Agricultural Lands Study. The actual report may not be on the web (might try Agricola if want it - very important item, still, in some opinion), but the brochure is still available, on website

American Farmland Trust, <http:www.farmland.org/>

Conclusions

- "PPP" -- presence in the community; participation in their issues, and persistence with your issues…" The more technical, the more personal" (e.g Renzo Taddei, Nicole Peterson, Mike Crimmins, Mark Shafer, others here)
- Climate/Weather are among the issues and threats
- Following a problem is not like following research - and you can get into big trouble --
- It might work, sometimes… (SECC group, CIG, CLIMAS)
- Moving water is a mess -- Drought panel noted that
- New problems! Hybrid ecologies…
- Extension is THE model for ag -- (for other sectors??)
- If you are winning, you like the rules
- PP (public participation) can slip into PR (public relations) -- people know this… (Nicole Peterson)

References on this slide are to other presentations at the CPASW4 conference, by author, and the the SECC is Southeast Climate Consortium (see Jagtap, Bellow, Zierden and Fraisse papers); CIG is Climate Impacts Group, represented at this conference by Alan Hamlet; CLIMAS is the NOAA RISA based at U of Arizona, with presentation at this conference by Hartmann and Haas, Wise, Crimmins, Garrick, Colby and Pittenger, and Comrie.

The extension -demonstration tradition was discussed by a panel at CPASW 2, and reported on the CPASW3 website, Wiener, J.D., 2005, Learning From and About Co-Operative Extension Services, Session Report and annotated references, from Panel Discussion at Climate Prediction Applications Science Workshop II, Tallahassee, FL, March 2004. Posted as Appendix to Wiener, 2005 presentation at Climate Prediction Applications Science Workshop III, Palisade, NY, International Research Institute for Climate Prediction, at http://iri.columbia.edu/outreach/meeting/CPASW2005/Presentation/JWiener.pdf

It was a distinguished panel, and annotated references are added for convenience.

Extension is the way to reach agriculture, but it is not so clear that it should be the model for other sectors. See, for example, Rayner, S., D. Lach and H. Ingram, 2005, Weather forecasts are for wimps: why water resource managers do not use climate forecasts. Climatic Change 69: 197-227.

People asked about "If you are winning, you probably like the rules." This is too true to be original with me - can anyone supply a better form and citation of this idea?

Two Constants and the Low-Cost Social Welfare Function

- Constant 1: Urban ability to pay
- Constant 2: Soil formation is slow at best
- Suppose you owned all the pieces? What could you do to maximize the outcomes?
  - Answer tells what you want to maximize (pie flavor)
  - Answer tell how much you might get (pie size)
  - Problem: you don't own it all. So, how to organize exchange so that owners can divide the biggest and best possible pie?
  - (Note: not a new question. See "H-HD")

This is actually more useful than it seems, in my experience. Asking people to think about what they would do if they owned all the pieces can help consider what could be done with some set of pieces. Why not think about that?

The H-HD refers to the Library of Congress call letters for most of economics and political economy; one ought to poke around in GN, too, (economic anthropology) to consider how widely human answers have ranged on the basic questions.

The point was just that there has been a lot of work on how to structure institutions (sets of rules, basically) to promote outcomes. And, how institutions prevent some outcomes or make them difficult.

Three forms of water transfer wanted

- Short term spot market -- “water bank”
- Long-term “rotating fallow” -- timing specified intermittent transfer to meet “base load” demand for municipalities (M&I sector)
- Long-term interruptible supply arrangement -- transfer when condition is met, to meet foreseeable but timing-unspecified demand
- [Along with temporary “bridge” deals (substitute water supply) and micro deals]

It is easier to see the details on the one-page description that will be supplied with the posted set of slides. If you don’t have that, please ask. In a pinch, a modified form with a committee of very good water managers involved will probably post some descriptions they agree on, from the Alternative Agricultural Transfers technical roundtable of the Statewide Water Supply Initiative, Phase 2: see Brad Wind slide set posted at time of this writing, at

<www.cwcb.state.co.us/swsi/>

Recommended Principles for Water Transfers to be good alternatives to "buy-and-dry" (BAD)

- Role of the state must be clarified
- Role of the market (scope of what is marketable) must be clear
- Certainty is essential to support a market
- Allocation within thresholds is very important
  - climatic limits -- kindly provide specifics soon!
  - TMDLs for water quality (climatic interactions, please)
  - ESA? - Poster child for resentment and inequity
- Transferor internal allocations must be possible
- Scale of impact analysis and transferor organization scale are important

Role of the state is mentioned on next slide. You may want to consider how water supply failure compares or does not compare to wildfire hazards -- that is an interesting analogy.

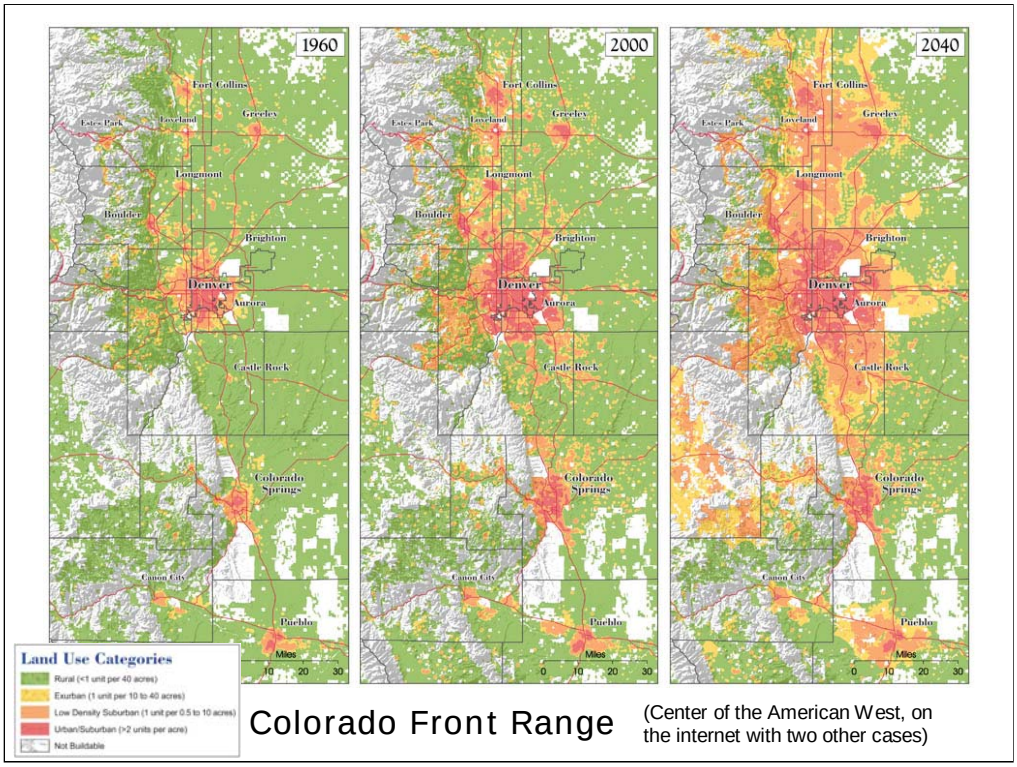
The principles recommended for transfer are also described in a little more detail on a one-pager supplied for posting with the slides. The novelties are that "certainty" here refers to conditions needed to "sell" an innovation to those we hope will use it. "Thresholds" refers to cumulative impacts which could put a sudden halt to innovations and derail a great deal of progress, while threatening the certainty that must be at least near that of the "buy-and-dry" tradition.

(If you are really new to this stuff, welcome to the Western Water World… If an irrigator sells water from her land, she has traditionally been required to keep that land dry to prove she is not irrigating, and that has led to a great deal of very poor condition land left since revegetation to any standard is difficult. More on that on request.)

Roles of the State - Which will be chosen, and when?

- Rule-maker: create structure; what can be done, who can act -- legislative function
- Referee: ensure applications of the rules
  - administrative or judicial process?
- Representative: act as agent for some interests?
  - All? "Public interest?" "The future"? The poor?
- Resource: support some interests? Provide technical support?
- Rescuer: When things go wrong… To what extent shall all pay for foreseeable injury or loss?
- (Re drought panel issues, with respect!)

What role the state government will, should, or could play in the event of failures of water supply is an unfortunately open question.

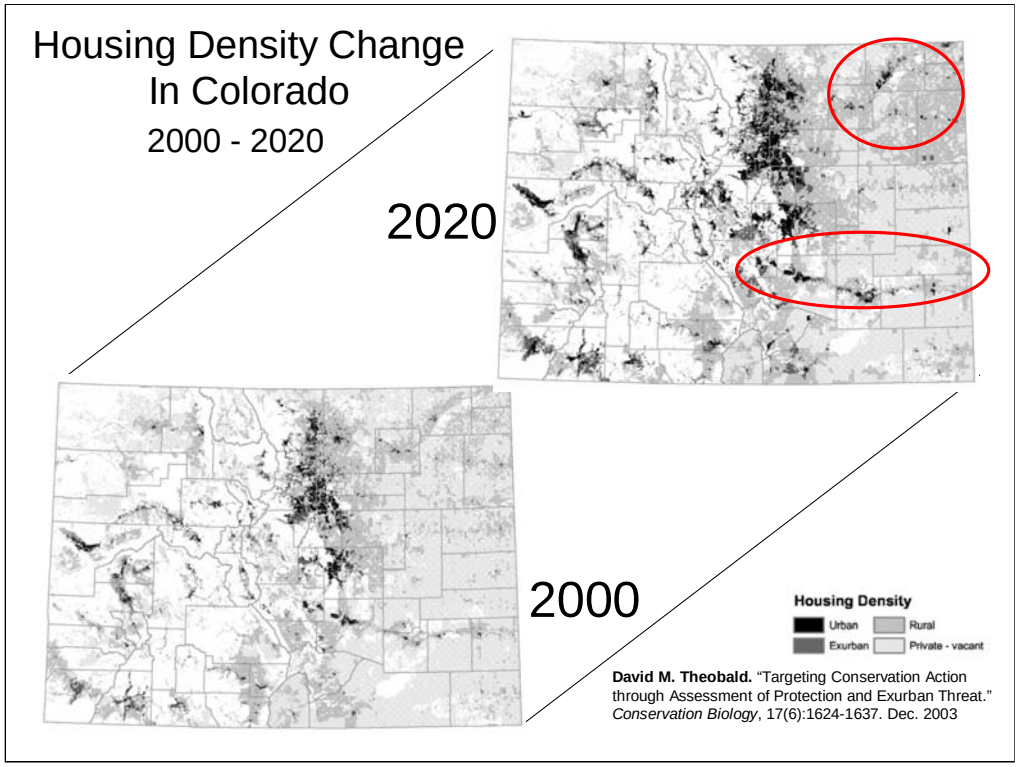


Colorado Front Range

(Center of the American West, on the internet with two other cases)

Details are on the website from which this is taken

Center of the American West, University of Colorado, 2005, Western Futures Project, <http://www.centerwest.org/futures/frtrng/>, accessed 09 December 2005.



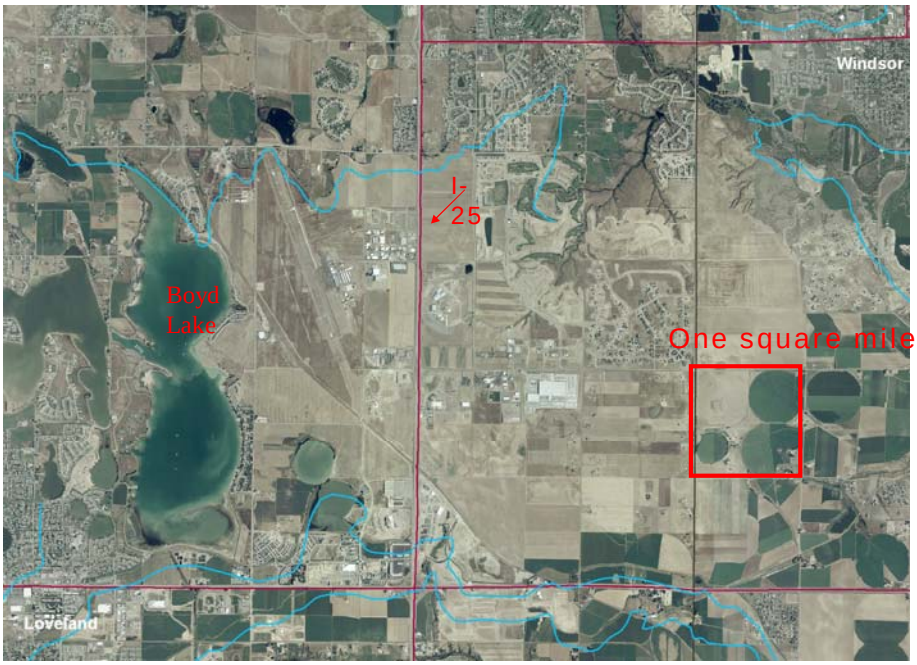
Source cited on slide

What is now happening to the farm-dependent areas of Colorado?

What about those blue areas gaining population?

Denver Post, from Census Bureau, 16 March 2006

The rates of growth are hard to relate to… this is growth in 5 years!!!!



Slide by Tom Dickinson, IBS and Geography, Source: National Agriculture Imagery Program (NAIP),USDA-FSA Aerial Photography Field Office

This slide is just to illustrate the kind of landscapes that are resulting form rapid development of agricultural lands; this was some of the best farmland in the US. I noted Boyd Lake and I-25 (Interstate 25) for orientation, and framed a section of land (one square mile, 640 acres) for sense of scale. You can see the size of a center pivot system, the green circles which are 1/4 sections at full size though they can be smaller. And, the blue lines are irrigation ditches, highlighted by Tom Dickinson who made the slide for us.

Table VI.1. The Range of Cost Estimates for a Variety of Water Management Options (from Denver Water IRP)

Type of Project	Cost Range, $ per Acre-Foot of Yield
Water Conservation	$4 to $8,000
Acquisition/Change of Irrigation Rights	$700 to $12,000
System Refinements	$700 to $16,000
Reservoir Enlargement	$1,400 to $10,000
Exchange/Augmentation	$4,600 to $10,200
Conjunctive Use	$7,400
Nonpotable Reuse	$8,000
New Transbasin Diversions	$4,300 to $11,700
New Reservoirs	$5,300 to $19,500
Indirect Potable Reuse	$14,000 to $16,000

From Denver Water Integrated Resource Plan, and in Luecke et al., 2003, What the Current Drought Means for Colorado… (on-line from Trout Unlimited, Colorado)

Source cited on slide. The point is that buying agricultural water is cheaper than almost anything else except conservation (demand reduction as substitute for supply increase). The Denver Water Integrated Resource Plan may have been updated since these ranges were given, but it is unlikely that the general point will change. It was easier to get a slide from the Trout Unlimited publication than to make one up from a hard copy of the IRP. See also the Western Water Policy Review Advisory Commission on this general topic.

> Western Water Policy Review Advisory Commission, 1998, Water in the West. Available from National Technical Information Service, Port Royal, Virginia.

It should be available from depository libraries.

Cost of Ban on New Taps -- Aurora's Analysis (from Doug Kemper, 2004 South Platte Forum)

- $1.4 Billion impact on Regional Economy
- $130 Million impact on Local Economy
- $32 Million impact on Aurora's Budget
- -- This is why Aurora wants water
- Front Range cities "retail" treated water for much more than farmers can make from that water

Source is Douglas Kemper, formerly with City of Aurora, and I offer no comment on the figures, or their source and method. The important point is that there is a very large municipal interest in meeting demand for water.

"Retail" prices for treated and delivered water are MUCH higher than the value of the water as an input to almost all commercial farming.

Pueblo Chieftain Survey November 2005 - Retail Water Rates		
Front Range City	150,000 g	Without block increase, charge for 325,000 g -- one acre-foot
Golden	$645	$1,397
Highlands Ranch	$632	$1,369
Aurora	$590	$1,278
Thornton	$511	$1,107
Broomfield	$498	$1,079
Westminster	$490	$1,062
Northglenn	$475	$1,029
Arvada	$472	$1,023
Colorado Springs	$471	$1,020
Pueblo	$452	$1,020
Boulder	$432	$936
Lafayette	$409	$886
Pueblo West	$374	$810
Englewood	$354	$767
Denver	$352	$763
Louisville	$345	$747
Pueblo	$327	$708
Based on annual use of 150,000 gallons and 1-inch meter rates. Figures are rounded.		

This is likely not correct - with inclining block rates, prices may be **higher** in most if not all cities.

Source is Chris Woodka story, Woodka, C., 2005c, "Water Board to Consider Rate Increase" [and survey of Colorado water rates], 02 November 2005, Pueblo Chieftain <www.chieftain.com>.

Source for claim of increasing popularity of inclining block rates:

Western Resource Advocates, 2004, Water Rate Structures in Colorado: How Colorado Cities Compare in Using this Important Water Use Efficiency Tool. On website, and also similar reports on New Mexico and Utah cities. <www.westernresourceadvocates.org/>.

Climate Change Vs Plains Farming

- USGCRP Sectoral Assessments (Water, Ag.):
  - Small changes with big water consequences? (2000)
  - Nationally, moderate effects on ag., no “crisis” (2001)
- USGCRP on Central Great Plains (Ojima et al 2002)
  - With less water, irrigation hurt
  - With more water, irrigation loses to dryland
- USGCRP on Great Basin/Rocky Mtns. (2003)
  - Ag declines in all scenarios
- Recent Integrated Assessments (2004, 2005):
  - Current management in trouble
  - Ag. Loses water, all scenarios, even “best case” (references, interpretive memo available) -- changes in comparative advantage of irrigation versus dryland

Two more twists on this set of reasons for wanting a market… climate variation is still largely ignored in public in Colorado - only a few mentions in policy meetings, recently…

Second reason: make it possible for non-market values to “get in” at last -- create a way for environmental and recreational interests to be represented. This is a story not told in this talk but important. Without some ownership, will they depend on politics alone?

references noted are listed in tiny tiny print on the next slide - copy the whole thing to “word” and change font to get a readable text.

Update on publications - Significant Transfers are coming! Copy the text to a "word" document, or select it and enlarge the font

- The "best case" scenarios described by Barnett et al. (2004 special issue Climatic Change 62(1)) establish that current management systems are already seriously threatened. In a different integrated assessment team effort, Edmonds and Rosenberg's group report the counter-intuitive finding that under all of the scenarios, with higher or lower precipitation for the areas studied, irrigation water use declines, even with strong growth in U.S. agricultural yields and no constraints from fossil fuel for energy of feedstock agricultural inputs, and without competition for water (Edmonds and Rosenberg 2005: 155, and Rosenberg and Edmonds 2005). The biggest changes will be in the semi-arid and arid West and Midwest, including increased variability if there is drying. An earlier series of climate impact assessments for the U.S. Global Change Research Program (Gleick et al. 2002, Ojima et al. 2002, Reilly et al. 2002, 2003, Wagner Ed. 2003) strongly support increased flexibility. (See also Herrmann Ed. 1992, and Adams, Ed., 1999 for American Water Resource Association conference proceedings.) We also face additional risks from more severe and frequent extreme events (Kim 2005). Downscaling from climate models to regional and local outcomes involves uncertainty and difficulty (Varis et al. 2004, and Water Resources Update special issue No. 124, May 2003), and there are problems in evaluation of risks and adaptations (Smit and Pilisofova 2001, Howarth 2003). Changnon wrote: "Hence, I conclude that quantifying the potential economic impacts of climate change will remain highly unpredictable." (Changnon 2005: 7).
- But, there are few calls to forego "no-regrets" adaptations – getting started with means to cope, and taking steps that help regardless of what happens.
- A market-based temporary water transfer mechanism should provide immediate benefits in flexibility for agriculture and other users (Wiener 2005) as well as long-term adaptive capacity by allowing long-term interruptible supply contracts for municipal firming without permanent transfer of water rights. Mechanisms for such purposes are becoming much more common (Clifford et al. 2004). Marginal agriculture already faces severe economic pressure aside from other social and climate change (Cai 2005, Reilly et al. 2003, Reilly et al. 2001), so there is little argument that agriculture "should" adapt, but sadly little evidence that it has. Negri et al. 2003, Bradshaw et al. 2004 provide reviews, and important case studies.

- Adams, B., Ed., 1999, Potential Consequences of Climate Variability and Change to Water Resources of the United States. Herndon, VA: American Water Resources Association.
- Arnell, N. and C. Liu, et al., 2001, Hydrology and Water Resources. Chapter 4 in IPCC 2001, Climate Change 2001: Impacts, Adaptation and Vulnerability, Working Group II, Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press.
- Barnett, T., R. Malone, W. Pennell, D. Stammer, B. Semtner and W. Washington, 2004, The effects of climate change on water resources in the West: introduction and overview. [Introduction to special issue.] Climatic Change 62 (1): 1-11.
- Bradshaw, B., D. Dolan and B. Smit, 2004, Farm-level adaptation to climatic variability and change: crop diversification in the Canadian Prairies. Climatic Change 67: 119-141.
- Cai, X., 2005, risk in irrigation water supply and the effects on food production. Journal of the American Water Resources Association 41(3): 679-692.
- Changnon, S.A., 2005, Economic impacts of climate conditions in the United States: Past, present and future. Climatic Change 68: 1-9.
- Colorado Water Conservation Board, 2005, Statewide Water Supply Initiative report, http://cwcb.state.co.us/SWSI/Table_of_Contents.htm
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- Easter, W.K., M.W. Rosegrant and A. Dinar, 1998, The Future of Water Markets: A Realistic Perspective. Pp 277- 283 in Easter, W.K., M.W. Rosegrant and A. Dinar, Eds., Markets for Water: Potential and Performance. Boston: Kluwer Academic Publishers.
- Edmonds, J.A. and N.J. Rosenberg, 2005, Climate change impacts for the conterminous USA: An integrated assessment summary [summary of special issue]. Climatic Change 69(1): 151-162.

Sneaky way to add text to a powerpoint file.

Second added slide - climate impacts update references

- Gleick, P.H., lead author, 2000, Water: The Potential Consequences of Climate Variability and Climate Change for the Water Resources of the United States: Report of the Water Sector Assessment Team. For U.S. Global Change Research Program. http://www.usgcrp.gov/usgcrp/nacc/water/default.htm
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- Howarth, R.B., 2003, Catastrophic outcomes in the economics of climate change. Climatic Change 56: 257-263.
- Howe, C.W., 1998, Water Markets in Colorado: Past Performance and Needed Changes. Pp 65-76 in Easter, W.K., M.W. Rosegrant and A. Dinar, Eds., Markets for Water: Potential and Performance. Boston: Kluwer Academic Publishers.
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- Howe, C.W. and J.D. Wiener, 2004, Attachments to Report on Exploratory Assessment of Potential for Improved Water Resources Management in Three Western States and Selected Tribes, under NOAA Office of Global Programs, Funded Research, Human Dimensions of Global Change, Howe et al., 1999 initial funding, "Exploratory Assessment of potential for improved water resources management…" and attachments file: http://www.ogp.noaa.gov/mpe/csi/econhd/1999/howe_2004_attach.pdf
- Kim, J., 2005, A projection of the effects of the climate change induced by increased CO2 on extreme hydrologic events in the Western U.S. Climatic Change 68: 153-168.
- Kindquist, C.E., 1996, The South Park water transfers : the geography of resource expropriation in Colorado, 1859-1994. Boulder, CO: University of Colorado Ph.D. Thesis.
- Negri, D.H., N.R. Gollehon, and M.P. Aillery, 2005, The effects of climatic variability on US irrigation adoption. Climatic Change 69: 299-323.
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- Reilly, J., et al., 2001, Agriculture: the Potential Consequences of Climate Variability and Change for the United States. For U.S. Global Change Research Program. <http://www.usgcrp.gov/usgcrp/nacc/agriculture/default.htm>
- Reilly, J., et al., 2003, U.S. Agriculture and Climate Change: New Results. Climatic Change 57: 43-69.
- Rosenberg, N.J. and J.A. Edmonds, 2005, Climate change impacts for the conterminous USA: An integrated assessment: From MINK to the `Lower 48' [introduction of special issue]. Climatic Change 69: 1-6.
- Robertson, G.P., J.C. Brown, E.A. Chornesky, J.E. Frankenberger. P. Johnson, M. Lipson, J.A. Miranowski, E.D. Owens, D. Pimentel and L.A. Thrupp, 2004, Rethinking the vision for environmental research in U.S. agriculture. BioScience 54(1): 61-65.
- Scott, M.J., L.W. Vail, J. Jaksch, C.O. Stockle, and A. Kemanian, 2004, Water exchanges: tools to beat El Niño climate variability in irrigated agriculture. Journal of the American Water Resources Association 40(1): 15-31.
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- Varis, O., T. Kajander, and R. Lemmela, 2004, Climate and water: From climate models to water resources management and vice versa. Climatic Change 66: 321-344.
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- Wiener, J.D., 2005, Learning From and About Co-Operative Extension Services, Session Report and annotated references, from Panel Discussion at Climate Prediction Applications Science Workshop II, Tallahassee, FL, March 2004. Posted as Appendix to Wiener, 2005 presentation at Climate Prediction Applications Science Workshop III, Palisade, NY, International Research Institute for Climate Prediction, at http://iri.columbia.edu/outreach/meeting/CPASW2005/Presentation/JWiener.pdf

Same. Let me hear of problems with this trick, please.

A nasty historical note...

- What was the biggest policy response to the very serious drought of the 1950s in Central Plains and Southwest?

- Trick question -- there was none! Seemed to be important in discussion of on-farm impacts. Doesn't look cheery for regional bail-outs as analogue to regional impacts from climate change.

Wiener, J.D, R.S. Pulwarty and H.D. Ware, "The Socioeconomic context of the 1950s U.S. Drought -- Bark without Bite?" Book chapter written for a cancelled project, will be submitted or posted in 2006.

What about the Climate Prediction Applications? Is this guy at the wrong meeting?

- Exploratory Assessment of Potential for Improved Water Resources Management by Increased Use of Climate Information in Three Western States and Selected Tribes -- large project (NM, UT, CO, Navajo, Hopi, Southern Ute, Ute Mountain Ute, etc.) - NOAA OGP HD
- Colorado Focus: Arkansas Valley, All scales, including irrigators and ditch companies -- they own the water not owned by cities…
- AG COULDN'T RESPOND TO Cx INFO. In water management

Howe, C.W. and J.D. Wiener, 2004, Attachments to Report on Exploratory Assessment of Potential for Improved Water Resources Management in Three Western States and Selected Tribes, http://www.ogp.noaa.gov/mpe/csi/econhd/1999/howe_2004_attach.pdf

How to Respond?

- Years of economics -- markets are a good idea
- Years of water economics and water resources studies -- markets are a good idea
- Years of recommendations: overcome barriers to moving water so a market can operate
- Along comes a set of bills…
- Economist and assistant dragged into the conceptual mud…
- Finally, outcome of rule-making from the "right" bill -- filling the idle hours… unexpectedly good welcome and outcome… in the rules

Numerous reviews of the economics ideas of markets are available (any good introductory textbook), and there are reviews of the idea of water markets. One might start with Howe, C.W., 1998, Water Markets in Colorado: Past Performance and Needed Changes. Pp 65-76 in Easter, W.K., M.W. Rosegrant and A. Dinar, Eds., Markets for Water: Potential and Performance. Boston: Kluwer Academic Publishers. And National Research Council, 1992, Water Transfers: Efficiency, Equity and Environment. Washington: National Academy Press.

But… More Mud to Wrestle in...

- Design of the water bank: major errors
- Explanation of the innovation? Not funded --
  - 125 years of Ag Innovation Tradition: ignored
  - Outcome: no use!
  - See CPASW3 posting
- Then, more stress: Drought Centered on 2002 (still on-going some places)
- Political Reactions:
  - (1) more authority for Water Banks - theory accepted
  - (2) some other legal authority for short-term transfers
  - (3) Statewide Water Supply Initiative - great study!
    - <www.cwcb.state.co.us/swsi/>

Regarding design problems, see CPASW3 posting, please, or contact author. Regarding drought severity, see Pielke, R.A., Sr., N. Doesken, O. Bliss, T. Green, C. Chaffin, J.D. Salas, C.A. Woodhouse, J.J. Lukas and K. Wolter, 2005, Drought 2002 in Colorado: An Unprecedented Drought or a Routine Drought? Pure and Applied Geophysics 162 (2005): 1455-1479.

Unauthorized Short History of Recent Colorado Water Politics

- Pressure building as hinted above
- Drought centered on 2002
- Popular support for farms, farming/ranching etc.
- Big troubles: Arkansas Valley forced to get well-users into compliance with prior appropriation, by Kansas v Colorado Compact litigation
- South Platte well users forced into compliance, partly by drought, partly by ESA issues on Platte, and many were unable to buy water and forced to discontinue irrigation

This is informal indeed! Most of the documentation of what happened in the Arkansas Valley and more recently in the South Platte would have to be gleaned from newspaper accounts. This is the author's synthesis. Contact author for further information.

Unauthorized Short History of Recent Colorado Water Politics

- Water Bank Pilot Project -- Failed, but Legislature extends authority to other basins, with some additional limits; two groups have stated interest in starting up
- Different authority used to accomplish a short-term lease… Aurora, big city, paid very high prices for 2 years -- The "demonstration effect" was startling… A LOT of attention
- Suddenly, much more interest in new forms of water management...

Claim of failed water bank experiment: short account is available in : Wiener, J.D., 2004c, Water Banking in Colorado: An Experiment in Trouble? Pp 515-525 in Proceedings, 2004 Water Management Conference: Water Rights and Related Water Supply Issues, US Committee on Irrigation and Drainage, (Denver, CO).

See Colorado Revised Statutes 37-80.5 sections.

Regarding Aurora-Highline lease, newspaper accounts again, and specific figures available from Kemper, Douglas, City of Aurora (at that time), presentation to South Platte Water Forum, 2004; copy on file with author.

Unauthorized Short History of Recent Colorado Water Politics

- Statewide Water Supply Initiative -- Phase 1
- Good News: An excellent study!
- Bad News: Got attention! Woke up some folks who might not have appreciated the situation --
- Good News: Legislature was startled, too… "Phase 2" of Study funded
- Bad News: This is a competitive private property market - lots more interest, lots more water moving and WE WON'T KNOW until after deals are done and found feasible and finally taken to water court...

Regarding stimulation of market by SWSI study, this is an insupportable claim based on author's opinion. The problem of this being a private competitive market is serious! For a sense of the issues, see Olinger, D. and C. Plunkett et al., 2005, "Liquid Assets – Turning Water into Gold", multi-part series with sidebars, 21, 22, and 23 November 2005, The Denver Post.

Unauthorized Short History of Recent Colorado Water Politics

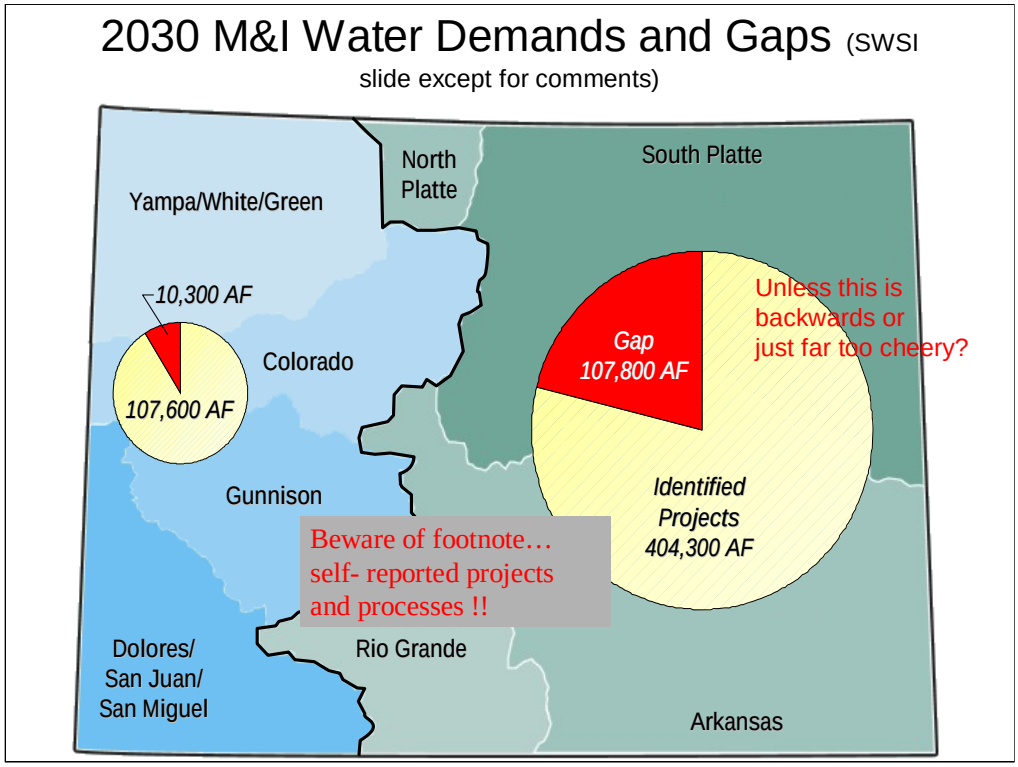
- The Big Limit: "Black box" on self-reporting
- Incentives: Wrong. No political suicides, so far…
- So… "Gap" between supply and demand described as demand less conservation expected and less supply from "identified projects and processes…"
- Two responses: Phase 2 "technical round tables" Alternative Ag. Transfers, Prioritize Recreational and Environmental Needs, and Conservation and Efficiency, as well as "Meeting the Gap"
- AND HB05-1177: Flip the incentives! Just keep on with meetings until you run out of (insert limit)...

The points argued here are made in more detail in comment submitted to the Colorado Water Conservation Board and the Department of Natural Resources by the author, available on request and submitted for posting as appendix to this presentation.

The point about political suicides is that no representative of a city should be expected to declare failure to plan and that sensible people should stay away.

Regarding HB05-1177, "Colorado Water for the 21st Century", see Colorado Department of Natural Resources website for explanation and reporting of processes:

<http://dnr.state.co.us>



SWSI slide from report posted on internet:

<www.cwcb.state.co.us/swsi/>

with notes added.

So… SWSI wants alternatives to "BAD"?

- Have we got a deal for you… CRM!
- Three new forms of transfer wanted, based on demand-side:
  - WATER BANK - short-term, spot market
  - LONG-TERM ROTATING FALLOW*
  - LONG-TERM INTERRUPTIBLE SUPPLY (dry year options and wet-year recharge opportunities)
- (Go with the flow…. We're practicing the doctrine of "PPP" - presence, becoming known, participation, working on their issues, not just ours and persistence: flexible and stubborn…)
- *"Your terms are fine!" (Beware of California…)

CRM stands for "climate responsive management"

The point about "your terms are fine" is that some prominent water managers introduced the rotating fallow idea in SWSI Phase 1, and we have been happy to use that term and idea instead of the fractional transfers and dry-year options ideas that we were promoting for the long-term in the earlier structure of the water bank. Accepting the "rotating fallow" term and idea makes sense because it will accomplish the same purpose and it links directly to existing cases so that it has been shown to be workable to at least some extent. But I also added "beware of California" because I fear that some of the historic and farm structure differences between Colorado potential areas of supply and California reclamation projects may be important. The differences may make it unwise to transfer too much from the California model.

An illustration area, next steps or stumbles...

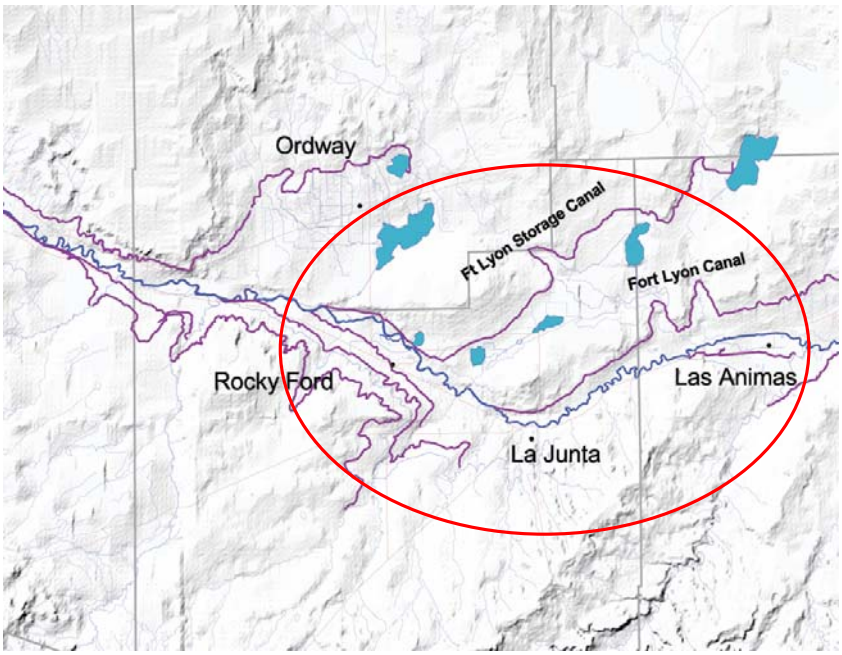
- More slides to keep visual distraction level high enough to escape the political risks (and meet Taddei's status from technology idea)
- Show some of the issues of "What if we get what we wished for?"
  - Workshop -- on-farm management issues - some very early info: NOT going to be easy
  - Biological issues -- workshop coming up - themes from literature review: ominous level of ignorance

The first bullet point refers to a good observation by Renzo Taddei about the value of technology as status symbol or demonstration.

Using this case study area from Gates et al., one can get some visual sense of how profoundly the environment depends on irrigation in much of the West, and especially away from mountain sources of snowmelt.


Arkansas River Basin in Colorado
Fort Collins
Greeley
Denver
Aurora
Grand Junction
Colorado Springs
Pueblo
Arkansas River
Arkansas River Basin

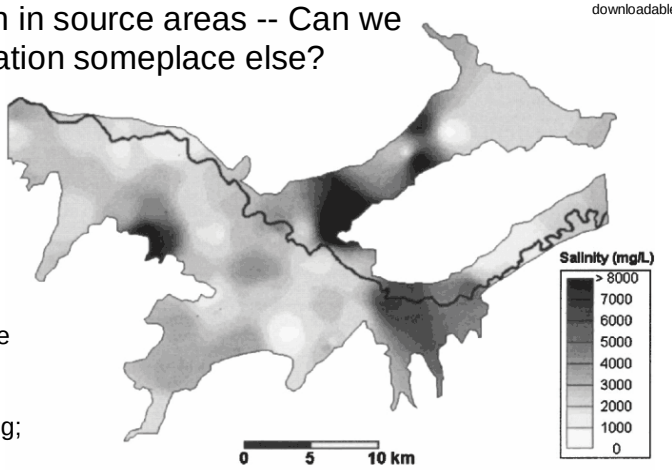
Locator map.



Zooming in, with highlighting of some big canals, towns and reservoirs, and topography under-emphasized as background. Note the “wishbone shape” which is indicated by the red circle.

Inhomogeneity of salt loading suggests remediation by ending deep percolation in source areas -- Can we move irrigation someplace else?

Figure from Gates et al., 2002, Monitoring and modeling flow and salt transport in a salinity-threatened valley. J. Irrig. And Drainage Eng., 128(2): 87-99; downloadable from journal site.



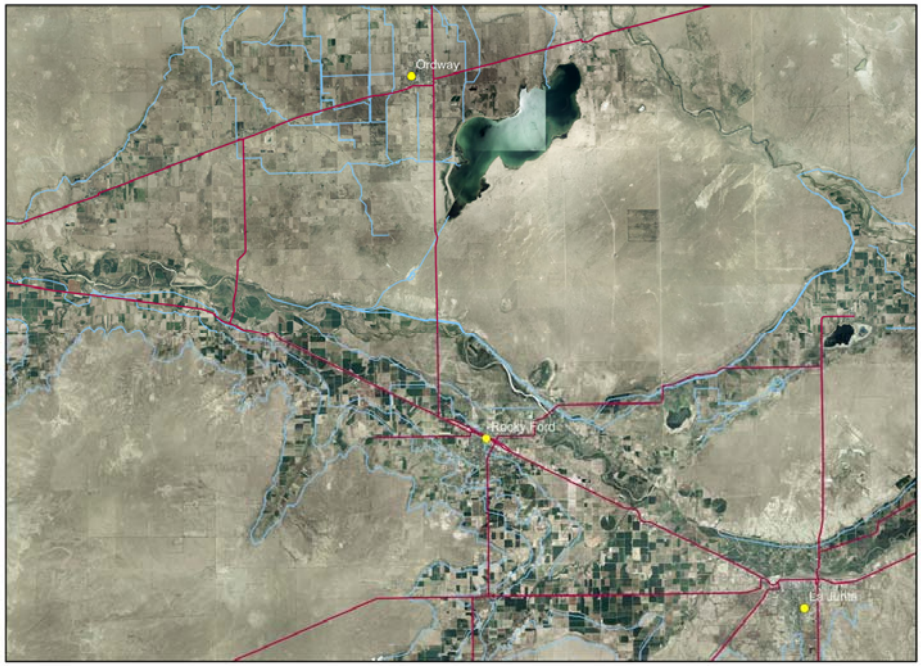
Salinity above 1500 mg/l is bad for even stock watering; these levels also reduce crop yields.

Estimated contours of water table salinity based upon specific conductance readings in observation wells for July 14±17, 1999

Far too much to go into, but note that the dark areas are in excess of any standards for salinity for drinking even by cattle. There are some other water quality issues, but they are associated with the same sources as the salinity, and the answers or solutions -- sorry! -- are likely to be the same.

Source is given on slide.

Slide of aerial photos, by Tom Dickinson, IBS and Geography, U of Colorado



Here is aerial photo view, in a slide by Tom Dickinson of the Institute of Behavioral Science and Department of Geography at University of Colorado, from National Agriculture Imagery Program (NAIP),USDA-FSA Aerial Photography Field Office

Note: blue lines are ditches, emphasized, to show how much of the biology is dependent on the “inefficiency” of the agricultural water distribution system. What will happen from withdrawal of that water? There has been more than 125 years of “hybrid ecology” here.

Biology Issues… Our next exciting episode of "a funny thing happened on the way to the forum…"

- The big picture is missing -- ditches as part of environment are just not covered
- This all happens on private, not public, land
- A minimum of intact wetlands and riparian areas of each type and connectivity are needed for restoration
- Cottonwood crisis and changing channels -- fluvial processes not proceeding, senescent non-recruiting canopy, invasives in the understory (geriatric situation!)
- From pre-manipulation to agriculture to ???
- "Hybrid ecologies" -- "you can't hold on and you can't let go…" Walk away is not a responsible option here...

Source of claims on biological issues: memorandum by author, included in set submitted for posting, of comments to SWSI, HB1177 groups.

Regarding "hybrid ecologies" see excellent survey of concept and its importance in

Crifasi, R. R., 2002, The Political Ecology of Water Use and Development, Water International 27(4): 492-503.

Crifasi, R. R., 2002, The Political Ecology of Water Use and Development, Water International 27(4): 492-503. [available from Wiener as file provided by author.]

Climate prediction applications for long-term arrangements?

- Yes, please!
- "We sell a tap forever!" Economically, forever probably means longer than 30 years, but psychologically, it might have to be real long
- Shifts in seasonality etc -- see the reservoir management/big system work -- HRC, Carolinas
- Short-term water bank goals - apparently, we just have to rationalize the system to get this nice little piece…
- The pot of gold? Long-term ag. Management - productivity potential is a very nice idea!

There are clearly important applications of climatology for long-term water management arrangements; in the CPASW4 conference, Carbone presented such a study, and the Hydrologic Research Center (Elyon Shamir et al.) has done several complete application packages.

The point about "we sell a tap forever!" is that cities want a high level of certainty, even though infrastructure and financial instruments seldom last "forever". At time of this presentation, this is an important issue in considering the alternative transfer arrangements.

The "pot of gold" of long-term management is remarkably attractive on consideration: what would you do if you had time enough to do it? How would you manage if you could do the best you could think of? To some extent, time can be a substitute for money. It is remarkable to think about a future in which you would not be ashamed to meet your great-grandchildren...

Can We Do Better Than This?

Holbrook Canal, May 2002

Another view of a canal -- in severe drought! -- this shows both drought and that these things are very vulnerable to flash flooding -- they run on a carefully engineered gradient, and they intercept all the drainages.

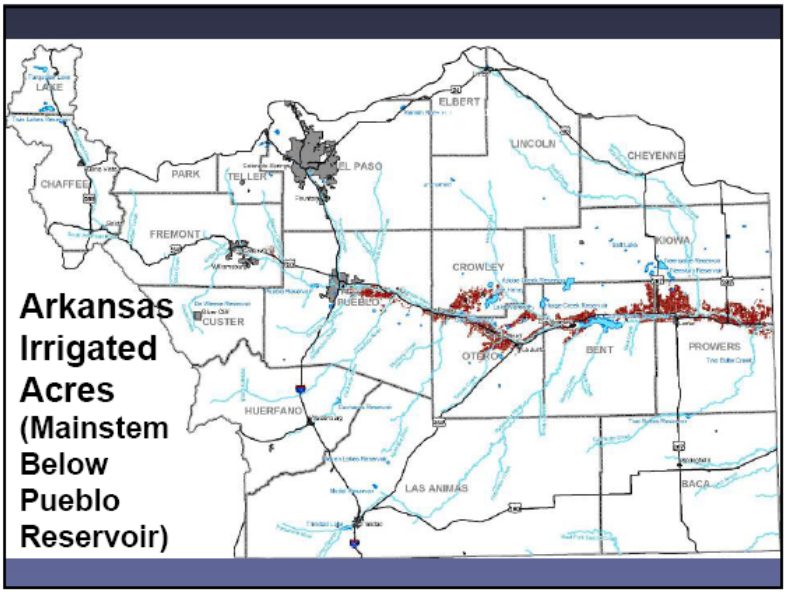
Can we do better than this in areas from which water will be transferred? End of oral presentation. Following are some slides not used but perhaps of interest.

SWSI Phase 2 Irrigated Acreage
Arkansas and South Platte
Slides from Agricultural Alternatives
Technical Roundtable Jan. 2006

Slides produced by CDM Inc. and
Colorado Water Conservation Board.

<www.cwcb.state.co.us/swsi/> see
Technical Roundtable Information

The following are slides taken from the source given -- I am adding them to the presentation file to give a sense of the areas that are involved in some way. Not all irrigated areas will undergo changes in water management, but it is likely that most or almost all irrigated areas on the East side of Colorado will undergo some impact from either growth and transfer of water or climate change and hydrological impacts, or both.



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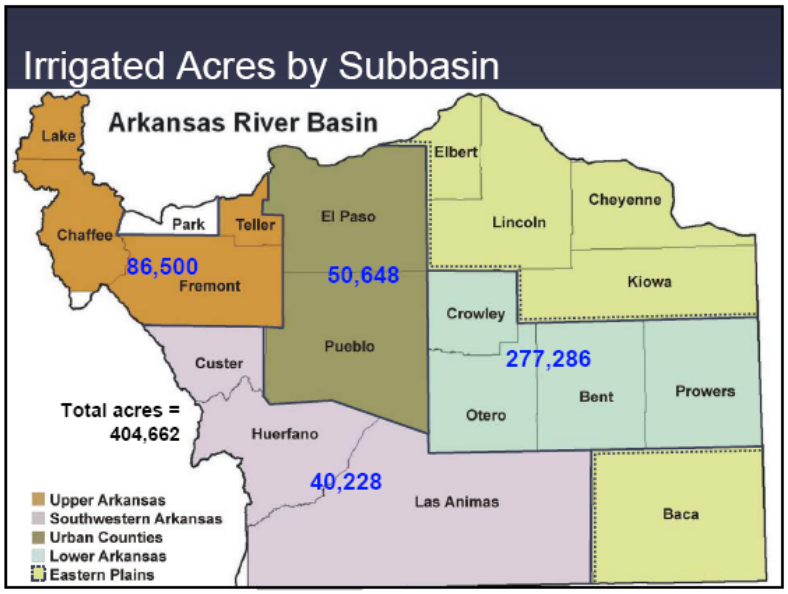

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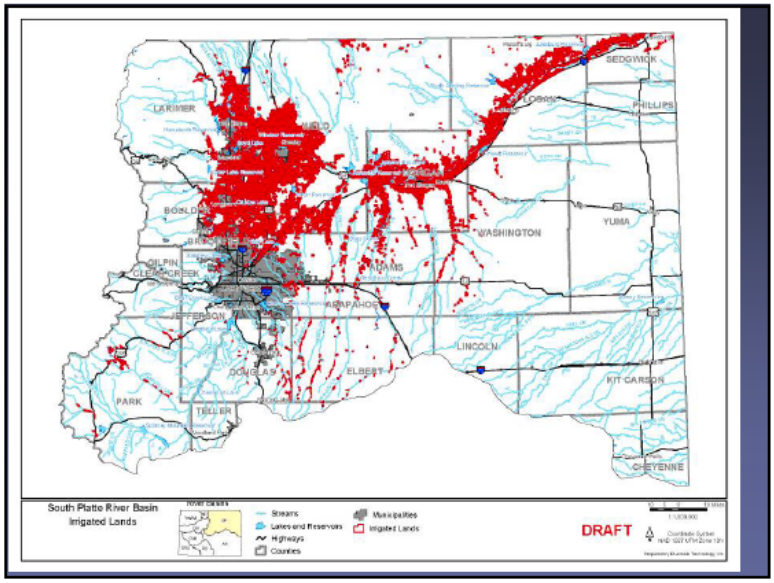

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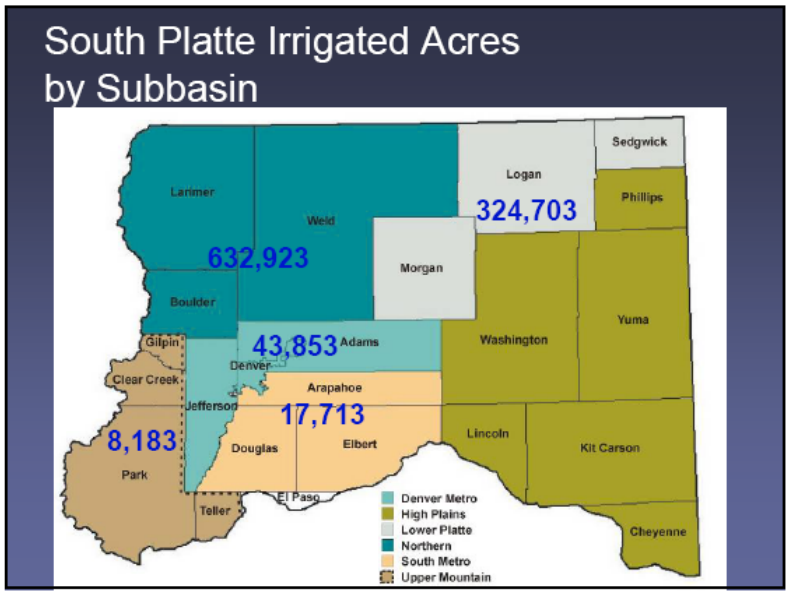

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