Appendix 4E

Sub-Team Activities

May 2015

4E | Sub-Team Activities

To facilitate a detailed discussion on key topics, four sub-teams were formed. The sub-teams explored conveyance system improvements, consumptive use reductions, on-farm efficiency improvements, and transfers. Each sub-team operated through a series of three to four calls. The first call allowed members to present topical example programs they were familiar with that were either particularly successful or provided lessons learned. Presenters were asked to convey any unique aspects of the example such as funding, timing, benefits, impacts, and legal considerations. The second call focused on developing the characteristics that are needed for a hypothetical successful program. The remaining calls examined challenges associated with implementation and potential opportunities to overcome said challenges.

Table 4E-1 lists the sub-team participants and call dates. Following the table are hypothetical programs associated with each sub-team. These were the results of the sub-team efforts.

TABLE 4E-1
Sub-Team Members and Meeting Dates

Sub-Team	Members	Call Dates
Conveyance System Improvements	Ken Nowak Angela Rashid Dan Charlton Dave Kanzer Grant Ward Greg Gates John Longworth Robert Cheng Russ Schnitzer	February 25, 2014 March 4, 2014 March 12, 2014 March 21, 2014
Consumptive Use Reduction	Reagan Waskom Chuck Cullom Dave Kanzer John Longworth Aaron Citron Dan Keppen Mohammed Mahmoud Angela Rashid Greg Gates	February 28, 2014 March 10, 2014 March 24, 2014
On-farm Efficiency Improvements	Reagan Waskom Tina Shields Dave Kanzer John Longworth Lee Miller Kate Greenberg Mohammed Mahmoud Angela Rashid Wade Noble Greg Gates	February 25, 2014 March 7, 2014 March 13, 2014
Transfers	Greg Gates Elston Grubaugh Aaron Derwingson John Longworth Dave Kanzer Jan Matusak Angela Rashid	February 26, 2014 March 7, 2014 March 17, 2014

4E.1 Conveyance System Improvements Sub-Team – Hypothetical Program Scoping

Improvements to water conveyance infrastructure have played a role in successfully meeting the growing demands for Colorado River water and show promise for building additional resilience. However, that potential depends on several considerations including, but not limited to, geographic location, desired outcome, involved parties, available funding, and general receptiveness. These major challenges associated with conveyance improvements can be explored from several perspectives, including a municipality seeking to bolster water supply for a growing population; an agricultural entity, such as a district or producer, interested in improving productivity and/or reducing operational costs; and a nongovernmental organization (NGO) intending to secure water for instream flow purposes. The hypotheticals below discuss the challenges from these different perspectives.

4E.1.1 Hypothetical Example 1 – Municipality Seeking Water for Growing Demands

Geographic considerations pose the greatest challenge for a municipality seeking to recover water from conveyance improvements by partnering with an agricultural entity. The two primary factors associated with geography are the potential for the improvements to yield salvageable water and the ability to transfer water savings to an area with growing demand.

A major concern associated with conveyance system improvements is that often limited water can be salvaged as a result of conveyance improvement projects. This is primarily an issue for projects within the hydrologic basin. By reducing transmission losses outside the hydrologic basin, a smaller diversion and subsequent export is required to deliver the same amount of water to growers, thereby keeping more water in the river, which could be repurposed. Accordingly, Southern California water districts have partnered to line considerable portions of canals serving agriculture outside the hydrologic basin. As a result, many of the most appealing opportunities have already been implemented.

Legal and accounting challenges can be significant. Legal considerations vary from state to state and limits on changing the timing, location, and beneficial use of diversions and subsequent return flows can render an otherwise appealing opportunity quite difficult. Closely tied to the legal considerations is the ability to accurately estimate the savings from the project and subsequently monitor/account for that salvaged water. Sufficient monitoring infrastructure is needed to evaluate a project's potential and upon completion, its performance.

Major Challenges Identified

1. Funding. Without ample funding for a program, participation will be limited.
2. Benefits. Within the hydrologic basin, conveyance improvements do not offer substantial "salvaged water."
3. Benefits. Legal hurdles exist to ensuring benefits accrue to the intended user/resource, such as instream benefits or water for a water bank.
4. Attitudes. It is difficult to change institutional practices, particularly in the Upper Basin where agriculture does not tend to be particularly water limited.
5. Environmental impacts. Because of its complexity, the National Environmental Policy Act (NEPA) process can be viewed as challenging.
6. Measurement/quantification of benefits. The salvaged water volume can be contentious.
7. Management and coordination. Particularly on large projects, with several entities involved, both construction and implementation management can be challenging.
8. Legal. While out of basin conveyance improvements offer a large potential benefit, the legal treatment of trans-basin water (for example, in Colorado) may reduce the appetite for participation in such a program.
9. Other limitations. In highly apportioned basins, such as the Arkansas, with a compact obligation, conveyance seepage and other "losses" may be heavily relied on (for example, groundwater pumping).

Potential Opportunities/Elements for Success

1. Project management and construction should be through a pre-agreed-upon framework.
2. Salvaged water and/or benefits should be well quantified and agreed upon by all parties in advance.
3. Where conveyance improvements may not yield significant salvaged water, these programs could serve as an incentive to participation in other programs (for example, a drought response rotational fallowing agreement).
4. Existing infrastructure may not be strategically designed or constructed. In making improvements, opportunities may exist to combine or improve conveyance networks, beyond simply lining or replacement with pipe.
5. Efforts to highlight benefits of conveyance improvements (for example, lower maintenance, improved efficiency, and productivity) can help to make others more receptive to programs.
6. Funding. The new farm bill (the Agricultural Act of 2014) allows districts to apply to the Environmental Quality Incentives Program (EQIP), whereas in the past, the program was limited to individual producers.
7. Funding. Additional incentives will ultimately make projects/programs more welcome (for example, Coachella Valley Water District [CVWD]) final canal lining was completed at no cost to the district).

4E.1.2 Hypothetical Example 2 – Agriculture Seeking to Improve Productivity and/or Reduce Operational Costs

By contrast, geography is not a major issue facing districts or growers wishing to improve their conveyance infrastructure. Funding and motivation tend to be larger hurdles in this case. Although benefits of conveyance improvements include increased reliability, reduced operational/maintenance costs, and higher productivity, this may not be sufficient motivation, particularly when coupled with available funding assistance.

Similar to the environmental considerations discussed earlier, improvements for within-district benefits are also likely to face environmental mitigation requirements for reduced seepage that had been supporting wetlands. These processes (for example, NEPA or the Endangered Species Act) can be cumbersome at times, further adding to project complexity. Mitigation in some form is often also required to ensure that canal/ditch lining or other activities do not adversely impact a downstream user's ability to divert and beneficially use water.

The planning and administration of a project likely comes with potential obstacles. While an "in-district" project likely has fewer layers of involved parties, most still require significant coordination. Challenges may arise with regard to planned improvements, specifically when they include changes to the existing paradigm (for example, the consolidation or moving of ditches/canals can be contentious among growers within a district). As noted, clear expectations and solid technical grounding at the onset of such an endeavor have been effective at mitigating these potential challenges.

Major Challenges Identified

1. Funding. Without ample program funding, participation will be limited.
2. Benefits. Within the hydrologic basin, conveyance improvements do not offer substantial salvaged water.
3. Benefits. There are legal hurdles to ensure benefits accrue to the intended user/resource (for example, instream benefits or water for water bank).
4. Attitudes. It is difficult to change institutional practices, particularly in the Upper Basin where agriculture does not tend to be particularly water limited.
5. Environmental impacts. The NEPA process can be viewed as a hindrance due to its involved nature.
6. Measurement/quantification of benefits. The salvaged water volume can be contentious.
7. Management and coordination. Particularly on large projects, with several entities involved, both construction and implementation management can be challenging.
8. Legal. While out of Basin conveyance improvements offer a large potential benefit, the legal treatment of trans-basin water (such as in

Colorado) may reduce the support for participation in such a program.

9. Other limitations. In highly apportioned basins, such as the Arkansas, with a compact obligation, conveyance seepage and other losses may be heavily relied on (such as for groundwater pumping).

Potential Opportunities/Elements for Success

1. Project management and construction should be through a pre-agreed-upon framework.
2. Salvaged water and/or benefits should be well quantified and agreed upon by all parties in advance.
3. Where conveyance improvements may not yield significant salvaged water, these programs could serve as an incentive to participation in other programs (for example, a drought response rotational fallowing agreement).
4. Existing infrastructure may not be strategically designed or constructed. In making improvements, opportunities may exist to combine or improve conveyance networks, beyond simply lining or replacement with pipe.
5. Efforts to highlight benefits of conveyance improvements (for example, lower maintenance and improved efficiency and productivity) can help to make others more receptive to programs.
6. Funding. The Agricultural Act of 2014 allows districts to apply to EQIP, whereas in the past, the program was limited to individual producers.
7. Funding. Additional incentives will ultimately make projects/programs more welcome. For example, CVWD final canal lining was completed at no cost to the district.

4E.1.3 Hypothetical Example 3 – Nongovernmental Organizations Seeking to Secure Water for Instream Purposes

Many NGOs are working in the Colorado River Basin whose interests may include securing water for environmental and or recreational purposes. Additionally, activities related to conveyance improvements can target other outcomes such as reduced fish entrainment through upgrades to infrastructure such as head gates. Most of the challenges facing an NGO are common with one or both of the previously discussed scenarios. However, some new challenges and nuances do exist.

Geographic considerations are certainly important if instream benefits are desired for a particular river reach. The ability to physically get water to the reach of interest is crucial to a project's success. Additionally, the same within and out of hydrologic basin considerations discussed earlier may have implications for securing instream flows. However, some legal/policy avenues have been suggested to address this challenge, particularly within the hydrologic basin. The basic premise is that if some activity were to reduce a within basin diversion need, seepage/return flows would be protected instream until reaching the downstream user with rights to beneficially use that water. This is not the case currently and serves to highlight another challenge, which is the protection of instream flows such that they reach and benefit the intended area. These types of legal hurdles are often one of the biggest challenges facing a potential program or project.

In addition to the challenges discussed above, funding is a major consideration in the scope and ability to develop such activities.

Major Challenges Identified

1. Funding. Without ample program funding, participation will be limited.
2. Benefits. Within the hydrologic basin, conveyance improvements do not offer substantial salvaged water.
3. Benefits. There are legal hurdles to ensure benefits accrue to the intended user/resource (for example, instream benefits or water for a water bank).
4. Attitudes. It is difficult to change institutional practices, particularly in the Upper Basin where agriculture does not tend to be particularly water limited.
5. Environmental impacts. The NEPA process can be viewed as a hindrance due to its involved nature.
6. Measurement/quantification of benefits. The salvaged water volume can be contentious.

7. Management and coordination. Particularly on large projects, with several entities involved, both construction and implementation management can be challenging.
8. Legal. While out of basin conveyance improvements offer a large potential benefit, the legal treatment of trans-basin water (for example, in Colorado) may reduce the appetite for participation in such a program.
9. Other limitations. In highly apportioned basins, such as the Arkansas, with a compact obligation, conveyance seepage and other losses may be heavily relied on (such as for groundwater pumping).

Potential Opportunities/Elements for Success

1. Project management and construction should be through a pre-agreed-upon framework.
2. Salvaged water and/or benefits should be well quantified and agreed upon by all parties in advance.
3. Where conveyance improvements may not yield significant salvaged water, these programs could serve as an incentive to participation in other programs (for example, a drought response rotational fallowing agreement).
4. Existing infrastructure may not be strategically designed or constructed. In making improvements, opportunities may exist to combine or improve conveyance networks, beyond simply lining or replacement with pipe.
5. Efforts to highlight benefits of conveyance improvements (for example, lower maintenance, improved efficiency, and productivity) can help to make others more receptive to programs.
6. Funding. The Agricultural Act of 2014 allows districts to apply to EQIP, whereas in the past, the program was limited to individual producers.
7. Funding. Additional incentives will ultimately make projects/programs more welcome. For example, CVWD final canal lining was completed at no cost to the district.

4E.2 Consumptive Use Reduction Sub-Team – Hypothetical Program Scoping

4E.2.1 Components of Hypothetical Example 1 – Deficit Irrigation

This example results in the development of a program that systematically encourages deficit irrigation through education and funding. This program intends to maximize sales per unit of water. Producers would enroll voluntarily and be compensated for loss of sales. The program would be widely distributed with limits on the number of participants in a given area. In addition, long-term crop and soil health would be considered.

The program would have good potential for quantifiable water savings, but baseline consumptive use needs to be quantified. Use of calculated potential crop evapotranspiration may lead to overestimation of saved water. Therefore, a method to assess actual evapotranspiration is required. Likewise, monitoring savings and yield over time as well as crop and soil health will be required. It is necessary to establish the variability or range of consumptive use values for a given scenario so that safety factors can be established to avoid overestimating savings.

Components of Hypothetical 1

1. Grass hay and alfalfa growers are diverting from the Colorado River.
2. Irrigation systems are predominantly gated pipe, siphon tubes, and corrugations, and a fair percentage are under overhead sprinkler on alfalfa; check dams with wild flooding and growing use of gated pipe on pasture.
3. Current irrigation efficiencies range from 35 to 70 percent.
4. Alfalfa growers will:
   - Irrigate for the first cutting only, then forego all irrigation for the remainder of the season.
   - Irrigate through the second cutting, then forego all irrigation for the remainder of the season.
5. Grass hay growers will irrigate for the first cutting only or once in the early season for grazed pasture,

then forego all irrigation for the remainder of the season, particularly at lower elevations.

6. There is potential to store saved consumptive use in reservoirs to re-time water to meet late-season needs or to directly lease saved water to meet other needs, including agriculture.

Major Challenges to Consider

1. Funding – what are the production economics and costs that must be included?
2. Producer time, interest, capacity – is deficit irrigation worth it for producers?
3. Impacts on productivity – how much yield is lost on average and during wet and dry years? Stressed crops are more susceptible to insect and disease pests.
4. Impacts on individual growers, including secondary field impacts (such as increased weeds), soil health, and salt accumulation.
5. Third-party and/or community impacts.
6. Environmental impacts – reduced leaching and runoff is positive; loss of wetlands may be negative.
7. Irrigation District impacts – district assessments must be maintained; operational issues for non-participating producers; "last man on the lateral."
8. Measurement/quantification of savings – issues with sub-irrigation; evapotranspiration from precipitation.
9. Persistence of consumptive use savings.
10. Legal and contractual.

Potential Opportunities/Elements for Success

1. Funding – examine impacts to producers in total net sales as well as potential third-party impacts.
2. Producer time, interest, capacity – provide educational programs and/or pilots to demonstrate process. Set incentives that are appropriate for both production loss and overall investment.
3. Impacts on productivity – include ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable.
4. Impacts on individual growers, including secondary field impacts (such as increased weeds), limit the number of growers that can participate in a given area to reduce local economic impacts. Include ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable.
5. Third-party and/or community impacts – include economic studies to estimate potential impacts. Set-up community funds as needed to mitigate impacts.
6. Environmental impacts – enact program in the context of the local system, considering potential positive and negative environmental impacts.
7. Irrigation District impacts – include economic studies to estimate potential impacts. Set up community funds as needed to mitigate impacts. Limit the number of growers who can participate in a given area to reduce local economic impacts.
8. Measurement/quantification of savings – issues with sub-irrigation; evapotranspiration from precipitation.
9. Persistence of consumptive use savings – include ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable.
10. Legal and contractual – examine specific local requirements and design programs within this framework.

Questions for Further Investigation

1. Practices along the full spectrum from regulated deficit irrigation to full season, temporary fallowing will likely need to be considered until many quantification, economic, and agronomic questions have been answered. Fallowing in the Upper Basin should also be explored. Can appropriate contractual forms be developed to provide certainty to all parties in a water bank or deficit irrigation/temporary fallowing water sharing program?
2. How can improvements in irrigation efficiency be connected to a water bank/fallowing/deficit irrigation program? That is, the challenge that individual participants create for water delivery at

the ditch company level could be addressed with more efficient conveyance and accounting.

3. What is the suite of agricultural best management practices that can reduce short- and long-term impacts associated with fallowing/deficit irrigation (for example, soil health, cover cropping, or minimum till)? How can these practices be used to maximize soil health and improve long-term agricultural viability?

4E.2.2 Components of Hypothetical Example 2 – Fallowing

This example results in the development of a program that systematically encourages temporary fallowing through education and funding. This program intends to consistently and effectively reduce overall water use while minimizing impacts to individual producers and communities. Producers would enroll voluntarily and be compensated for loss of sales. The program would be widely distributed with limits on the number of participants in a given area.

The program would have good potential for quantifiable water savings, but baseline consumptive use must be quantified. Because the use of calculated potential crop evapotranspiration may lead to overestimation of saved water, a method to assess actual evapotranspiration is required. Likewise, monitoring savings, yield over time, and crop and soil health will be required. It is necessary to establish the variability or range of consumptive use numbers for a given scenario so that safety factors can be established to avoid overestimating savings.

The return flow issue must be evaluated, and carriage losses must also be considered. Savings may not be 1 for 1; that is, 25 percent land fallowed may not yield 25 percent of consumptively used water. All lands are not equally productive, and farmers tend to set aside their least productive lands.

Weed and pest management, soil erosion, and dust management on fallowed lands must be considered. District assessments must be maintained to protect district interests and capacity. Regular maintenance of best management practices is critical to success.

Components of Hypothetical 2

1. Crop rotation includes field crops, vegetables, and perennial crops.
2. Irrigation system is predominantly gated pipe and level basins.
3. Current irrigation efficiencies range from 50 to 65 percent.
4. Twenty-five percent of irrigated lands within the district will be left idle for the entire year (either entire fields or some fraction thereof).
5. Crops may be produced on fallowed fields in subsequent years.
6. Saved consumptive use will be available for other uses, including agriculture.

Major Challenges to Consider

1. Program funding
2. Impacts on productivity – yield and economics must be evaluated; production after fallowing.
3. Impacts on individual growers.
4. Third-party and/or community impacts – Public perception is paramount. The politics can change during a conservation program.
5. Environmental impacts.
6. Irrigation District impacts.
7. Measurement/quantification of benefits.
8. Persistence of consumptive use savings.
9. Legal.

Potential Opportunities/Elements for Success

1. Funding – examine impacts to producers in total net sales as well as potential third-party impacts.
2. Impacts on productivity – include ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable.
3. Impacts on individual growers, including secondary field impacts (such as increased weeds), limit the number of growers that can participate in a given area to reduce local economic impacts. Include ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable. Provide tools and education for enacting best management practices to control weeds, pests, and dust.

4. Third-party and/or community impacts – include economic studies to estimate potential impacts. Set up community funds as needed to mitigate impacts. Provide public education so that impacts and mitigation are fully understood.
5. Environmental impacts – enact program in the context of the local system, considering potential positive and negative environmental impacts.
6. Irrigation District impacts – include economic studies to estimate potential impacts. Set up community funds as needed to mitigate impacts. Limit the number of growers who can participate in a given area to reduce local economic impacts.
7. Measurement/quantification of savings – issues with sub-irrigation; evapotranspiration from precipitation.
8. Persistence of consumptive use savings includes ongoing metering, measuring, and study of impacts so that the program can be adjusted over time to be sustainable.
9. Legal and contractual – examine specific local requirements and design programs within this framework.

Questions for Further Investigation

1. Have we evaluated all relevant scientific studies related to fallowing?
2. What are the positives and negatives in terms of socioeconomic impacts?
3. What is the business deal that works for farmers, holistically considering not just sales, but soil and crop health, long-term sustainability, and broader socioeconomic impacts?

4E.3 On-Farm Efficiency Improvements Sub-Team – Hypothetical Program Scoping

This example involves completing on-farm efficiency increases primarily through changes in irrigation methods to a farm in the Upper Basin. For farms in the hydrologic basin, it is likely that no transferable water savings will occur. However, if diversions are reduced, benefits associated with efficiencies could arise, such as increased production, improved environmental flows, and improved water quality. If water is scheduled for delivery from a reservoir or if the farm is outside of the hydrologic basin, there may be opportunities for moving the water to other users or storing the water for future use.

All practices will have costs including increased management and labor in the case of irrigation scheduling and monitoring. Cost sharing is important to producer adoption and buy-in. Any savings must be monitored and verified over time to ensure savings are maintained.

4E.3.1 Components of Hypothetical Example 1

1. Ditch company in the Upper Basin is diverting water from a tributary to the Colorado River.
2. Crop rotation primarily includes alfalfa, field corn, grass pasture, and spring grains.
3. Irrigation systems are predominantly siphon tubes and furrows on row crops, corrugations and tubes on alfalfa, and check dams with wild flooding on pasture.
4. Current irrigation efficiencies range from 30 to 60 percent.
5. On-farm efficiency improvements include converting to sprinkler and drip irrigation, irrigation scheduling using soil moisture monitoring and evapotranspiration data, installing pressurized pipe, and land leveling.
6. Crop consumptive use will not be reduced under these examples, but irrigation efficiencies will increase from 60 to 85 percent. In fields where irrigation uniformity is significantly improved, it is likely that crop consumptive use will increase.

Major Challenges Will Be Case-Specific, but Generally:

1. Funding support for practices will likely be needed. EQIP and other programs needed.
2. Producer time, interest, and capacity may be challenged initially to upgrade irrigation systems.
3. Impacts on productivity should be positive as greater uniformity and reduced leaching occur. Soil health may be improved.

4. Impacts on individual growers should be positive because improved irrigation systems may result in labor savings and more flexibility.
5. Environmental impacts should be positive in cases where leaching and surface runoff are reduced; however, irrigation-created wetlands may be lost or diminished.
6. Irrigation District operations may be impacted by reduced return flows.
7. Measurement/quantification of benefits is a significant challenge that must be addressed.
8. Persistence of water savings created by increased efficiency is likely where systems are upgraded but could slip where based on improved management such as for irrigation scheduling.
9. Legal barriers include lack of clarity in state laws about short- or long-term transferability of water saved through efficiency.

Potential Opportunities/Elements for Success

Producers can benefit if economic incentives are in place to fund or reward practices – labor savings, improved productivity, and potential for extending water later in the season. It is not clear that there are many situations where transferable water will be obtained through increased irrigation efficiency, but reduced diversion and subsequent environmental or recreational flows are a possibility.

Questions for Further Investigation

1. What are the optimal governance arrangements at the local, state, and federal levels to incentivize increased irrigation efficiencies to produce measurable savings?
2. What are the costs and benefits of efficiency measures?
3. What are the best methods to achieve producer adoption of practices?
4. How are efficiency programs targeted to get the most bang for the buck?

4E.3.2 Components of Hypothetical Example 2

This example involves completing on-farm efficiency increases, primarily through changes in irrigation methods to a farm in the Lower Basin. For farms in the hydrologic basin, it is likely that no transferable water savings will occur. However, if diversions are reduced, benefits associated with efficiencies could arise, such as increased production, improved environmental flows, and improved water quality. If water is scheduled for delivery from a reservoir or if the farm is outside of the hydrologic basin, there may be opportunities for moving the water to other users.

Water can be saved but in some cases difficult to transfer out of the system. Outcomes will depend on the individual system/district; many Lower Basin farms have already installed many of these practices and the efficiency savings have been achieved. Many of these practices were installed to achieve crop timing and quality demanded by market. While some areas of the Lower Basin operate efficiently, in other cases mitigation for sandy soils cannot occur where efficiencies are lower. Salinity management must be maintained.

1. Irrigation District in Lower Basin is diverting from the Colorado River.
2. Crop rotation includes alfalfa, field corn, cotton, vegetable crops, and spring grains.
3. Irrigation system is predominantly gated pipe and level basins.
4. Current irrigation efficiencies range from 50 to 65 percent.
5. On-farm efficiency improvements include conversion of surface irrigation to pressurized sprinkler and drip irrigation, irrigation scheduling with soil moisture monitoring and evapotranspiration data, improving surface irrigation through tail water recovery, land leveling, and field reconfiguring to enhance application efficiency and uniformity.
6. Irrigation efficiencies will be increased from 75 to 85 percent through these measures but crop consumptive use will not be reduced.

Major Challenges

1. Funding
2. Producer time, interest, and capacity
3. Impacts on productivity
4. Impacts on individual growers
5. Environmental impacts

6. Irrigation District impacts
7. Measurement/quantification of benefits
8. Persistence of savings
9. Legal

Potential Opportunities/Elements for Success

Producers who have not already maximized efficiency can benefit if economic incentives are in place to fund or reward practices; these incentives could include labor savings, improved productivity, and potential for extending water later in the season. Legal consideration associated with any potential transfer of saved water is critical to program success.

Questions for Further Investigation

1. Uniform standards for determining efficiency on various farms and systems are needed.
2. Details on what saved water can be transferred under what situations.

4E.4 Transfers Sub-Team – Hypothetical Program Scoping

4E.4.1 Hypothetical Example 1

This example involves a community-run water bank on a local and/or regional scale (that is, not basin-wide). In exchange for compensation, farmers voluntarily and temporarily transfer water into a water bank for use by any local entity, such as agricultural users, municipal and industrial, and environmental. Funds from water purchases are managed by the community and invested back into the community to offset the economic impacts from the reduction of agriculture. A community fund based on an economic analysis would likely be required to start a community program.

Components of Hypothetical Example 1 (Local and/or Regional Scale)

1. Compensation is provided to farmers who voluntary allow their land to remain fallow to free up water for other uses within the region.
2. Economic studies are developed to help estimate appropriate compensation.
3. Niche crops such as intermediate crops in rotations are targeted.
4. Other water users may temporarily forego water usage in exchange for same payment.
5. Water rights are not permanently transferred.
6. Water is potentially stored as non-system water to allow for re-timing of deliveries or long-term reserve for drought use.
7. Transfers are recipient neutral. Anyone may purchase water from the bank. Combined with source-neutrality, this set-up facilitates many types of transfers: agriculture to urban, agriculture to agriculture, agriculture to environment, urban to agriculture, and urban to environment.
8. Water purchases are limited to local or regional entities.
9. Community fund is set up. The agricultural community would be directly involved in decisions on how to spend money. Money in excess of that paid to farmers or other depositors to the bank would be reserved for job creation and community development programs to offset the effects of reduction of agriculture in basin.

Major Challenges/Solutions Will Be Case-Specific, but in General:

1. Reliability of Supply – If transfer to urban, reliability of supply may be an issue due to the voluntary and temporary nature of transfers.
2. Education/community involvement – All parties need to understand the impacts as well as the costs and benefits (for example, not viewing agriculture as a "reservoir" or recognizing limitations). Urban stakeholders need to understand the local and/or regional impact of transfers to the agricultural community, including secondary and tertiary effects (for example, car dealerships, implement dealers, and economy of area).
3. Governance – Operations and effectiveness are impeded when too many stakeholders are engaged in decision making.
4. Economics – Recognizing the potential impact to communities, examining economic impacts, and designing an appropriate community/economic development fund.

Potential Opportunities/Elements for Success

1. Reliability of Supply – Look at long-term programs but limit calls to individual farmers. Depending on community acceptance and legal issues, consider permanent transfers.
2. Education/community involvement – Provide framework for community input and involvement.
3. Governance – Streamline organization; define oversight but have one agency and/or group in charge of day-to-day decision making.
4. Economics – Advance economic studies and/or model after existing community programs to estimate appropriate funding or programs.

Questions for Further Investigation

1. Best management practices for governance
2. Components of education program
3. Scope and scale of economic studies
4. Catalog of local/regional legal requirements

4E.4.2 Hypothetical Example 2

In this example, federal funding and matching local funds are used to compensate farmers who volunteer to temporarily transfer saved water without giving up water rights. Land is fallowed on a rotating basis, with multiple parties involved, allowing for a new long-term urban supply and a supplemental supply that could be purchased on an annual basis by any water user.

Components of Hypothetical Example 2 (Basin Scale)

1. A regional program for transferring water from agricultural areas to urban areas is established.
2. Federal pilot program is started and expanded where successful. Historically the federal government has brought together potential funding partners.
3. Open offers to exchange a defined amount of money for a defined quantity of transferred water are allowed.
4. Funding could be split 50-50 between federal funds and water recipients.
5. A basin-scale framework is set up for local and regional transfers and for system water savings.
6. Water generated is considered "system water" not targeted for a specific entity.
7. The U.S. Department of Agriculture could be a primary partner and advise on which crops are in surplus and which crops are in short supply. Focus on the surplus crops.
8. Regional committees set up to consider broader economic impacts of shifting water to urban areas.
9. Long-term supply is created for interested urban areas.

Major Challenges to Consider

1. Legal – Legal frameworks vary throughout the basin area.
2. Reliability of Supply – If transfer to urban, reliability of supply may be an issue. Can a basin-wide program facilitate local/regional transfers?
3. Education/community involvement – All parties need to understand the impacts as well as the costs and benefits (for example, not viewing agriculture as a "reservoir" or recognizing limitations).
4. Governance – Operations and effectiveness are impeded when too many stakeholders are engaged in decision making. Federal program may have additional limitations, such as NEPA or cost share.
5. Economics – Recognizing the potential impact to communities, examining economic impacts, and designing an appropriate community/economic development fund.

Potential Opportunities/Elements for Success

1. Legal – Develop a large-scale flexible program to accommodate regional differences.
2. Reliability of Supply – Look at long-term programs but limit calls to individual farmers (for example, rotate participation so as to not encourage permanent dry up). Depending on community acceptance and legal issues, consider permanent transfers.
3. Education/community involvement – Provide framework for community input and involvement. Possibly fund basin-wide education program.
4. Governance – Streamline organization; define oversight but have one agency and/or group in charge of day-to-day decision making. Develop federal program to allow for day-to-day decision making.

5. Economics – Advance economic studies and/or model after existing community programs to estimate appropriate funding or programs.

Questions for Further Investigation

1. Federal or basin-wide pilot program
2. Economic studies
3. Catalog of local/regional legal requirements