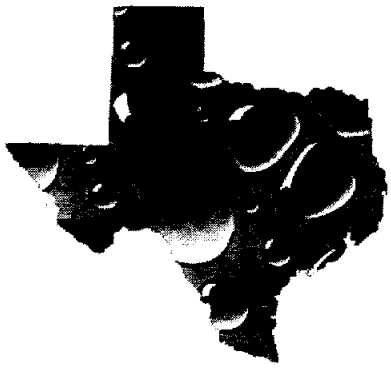

TRANS-TEXAS WATER PROGRAM

SOUTHEAST AREA

Planning Memoranda

Equity Issues Related to Water Transfers

Southeast Area

January 16, 1998

Sabine River Authority of Texas
Lower Neches Valley Authority
San Jacinto River Authority
City of Houston
Brazos River Authority
Texas Water Development Board

Preface

This document is a product of the Trans-Texas Water Program: Southeast Area. The program's mission is to propose the best economically and environmentally beneficial methods to meet water needs in Texas for the long term. The program's three planning areas are the Southeast Area, which includes the Houston-Galveston metropolitan area, the South-Central Area (including Corpus Christi) and the West-Central Area (including San Antonio).

The Southeast Area of the Trans-Texas Water Program draws perspectives from many organizations and citizens. The Policy Management Committee and its Southeast Area subcommittee guide the program; the Southeast Area Technical Advisory Committee serves as program advisor. Local sponsors are the Sabine River Authority of Texas, the Lower Neches Valley Authority, the San Jacinto River Authority, the City of Houston and the Brazos River Authority.

The Texas Water Development Board is the lead Texas agency for the Trans-Texas Water Program. The Board, along with the Texas Natural Resource Conservation Commission, the Texas Parks & Wildlife Department and the Texas General Land Office, set goals and policies for the program pertaining to water resources management and are members of the Policy Management Committee.

This is the final version of this document.

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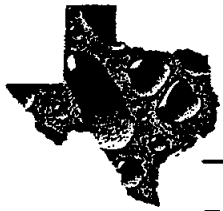


Executive Summary

Texas surface waters are owned by the State. Individuals or organizations are granted the right to divert and use the State's water through a permitting process. Permitted water rights holders may sell all or part of their water supply -- a transaction between a buyer and seller. Issues exist relative to the equity interests of parties not involved in such a transaction as either buyer or seller.

This study examines equity issues related to a major transfer of water from the Sabine Basin. Two major types of issues were identified for the southeast area: environmental impacts and "our water" basin of origin concerns. The amount of information needed to resolve uncertainties surrounding the first issue and the involvement of a number of third-party interests in both issues dictate that a long lead time will be necessary for any transfer. The basic approach recommended for accomplishing water transfers in southeast Texas is *informed negotiation with compensation and mitigation for impacts.*

Conclusions

1. The lack of accepted information in areas such as environmental impacts and future economic development restricts the potential for arriving at solutions. Uncertainties lead people to assume the worst case.

2. Identifying and including all affected parties, and potentially affected parties, at the beginning of the water transfer process is critical. Time and money are required to communicate with the many interests, but there is no substitute for broad-based acceptance of a major water project.

3. The water marketplace no longer consists only of a willing buyer and seller. Today's market includes third party interests; large scale water transfers will have to reflect full cost pricing with regard to this "larger" marketplace.

4. Litigation is useful only as an incentive to come to, and remain at, the negotiation table or as a last resort for parties who have not been included in the process.

5. A role for federal and/or state government agencies may be necessary to resolve the regional conflicts inherent in interbasin transfer projects.

Recommendations for the Southeast Study Area

1. The State of Texas should take the lead in identifying and supporting a planning entity to undertake the information gathering programs needed for decision-making on water transfers from the Sabine River basin. The role suggested is similar to that already taken by the State in programs such as Clean Rivers (watershed), the National Estuary Program (bays and estuaries), and Regional Water Planning (defined regions) under Senate Bill-1.

2. Once acceptable information is assembled, involved parties should enter into negotiation seeking a solution that will recognize the full cost of a water transfer. The agreement eventually reached may require legislation at the state or federal levels, intergovernmental agreements or executive orders,

mitigation activities, and/or compensation payments or programs for the Sabine basin, depending on the project defined and the specific needs and impacts identified.

1. Introduction

The term equity encompasses both notions of fairness and of ownership. In the arena of water supply planning, these notions come to the forefront especially when considering transfers of water or of water rights.

In Texas, surface waters are owned by the State, and individuals or organizations are granted water rights to permit diversion and use of the State's waters. To promote economic well-being, the State also has participated in development projects to store or convey water for use. At the same time, the State acts as trustee for the protection of wildlife and habitat that are common property resources of the public. All of these roles give the general citizenry some ownership, or a "stake", in the outcome of decisions about the use of water.

Those who live within a river basin often take a proprietary interest in the water resources of that basin. Basin residents also have a particular concern about the impacts resulting from changes in the water resources within the watershed.

In the most simple case, water transfer decisions are made by two parties: the buyer and the seller or the permitter and the permittee. Basin residents or others in the general public who have a particular interest, such as environmental or economic development concerns, are not usually involved in the decision. Equity issues, and conflicts, arise when these "third" parties are affected by a water transfer but have no voice in the decision.

The purpose of this report is to suggest an approach or framework for avoiding or resolving conflicts over equity issues related to potential water transfers in the Southeast Area. The major techniques available for resolving conflicts over water transfers in the U.S. are presented. To aid in developing the framework, case studies of existing major water transfers in the U.S., particularly in the West, were examined for lessons they may hold about methods that have been tried by others. The issues illustrated in these cases were presented and discussed with local government officials from the Southeast Texas region in a task force formed to advise the study team. Their comments were then considered in developing a recommended framework to address equity issues.

1.1. TTWP Background

The Trans-Texas Water Program (TTWP) has examined ways to meet the long range water needs of the Southeast Texas area (see Figure 1). The Southeast region has an urban area on the eastern side (Beaumont/Port Arthur/Orange) and a more populous urban area on the western side (Houston-Galveston). The Houston-Galveston area is located in the San Jacinto, Trinity and Brazos river basins. The Beaumont, Port Arthur, Orange area is in the Neches and Sabine basins. The Sabine River and Sabine Lake form the border between Texas and Louisiana. (Both the Sabine and Neches rivers provide inflows to Sabine Lake.) The Sabine River Compact provides that water in the shared reach of the Sabine River is owned 50% by Texas and 50% by Louisiana. Both states participated in building Toledo Bend Reservoir, the yield of which also is owned 50-50 by Texas and Louisiana.

1.2. TTWP Findings

Water availability studies and consensus water demand projections indicate that the Houston

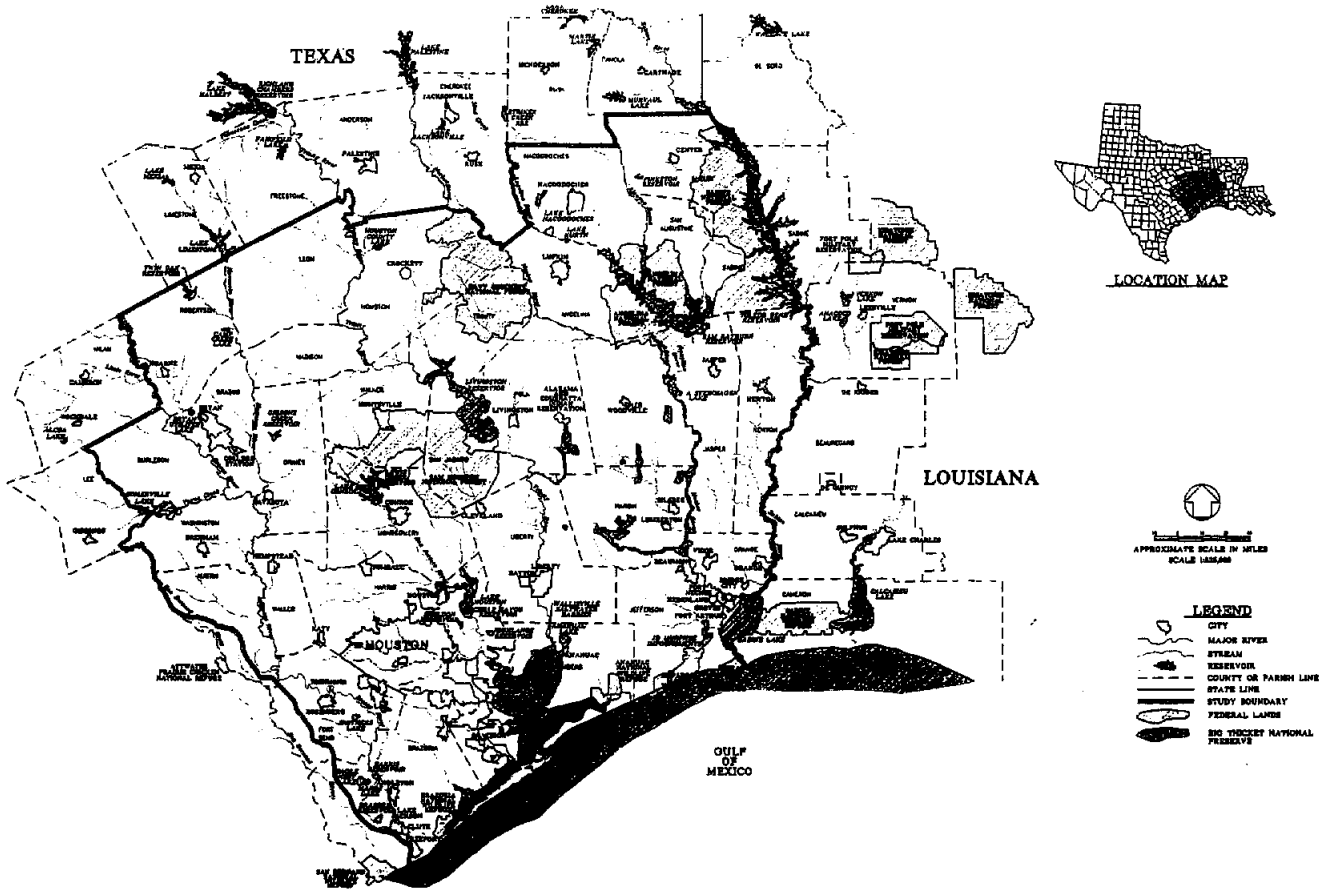


Figure 1 Trans-Texas Water Program Southeast Study Area.

area (San Jacinto, Trinity, and Brazos basins) will need additional supplies to meet 2050 demand. The lower Sabine basin, and specifically Toledo Bend Reservoir, is projected to have supplies not needed within the lower basin through 2050. Within the state, the San Antonio area, west of the Southeast Area, is expected to need additional water supplies earlier than the Houston area. The TTWP Southeast Area study used two scenarios [300 million gallons per day (mgd) and 600 mgd] for interbasin transfer of water from the east (Sabine basin) to the west (Houston or San Antonio) among the alternative strategies considered for meeting water needs. Although many interbasin transfers exist in Texas, either of these scenarios (300 mgd or 600 mgd) represents a major effort that would be undertaken in circumstances that differ significantly from existing water transfers. TTWP management recognized that representation of a wide range of interests would be required in the study process.

During Phase I, public input was achieved by establishing a Technical Advisory Committee (TAC) of approximately 50 representatives of parties interested in water planning in the Southeast Area. An "enhanced public participation" effort also was initiated to identify and interview other interests who might not be represented on the TAC. As the interviews progressed, the size of the TAC doubled. A number of specific concerns of residents in the

basin of origin were identified from the public participation effort, but two major issues emerged that need to be addressed by any transfer of water in the Southeast Area: (1) environmental impacts, particularly to Sabine Lake, and (2) the "our water" position of basin residents.

Noteworthy in conjunction with the environmental impacts issue is the fact that environmental water needs of basins, bays and estuaries have not been quantified. Therefore, they are not included in the calculated demands for state water planning. Only minimum flows necessary for maintenance of instream water quality are incorporated in current diversion permits from the State of Texas.

Additionally, there are a number of uncertainties and unknowns about the ecological impacts of major transfers on Sabine Lake. During Phase II, TTWP and many partners and scientific contributors held a Sabine Lake Conference in September 1996 to compile existing information on Sabine Lake and to identify specific interests and areas of concern. One environmental concern discussed at the Conference is freshwater flows to the Louisiana marshes, including a federal wildlife refuge, on the eastern shore of Sabine Lake. Because of the federal role in the Sabine River Compact, the Louisiana Coastal Zone Management Program, and the Texas Coastal Management Program, federal agency interest in this issue of freshwater flows between the two states is increased.

The "our water" issue has both present compensation and future opportunities dimensions. Although surface water is owned by the State, residents of the Beaumont/Port Arthur/Orange areas consider themselves as the rightful owners of the waters of the Neches and Sabine basins. (Rights to Texas' share of water in Toledo Bend Reservoir are held by the Sabine River Authority of Texas.) These areas view the "excess" supply in the Sabine basin both as a commodity for which they should receive payment in any transfer and as an asset that will reap economic development benefits in the future. When considering transfers outside the Southeast Study Area, residents of the Houston-Galveston area also consider available water in the Southeast area as "our water."

1.3 Addressing Equity Issues in the Southeast Area

Specific equity issues and third party interests exist relative to specific water transfer projects. For a study such as the TTWP, interests have been identified based on planning scenarios, and are very preliminary. Nevertheless, based on information from the TAC and interviews, third party interests that can be expected in water transfers from the Sabine basin include:

- local governments (as representatives of basin residents, as proponents of basin economic development, as protectors of local quality of life)
- chambers of commerce and economic development organizations (with concerns about water as an asset to attract growth and business)
- environmental groups, State and federal natural resource agencies, sport and commercial fishers (with concerns for instream flows, inflows to Sabine Lake, fresh water for coastal marshes, effects on water quality)
- agricultural interests (with concerns about being "out-bid" for water)
- recreational fishers and marinas around Toledo Bend Reservoir (with concerns about water levels in the Reservoir)

- State of Louisiana (with concerns about fresh water to Louisiana marshes and concerns about continued availability of water for use by communities and industry in Louisiana)
- Federal government (with concerns about any transfer route that might impact the Big Thicket National Preserve or national forests or wildlife refuges)

The South East Texas Regional Planning Commission convened a task force of local government representatives from the eastern part of the study area to consider issues raised during Trans-Texas planning. Members represented water districts, river authorities, school districts, counties, and cities. A representative of the neighboring regional planning agency in Louisiana also attended. At two meetings held in 1997, the TTWP study team discussed information with the task force on topics covered in this report: lessons from case studies of water transfers and techniques for resolving conflicts and for achieving representation of third party interests.

In a discussion of possible forms of compensation for a water transfer, South East Texas Equity Task Force members mentioned participation in funding a Neches Salt Water Barrier, as well as flood control/ recreation/water supply reservoir and wastewater projects. Infrastructure projects that could be investigated as potential compensation include previously planned water supply reservoirs in the Neches and Sabine Basins: Waters Bluff, Big Sandy and Carthage reservoirs in the Sabine Basin and Ponta, Weches, Rockland and Eastex in the Neches Basin (Texas Water Plan, 1985) and the U.S. Bureau of Reclamation's Bon Wier Flood Control Reservoir in the lower Sabine Basin. Compensation issues may also include efforts to induce growth to the water-rich areas of Texas, a joint air pollution control planning and implementation process and a joint Houston-Golden Triangle economic development/ marketing program. These concerns and suggestions will be revisited in the concluding section of this report.

1.4. Regional Water Planning

Major water planning legislation (Senate Bill 1) from the 1997 session of the state legislature created a regional water planning approach to state water planning in Texas. As a result, TTWP studies will not select preferred alternatives for meeting long range water needs. However, all of the TTWP studies relating to technical alternatives for the Southeast Area (including the one which pertains to interbasin transfer) will be available to regional planning under SB-1. The legislation recognizes third party interests in water planning and mandates a balancing of interests in interbasin transfers. SB-1 also provides that interbasin transfer applications can include compensation and mitigation to the basin of origin (Section 2.08). This provision gave transfer applicants a means to internalize these project costs.

2. Resolving Conflicts over Water Projects

When Mark Twain wrote "whiskey is for drinkin' and water is for fightin'" he must have had in mind the transfer of water from one basin to another. In almost all cases, such transfers involve a dispute between those in the basin of origin and the receiving area over the issue of compensation. How much is the water worth? What costs are incurred in the basin of origin? Are all the effects of the transfer being considered? Are there indirect costs that should be paid? What methods can be used to settle the issue of basin of origin equity?

There are four broad mechanisms for resolving water disputes, including issues of equity: legislation, litigation, water markets, and negotiation/mediation. These mechanisms are not mutually exclusive. The resolution of conflicts over water transfers usually requires the application of more than one technique.

2.1 Legislation

Water transfers and compensation schemes can be directly enacted by state legislatures. Current Texas law allows interbasin transfers of water, as does water law generally in the western U.S. In fact, there is a substantial reliance on water transfers in Texas to meet the needs of various parts of the state. Over 80 transfers are currently in effect in Texas including transfers from the Sabine River to Dallas, Trinity River to Houston and Navidad/Lavaca Rivers to Corpus Christi.

Equity issues also can be resolved by federal legislative action since the Sabine River Compact Commission is interstate, including representatives of both Texas and Louisiana. In this case, Congress has the Constitutional authority to resolve interstate water conflicts through the enactment of legislation. Thus, a resolution to claims would be either through direct Congressional apportionment (as with the current Compact apportionment) or through Congressional delegation of authority to the executive branch.

Among factors favoring a state or federal legislative approach to resolving conflicts are the complexity of water issues, the inconsistency of positions by different agencies and interest groups, the need for a watershed approach (crossing jurisdictional boundaries) to water management and the inability of parties to resolve such conflicts. On the negative side, a legislative process usually is lengthy. This is particularly the case in Texas where the legislature meets only every other year. Another possible negative is that a legislative approach is necessarily political and has an uncertain outcome.

2.2 Litigation

The courts, both state and local, have always been a place to resolve water disputes in an adversarial situation. Whether at the local, state, or federal level, the courts can be used for conflict resolution, with all the risks, rewards and costs associated with this course of action. The principal factor favoring litigation as a conflict resolution method is that the conflict *will be resolved*; at some point, a decision will be reached. The negative aspects of litigation for resolving conflicts over water transfers include the time and cost of the process, as well

as the win-lose nature of adversarial proceedings.

Additionally, litigation frequently hinges more on procedural matters than substantive issues. Suits brought under provisions of the National Environmental Policy Act (NEPA), for example, are centered on agency procedures -- did they consider the right factors or follow the right sequence -- rather than the substance of their actions. As a consequence, litigation can result in resolutions that satisfy neither plaintiffs nor defendants.

2.3. Water Markets

While legislation and litigation are more common, water markets conceptually can both resolve conflicts (by establishing a price that is agreeable to all parties) and provide for efficiency and equity (by determining the highest and best resource use by incorporating all costs) in the transfer of water. There are five prerequisites for an effective system of marketing water:

1. Water rights must be clearly established; there must be clear title to the water to be transferred.
2. The water right to be transferred must be quantifiable; a system of measurement is necessary.
3. An institutional system must be in place to administer water rights, requiring record keeping and fair and reliable administration.
4. The infrastructure must exist, or be feasible, to move water between buyer and seller.
5. The marketing system must provide both an efficient and equitable transfer of water.

In most cases, the first four prerequisites for a water transfer exist, while the fifth does not. The last prerequisite implies that third-party implications of the water transfer must be considered. Third parties are interests affected by an action, but who are neither buyer nor seller. In other words, the ***full cost*** of the transfer must be determined. For a market system to work, the real costs and benefits to buyer, seller *and* third parties must be included as part of the transaction. Potential external effects that have been identified in previous work on the use of water markets in Texas are: return flow externalities, instream values, and secondary economic effects (Griffin and Boadu, 1992, p. 270). Failure to take all these costs into account will result in diseconomies within the market, resulting in an inefficient solution.

The ability to identify and incorporate the full cost of transfers is an important consideration when exploring the use of markets to resolve water conflicts. In water transfers, the transaction price normally considers only those costs and benefits that affect the buyer and seller directly. Missing from most market transactions are the third-party implications of a water transfer. Even the most sophisticated market systems for water rights have yet to offer the complete resolution of all third-party affects.

It is unlikely that the market system will be relied upon fully to resolve conflicts over water transfers in Texas. However, mimicking the market system and its prices as much as possible can take advantage of the resource allocation information embodied in prices. There is an administrative role for areas in which markets do not achieve efficiency and equity, such as instream values or basin of origin issues.

2.4 Negotiation/Mediation

Implicit in the notion of conflict -- two or more parties disagreeing -- is the idea that negotiating or mediating the interests/viewpoints of the

participants can resolve conflicts. Of course, the process of resolving conflict through negotiation is often a long and difficult endeavor. For any group involved in negotiation, the first question is: do you want to arrive at a resolution? In some cases, the answer might be no. However, just saying "no" to a transfer and being unwilling to consider alternatives is not negotiation. Once a group or area decides to become a party to a negotiated solution to a water transfer conflict, the process normally includes the need to:

1. Identify the type of negotiation process which best suits the situation.
2. Identify the issues which need to be addressed.
3. Prioritize these issues; they should relate directly to the transfer.
4. Identify other stakeholders and bring them into the process.
5. Identify representatives (who speaks for whom).
6. Understand that recognizing an issue or interest in order to examine the full cost of the transfer does not mean that the cost related to that issue or interest is above zero or meaningful.
7. Identify the types of data and research needed, usually an expensive and time consuming process.
8. Consider discrete issues such as water allocation in drought conditions -- sharing risk in the future.

In addressing the items listed above, those in a basin of origin must be aware that in Texas the State owns the water, not local officials, interest groups or individuals. Also, while it is difficult to look 50 years into the future, to declare an impact on future water use, there must be an identifiable need for which water can be put to a beneficial use. In terms of economic efficiency and equity, the impacts of a water transfer must be real. Simply saying, "it's our water and you can't have it," is not enough to show that an impact will occur.

While there are many examples of water transfers and resolutions of water conflicts, local conditions and issues often make the process unique to each case. In addition to the many interests and interest groups from the basin of origin, people with other interests -- some competing -- will complicate the process of resolving a disagreement over a water transfer.

Three factors are required to mediate a water conflict or to have any successful negotiation:

1. Interests involved must possess many and independent preferences;
2. Power must be shared among the interests;
3. The cost of transaction must be low.

The first factor means participants are willing to make tradeoffs. In short, trade must be possible. The second factor says no one party can stop negotiations or expect all the gains. Compromise is necessary. The third factor deals with communication and the information necessary to complete a trade. Successful negotiations require an accurate assessment of the impact of water transfers. If there are information deficiencies, negotiators bargain from the worst-case assumptions about the impact on their welfare.

As a water transfer evolves for which real basin of origin losses are identified, two issues become prominent in a negotiation/mediation process :

- the issue of basin of origin *compensation*, and
- the *mitigation* of potential damages due to the transfer.

There is ample precedent for both basin of origin compensation and mitigation, as illustrated in the case studies discussed in Sections 4 and 5. Section 3 looks more closely at the issues of full cost pricing and third parties. These concepts are important to the resolution of conflicts over water transfers.

3. Full Cost Pricing and Third Parties

Full cost pricing is a concept that is particularly applicable to water markets, but also has a place in discussion of the allocation of public resources by any means. The idea of the full price of a water transfer is derived from one doctrine and one theory: the doctrine of beneficial use and the theory of externalities. The doctrine of beneficial use holds that the State owns the water resource to be used for the benefit of society. The theory of externalities says that equity and efficiency of a course of action requires that the external -- or third party -- effects of a transfer be considered in decision making.

Too often, issues of equity and efficiency in economic transactions are thought to be separate concerns. In truth, for water transfers to be beneficial, both equity and efficiency concerns must be satisfied.

Equity issues arise from the unequal status of parties in a water transfer. The buyer and seller most often set the terms of a transfer. However, others are affected, particularly those in the area or basin of origin. Equity concerns arise when acts intended to benefit others injure parties who have no voice in the decision and no control over the action or its outcome. This means that economic costs are being borne by these ***third parties***. The true market value of water must reflect all economic costs in order for the most efficient allocation to occur.

A water allocation is ***efficient*** relative to some other allocation if those who benefit fully compensate those who give up water, income, or something else of value as a result of the transfer. Thus, benefits must at least equal all costs. For an optimal transfer of water, two conditions are necessary:

1. The transfer must be the least cost alternative, and;
2. The benefits must exceed the losses to the area of origin including downstream basins plus transfer related costs as well as operation and maintenance of the movement of water.

To arrive at the least cost alternative, all costs must be examined, including basin of origin costs. These include the real costs of foregone future uses in the area of origin (opportunity costs), and environmental and social costs.

The full cost of a transfer should incorporate water quality, instream flows, future uses and other public interest values as well as the costs of purchase, transmission, operating and maintenance. Thus equity, or third-party impacts, must be included to produce an efficient transfer of water. Consequently, equity and efficiency, rather than being separate issues, are connected and mutually dependent.

Including third-party effects means that procedures must be established to identify and value the impacts of a transfer. From previous water transfers, a number of typical kinds of third party interests have been identified, including: agriculture and rural communities; ethnic communities and Indian tribes; environmental interests, urban interests, federal taxpayers, and other water rights holders. These affected parties should be brought into the

bargaining process or compensated as appropriate once a transfer has occurred. Only transfers for which social benefits exceed social costs would be undertaken, producing an efficient and equitable distribution of resources.

If an efficiency-full cost approach to water transfer is followed, equity issues are addressed as part of the transfer process. Policies and procedures include third-party concerns to resolve equity issues.

Accounting for instream flows, water quality and other economic values that have not normally been represented in water transfers will raise the costs incurred by buyers and sellers above what would have been set and will prevent some transfers from occurring. Trade-offs exist between the benefits of protecting third parties and the public interest, and the costs of doing so. Transfer policies must balance the costs of protecting third parties and the benefits foregone when these interests are neglected.

4. Case Studies of Water Transfers

4.1 Introduction

There is a large body of literature covering water transfers in the United States and other countries (see Bibliography). Much of the international literature approaches the topic from the general direction of conflict resolution. Several cases included in Dinar and Loehman's *Water Quantity/Water Quality Management and Conflict Resolution* (1995) are typical of this body of work.

Interbasin transfers that have a high degree of transferability of information for major water transfers in Texas are more limited in number. Because of similarities in water law and in development history, the most readily applied models to examine deal with water transfers in the American west. Several studies exist for most of these transfers, and a compilation of the state of knowledge for selected transfers was prepared by the National Research Council in 1992. *Water Transfers in the West: Efficiency, Equity, and the Environment* raises many of the questions being posed in this report and is an excellent general reference on the subject. The cases detailed in *Water Transfers...* are restricted to intrastate transfers, based on the reasoning that there will be fewer interstate transfers and that interstate transfers will be very large, controversial, and may involve federal legislative action -- making them atypical of water transfers in general (NRC, 1992, p.19).

4.2 Water Transfers in the Western U.S.

This section will briefly describe several western water transfers that represent different approaches to resolving water issues. Particular attention will be paid to the methods used to resolve equity issues and reconcile differing viewpoints on interbasin transfers. Cases involving the Colorado River will be revisited in section 5 in the context of cumulative impacts and full cost pricing.

4.2.1 Windy Gap Project, Colorado

Transfers from the Colorado River in the state of Colorado have usually occurred from the less developed western face of the Rockies to the more populous eastern face, or Front Range. In 1979, the cities of Boulder, Estes Park, Fort Collins, Greeley, Longmont and Loveland formed a subdistrict to build the Windy Gap project. The Municipal Subdistrict, Northern Colorado Water Conservancy District (MSD) uses some of the facilities of the Colorado-Big Thompson project (completed in the 1950s) to transport 54,000 acre-feet of water from the Colorado River through the Big Thompson River to the Cache la Poudre River and the South Platte River watershed. Windy Gap deliveries began in 1985, after an agreement was negotiated for compensatory storage in the Colorado River. Although Colorado law does not formally recognize third party interests, this privately funded project to meet future municipal needs addressed basin-of-origin and third party interests in several ways, including both compensation and mitigation:

- MSD paid Grand County $25,000 to conduct salinity studies.
- MSD paid the Town of Hot Sulphur Springs payments of $150,000 for improvements to its water treatment facility and $270,000 for improvements in its wastewater treatment facility.

- MSD guaranteed that it would build any additional facilities needed to address possible adverse effects on downstream rights of ranchers.
- MSD donated $550,000 for studies and guaranteed minimum streamflows to address U.S. Fish and Wildlife Service and Colorado Division of Wildlife concerns regarding endangered fish species.
- MSD agreed to measures to protect wetlands suggested by the U.S. Environmental Protection Agency.
- MSD addressed concerns of Grand County and Middle Park Water Conservancy District about water for their future development by providing an additional 3,000 acre-feet of water to each.
- MSD agreed in 1985 to pay the Colorado River Water Conservation District over $10 million to construct a project to satisfy compensatory storage requirements of the Colorado River Conservancy Act. (NRC, 1992)

Although the water transfer made possible by the Windy Gap Project was designed for future municipal use, under Colorado law this water can be transferred to other users or purposes, but must be used within the boundaries of the large Northern Colorado Water Conservancy District.

4.2.2 Kendrick Project Agreement, Wyoming

The Kendrick Project Agreement was struck in 1983 among the Casper-Alcova Irrigation District, the City of Casper, and the U.S. Bureau of Reclamation, Lower Missouri Region. The City of Casper was facing water shortages; the Irrigation District was losing water due to seepage in its irrigation system; and the Bureau of Reclamation (BuRec) needed repayment for the original construction costs of the Kendrick Project on the North Platte River. The agreement that was negotiated covers a term of 40 years and is renewable if agreed to by all parties. Through the prevention of seepage losses in agricultural operations, conserved water is made available for municipal use. Major provisions of the agreement are:

- City will provide funds on an accelerated schedule to repay the District's $750,000 obligation to BuRec for Kendrick Project construction.
- City guaranteed payment of at least $150,000 per year for 15 years for system improvements.
- City will pay to BuRec a pro rata share of construction costs, in the form of a service charge of $24 per acre-foot.
- City will pay to District a pro rata share, $25 per acre-foot, of operation and maintenance (rehabilitation and betterment) costs after completion of improvements.
- District will be responsible for maintenance and operation of the system works.
- BuRec must inspect and approve all system improvements and determine the amount of water losses conserved by the improvements.
- City receives up to 7,000 acre-feet per year of additional municipal water supply.

The Kendrick Project Agreement is an obvious illustration of a win-win solution. Although this case entails an agricultural to municipal transfer, agriculture does not actually lose water; it gives up only the water that can be conserved by system improvements. The Bureau of Reclamation received an accelerated repayment schedule. The City of Casper received additional water and was assisted financially by a long term low-interest loan from the Wyoming Farm Loan Board and by a grant from the Department of Economic Planning and Development approved by the state legislature.

Identifying the "essential requirements" of each interest early in the planning process has been noted as a key element in the successful negotiations for this project. (Ervin, 1985; Ervin, n.d.)

4.2.3 Thornton, Colorado's Northern Project

Some disagreements over water transfers wind up in litigation, with varying degrees of satisfaction for the involved parties. Since its incorporation in 1956, Thornton, a Denver suburb of about 78,000, has relied on wells yielding a total of 26,000 acre-feet of water. Concerned that the quality of its water supply for municipal and industrial use reduced the total available to 10,000 acre-feet, and looking for water to support expected growth to 379,000 by 2050, Thornton sought supplemental supplies. In 1985, the City began buying irrigated farms in northern Colorado. $55 million was paid for 103 farms totalling 21,000 acres, of which 18,000 acres will be taken out of production. With the farms came 47% of the shares in the Water Supply and Storage Company (WSSC), owner of senior water rights in the Colorado, Laramie, Michigan and Poudre River basins. Thornton will transfer those water rights from irrigation to municipal use and plans a $470 million project of diversions, pump stations and pipelines to deliver water to its users.

In 1986-87, Thornton filed four applications to divert water and exchange rights which were consolidated for hearing by the Water Court. Forty-nine statements of opposition, including one by the Northern Colorado Water Conservation District (NCWCD) were filed. The case came before the Court in 1991 and continued until April 1992. A memorandum of decision was issued in August 1993 and a Court decree in February 1994. The decree confirmed Thornton's conditional water rights and imposed conditions to protect northern Colorado water users. Thornton then appealed to the Colorado Supreme Court; cross appeals were filed by project opponents. Arguments were heard in 1995, and a final ruling was issued in 1996:

- Determination of the exact amount of water Thornton can divert was remanded to the Water Court; Thornton can export at least 56,800 acre-feet per year.
- Thornton must periodically demonstrate need for the water relative to its projected need for 2050.
- Agreed with NCWCD that Colorado-Big Thompson waters cannot be used outside District boundaries.
- Upheld Water Court in requiring Thornton to replace groundwater return flows to replenish groundwater supplies from which lower-priority junior wells are supplied.
- Upheld Water Court requirement that Thornton revegetate the 18,000 acres of farmland from which water will be removed.
- Agreed with Thornton that it could divert transmountain return flow water that historically was available to other water users in the Poudre and South Platte basins.
- Required Thornton to provide an adequate quality of water to WSSC shareholders at their farm headgates as part of the exchange.
- Dismissed Kodak of Colorado's claim that it may suffer significant wastewater treatment costs because reduced river flows will diminish dilution of Kodak's discharges into the Poudre River.
- Held that the Water Court could not require Thornton to pay for the Division Engineer's future expenses in administering the decree.

The mixed result of the Supreme Court decree illustrates one drawback of relying on litigation to resolve conflicts. Parties also were further

polarized in this process. The agricultural communities in northern Colorado recognize the impact that the loss of 18,000 acres of farming operations will bring to their economies. Although Thornton's Northern Project can move forward, a coalition of rural interests has formed to "protect" remaining northern Colorado water supplies from future diversions to urban areas. (NCWCD, 1997)

4.2.4 Land Fallowing in California

A different approach to the transfer of water from agriculture to municipal use has been examined in California. In 1992, a number of water interests in southern California designed a two-year test land fallowing program to make agricultural water from the Colorado River available for municipal use. Participants were the U.S. Department of Interior, Palo Verde Irrigation District (PVID), Metropolitan Water District of Southern California (MWD), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), and landowners. Major provisions were:

- PVID, IID and CVWD will not demand "saved water" created by land fallowing.
- MWD will pay PVID $250,000 per year for costs of program.
- PVID will assist MWD is preparing environmental documentation; develop and maintain a data base management system for water delivery; monitor lands and notify MWD of violations; repair breaks in canals; and provide weed control related to breaks in canals.
- MWD will administer and enforce the fallowing agreements; severe penalties are in place for violators of the land fallowing agreements.
- A landowner with a land fallowing agreement will not apply water on the fallowed acres and will not grow any agricultural crops which would require the use of water from the Colorado River.
- MWD will make five payments to the landowner during the two year period of $248 per fallowed acre.
- MWD will gain a targeted 100,000 acre-feet per year (Saved water is expected to be 4.6 acre-feet per fallowed acre per year.) or a total of 200,000 acre-feet during the project.

This approach to the transfer of senior agricultural water rights to junior municipal water rights is a vehicle for term transfers that may be particularly appropriate for dealing with times of drought. As a long term solution, it clearly would impact the agricultural economy and could have other third party impacts.

4.3 Characteristics of Western Water Transfers

In general, transfers of water in the American west have involved transfer from older agricultural water rights to newer municipal/industrial uses. Although in some cases the agricultural water rights were not being fully exercised, frequently the transfer of water resulted in a decrease in farming activity. In very few cases did the transfers involve surplus, excess, or unused water. Nor were there cases of voluntary transfer of water between urban areas. In fact, most states have allowed cities to hold water for future growth in spite of beneficial use provisions in their water law. Basin-of-origin compensation historically has been fairly narrowly defined in terms of economic interests, but increasingly encompasses broader third party interests such as cultural or environmental concerns. The development of water markets and the use of market mechanisms have been sought as a way to efficiently allocate a scarce resource.

5. Resolving Conflicts by Addressing Third Party Interests and Full Costs

This section examines water issue from four areas of the U.S. with a focus on the different ways they resolve conflicts over water issues by addressing full cost pricing and the involvement of third party interests. Although full cost pricing has been recognized as a main element of efficient and equitable water transfers, attempts to apply this principle are fairly recent. Similarly, methods of involving third parties in water transfers are still being developed.

5.1 Georgia-Alabama-Florida

The "water wars" between Georgia, Alabama, and Florida relate to issues in two river basins: the Alabama-Coosa-Tallapoosa (ACT) in the states of Alabama and Georgia and the Apalachicola-Chattahoochee-Flint (ACF) in Alabama, Georgia, and Florida (Figure 2). These basins both originate in north Georgia and have a common boundary of approximately 233 miles. Both basins have experienced extensive water resource development in the form of multiple purpose reservoirs by the U.S. Army Corps of Engineers (Corps) and non-Federal interests. There are 10 Corps operated reservoirs and 21 privately operated Federal reservoirs in the two basins.

5.1.1 History of Tri-State Conflict over Water Resources

The water conflict in the southeastern U.S. began due in large measure to the growth and needs of the Atlanta metro area. The rapid pace of population growth during the 1980s and into the 1990s, along with a series of droughts, created a demand on the water resources of the two basins. Also, as in the Houston/Southeast Texas case, the issues involved are diverse and complex, involving both surface and ground water as well as water quality, environmental flows, economic development issues, and the interbasin transfer of water.

What makes this case a useful one to explore in the Southeast Texas context are the concerns being expressed by the parties to the conflict. Atlanta sees itself as the economic engine of not only Georgia, but the entire region. Due to a variety of factors, the Atlanta area is growing at a pace that is severely testing its resource base, even in the face of plentiful rain.

Officials, businesses, and farmers in Alabama are concerned about the economic development effect of less water being available in the ACT river basin. While the water flowing from Georgia to Alabama in the ACT basin meets current demands, the people of Alabama view the water as a necessary resource for future growth in areas that have experienced slow growth in recent years. From their point of view, the water is theirs, it just happens to flow through Georgia first. However, it is difficult for Alabama to demonstrate a potential economic loss from the reallocation of water requested by Atlanta. Yet, they are concerned about the effect of water reallocation on their economic future. The Alabama media was especially critical of Georgia's increasing demands for water with what was perceived as little concern for downstream interests.

The Florida part of this conflict is substantially different and, like issues surrounding Texas and Louisiana, presents a more complex problem. Florida officials, businesses, and fishing interests are concerned about the environmental impact that the reallocation of water may have on oyster and other fisheries in the Apalachicola basin in Florida. The State of Florida became increasingly concerned with potential impacts to the Apalachicola River and Bay, a National Estuarine Reserve and valuable seafood producer. Here, Coastal Zone Management requirements make environmental issues more complex. Water in the Flint and Chattahoochee rivers flows into Lake Seminole and is released into the Apalachicola Bay. A reduction in this flow could increase salinity and be detrimental to the oyster beds in the Bay as well as reduce the nutrients in the fishing areas.

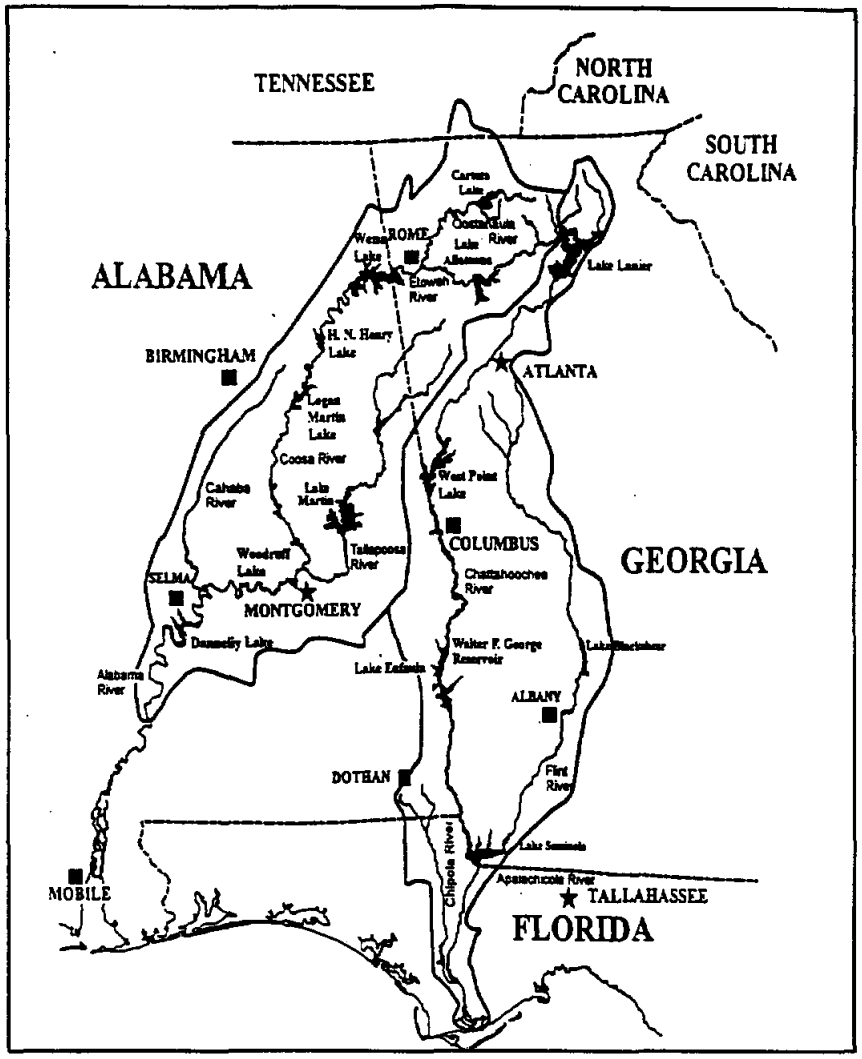


Figure 2 Alabama-Coosa-Tallapoosa Basin and Apalachicola-Chattahoochee-Flint Basin

5.1.2 Past Efforts to Resolve Conflicts

Over the last 30 years, a number of water resources studies have been conducted by Federal and state agencies in both the ACT and ACF river basins. Over time, the issues considered in these studies became more controversial until, in June 1983, the Governors of Alabama, Florida and Georgia, together with the Corps negotiated and signed a Memorandum of Agreement (MOA) to develop a water management system for the ACF Basin. At the same time, as a result of several drought periods, the Corps had received requests from several north Georgia communities requesting reallocation of reservoir storage to satisfy increasing water supply needs. Acting upon the MOA and these requests, the Corps prepared draft reports proposing reallocation of storage in three reservoirs (Lake Lanier, Lake Allatoona, and Carters Lake) from hydropower to municipal and industrial uses.

On June 28, 1990, the State of Alabama, concerned about the downstream and cumulative impacts of proposed and potential future water resource actions, filed **litigation** in the United States District Court for the Northern District of Alabama, challenging the adequacy of the Corp's environmental impact documentation addressing the proposed reallocations and the procedures that the Corps had followed in operating Federal reservoirs.

Shortly after the litigation was filed by Alabama, representatives of Alabama, Georgia, Florida, and the Corps began discussions seeking to resolve the conflicts. There was general agreement among the parties that litigation was the least desirable option for resolving the water resource conflicts. The State of Alabama requested the Court stay the litigation while **negotiations** were pursued; the Court granted this request. A significant breakthrough occurred when the three States agreed to play a greater role as full partners with the Corps in the comprehensive study process. The States, as evidence of their commitment to the process, agreed to voluntarily contribute funds to the study to supplement Federal funding.

5.1.3 Comprehensive Study as a Means to Conflict Resolution

As a result of the dialogue among the parties, a Letter of Agreement (LOA) was signed by the Governors of the States of Alabama and Georgia and the Assistant Secretary of the Army for Civil Works on April 29, 1991. The LOA addressed short-term issues within the ACT River Basin, including a proposed regional west Georgia reservoir. After 18 months of dialogue and **negotiations**, on January 3, 1992, the Governors of the States of Alabama, Florida and Georgia and the Assistant Secretary of Army (Civil Works) signed an MOA committing the States to work together as equal partners through the Comprehensive Study process to seek resolution of water resource issues.

In an attempt to resolve some conflicts with **legislation**, two interstate compacts have been approved by the legislators in each state, one for each river basin. These compacts recently have been ratified by Congress. The compact for the ACT basin is between Alabama and Georgia. The compact for the ACF involves Alabama, Florida and Georgia. For a decision to be made in either case, there must be unanimous support from the voting members. The compacts will formulate the administrative mechanisms under which the study will operate but will postpone decisions on apportioning water until the study is complete.

A major element in the on-going efforts to resolve the conflict has been the use of "shared vision models." Shared vision models are computer simulation models of water systems that are built, reviewed, and tested collaboratively with stakeholders, including third party interests, through a shared vision process. The shared vision process includes both decision makers and key stakeholders in the development of the models to more accurately reflect the operational aspects of the system, as well as increase the probability of acceptance of the models and solutions generated by them. The models are designed to represent not only the water system infrastructure and operation, but also the interrelationships among various water demands.

The models have been used to estimate the impacts to stakeholders of changing basin management rules to favor each of the major uses over all other demands. The models helped each group understand how the water system responds to these changes and helped formulate alternatives. Evaluated were the effects of new reservoirs, training dikes, and navigation

projects, changes in reservoir operation rules, ground water pumping rules and navigation dredging programs. Finally, modifications to demand were examined, such as the effect of changes in agricultural, municipal and industrial uses, and of energy conservation efforts.

The core of the Shared Vision Modeling approach as applied in the ACT-ACF study was to develop simulation models of the two basins that could serve many purposes, including:

1. a repository for important data (hydrologic information, demand data, supply data, etc.);
2. a characterization of the physical features of the basin;
3. a consistent statement of system operating policies;
4. a tool for evaluating alternatives;
5. a vehicle for resolving conflicts, and;
6. a framework for expanding the number of people who understand system operation.

In the first phase of model application, a number of specific management questions were examined, including: navigation reliability, power generation, Atlanta's water supply, effects on the Apalachicola River and Bay, recreation, Chattahoochee River quality, interbasin transfers, south Georgia irrigation, and the potential for growth of Alabama.

A main purpose of using a comprehensive study approach to water conflict resolution was to "turn on the lights" of information for all parties concerned, including third parties. The major questions to be answered were: what can the resources of the two water basins provide and what management options can best utilize, optimize and protect those resources? Only when all parties have equal information, and believe in the accuracy of that information, can an equitable resolution to a water conflict occur. This case illustrates the usefulness of the techniques available for resolving conflicts over water transfers.

- Legislation was needed to address relationships between states and between the states and the federal government.
- Litigation was used by Alabama, but was set aside to allow for negotiation as a preferable technique.
- Negotiation was attempted on several occasions, and resulted in a cooperative effort to gain information needed to make resolution of the water issues possible.

This case also highlights the usefulness of cooperative studies. Developing information that is accepted by all parties and available to all parties decreases uncertainties that impede resolution of conflicts over water.

5.2 Platte River Protection Plan

The Platte River Protection Plan agreement addresses habitat for endangered species rather than a water transfer for traditional consumptive uses, although traditional water issues are involved in the agreement. It provides a model for negotiated settlement rather than litigation. The U.S. government and the states of Colorado, Nebraska and Wyoming recently negotiated the agreement for a multi-year program to restore Platte River habitat for the endangred whooping crane, least tern, and pallid sturgeon and the threatened piping plover. The agreement is not binding, and some issues await settlement of litigation (Nebraska v. Wyoming) filed over a water dispute in the North Platte River.

5.2.1 Background

The Platte River flows from Colorado into Nebraska where it joins the North Platte, which stems from Wyoming, and then empties into the Missouri River. Interstate compacts allocate the

waters of the Platte. In 1988, Nebraska sued Wyoming for violating terms of their compact. As of mid 1997 *Nebraska v. Wyoming* was in the Supreme Court.

In the early 1990s, the U.S. Fish and Wildlife Service began to address the need for a restoration plan for habitat used by endangered species along the Platte River. In 1994, fearing that an environmental lawsuit would be filed, the three states and the Department of Interior agreed to negotiate rather than fight about the expense of the plan. In 1997, after three years of negotiation, an agreement was forged.

5.2.2 The Agreement

An immediate binding agreement was not possible because of a number of uncertainties caused by the Nebraska-Wyoming litigation and by scientific questions. Nevertheless, delay of all action posed unacceptable risks for the endangered and threatened species and for water users along the Platte. The solution was a two-stage agreement, non-binding in its first phase, that could become binding later. During the 3-year first phase parties will:

- undertake comprehensive, basin-wide research;
- implement projects to restore and manage land to improve habitat, including 29,000 acres in Nebraska;
- develop and implement water management and water conservation measures; and
- design a comprehensive basin-wide program for habitat restoration.

The second stage will involve implementation of the habitat restoration plan.

The Program will be administered by an eight-member Governance Committee created as part of the agreement. The Committee is charged with establishing technical committees, allocating funds or other resources, developing milestones, assessing achievements, and preparing for long-term implementation. Its membership consists of:

- one member from each state, selected by the governors;
- two federal members (one from FWS and one from BuRec) selected by the Secretary of the Interior;
- two environmental members representing environmental groups in the three states, to be selected by those groups;
- three members representing water users on the North and South Platte Rivers, selected by users in each of three river segments;

5.2.3 Characteristics of the Agreement

Several elements of the Platte strategy are instructive for successful negotiations:

- It will be difficult for parties to reject research results since they are the product of jointly agreed upon research.
- Each signatory can reassess its participation based on the outcome of Nebraska v. Wyoming and all signatories agree not to engage in other judicial or administrative proceedings, giving a "breathing space" to resolve differences by negotiation rather than litigation.
- All participants agreed to contribute financially to the program; there are no free riders. The three states will pay half and the federal government will pay half.
- The federal government will pay the major portion of costs during the non-binding first phase ($7.5 million out of $8.8 million).
- It is important to take concrete action as well as promise research. Immediate restoration projects were seen as an effective way to lower the risk of litigation.
- Flexibility in enforcing federal rules was

offered as an incentive. This was coupled with the Program intent of achieving regulatory certainty for water related activities.

5.2.4 Lessons from the Platte River

Five principles for a win-win negotiation have been drawn from the Platte River Protection Plan (Water Strategist, 1997, p. 7):

1. Pay to play: only interests prepared to contribute resources (of some type) are allowed at the table.
2. Do the research on solutions jointly: so agreement can be reached on the relative value of alternative actions.
3. Don't just stand there, do something: no matter how important the basic research, action is also required.
4. Break a complex problem into feasible sections and tackle each stage in turn: when you can announce the completion of one stage successfully, you are more likely to stay at the table to announce the next success.
5. Be flexible.

5.3 Calculating the Full Cost of Water Transfers in Florida: Everglades Restoration

January 3, 1997, marked the groundbreaking of Everglades Restoration, a project touted as the nation's largest environmental restoration project. Two major projects were initiated on this date, both designed to restore natural flow patterns to parts of Everglades National Park. The Everglades Restoration illustrates costs that in the past were not included in buyer-seller water transactions and identifies some third party interests that need to be identified early in water transfer planning.

The ecosystem of central and southern Florida is a complex natural system that has been further complicated by changes in the natural flow of water. From 1882 to the 1980's, millions of dollars were spent to construct a complex system of canals, water storage areas and gated releases. Structures re-routed, stored and released water according to a schedule defined by man's needs with little understanding of possible negative effects. Today, in the face of uncertainty and controversy, local, state and federal agencies have begun to study and rectify the negative environmental effects of drainage modifications made over more than a century. At an estimated cost of $1.5 billion over 15-20 years, the adverse effects of dozens of drainage and water storage projects are being undone.

5.3.1 The Significance of the Everglades

Spanning south from the Kissimmee River basin just north of Lake Okeechobee to the coral reefs of the Atlantic south of Florida Bay, the Everglades is an internationally-recognized unique and diverse ecosystem. The area also provides natural functions such as flood control and water purification. Recreational boaters and fisherman provide a steady stream of tourism to Florida Bay, attracted by the clean water and abundant crab and lobster. In addition to the recreational activities supported by Florida Bay, two national parks, four national wildlife refuges and one national marine sanctuary draw over 1.6 million visitors each year.

In 1995 the governor of the state of Florida created the Governor's Commission for a Sustainable South Florida, a group with diverse interests. A large part of the commission's October 1995 and August 1996 reports addressed the natural system of south Florida as it relates to Florida's continued growth. Identifying the manner in which South Floridians use the resources of the area as not

sustainable, the Commission recognized water management as the capstone of sustainability in south Florida. Both of the Commission's reports reiterate the importance of maintaining the Everglades as a natural area. The Commission proposes the restoration of the Everglades using cost-benefit analysis and the principles of full cost accounting[1] to achieve economic, social and environmental sustainability for south Florida.

5.3.2 Water Development and Drainage Projects

As early as 1847, plans were made to drain parts of south-central Florida for agricultural use. Beginning in 1882, a series of hydrological changes from structures such as canals, water management pools, and gates were made by the federal and state government to offer increased flood control and water delivery to the growing urban population of central and southern Florida. Collectively, this work was known as the Everglades Drainage District.

As part of the Flood Control Act of June 30, 1948, Congress authorized The Central and Southern Florida Project (C&SF Project) , after nearly 100 inches of rain fell on southern Florida in 1947. This was a comprehensive project for flood control, water level control, water conservation, prevention of salt water intrusion and preservation of fish and wildlife. The act authorized 30 pumping stations, 212 control and diversion structures, 990 miles of levees, 978 miles of canals, 25 navigation locks and 56 railroad relocations (bridges). The project created the Everglades Agricultural Area, multiple water conservation areas and Everglades National Park. Subsequent congressional authorizations moved water away from Everglades National Park (and then later required minimum flow to the park in response to fire hazards there), created floodway channels in the Kissimmee River Basin and attempted to protect freshwater wells on the east coast from saltwater intrusion. These drainage projects altered the natural system of the Everglades and Florida Bay.

5.3.3 Effects of Alterations

By the 1980's nutrient-rich agricultural run-off resulted in the eutrophication of Lake Okeechobee and the dominance of nutrient-hungry cattails in part of the Everglades' "sea of grass." Changes in natural drainage altered the natural patterns of freshwater flow to Florida Bay. Hypersaline conditions were observed more frequently than in earlier years. Unseasonal freshwater discharges and large, sudden discharges radically changed the salinity of the bay, impacting both plant and animal species. Differences between current, managed freshwater inflows and the historic natural inflows proved to be detrimental to the water and wildlife quality of the bay. Decreased circulation in the bay also resulted from railroad construction and filling in some of the Florida Keys. As a result, the nursery function the bay once provided to shrimp, fish and other aquatic and amphibian species, including the endangered crocodile, has been impaired, and numbers of young and adult specimens decrease every year. Once clean and productive, the now-cloudy bay is subject to frequent algae blooms. Dwindling numbers of birds signal trouble with the bay because of their sensitivity to changing foraging conditions. The changes in the Everglades have

[1]The Glossary to the Commission's Report defines *full cost accounting* as an economic tool that takes into account the externalities involved in the production, use, and disposal of goods and services over time. Externalities are given prices to reflect their costs, including energy sources used, the environmental damange caused by the production, and the costs of disposal or recycling when the product is no longer usable. Natural or renewable resources, traditionally viewed as "free goods," are redefined as assets, having substantial value to an enterprise and being appropriately allocated in the calculation of profit and loss.

forced a shift of the natural ecosystem to a less productive, less diverse and therefore less resilient system, endangering the survival of the Everglades as a unique ecological treasure.

5.3.4 Remediating Impacts

In a 1992 legislative action, Congress authorized a comprehensive Review Study (Restudy) of the C&SF Project. The restudy aims to restore the Everglades and the South Florida ecosystem and acknowledges the value of the area's unique natural environment. The authorization also acknowledges the presence of a large agricultural economy, a growing urban area and a huge tourism industry. The purpose of the restudy is to develop methods to restore the natural ecosystem while providing for the needs of development in the study area, which totals about 18,000 square miles. In 1994, the Florida legislature passed the Everglades Forever Act. Everglades Forever provides state support for the gigantic restoration project, including taxation authority and a timeline. A reconnaissance study of the C&SF was completed in November 1994, outlining possible conceptual plans, evaluating those plans and recommending additional studies.

On August 28, 1996, Florida's Governor's Commission for a Sustainable South Florida released "A Conceptual Plan for the C&SF Project Restudy." In Congressional legislative action that same year, the Water Resources Development Act authorized the Corps of Engineers to construct projects consistent with the Governor's Conceptual Plan. Also in 1996, the U.S. Department of the Interior outlined a plan for funding the project. In addition to large "down payments" made by the federal government to accelerate restoration, a 50/50 cost-sharing program between the federal government and the state of Florida was established for some projects. The costs of other projects were distributed among state, federal, nonprofit and industrial sources. These cost-sharing programs provide for Florida's sugar industry to bear some of the cost of Everglades restoration, recognizing that industry as a major beneficiary of the C&SF Project.

A combination of studies and carefully chosen actions are proceeding, as the partnership among state, federal, local, public and private groups work to finance the task before them. Estimates for the total cost of the project range from $1.5 billion to $2 billion over 20 years.

As an example, the South Florida Water Management District plans to build wetland storage areas that will help purify water discharged from farms into the Everglades. Land acquisition and construction of these "stormwater treatment areas" are estimated to total over $700 million over ten years. About one third of the cost to build these wetlands will be born by the Sugar Cane Growers Cooperative of Florida.

5.3.5 Lessons for Water Planning

The lesson of the Central and Southern Florida and the Everglades Restoration projects is the significance of accounting for the full cost of projects when they are being planned. To calculate today the full cost of flood control and water delivery to agricultural and urban users in Florida, the cost of correcting the damage done by the drainage projects as well as the cost of the original drainage "improvements" must be considered. This sum provides ample reason to include costs incurred by all interests, including those resulting from cumulative impacts to a natural system, when considering any proposed water transfer. The inclusion of third parties and consideration of full project costs can not only

help in resolving conflicts over water transfers, but also encourage economically efficient and equitable decisions about resource use.

Legislative remedies at the state and federal level were sought several times in this case. This is partly explained by the active presence of multiple federal agencies as participants: the Corps of Engineers (Department of the Army); the Park Service and Fish and Wildlife Service (Department of the Interior); and Coastal Zone Management program of the National Oceans and Atmospheric Administration (Department of Commerce). One way Florida could affect the actions of those agencies was through Congressional directive. Federal legislation in this case is also the result of federal financial involvement in both the initial projects and the planned restorations.

State legislative action grew out of the Governor's Commission and its "consensus building" process, a form of negotiation among the interested parties. As with the ACT-ACF case, studies are being used to provide acceptable information to all the interests.

5.4 The Colorado River: A Study of Multiple Water Transfers

Water transfers and diversions from the Colorado River in the western United States are the result of complicated agreements involving seven states, two countries, individuals, industries and government agencies. These agreements control the flow of the Colorado River from its origins in the Rocky Mountains to its eventual destination at the Gulf of California. Canals and dams divert, store and deliver water to millions of consumers in urban areas and millions of acres of cultivated farmland. With all of its resources allocated, the Colorado at the end of its 1000-mile course, at least during dry periods, is the product of return flows from water users.

This case study will briefly touch upon several of the Colorado's major water transfers within the context of a cumulative impact on the Colorado River and the full cost of these water transfers. Figure 4 is a map that displays the entire length of the Colorado, including both the upper and lower basins. Though the basins are legally divided by treaty and compact and are considered independently in project planning, the basins function as a single ecological mechanism -- changes in the upper basin impact the lower and therefore the whole system. Many water transfer agreements address ecological impacts, economic costs and the interests of third parties within their individual project area. However, each of these transfers contributes to the costs and impacts felt on the river system as a whole. It is the aim of this section to illustrate the full cost of these water transfers when cumulative impacts are considered.

5.4.1 Background

Beginning in the late 1800's, western settlements began to transfer water from the Colorado River for agricultural purposes. As the west grew, cities also sought Colorado River supplies. Today, users of Colorado River water are, for the first time in its history, facing full allocation of the river's resources. Consequently, areas accustomed to a surplus of river water now face shortages.

Historically, water rights in the western United States have been governed by a "first in time, first in right" ideology. Driven by inexpensive (or in some cases, free), land, early settlement interests were primarily agricultural. Because the west was initially developed for agricultural uses, agricultural water users obtained senior

water rights. The later urban developments generally received secondary water rights. However, many water rights went unexercised, leaving a surplus in the river. Under these conditions, the Colorado adequately satisfied all users, regardless of water right priority.

Twentieth century urban expansion in the west has eliminated that surplus. As more water rights holders exercise their claim to water, other users dependent on the previous surplus are left with shortages. In spite of changing social and economic factors in the west, historic allocation retains legal precedence; agricultural uses still claim over 90% of available water.

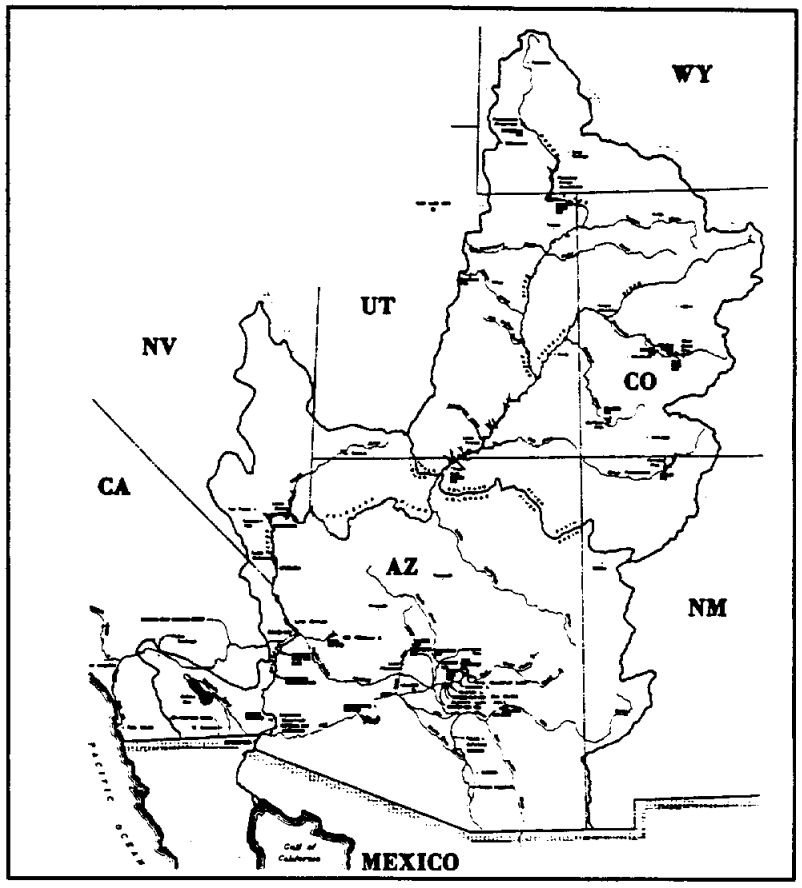


Figure 3 The Colorado River in the western U.S.

In addition to a division existing between agricultural and municipal uses, the users of the Colorado River are divided by the Colorado River Compact of 1922. The Compact divides the Colorado River into two basins. New Mexico; Arizona, Nevada and California comprise the lower basin. The upper basin consists of Wyoming, Utah, and Colorado. According to the compact, each basin was allocated a portion of the estimated annual flow of the river, said to be 17 million acre-feet. Even though the average virgin flow between 1922 and 1983 was 14 million acre-feet, the compact allocates a total of 15 million acre-feet: 7.5 million acre-feet to each basin. The purpose of this agreement was to protect water rights of the upper basin, while permitting lower basin states to put the unused water of the upper basin to a beneficial use. When the upper basin develops uses for its share of the water, it can reclaim its water even though the southern basin has put the water to use in the interim.

After both the upper and lower basins make their withdrawals, the Colorado River as it nears the Mexican border consists largely of contaminated irrigation run-off that pushes salinities over 3,000 parts per million (ppm). This highly saline water does not meet the negotiated quality and volume of water contracted to be delivered to Mexico under international treaty. In 1944, the United States and Mexico entered into a treaty guaranteeing Mexico 1.5 million acre-feet of water from the Colorado River each year. After 1944, however, larger and larger amounts were diverted from the river in the U.S., significantly degrading the quality of the water delivered to Mexico. The low grade of the water

caused a dispute between the United States and Mexico. Mexico believed that the U.S. was violating the 1944 treaty guaranteeing Mexico 1.5 million acre-feet of water per year. When Mexico threatened to request international sanctions, the U.S. agreed to a negotiated settlement. The settlement, known as Minute 242, requires the U.S. to deliver 1.5 million acre-feet of water to Mexico at a salinity no greater than 115 +/- 30 ppm than the water released from Imperial Dam in 1976. Based on the 1976 output at Imperial Dam of 879 ppm, the agreement established a salinity limit of about 1,000 ppm in water to be counted toward the 1.5 million acre-feet required by the original treaty. It is this minimum standard that leads to a means of calculating the full cost of the cumulative impact of water transfers from the Colorado River: what price must the U.S. pay to attain the water quality level required by Minute 242?

5.4.2 Upper Basin Transfers

Water law in the State of Colorado does not formally protect basin of origin communities; instead, it allows water to be diverted to where it is needed. At the headwaters of the Colorado River in Colorado, the intricate series of water transfers from the river begins with more than twenty transmountain projects carrying over 0.5 million acre-feet across the continental divide. As early as 1900, the 14-mile Grand Ditch was delivering Western Slope water across the divide to Ft. Collins on the Front Range of the Rockies. The Colorado-Big Thompson (C-BT) Project delivered its first water to the east side of the Continental Divide in 1947. The C-BT project, financed by the Bureau of Reclamation (BuRec), provided supplemental water to an already developed area. Most (85%) of the water was allocated to agricultural uses. All users had the right to sell, lease or rent their primary flow, but were required to return to the river all return flows and runoff.

A more recent transfer (1985), the Windy Gap Project, was described in Section 4. In that case, impacts were addressed through a series of negotiated compensations between water users and basin of origin and other third party interests. The difference between the C-BT and Windy Gap projects reflects the growing role of third parties in water transfers. The role is not a legally protected position in Colorado; Colorado state water law requires no mitigation, weighing of impact or avoiding impact to third parties. Examples of third party interests who have become involved in water transfers include, but are not limited to, recreational uses, environmental concerns, and cultural functions.

5.4.3 Lower Basin Transfers

Before 1990, surpluses created by unused water rights supplemented southern California's Metropolitan Water District's (MWD) ability to meet increasing demand. This surplus doubled the amount of water MWD was able to divert, totaling over one million acre-feet per year.

In 1990, the Central Arizona Project (CAP) complicated water use in the lower basin. For the first time, the lower basin had used up its share of water as designated by the 1922 Colorado River Compact. With this major diversion, Arizona laid claim to water that California had used in previous years. CAP, a $3.5 billion project, pumps 1.5 million acre-feet to Arizona for municipal and agricultural use. MWD, facing a shortage, turned to the newly developing water market to supplement its sources. In an agreement with the Imperial Irrigation District, (IID) MWD paid $223 million for improvements to irrigation infrastructure in the Imperial Irrigation District in exchange for a right to the water saved by the conservation improvements, about 100,000 acre-feet.

5.4.4 The Full Cost of Water Transfers

The Colorado has a naturally high salinity due to the silty nature of the river and its mineral composition. However, as the Colorado nears the border with Mexico, salinities are further increased by irrigation return flows from groundwater pumpage. As negotiated by Minute 242, the U.S. is required to deliver 1.5 million acre-feet of water at approximately 1,000 ppm to Mexico. In a negotiated settlement that was prompted partly by the treaty and partly by concern of southern California agricultural interests that their Colorado River allocations might be decreased in a federal settlement, BuRec undertook a multi-million dollar corrective measure, the Yuma Desalting Plant.

The Yuma Desalting Plant is the largest reverse osmosis desalting plant in the world. The plant can produce about 93 million gallons of desalted water per day, reducing salinities from 3,000 ppm to 300 ppm. Treated water is mixed with untreated streams to achieve the target salinity of about 1,000 ppm. A wastewater stream containing concentrated salt (often at 10,000 ppm) is discharged into the Santa Clara Marsh at the Gulf of California.

The significance of the desalting plant for this study lies not in its technological achievement, but in what it represents for full cost accounting. The high salinity of the Colorado at the border is a direct effect of the transfers made along the span of the river. Because each of these projects did not consider their "full costs," including cumulative impact costs, U.S. taxpayers now bear the unaccounted-for cost of constructing and operating the Yuma Desalting Plant.

5.4.5 Lessons for Water Transfers

The central lesson of water transfers from the Colorado River case is the cumulative impact that resulted from failing to evaluate the full cost of these transfers. Consideration of third party interests and a comprehensive study of the Colorado River system could have produced a more beneficial and sustainable application.

The costs of cumulative environmental impacts are not accounted for in the budgets of municipalities and water districts using Colorado River water, yet each withdrawal contributes to those impacts. Many projects do not provide a monetary standard by which to measure its full cost. In the case of the Colorado River, the cumulative impact of the river's diversions carries a one billion dollar price tag based on estimates to operate the Yuma Desalting plant for 50 years. That figure represents the value of cumulative salinity impacts from the Colorado River transfers.

Although it was required to guarantee water of acceptable salinity during periods of dry weather, BuRec reports that the Yuma Desalting plant operated only briefly in 1992, its year of installation. Continuing wet weather, beginning with the 500-year Gila River floods of 1993, have made its operation unnecessary since then. (BuRec, 1997)

6. Summary and Conclusions

6.1 Summary

One goal of the Trans-Texas Water Program is efficient and equitable resolution of water resource decisions for southeast Texas. Among the techniques identified in section 2 for resolving conflicts over water transfers, case studies have shown a decided preference for avoiding litigation. Nevertheless, litigation is a legitimate means of reaching decisions about resource allocation, and in some cases may be the only option suitable. As case studies in sections 4 and 5 have shown, interstate and international water transfers are very likely to require legislative solutions. The techniques of negotiation/mediation and water markets, on the other hand, are very useful for conflict resolution and in pursuing a full cost-efficiency approach to resource allocation. For major water transfers, the use of several of these techniques in combination is likely.

In considering a water transfer of the magnitudes assumed (300 or 600 mgd) in the planning scenarios for the Southeast Texas area, a number of third parties will perceive their interests as being affected. The passage of Senate Bill 1 in 1997 codified some of the concerns which must be addressed in any interbasin transfer. Sorting out and quantifying the actual effects to third-party interests will be a lengthy process and the sharing of credible information will be a key element in that process.

Senate Bill 1 also provided that interbasin transfer applications could include compensation for and mitigation of project impacts to the basin of origin. This gave formal recognition of the existence of third party interests in an interbasin transfer and a means to internalize project costs resulting from compensation or mitigation. In southeast Texas, a number of possible compensation concepts that could be related to any specific project impacts have been identified. They fall under the category of direct payments to the basin of origin for infrastructure projects as well as economic development programs to offset perceived future losses due to the transfer of water.

The South East Texas Regional Equity Task Force focused principally on their concerns as "third parties" to a potential water transfer. In addition to voicing opposition to a major water transfer from the Sabine River, they reiterated concerns about potential impacts and identified several areas in which compensation or mitigation for impacts might be appropriate. Principal concerns voiced were: uncertainties about the future, loss of economic assets, water management problems within the basins (flooding, salt water intrusion), damage to wetlands or Sabine Lake and loss of recreation amenities. Although its deliberation of possible compensation or mitigation was very preliminary and based on the assumption of impacts, the task force suggested that appropriate compensation probably should relate directly to the area's water resources, or perhaps to other indirectly related public projects. Infrastructure projects that were noted include the Neches Salt Water Barrier and flood control/recreation/water supply reservoirs and wastewater projects. Economic development efforts aimed at attracting growth to water-rich areas of Texas were also discussed.

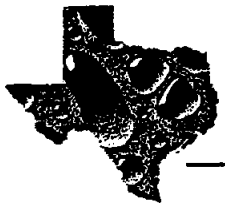
If litigation is to play a role in an interbasin transfer from the Sabine River, it will most likely be based on issues of environmental impact. The environmental impacts, particularly instream flows on the Sabine and the Neches and inflows to Sabine Lake and the Louisiana marshes on its eastern banks, were a major concern to basin of origin interests and to the state of Louisiana.

The development and sharing of credible information about the impacts of a large interbasin transfer is fundamental to any water transfer project. Discussions of transfers will be hampered by the uncertainty of impacts until data have been collected and analyses performed on the impacts. The inclusion within project planning groups of individuals or representatives of organizations interested in these topics is essential to establish both credibility and communication. It is also a precursor of negotiations involving compensation or mitigation.

While water markets have potential in Texas for allocating scarce resources and helping to establish a price for water that is more reflective of full cost, it is unlikely that a major water transfer will be decided solely in the marketplace--there are too many third party interests and unpriced social costs involved. As a result, negotiation and mediation are likely to be the most applicable techniques.

6.2 Conclusions

1. The lack of accepted information in areas such as environmental impacts and future economic development restricts the potential for arriving at solutions. Uncertainties lead people to assume the worst case.
2. Identifying and including all affected parties, and potentially affected parties, at the beginning of the water transfer process is critical. Time and money are required to communicate with the many interests, but there is no substitute for broad-based acceptance of a major water project.
3. The water marketplace no longer consists only of a willing buyer and seller. Today's market includes third party interests; large scale water transfers will have to reflect full cost pricing with regard to this "larger" marketplace.
4. Litigation is useful only as an incentive to come to, and remain at, the negotiation table or as a last resort for parties who have not been included in the process.
5. A role for federal and state government agencies may be necessary to resolve the regional conflicts inherent in interbasin transfer projects.



7. Recommendations

7.1 Recommendations for the Southeast Study Area

1. The State of Texas should take the lead in identifying and supporting a planning entity to undertake the information gathering programs needed for decision-making on water transfers from the Sabine River basin. The role suggested is similar to that already taken by the State in programs such as Clean Rivers (watershed), the National Estuary Program (bays and estuaries), and Regional Water Planning (defined regions) under Senate Bill-1.

2. Once acceptable information is assembled, involved parties should enter into negotiation seeking a solution that will recognize the full cost of a water transfer. The agreement eventually reached may require legislation at the state or federal levels, intergovernmental agreements or executive orders, mitigation activities, and/or compensation payments or programs for the Sabine basin, depending on the project defined and the specific needs and impacts identified.

7.2 An Approach for Water Transfers in Southeast Texas

Two major types of issues were identified for the southeast area: possible environmental impacts and "our water" basin of origin concerns. The amount of information needed to resolve uncertainties surrounding the first issue and the involvement of a number of third-party interests in both issues dictate that a long lead time will be necessary for any transfer. The basic approach recommended for water transfers in southeast Texas is *informed negotiation with compensation and mitigation for impacts*. Steps to begin such an approach are detailed below.

7.3 Beginning Steps

1. The first step is to address the need for information. A comprehensive study, or a series of studies, should be undertaken to create a widely accepted sound scientific base of knowlege about possible environmental impacts within the basin of origin to:

- instream flows of the Sabine and Neches Rivers;
- inflows to and circulation in Sabine Lake, and
- the relationship between Sabine Lake and eastern marshes.

This study could be funded and administered jointly by the states of Texas and Louisiana, with possible participation by the federal government because of the interstate nature of the Sabine River and Sabine Lake.

There also is a need for information about economic development in the basin of origin and the receiving basin(s). Uncertainties about future growth and the value of natural resources as economic attractions hinder the development of mutually acceptable solutions. Studies in this area also may inform the effort to determine project impacts and appropriate compensation or mitigation for identified impacts.

Third party interests such as environmental groups and navigation companies should be

included in an oversight group. Communication vehicles such as the Sabine Lake Conference should be used to widely disseminate the information acquired. An evaluation also should be made of the environmental impacts of a transfer on the receiving basin(s).

2. As a means of including third party interests with potential buyers and sellers of water, at least one group with representation of diverse interests should be formed in the Southeast area, probably under the auspices of the State of Texas. A neutral facilitator would be helpful. This group should address the "our water" issue by continuing discussions of water transfers, potential impacts, and possible forms of compensation and mitigation. Forms of compensation or mitigation suggested by the South East Texas Equity Task Force, as well as other compensations which may address identified impacts, should be explored.

It might be appropriate to have more than one group formed initially, as third party interests better define their concerns and the type and extent of impacts they foresee. What is most important at this early stage is a continuing conversation among the participants while information is being gathered. A group with representation of a broad spectrum of interests could draw membership from the groups formed in step 1 to oversee information collection. Depending on the make-up of the Regional Water Planning Groups established under SB-1, one group might serve both purposes.

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