



## MEMORANDUM

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**TO:** Region C Water Planning Group (RCWPG)  
**FROM:** Stephanie Griffin [NTD02182] T:\Task 4\M\_Water Management Strategies-with tables.doc  
**SUBJECT:** Potential Water Management Strategies - Region C  
**DATE:** May 29, 2003

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Senate Bill One Phase II requires certain types of water management strategies to be considered as a means of developing additional water supplies. The water management strategies that must be addressed include:

- Water conservation practices
- Drought management measures
- Reuse of wastewater
- Expanded use of existing supplies
  - System operation
  - Conjunctive use of ground and surface water
- Reallocation of reservoir storage
- Voluntary redistribution of water resources
- Voluntary subordination of existing water rights
- Yield enhancement
- Improvement of water quality
- New supply development
- Surface water resources
- Groundwater resources
- Brush control
- Precipitation enhancement
- Desalination
- Water rights cancellation
- Aquifer storage and recovery
- Interbasin transfer
- Other measures

During the first phase of Senate Bill One planning, the RCWPG adopted statements regarding most of the water management strategies listed above. The following summarizes the RCWPG's thoughts on each topic in the January 2002 *Region C Water Plan*.

## Water Conservation

During the first phase of regional water planning, the projected water needs included significant savings in water use due to water conservation. The projected municipal water demands included a savings of 15% in per capita municipal water use for the region (representing a savings of 400,000 acre-feet by the year 2050). The RCWPG adopted the following strategies

- Take active measures to achieve the 15 percent water conservation savings included in the municipal demand projections. Measures would include:
  - Low-flow plumbing fixtures (required by state and federal law)
  - Outdoor water conservation measures
  - Improved indoor water use habits
  - Continued and expanded public education programs for water conservation
    - Education for policy makers
    - Education programs in the public schools.
- Assess the effectiveness and applicability of specific water conservation measures in Region C during the next five years.
- Encourage state funding for research on the effectiveness of water conservation programs and for support of education programs.

Phase 1 Decision: Continue efforts to implement water conservation, focusing on meeting the 15 percent reduction in municipal per capita use due to conservation included in the projections. Encourage state funding of conservation education and of efforts to evaluate and improve conservation programs. Use data developed to evaluate additional conservation savings in the next five-year planning cycle.

Phase 2 Planning: The TWDB completed a water conservation study in the Fall of 2002. The water conservation measures are included in the table below. The RCWPG may want to consider these possible water conservation strategies.

**Summary of Water Conservation Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific projects recommended	No specific projects mentioned	Single-family toilet retrofit
		Single-family showerheads and aerators
		Single-family clothes washer rebate
		Single-family irrigation audit for high users
		Single-family rainwater harvesting
		Single-family rain barrels
		Multi-family toilet retrofit
		Multi-family showerheads and aerators
		Multi-family clothes washer rebate
		Multi-family irrigation audit
		Multi-family rainwater harvesting
		Commercial toilet retrofit
		Coin-operated clothes washer rebate
		Irrigation audit
		Commercial general rebate
		Commercial rainwater harvesting

**Drought Management Measures (Emergency Management and Drought Response)**

Senate Bill One included a measure that required water suppliers to develop drought contingency and emergency demand management plans. Drought contingency and emergency response plans are important planning tools for providing protection in the event of water supply shortages. However, these measures are not reliable sources of additional water supplies to meet growing demands.

Phase 1 Decision: Continue efforts to implement drought contingency and emergency response planning, but do not treat these as water management strategies to provide additional long-term supplies.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Drought Management Measure Strategies**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
Not used as a supply	None listed	

**Reuse of Wastewater**

Reuse of treated wastewater is becoming an increasingly important source of water in Region C and across the state of Texas. There are a number of water reuse projects in operation in Region C, and many others are currently in the planning and permitting process.

Two types of reuse are permitted in Texas: direct and indirect. Direct reuse requires a notification to the TNRCC, which is routinely accepted so long as requirements to protect public health are met. Indirect reuse occurs when treated wastewater is discharged to a stream or reservoir and is diverted downstream or out of the reservoir for reuse. Indirect reuse requires a permit from the TNRCC, and TNRCC’s regulatory approach to such reuse permits is not entirely clear at this point.

Potential applications for water reuse projects in Region C include:

- Landscape irrigation (parks, school grounds, freeway medians, golf courses, cemeteries, residential)
- Agricultural irrigation (crops, commercial nurseries)
- Industrial and power generation reuse (cooling, boiler feed, process water, heavy construction)
- Recreational/environmental uses (lakes and ponds, wetlands, stream flow augmentation)
- Supplementing potable water supplies (surface and groundwater supplies)

Phase 1 Decision: Incorporate water management strategies involving reuse as a major component of the long-term water supply for Region C. Encourage planning and implementation of additional reuse projects. Monitor legislation and regulatory actions related to reuse.

Phase 2 Planning: The City of Grapevine is considering purchasing reuse water from Park Cities MUD #1. The RCWPG may see revised approaches and projects during this phase of planning. The City of Athens is currently seeking a reuse permit.

**Summary of Wastewater Reuse Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Amount of Water in 2050 (Ac-Ft/Yr)</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
TRWD indirect reuse from Trinity River (Cedar Creek/Richland-Chambers)	115,500	City of Irving reuse (Lake Chapman)	City of Grapevine reuse from Park Cities MUD #1
DWU indirect reuse (Lake Ray Hubbard)	68,300		May see revised approaches & projects
TRA indirect reuse from effluent (Joe Pool Lake, Dallas County Other).	28,000		City of Athens reuse
TRA direct reuse from effluent (Ellis County, Ellis County Steam Electric).	20,000		
TRA indirect reuse from effluent (Grapevine Lake, Dallas County Other).	16,000		
City of Garland direct reuse	15,694		
UTRWD indirect reuse of Lake Chapman	13,900		
TRA Las Colinas	7,000		
City of Weatherford indirect reuse	6,000		
Denton County Steam Electric indirect reuse	5,500		
TRA direct reuse from effluent (Denton Creek Plant, Denton County Other).	5,000		
TRA indirect reuse from effluent (Mountain Creek, Dallas County Steam Electric).	3,000		
City of Fort Worth direct reuse	2,600		
Tarrant County-Other reuse	2,600		
TRA direct reuse from effluent (Denton Creek Plant, Tarrant County Other).	2,500		
Ellis County Steam Electric indirect reuse from Ennis	2,427		
City of Grapevine reuse (Lake Grapevine)	1,495		

**Expanded Use of Existing Supplies – Reservoir System Operation**

Region C already has a number of reservoir systems in operation. System operation can enhance yield, reduce pumping costs, and maintain acceptable quality. Dallas Water Utilities operates its system to produce additional water supply during high demand years in a drought. System operation is being used in several places in the region, including:

- North Texas Municipal Water District system
- Dallas Water Utilities system
- Tarrant Regional Water District system
- Lost Creek Lake/ Lake Jacksboro system
- Lake Weatherford/Lake Benbrook system
- Lake Waxahachie/Lake Bardwell System
- Lake Halbert/Navarro Mills Lake system

Phase 1 Decision: Include system operation for Dallas Water Utilities as a source of yield. System operation should be allowed when needed or desired but is not considered as a source of significant additional yield for Region C.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Expanding Existing Supplies Using System Operations**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Dallas Water Utilities system	No specific projects mentioned	

**Expanded Use of Existing Supplies – Connecting Existing Sources**

There are several sources of water supply that are committed for use in Region C and will be connected and used between now and 2050. Plans for connecting existing sources include:

- Dallas Water Utilities connecting Lake Fork
- Irving connecting Lake Chapman
- Upper Trinity Regional Water District connecting Lake Chapman
- Gainesville connecting Moss Lake (completed)
- Weatherford connecting to Lake Benbrook
- Connecting two proposed Wise County power plants to Lake Bridgeport
- Connecting proposed Freestone County power plans to Richland-Chambers Reservoir (completed)
- Tarrant Regional Water District connection of Lake Benbrook and Eagle Mountain Lake
- Tarrant Regional Water District East Texas pipeline capacity expansion
- Dallas Water Utilities connecting Lake Palestine

- Grapevine direct reuse project
- Other projects.

Other existing supplies that could be connected for use in Region C include:

- Uncommitted Lake Texoma supply
- Corsicana’s Richland-Chambers supply
- Duncanville, Cedar Hill, and remainder of Grand Prairie supply in Joe Pool Lake
- TXU Forest Grove supply in Cedar Creek Lake
- Mineral Wells Lake Mineral Wells supply
- Carrizo-Wilcox aquifer in Freestone County
- Carrizo-Wilcox aquifer in Navarro County
- Trinity River Authority/Ennis reuse project

Phase 1 Decision: Include connection of existing supplies as a major component of the Region C plan.

Phase 2 Planning: Mesa Water has proposed a plan to bring groundwater from the Ogallala aquifer to the Metroplex area. At this time, we are not aware of any water suppliers who have accepted Mesa’s offer. Various water suppliers are considering the possibility of pumping surface water from Toledo Bend Reservoir to the Metroplex. GTUA is currently seeking funding to build a pipeline from Sherman to Howe, Van Alstyne, Melissa and Anna to transport treated surface water to these entities.

**Summary of Expanding Existing Supplies by Connecting Existing Sources**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Amount of Water in 2050 (Ac-Ft/Yr)</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
DWU Lake Fork connection	120,000	City of Corsicana pipeline to Cedar Creek/Richland-Chambers Reservoir	Mesa Water's Ogallala aquifer project
TRWD Cedar Creek/Richland-Chambers pipeline expansion	110,000	City of Irving - Oklahoma water	Pipeline to Toledo Bend Reservoir
DWU Lake Palestine connection	109,600	NTMWD substantial additional Lake Texoma water	GTUA pipeline for Howe, Melissa, Anna & Van Alstyne
Oklahoma water connection (TRWD & NTMWD)	62,000	TXU Forest Grove supply in Cedar Creek	
City of Irving pipeline to Lake Chapman	48,800	Uncommitted Lake Texoma supply	
Fannin County Water Supply Project	24,155	Carrizo-Wilcox aquifer in Freestone and Navarro Counties	

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<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Amount of Water in 2050 (Ac-Ft/Yr)</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
DWU additional temporary overdraft	22,000	Mineral Wells supply in Lake Mineral Wells	
Freestone County proposed power plant - Richland-Chambers Reservoir	15,715	Duncanville, Cedar Hill & Grand Prairie in Joe Pool Lake	
TRA Ellis County water supply project	13,098		
Wise County proposed power plants - Lake Bridgeport	11,200		
UTRWD pipeline to Lake Chapman	10,900		
DWU extend Elm Fork term permit	10,000		
NTMWD additional Lake Texoma	10,000		
Add new water wells in the Trinity Aquifer in Cooke, Dallas, Denton, Grayson, Parker, Tarrant & Wise	5,930		
Grayson County Water Supply Project	5,093		
Additional other local supply for mining	3,046		
Pottsboro acquires water right in Lake Texoma	3,000		
Overdraft Lake Weatherford in 2000	2065		
City of Gainesville pipeline from Moss Lake (completed)	1121		
Cooke County Water Supply Project	914		
Add new water wells in the Woodbine Aquifer (Collin, Cooke, Denton, Ellis, Grayson, & Kaufman Counties)	681		
City of Malakoff connect to TRWD	563		
Additional irrigation local supply in Kaufman County	397		



<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Amount of Water in 2050 (Ac-Ft/Yr)</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
City of Terrell supply County-Other through Lake Terrell	330		
Add new water wells in the Carrizo-Wilcox aquifer in Freestone, Henderson & Navarro Counties	154		
Add new water wells in the Other Aquifer (Parker and Wise Counties)	50		
City of Weatherford connect to Lake Benbrook	0		
Fort Worth's Northeast Tarrant County Regional Water System (from Fort Worth to Keller, Roanoke, Southlake, Trophy Club, Westlake/Lake Turner MUDs).	0		
TRWD East Texas pipeline expansion	0		
TRWD West Fork connection (Lake Benbrook to Eagle Mountain)	0		
Water treatment plant expansions	0		
Overdraft aquifers in 2000	included above		
Reallocate aquifers	included above		

### Reallocation of Reservoir Storage

There are two types of reallocation of existing reservoir storage. Reallocation among various water supply uses (municipal, industrial, irrigation, etc.) is a relatively simple matter. It is considered to be a minor water right amendment by TNRCC. This type of reallocation should be allowed at the discretion of the owner of the water right.

Phase 1 Decision: Permit transfers among types of water use at the discretion of the water right holder. Conduct further studies of reallocation to municipal use of Lake Texoma water.

Phase 2 Planning: Additional water may be available for municipal purposes in Lake Wright Patman.

**Summary of Reallocation of Reservoir Storage Strategies**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
No specific projects recommended	Lake Texoma - hydropower use to municipal use	Lake Wright Patman

**Voluntary Redistribution of Water Resources (Voluntary Transfer of Water Rights)**

Water rights can be transferred from one owner to another. There are no specific water right transfers included in the Region C plan, but the plan allows for voluntary transfers of water rights as needed and as desired by the owners of the water rights.

Phase 1 Decision: Allow voluntary transfers as needed and desired by the owners of the water rights.

Phase 2 Planning: Athens is investigating the possibility of purchasing Forest Grove Reservoir from TU. If TU is not interested in selling the reservoir, Athens may consider contracting with TU to purchase water from Forest Grove.

**Summary of Voluntary Redistribution of Water Sources**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
No specific projects mentioned.	None listed	Athens purchase from Forest Grove

**Voluntary Subordination of Existing Water Rights**

Voluntary subordination of water rights is most useful where senior hydropower rights limit reservoir yields. Very little additional yield is available in Region C by voluntary subordination. Voluntary subordination of water rights is not considered as a potential source of supply for Region C.

Phase 1 Decision: Do not include voluntary subordination of water rights as a source of water supply for Region C.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Voluntary Subordination of Existing Water Rights**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
Not used as a supply	None listed	

**Enhancement of Yields of Existing Sources**

Examples of ways to enhance the yield of existing sources might include the following:

- Artificial recharge of aquifers (as part of aquifer storage & recovery)
- System operation of reservoirs (discussed above)
- Conjunctive use of surface water and groundwater (meet peak needs with groundwater to reduce required capacity of surface water)

Phase 1 Decision: Do not include enhancement of yields of existing sources as a source of water supply for Region C except as discussed above under reservoir system operation.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Yield Enhancement Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
DWU System Operation	None listed	

**Improvement of Water Quality (Control of Naturally Occurring Chlorides)**

The Brazos and Red River Basins have chloride concentrations in excess of desirable levels for municipal use. Chloride control has been studied in the Brazos and Red Basins and partially implemented in the Red Basin. Chloride control projects should continue to be monitored.

Phase 1 Decision: Monitor chloride control projects. Do not include control of naturally occurring chlorides as a source of water supply for Region C.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Improvement of Water Quality Projects**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific projects recommended	None listed	

### Development of New Supplies

New supplies that might be developed for Region C include new reservoir sites and currently undeveloped groundwater supplies. The following lists potential new reservoir sites that could be used by Region C:

- Tehuacana
- Muenster
- Roanoke
- Upper Red Oak
- Lower Red Oak
- Boyd
- Italy
- Tennessee Colony
- Lower Bois d'Arc Creek
- Upper Bois d'Arc Creek
- Ralph hall
- Ringgold
- Big Pine
- Pecan Bayou
- George Parkhouse I (South)
- George Parkhouse II (North)
- Marvin Nichols I (North)
- Marvin Nichols II (South)
- Little Cypress
- Upper Little Cypress
- Black Cypress
- Marshall
- Waters Bluff
- Carl Estes
- Big Sandy
- Carthage
- South Bend
- Bedias
- Ponta
- Eastex
- Weches
- Rockland

After a preliminary evaluation, many of these potential reservoir sites were eliminated from further study for one or more of the following reasons:

- Major conflicts at the reservoir site
- Insufficient yield and/or high cost
- Small yield considering the distance for water transmission
- Combination of environmental impacts, distance, and yield
- Supply needed locally and unlikely to be available for Region C.

Five of the potential reservoir sites retained for further study are located in Region C:

- Lower Bois d'Arc Creek (formerly known as New Bonham)
- Tehuacana
- Muenster
- Ralph Hall
- Upper Bois d'Arc Creek.

The other four sites retained for further study are located in the Sulphur Basin in Region D:

- George Parkhouse I (South)
- George Parkhouse II (North)
- Marvin Nichols I (North)
- Marvin Nichols II (South)

Phase 1 Decision: Conduct additional studies of Upper Bois d’ Arc Creek, Lower Bois d’ Arc Creek, Tehuacana, Muenster, Ralph Hall, George Parkhouse I, George Parkhouse II, Marvin Nichols I, and Marvin Nichols II. Develop additional groundwater supplies where appropriate. Lower Bois d’ Arc Creek, Muenster, and Marvin Nichols I were recommended strategies in the 2001 Region C Water Plan. Ralph Hall, Upper Bois d’ Arc Creek, and Tehuacana were included in the 2001 Region C Water Plan as alternative sources for additional water supply.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of New Water Supply Development Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Lower Bois d'Arc Creek Lake (NTMWD)	Lake Tehuacana (TRWD)	
Marvin Nichols I Reservoir	Upper Bois d'Arc Creek (Fannin County)	
Muenster Lake	Ralph Hall Reservoir (Fannin County)	
	Marvin Nichols II Reservoir	
	George Parkhouse I Reservoir	
	George Parkhouse II Reservoir	
	Upper Red Oak	
	Lower Red Oak	
	Boyd	
	Italy	
	Tennessee Colony	
	Ringgold	
	Big Pine	
	Pecan Bayou Little Cypress	
	Upper Little Cypress	
	Black Cypress	
	Marshall	
	Waters Bluff	
	Carl Estes	
	Big Sandy	
	Carthage	
	South Bend	
	Bedias	
	Ponta	
	Eastex	
	Weches	
	Rockland	

**Brush Control**

Brush control is the process of removing non-native brush from the banks along rivers and streams in order to reduce water consumption by vegetation and increase stream flows and groundwater availability.

Phase 1 Decision: Allow for studies and localized pilot projects to further investigate brush control, and request state funding for these studies.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Brush Control Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific projects recommended	None listed	

**Precipitation Enhancement**

Precipitation enhancement involves seeding clouds with silver iodide to promote rainfall. The impacts of precipitation enhancement on streamflows and reservoir yields have not been studied. The benefits of cloud seeding are highly uncertain for this area.

Phase 1 Decision: Do not include precipitation enhancement as a specific management strategy. Allow for studies and localized pilot projects to further investigate precipitation enhancement.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Precipitation Enhancement Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific projects recommended	None listed	

**Desalination**

The salinity of water in Lake Texoma and the Red River is too high for municipal use, and the water must be desalinated or blended with higher quality water in order to meet drinking water standards. Desalination should be considered as a way to use supplies from Lake Texoma and the Red River.

Phase 1 Decision: Include desalination as a management strategy in order to utilize supplies from Lake Texoma and the Red River.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Desalination Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific project recommended	Lake Texoma desalination Red River desalination	

**Water Right Cancellation**

The TNRCC has the power to cancel water rights after ten years of non-use, but this involuntary cancellation authority has seldom been used. The water availability modeling studies being conducted across the state will determine the additional water supply that could be gained from water right cancellation. Water right cancellation is not seen as a viable water management strategy to develop additional water supply for Region C.

Phase 1 Decision: Do not include water right cancellation as a source of water supply for Region C.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Water Right Cancellation**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Not a recommended strategy	None listed	

**Aquifer Storage and Recovery**

Aquifer storage and recovery (ASR) involves storing excess water in aquifers and retrieving this water when needed. Studies of ASR should continue, and pilot projects should be implemented if the strategy appears to be promising.

Phase 1 Decision: Studies of ASR should continue, and pilot projects should be implemented if the strategy appears promising.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Aquifer Storage and Recovery Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific project recommended	TRWD aquifer storage & recovery project	

**Interbasin Transfers**

An interbasin transfer permit is required when an entity requests to use water that originates in a different basin than where it will be used. Existing sources with the potential to provide increased supply through interbasin transfers include Lake Texoma, Lake Granbury, Lake Whitney, Toledo Bend Reservoir, Lake Sam Rayburn, Lake Palestine, and Oklahoma reservoirs. Potential reservoir sites that could provide increased water supply to Region C by interbasin transfers include Marvin Nichols I and II, George Parkhouse I and II, Lower Bois d'Arc Creek, Waters Bluff, South Bend, Black Cypress, Little Cypress, Marshall, Big Pine, Pecan Bayou, Rockland, and Ralph Hall. Development of adequate supplies for Region C and the other growing areas of Texas will require interbasin transfers.

Phase 1 Decision: Include interbasin transfers as management strategies in the Region C plan.

Phase 2 Planning: Interbasin transfers would be required for water supplies in Lake Wright Patman and Toledo Bend Reservoir. Any additional water supply for the City of Athens will likely require an interbasin transfer as all of their current and potential supplies are located in the Neches Basin.

**Summary of Interbasin Transfer Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Lake Texoma	Upper Bois d'Arc Creek	Wright Patman
Oklahoma water	Ralph Hall Reservoir	Toledo Bend
Marvin Nichols I		
Lower Bois d'Arc Creek		

**Other Measures - Renewal of Contracts**

Many of the water suppliers in Region C purchase water from a major water provider or from another water supplier. TWDB guidelines for Senate Bill One planning efforts indicate that such purchased supplies should be assumed to cease to be available to the purchaser after the expiration of the existing contracts.

Phase 1 Decision: Include the renewal of existing contracts as a major source of water supply in Region C.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Other Measures – Renewal of Contracts**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Renewal of existing contracts	None listed	



**Other Measures – Temporary Overdrafting**

In many counties in Region C, the current use of groundwater exceeds TWDB’s estimate of long-term reliable groundwater supplies. In order to reduce the demand on overused groundwater resources, water suppliers will need to develop alternate sources of supply. However, the development of alternate sources will take some time. Temporary overdrafting of some groundwater supplies will continue in order to provide water in the interim.

Phase 1 Decision: Temporary overdrafting of groundwater resources and surface water reservoirs can be used as an interim measure while other water supplies are developed.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Other Measures – Temporary Overdrafting Strategies**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
Temporary overdrafting of groundwater and surface water supplies	None listed	

**Other Measures – Groundwater Management Districts**

Texas law allows for the establishment of groundwater management districts to help control the development and use of groundwater resources. Groundwater districts can control well size and use, well spacing, and groundwater pumping. There are currently no groundwater management districts in Region C, although there are many in other parts of the state.

Phase 1 Decision: Local water suppliers and government officials should consider the formation of groundwater management districts in areas of heavy groundwater use.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Other Measures – Groundwater Management Districts**

<b>Recommendations in the 2001 Region C Water Plan</b>	<b>Other Alternatives Considered in the 2001 Region C Water Plan</b>	<b>New Possibilities</b>
No specific districts were recommended	None listed	

**Other Measures – Assumed Reallocation of Groundwater**

As suppliers currently using groundwater convert to surface water supplies, which will happen in many parts of Region C, they may reduce their current use of groundwater. The resulting decrease in groundwater use may make a portion of the limited groundwater supply available to other water suppliers.

Phase 1 Decision: In some cases, assume a gradual decrease in groundwater use as other supplies are made available and assume that groundwater supplies will become available to other water suppliers.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Other Measures – Assumed Reallocation of Groundwater Strategies**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
Gradual decrease in groundwater use assumes that those groundwater supplies will become available to other water suppliers	None listed	

**Other Measures – Wellhead Management**

Wellhead management is a means to protect groundwater quality. It involves making an analysis of potential threats to water quality in the vicinity of wells and protecting water quality by regulations, zoning, land purchase, physical changes to the well, or other measures.

Phase 1 Decision: Wellhead protection is a potential tool for local suppliers to protect groundwater quality.

Phase 2 Planning: No new possibilities have been brought to our attention at this time.

**Summary of Other Measures – Wellhead Management Strategies**

<b>Recommendations in the 2001 <i>Region C Water Plan</i></b>	<b>Other Alternatives Considered in the 2001 <i>Region C Water Plan</i></b>	<b>New Possibilities</b>
Potential tool to protect groundwater quality	None listed	