



# Rattlesnake Creek

## Management Program Proposal

By Rattlesnake Creek/Quivira Partnership

Subbasin Water Resource Management Program

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**RATTLESNAKE CREEK MANAGEMENT  
PROGRAM PROPOSAL**

*by*

**Rattlesnake Creek/Quivira Partnership**

*Water Protection Association of Central Kansas*

*Big Bend Groundwater Management District #5*

*U.S. Fish and Wildlife Service, Quivira National Wildlife Refuge*

*Kansas Department of Agriculture, Division of Water Resources*

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## **I. Introduction**

In 1993, residents of the Rattlesnake Creek Subbasin (subbasin) area and government agencies formed the Rattlesnake Creek/Quivira Partnership (Partnership) to cooperatively develop and implement solutions to water resource problems within the subbasin. It was agreed that the partners would use a community involvement approach with water conservation as the guiding principle to address water related concerns in the subbasin. This would be accomplished through a joint effort which recognized the different obligations, duties, responsibilities and roles that each partner has outside the Partnership. The Partnership -Big Bend Groundwater Management District No. 5 (GMD #5), Water Protection Association of Central Kansas (Water PACK), Kansas Department of Agriculture, Division of Water Resources (DWR), and U.S. Fish and Wildlife Service (USFWS) - signed a Cooperative Agreement to this effect in June 1994.

Since its inception, the Partnership has evolved into a functional working group that has a thorough understanding of the hydrologic conditions of the subbasin. An established, trustful working relationship between the resident water users and government agencies has made this group extremely effective. As a result of this effort, the Partnership has developed a Rattlesnake Creek Management Program (program) which suggests a proactive approach to maintain sustainable water supplies in the subbasin.

The implementation of the program will not be a "quick fix" solution to the water resources problems in the subbasin. The type of management program the Partnership has proposed is intended to address the long term sustainability of the water resources in the subbasin. However, the management strategies proposed should address the water resources issues for both the short and long term. The program was developed in this way to allow for management alternatives that may take a few years to show measurable effects to have time to get up and running. This is necessary because the main methods of reducing water use are mainly incentive-based programs which would need to be incorporated into water users' existing operations. Therefore, the success of these management alternatives and their degree of effectiveness depends greatly upon the participation of the water users in the subbasin. Active participation by water users in the new management program is one of the main objectives of the Partnership and is especially important during implementation. The Partnership has concentrated its efforts on a voluntary approach for lowering the total water use in the subbasin. This will occur through the use of the new management alternatives, an information/education program implemented simultaneously, and an enhanced compliance and enforcement effort. The primary mechanism to reach the goals of the management program is to reduce the total amount of water used in the subbasin through these methods, especially in those areas identified as priority areas. This design should result in the stabilization and reversal of the declining groundwater trends and enhanced streamflows.

## **II. Statement of Issues**

The Rattlesnake Creek subbasin encompasses approximately 1,303 square miles. The subbasin is located predominantly within Groundwater Management District No. 5 (GMD #5), with the exception of Ford County, which is located within Groundwater Management District No. 3 (GMD #3). The subbasin encompasses portions of the following counties: Stafford, Edwards, Kiowa, Rice, Reno, Barton, Pawnee, Pratt, Ford, and Clark. (See Figure 1 - General Reference Map) Fluctuations of aquifer levels in the Rattlesnake Creek subbasin may result in streamflows that are inadequate for the appropriated surface water demand for periods of time during some years. Groundwater withdrawals, especially during dry periods, decrease the total available stored water in the hydrologic system, resulting in declining groundwater levels and reduced stream flows. The timing of irrigation demands for water often coincides with the demands for surface water from the Rattlesnake Creek. The Partnership members have developed new management strategies for the Rattlesnake Creek subbasin to ensure: adequate, good quality water for all users; profitable agriculture; abundant wildlife and habitat; and an acceptable standard of living for subbasin residents.

The Partnership used the following methodology to develop the new management strategies:

- Reviewed data and information provided by the partners
- Received reports from DWR on additional data collection efforts
- Identified areas of concern within the subbasin
- Determined extent of problems
- Brainstormed ideas for potential management strategies
- Developed management strategies
- Recommended new management program
- Will assist in implementation of the management strategies

## **III. Goals and Objectives for Priority Management Areas**

Goals and objectives were identified for priority management areas of the subbasin through data analyzes, including SWATMOD model runs, regression analysis, and other standard methods. These data analyzes helped the Partnership determine the estimated water use savings required to achieve long-term sustainable management in the Rattlesnake Creek subbasin, as well as where suggested reductions in water use would have to occur to achieve the desired effect. Figure 2 - Priority Management Areas Map - illustrates the priority management areas where the management strategies discussed within this document should be concentrated. These areas are described in the remainder of this section, along with the specific goals and objectives.

### **A. Stream Corridor Area**

This area covers a four-mile wide corridor extending from the west side of Section 10, Township 27 South, Range 17 West in Kiowa County, and continues in a northeast direction to the west side of Section 26, Township 22 South, Range 11 West, located in

northeast Stafford County. This area was selected based on the hydrologic relationship to the stream.

**Goal:** To stabilize the decreasing trend in streamflow in the short term and improve streamflow in the future.

**Objective:** Reduce average groundwater use within the corridor of the Rattlesnake Creek over a period of 12 years. Based on hydrologic analyzes to date, average annual water use within the corridor should be 29,284 acre-feet (12% reduction in the 10 year (1987-1996) average annual water use) in order to attain a target 10 year average January streamflow of 25 cfs at the Zenith Gage. By achieving 25 cfs on average during January at the Zenith Gage, base flows should be restored to Rattlesnake Creek. The 10 year average groundwater use should be calculated by dropping off year 1 of the record and adding the next year. If the average January streamflow reaches 25 cfs, the reduction in water use should be adjusted, even if the amount of water use is not 29,284 acre-feet on average, as the streamflow is the goal and the change in water use is only a means to achieve it. Analysis of streamflow data should be used to evaluate whether the trend in streamflows has moved to a positive trend or not.

## **B. Groundwater Management Area**

An area that consists of a portion of the subbasin located north/central in the subbasin is where management strategies to address groundwater declines would be focused. This area consists of parts of Kiowa, Edwards, Stafford and Pawnee counties. Within this area is one smaller area of high decline. This area is located along the northern boundary of the watershed in parts of Pawnee and Stafford counties.

The entire groundwater management area was defined based on the extent of groundwater declines, and saturated thicknesses of aquifers in this region. The high decline areas should be given priority with certain management alternatives in order to enhance the reduction of water use in these areas to a greater degree.

**Goal:** Stabilize groundwater declines and, over the long term, improve groundwater level trends.

**Objective:** Reduce average annual water use in this area over a period of 12 years. Based on hydrologic analyzes, average water use within the groundwater area should not exceed 84,996 acre-feet when calculated using a 10 year average. This results in a 16%, or 16,480 acre-feet, reduction in the 10 year (1987-1996) average of water use. The 10 year average groundwater use should be calculated by dropping off year 1 of the record and adding the next year.

## **C. Mineral Intrusion Area**

An area extending east and north of Highways 281 and 50 in the Rattlesnake Creek subbasin is affected from natural mineral intrusion. This area has been defined by the Groundwater Management District and is further documented in publications by the

Kansas Geological Survey in cooperation with GMD #5. (See Figure 3 - Wells within Mineral Intrusion Area Map)

**Goal:** To reduce the potential for further mineral intrusion into freshwater sources and improve water quality.

**Objective:** Decrease the effects of pumping on natural mineral intrusion into the fresh water aquifer, generally through modifications in well construction and pumping rates. If wells in the mineral intrusion area are brought under a special management program, a trend towards higher quality groundwater should be obtained.

#### **IV. Description of Management Strategies**

The management strategies that will be used within the priority areas are detailed below. An explanation of where and how the new management strategy would be applied and the intended effects are summarized below. Also, each management strategy, the cost associated with it, and the potential water savings is detailed in Table 1 - Management Alternative Numbers and Funding spreadsheet. These management strategies are not intended to preempt the statutory processes that may be necessary to implement these management strategies through regulatory actions.

##### **A. Water Rights Purchase Program**

The water rights purchase program should be used to permanently reduce water use in the stream corridor and areas of high decline within the groundwater management area. The purpose of this program is to provide State cost share assistance with a local entity to purchase water rights to restore base flows in designated streams and/or slow or reverse the decline of groundwater levels in specific areas. The objectives of this State Conservation Commission program are as follows:

- a) To recover streamflow in depleted streams.
- b) To protect existing alluvial and groundwater aquifers from further depletion and restore them to a safe yield level.
- c) To provide an economic incentive for conversion to dryland farming.
- d) To extend the life of a mined regional water supply by lowering the demand placed on that supply.
- e) To restore and protect aquatic and other wildlife habitats.

All of these objectives are a perfect match for what could be achieved in the Rattlesnake Creek subbasin.

This program allows a water right holder to voluntarily sell a water right. GMD #5 would act as the local entity for purchasing water rights. Once the water appropriation is purchased, it would be placed under the custodial care of the State and retired from further use.

An executive committee representing Partnership interests has been formed to provide information, data and recommendations to various state agencies, and any legislative

committees that study this program. Water PACK and GMD #5 would continue their active participation with these entities. DWR and USFWS would continue to provide technical support and data relating to the use of the program in the Rattlesnake Creek subbasin. The executive committee would interact, as necessary, with these entities during work sessions and develop materials to provide input in the decision-making process. This committee will keep the larger Partnership group informed of progress and provide copies of all materials provided to the state agencies and legislative committees. Recommendations that have been developed are described below:

- 1) The price for water purchased would be established in a bid format. The purchasing entity (GMD5), would establish initial bids. Bids would be advanced to a point where the available funds are expended for that year. Each year the process starts over at a low initial value and proceeds until all funds are expended. After each year of buyback operations, an assessment would be made to evaluate progress and to determine if funding levels are adequate to meet goals.
- 2) A point system would be developed for use according to the priority areas to help establish the value of water rights in those locations. A weighting of the most important area(s) would be accomplished by assigning a larger value to that area(s). The value would be multiplied by the current rate of purchase for water. This would be available to the public so others can attend an auction knowing what they can sell.
- 3) A buy-back and funding schedule are set up to distribute the relative high cost of this program over 12 years, allowing for detailed planning and allocation of funds through State and local entities. Detailed cost and water savings are shown in the attached spreadsheet. GMD #5 or other local entity would provide at least 20% matching monies for each water right purchased; the State would provide a maximum of 80% of the cost to purchase the water rights. It is anticipated that funding would begin in Fiscal Year 2001 (July 2000). There are two options for the manner in which the local matching money would be provided through GMD #5:

**Option A** - This would be pursued prior to implementing option B. The private sector portion of funding would come from a designated trust fund or contributions to GMD #5. The trust fund could be funded by a coalition of non-governmental organizations, environmental interests, and private sector contributors.

**Option B** - Local funding would be provided through an assessment on all water rights in the District. The Groundwater Management District may assess a water use charge of up to \$0.60 per acre-foot. It is estimated that the District would need to generate approximately \$86,800.00 per year based on calculated projections.

**Area of Application:**

The Water Rights Purchase Program would be implemented on a priority basis in the stream corridor and groundwater management areas. (See figure 4 for priority areas). It should be noted that although water rights would not be purchased outside of the priority management area, due to the overlap of the corridor and mineral intrusion areas, beneficial impacts should be seen in the mineral intrusion area.

**Stream Corridor Target:** Purchase 2,083 acre-feet of appropriations from the corridor (this is approximately 4.52% of the total appropriations in the two-mile corridor). Preference will be given according to priority areas in the stream corridor.

**Groundwater Area Target:** Purchase a total of 8,333 acre-feet of appropriations from the groundwater units with priority given to high decline areas. This is approximately 5.91% of the total appropriations in the entire groundwater management unit.

**Mineral Intrusion Area Target:** The purchase of water within the stream corridor and eastern parts of the groundwater management unit should positively affect the water quality in the aquifer east of Highway 281. All wells located in the mineral intrusion area should be brought under the GMD #5 guidelines (described later) as they are redrilled.

**B. Water Banking**

Water banking in Kansas is still under construction. A Task Force was assigned the duties of developing this water marketing concept to meet the goals of the State Water Resource Planning Act pertaining to the efficient, economic distribution of the water supplies of the state, and the protection of public interest by conserving the water resources of the State in a technologically and economically feasible manner. All of the basic functions of a water bank as described by the Task Force were considered during the development of this strategy. The primary purpose of water banking in the Rattlesnake Creek subbasin would be to provide incentive for water conservation and redistribution of water use within the subbasin. The Partnership has provided recommendations to the Water Banking Task Force as follows:

- 1) A bidding process should be used to establish the beginning annual price of water purchased and sold by a water bank.
- 2) Water use history of individual water rights should not be used to calculate the appropriate conservation component. This may cause water users to build an inflated water use prior to participation in a bank. It is recommended that an average water use for a region be established by evaluating the best water use record available. Based on this information, an average water use quantity should be established and be used in the calculations for leased quantities from the bank. This information should be included in the charter.
- 3) Propose that charters include an analysis of the watershed be conducted to delineate sensitive areas where water rights should not be moved. This analysis should include at least hydrologic variation and water use patterns. In addition, this work should include identification of any areas that could withstand further water use locally. Maps showing this information should be available to customers of a water bank.

The development of the Rattlesnake Creek subbasin water banking charter would allow for procedures for each function of the bank to be detailed and tailored for the Rattlesnake. The Partnership would like the following information to be considered when drafting the proposed charter.

- 1) Deposits and Leases - A complete or partial water right can be deposited into the water bank to decrease overall water use.
- 2) Safe Deposit Box - 25% of the difference between a dry year (approximately 85% of the authorized quantity) average use and actual use in the current year the deposit occurs could be placed into the safe deposit box.  
The water in the safe deposit box would be subject to an annual 10% negative interest component. This should be considered during the development of the Charter for the Rattlesnake.
- 3) Bulletin Board - Interested parties may determine the current status of water availability for leasing, current prices for deposits of water, or the availability of sales of water rights.
- 4) Conservation assessments on whole water rights processed by the bank should be structured to provide incentives to move water away from hydrologically sensitive areas. Conservation assessments would be calculated using some representation of appropriation and use combined. Potential conservation components to be used in the Rattlesnake are listed below: (Note: No transactions would be allowed that move water use into the corridor or closer to the stream.)

Corridor to non-management unit.....	0%
Within corridor - further from stream.....	10%
Corridor to minor groundwater unit.....	0%
Corridor to severe groundwater unit.....	75%
Non-management unit to minor groundwater unit....	30%
Non-management unit to severe groundwater unit..	75%
Within non-management unit.....	15%
Within minor groundwater unit .....	10%
Minor groundwater unit to severe unit.....	75%
Minor groundwater unit to non management unit ...	10%
Within severe groundwater unit .....	10%
Severe groundwater unit to non management unit ..	10%
Severe groundwater unit to minor unit .....	28%

\* All other transactions would be considered on a case-by-case basis.

- 5) The Rattlesnake Creek Subbasin Water Bank would seek funding through the Kansas Water Office's technical assistance program to establish a water bank in this area.

**Area of Application:**

This management strategy should be available throughout the basin, but its benefits would be targeted toward the stream corridor, groundwater management and mineral intrusion areas. The stream corridor objective is to reduce average annual water use by 498 acre-feet. The groundwater management area objective is reduce average annual water use by 1,522 acre-feet. The mineral intrusion area objective is to allow movement of water use out of the mineral intrusion area and away from the stream which would reduce the effects of mixing caused by pumping of wells.

**C. Five-Year Water Right Program**

The objective is to establish a voluntary water right management program that should enable water users to better manage their water rights in a manner which would promote conservation and efficiency, yet allow for crop demands in dry years. Participants would obtain a five-year term permit which would allow flexibility in annual withdrawals. This term permit would reflect a conservation component reducing the total authorized amount for the five-year period. This program would require the water user to apply improved management and conservation techniques with better record keeping practices. Compliance would be evaluated through water use monitoring and spot field checks. This program would be administered by GMD #5.

This program would allow an individual with an existing water right to apply for a five-year term permit which:

1. Allows up to 22" per year depending on location and precipitation figures for this area of Kansas. (See average precipitation map for Kansas.)
2. 5-year term limited to (county NIR of 50%/.85\*base acres\*5). Water rights with less than the NIR calculations would have the 5% conservation component calculated from water use for years 1987 through 1996.
3. To be eligible water user must be able to achieve a minimum 5% conservation component from individual water use average between 1987 and 1996.
4. Participants with a conservation component of 10% or more from their 1987 - 1996 water use are exempt from any alternative action while in the program and after completion of two five year terms in the first twelve year program, subject to implementation through rules and regulations.
5. Violations exempts water user from participating in the program and is no longer exempt from alternative actions. Exemptions only apply while remaining in the program.

## **Area of Application:**

This program will function in the entire Rattlesnake subbasin, except inside the 4 mile Rattlesnake Creek corridor. Because the program would function the same, wherever the water right is located, it is covered only in this section.

This voluntary program should allow water users to better manage their water rights in a manner that would promote conservation and efficiency, yet allow for crop demands in dry years. If 15% of the water users in the basin participate, a potential savings of 5% per year should take place. This results in basin wide water use savings of 761 acre feet per year.

## **D. Conservation Practices and Irrigation Management**

A survey of irrigation practices and equipment was completed in the Rattlesnake Creek subbasin in 1994 to identify and inventory the various types of conservation efforts and the extent of these practices. It was found at that time that significant efforts had been made by water users and much improvement was underway. These efforts were substantially furthered in recent years through work of the Partnership and other interested parties in the subbasin. Examples of this include:

- GMD #5 installed 10 weather stations throughout the district to be used in irrigation scheduling and conservation practices. The weather stations measure evapotranspiration or crop water use, which gives the water user a tool to make better irrigation management decisions. GMD #5 is continually working to educate the water users throughout the subbasin in the use of this program.
- Water PACK, in partnership with Kansas State University Extension, has established 13 field sites for informational and educational purposes. This program was started in 1996 and would conclude in the year 2001. The program focuses on irrigation scheduling using climatic data and subsequent knowledge transfer to local irrigators.
- The Partnership has provided information to the State Conservation Commission and worked with them to target cost share assistance money for conversions to more efficient irrigation equipment in the Rattlesnake Creek subbasin. The Partnership should coordinate with the State Conservation Commission for continuance of this program.
- GMD #5, with assistance from the Division of Water Resources, has held water use workshops during the past several winters to help water users accurately fill out their water use reports. This program would be continued.
- The U.S. Fish and Wildlife Service contracted with U.S. Geological Survey and Kansas Geological Survey to develop a water budget computer model to assist refuge staff at Quivira in managing the refuge's water supply in the most efficient and effective way to meet resource objectives.

Overall enhancement of current and new conservation efforts and irrigation management should lead to the more efficient use of water resources and more accurate reporting of water use. A follow-up conservation practice and irrigation equipment survey would be conducted during the implementation of this program to evaluate the effectiveness of some of the examples listed above.

**Area of Application:**

This management strategy should have application throughout the basin. Conversion to more efficient water distribution systems, irrigation scheduling, and other conservation efforts should be fully implemented within the area. Education for water users on various practices and the use of the GMD #5 weather stations for use in irrigation scheduling are integral components. A 5% reduction in average water use should take place, resulting in basin wide water use savings of 9,269 acre feet for the 12-year period, compared to the average water use from 1987-1996. This would be an on-going alternative that would change as technology allows.

**E. Voluntary Removal of End Guns**

This management strategy should decrease the appropriated quantity, amount of irrigation water pumped and the number of acres irrigated. This would occur on a voluntary basis. An irrigator can request a reduction in their water right from the Division of Water Resources. This reduction would include the following:

- 1) 8% reduction in authorized irrigated acres under center pivot.
- 2) 10% reduction in water right authorized quantity associated with center pivot.
- 3) Most water rights that use this management strategy would receive an exemption to the alternative actions described in this program, subject to implementation through rules and regulations. To be eligible for the exemption, removal of end guns must take place during the first 4 years of the management program. If the alternative actions are needed, wells subject to the Minimum Desirable Streamflows (MDS) law that participates in this program, would receive a lesser reduction, as described in the alternative action section.
- 4) New conditions on water rights involved in this management option:
  - A. If a participating water right exceeds its authorized quantity, it would lose the exemption to the alternative action.
  - B. Pressure regulators are required on systems that do not already have them.

The physical change in acres irrigated and equipment used on center pivot systems should reduce the amount of water used. The water right holder would have made their contribution in water savings to the Rattlesnake Creek Subbasin Management Program, as described in this document. Therefore, the implementation of this management strategy would also exempt a water right from further reductions that might be imposed as part of any implementation of the alternative actions described under sections defining specific management alternatives in the designated management units identified below.

It should be noted, in cases where there are additional acreage or authorized quantity not associated with the current center pivot system, a water right may be divided or recalculated to ensure the intended impact of this management option.

**Area of Application:**

Removal of end guns is available to all water users in the subbasin. This includes requesting a reduction in total authorized quantity equivalent to the water used by the end gun (approximately 10%) and a reduction in the related number of irrigated acres (approximately 8%). This change in equipment has the potential to save approximately 996 acre-feet in water use in the corridor, and 3,044 acre-feet in the groundwater unit, assuming a 30% participation level. The option to make the reduction request is currently available at DWR. The removal of the end gun equipment would be the responsibility of the water right owner(s).

**F. Enhanced Compliance and Enforcement Activities**

It becomes especially important during an effort to conserve water by voluntary means of reducing water use to establish fair conditions across the subbasin with the enforcement of all water right conditions. Rate and quantity limitations, plus other permit conditions, should be strictly enforced. The Division of Water Resources, with some assistance from GMD #5, would enhance the current compliance and enforcement efforts to ensure water right conditions are adhered to and that the guidelines pertaining to the use of new management options are followed.

As this would be done mainly by the Division of Water Resources, with assistance from Groundwater Management District, no additional funding is identified at the present time. However, this may change as work tasks increase with the implementation of enhanced efforts. It should be noted that because of the ongoing efforts to conserve water, even prior to the full implementation of this program, compliance with water rights conditions is quite good, which is why such a relatively small quantity of water is estimated for the objective.

**Area of Application:**

This management strategy should be implemented subbasin-wide. Water use is estimated to be reduced by .5% by more strictly enforcing water rights conditions in situations where over-pumping and other violations of water right conditions occur. This would result in saving 927 acre-feet over the 12-year period.

**G. Water Appropriation Transfers**

Subject to the development of Rules and Regulations, water right holders within the Rattlesnake Creek subbasin would have the ability to move water rights, or portions thereof, to other locations in the basin that are not experiencing major water level fluctuations. The purpose is to add flexibility in achieving the overall objective of the program by allowing water rights to be moved from within the two-mile corridor and the high decline groundwater areas to other locations in the basin. An overall reduction in water use should take place. No water rights would be allowed to be moved into the stream corridor or closer to the stream or into the priority high decline areas.

Conservation assessments should be structured to provide incentives to move water away from hydrologically sensitive areas. The conservation components would function using a similar scale, as described under the water banking section.

All proposed transfers over ½ mile and 20 acre-feet shall be subject to the following review:

1. Subject to safe yield of 1,500 acre-feet within two-mile circle.
  - A. Proposed transfers to areas with less than 1,500 acre-feet are eligible for approval.
  - B. Proposed transfers to areas with over 1,500 acre feet would require hydrologic analyzes to determine impact to area.
2. Maintain spacing as required by K.A.R. 5-25-2.
3. Water right would be considered junior to existing wells if an impairment problem arises. A letter designation would be attached to the water right to document the move by this program.
4. If an impairment situation occurs or water user wishes to return to original well location for any other reason, the transfer can move back to original location with a 10% water right reduction.

**Area of Application:**

This management strategy is available throughout the basin. Water use would be reduced by 5% if there is a 10% participation level. This would result in a savings of 927 acre-feet for the entire basin.

**H. Mineral Intrusion Area - Replacement Wells**

This management strategy would be implemented by GMD #5 through a program designed to delineate the wells withdrawing mineralized water and then require modifications to well placement and construction when the wells are re-drilled. The results of this program would be beneficial in reducing the intrusion of the highly mineralized water.

All water right holders of existing groundwater wells, within the mineral intrusion management area, would be required to participate in this enhanced approach to water quality monitoring. The following procedure would be used and water quality monitoring would be accomplished as follows:

- Water users in this area would be required to submit certified water quality samples at times designated by GMD #5. Water users would be required to submit the analyses to the GMD.
- GMD #5 staff would be on site to split the water sample to compare with the water user. The GMD may take additional samples as deemed necessary.
- Water users with wells testing over 300 mg/l chloride would be required to drill an observation well to bedrock meeting specifications outlined in GMD #5's Regulation 5-25-10 before any change in the point of diversion can be approved.
- Wells not currently being used would come under these guidelines when they are brought back into production.

Water quality monitoring would occur for two years at which time water users with analyses over the 300 mg/l chloride limit would be notified that observation wells would be required when they re-drill the existing wells. Approximately 110 wells would be affected by this management strategy. Each water right holder would be responsible for re-drilling their well. An attempt would be made to obtain cost-share money for these water users.

**Area of Application:**

This management strategy would be used in the mineral intrusion area.

**I. Augmentation**

Augmentation will be utilized to meet Quivira’s objective of having a water supply in the fall when streamflows are inadequate for their appropriated surface water right. The partnership agrees that approximately 2100 acre feet is needed during August and September to meet the Refuge’s needs. Augmentation would not be required in years of extreme drought.

The Little Salt Marsh needs to be maintained at a gage height of 4.0 ft. in order to assure that water can be delivered to the other units the Service wants to maintain. The Service would like to be able to fill and maintain Units 7,10A, 10B, 10C, 11A, 11B, 14A, and 14B (surface area 306 acres, capacity 1101 acre-feet). The Refuge would not operate to artificially create a situation where augmentation would be called for.

An augmentation program will be developed using the following 4-step assessment process:

1. An augmentation year shall be designated when the average flow in January, at the Zenith gauge, is less than 25 cfs.
2. A review will be made in July using the Palmer Drought Severity Index to determine if drought conditions exist. Augmentation will not be implemented when conditions in region 8 of Kansas depicts a severe drought of -3.0 to -3.9, or more.
3. Augmentation may begin on August 1, or when requested by the QNWR, if and when natural flows of 21 cfs are not being maintained and the staff water level at the Little Salt Marsh is below 4 feet. Augmentation will continue for up to 45 days if necessary. An average of 21 cfs for 45 days is needed to fill the pools and allow for evaporation. The rate of augmentation will be regulated to maintain the desired flow.
4. Augmentation will continue from September 15 through September 30 when natural flows of 7.05 cfs are not being maintained. 7.05 cfs is needed to offset evaporation in the refuge.

The quality of augmentation water supplied by wells will vary, but shall not exceed a maximum of 1500 mg/l chloride, or as approved by KDHE standards.

## **J. Low Head Dams**

GMD #5 has initiated action to proceed with securing a grant to fund a pilot project using low head dams to enhance aquifer recharge. A study completed in 1999 for the Quivira National Wildlife Refuge by Burns and McDonnell indicate recharge estimates of as much as 2500 to 5000 acre feet per year by constructing a number of low head dams on the Wild Horse Creek which is a tributary to the Rattlesnake and overlies much of the area where the declines are being documented. Recharge structures should reduce and possibly reverse the rate of decline in these areas. The District would proceed with the grant process for this program.

## **V. Anticipated Results**

The application of the above described management strategies in these areas should result in a long-term sustainable water resources supply. Specifically, the following would occur:

- Stabilization of groundwater levels of the basin, with an increase in some areas.
- Increased streamflows, due mainly to improvements in baseflow.
- Maintenance of current salinity levels and some reduction over a long period of time.

## **VI. Monitoring of Hydrologic Condition and Data Analyses**

### **A. Streamflow Monitoring**

There are 12 streamflow measurement sites on the Rattlesnake Creek which were established in 1993. (See Figure 4 - Monitoring Sites Map) These sites have been measured 2-4 times a year. Measurements would continue to be made at these sites through the implementation of any new management and the data collected would be used in the evaluations to support any changes proposed in the future. This data would be used to plot hydrographs in order to evaluate the health of the stream and confirm a change in the declining trend. The Zenith Gage would be the reference streamflow gaging station used in this program.

### **B. Groundwater Monitoring**

Groundwater measurements have taken place at 73 monitoring wells across the subbasin since early 1994 (See Figure 4 - Monitoring Sites Map). In addition, transects of monitoring wells have been identified and used in the data analyzes. Measurements would continue at these locations throughout the implementation of this program. The effectiveness of the new management would be evaluated by using data collected from these points and all other related data and information.

### **C. GMD#5 Stream/Aquifer Research & Monitoring Program**

In order to enhance current data collection, GMD#5 would evaluate potential sites and install transects of monitoring wells across the stream corridor to coincide with streamflow measurement sites. The transect wells would add to the current data collection efforts and would be a key component in the development of an accurate database. Information expected to be obtained throughout the duration of this project include:

1. A better understanding of the stream/aquifer interaction,
2. Aquifer characteristics, and
3. Precipitation, water level, and flow data.

### **D. Mineral Intrusion Monitoring Sites**

On a regional scale, there are ten water quality sites that are being monitored on a periodic basis using an electro-magnetic induction logger. Monitoring of required observation wells should take place as they are drilled, also using the induction logger and water quality analyses.

## **VII. Evaluation of Management Program**

Review and evaluation of the effectiveness of the management strategies should be conducted at least every 4 years (4, 8 and 12 years). Each 4-year evaluation would provide an opportunity to determine the success of the new management program to date and allow for any needed changes in the program to enhance its effectiveness. A review of each specific management strategy would occur to determine that it is having the anticipated effect and allow an opportunity to make any improvements.

Each four-year evaluation should include at least the following criteria:

### **Stream Corridor**

- a. January 10 year average of 25 cfs is being achieved at the Zenith Gaging Station.
- b. Review of 10 years of average annual water use and comparison to targets.
- c. Comparison calculations begin with 1996 for improved water conservation program and the enforcement and compliance program.
- d. MDS is being met.
- e. Use of the following table for progress checkpoints

<b>Years</b>	<b>Target Groundwater Use for Corridor</b>
<b>0-4</b>	<b>Achieve reduction in water use equal to or greater than 4%</b>
<b>4-8</b>	<b>Achieve reduction in water use equal to or greater than 8 %</b>
<b>8-12</b>	<b>Achieve reduction in water use to meet a. and c. above or reduction in water use equal to 12 %</b>

## **Groundwater Unit**

- a. Stabilization of water levels in high decline areas.
- b. Stabilization of water levels outside the currently established groundwater priority area.

If resource limitations exist during the 12 years, the focus of the management strategies would be the stream corridor, especially in the first four years. However, it is acknowledged the stream corridor is hydrologically connected to the groundwater unit, and over the long term, groundwater levels must improve to assist in meeting the goal of the stream corridor.

## **16 Year Evaluation**

An update of all hydrologic data should be completed and considerations given to flood and drought events that may have occurred.

Following the 12-year implementation schedule, another evaluation should be conducted 4 years after full implementation (in year 16) to document the full effect of the management program. This evaluation would occur, assuming that no changes are made to the management strategy during the 12-year implementation phase. Any new data and information acquired should be used in these processes and improvements made to the current program as part of an ongoing maintenance procedure.

## **VIII. Alternative Action Management Strategies**

If, after the 12-year time line, the goals have not been achieved, then sufficient reductions in water rights would be imposed to achieve the goals. Reductions in appropriations will be calculated by dividing the remaining amount of water use needed to reach the goal by 72%. As stated earlier, the goals are:

Stream Corridor Area: To stabilize the decreasing trend in streamflow in the short term and improve streamflow in the future, maintaining a 10 year January average of 25 cfs.

Groundwater Management Unit: Stabilize groundwater declines and, over the long term, improve groundwater level trends.

It should be noted that the impacts of the management alternatives put into effect during the last couple of years of the implementation period may not be observable in streamflow and groundwater immediately. If the water use reductions have been reached by the incentive based management and the goals and objectives have not been achieved, the Partnership would reconvene to determine what further actions must be initiated and what recommendations should be made to the Chief Engineer. The solutions developed at that time would be based on streamflow and groundwater level data, with consideration of appropriation and water use levels. If alternative actions are needed, and the Groundwater Management District, Board of Directors deems it necessary, they would consider requesting that an Intensive Groundwater Use Control Area (IGUCA) be established. The IGUCA would function as described in the following stream corridor and groundwater sections.

There is some fear that the alternative action would result in actions other than what is intended and agreed upon by the participants. The water use targets are estimates of the long term sustainable water use numbers and are not intended to be used to limit total appropriations in the basin. This proposal attempts to provide existing water right holders access to their share of the available water supply.

### **Stream Corridor**

The water use reductions should be completed using the water rights priority system. Allocations should be handled as described below:

1. The remaining quantity would be established by evaluating the effects of the voluntary programs and evaluating all additional data obtained since the implementation of those programs.
2. The remaining quantity would be prorated across water rights in the corridor using the following groupings of water rights:
  - Group a. The most senior grouping would be Water Right File Number 7,571 and all water rights senior to this right. This group should not be subject to any of the regulatory actions associated with the alternative action of this management program.
  - Group b. Water rights junior to File Number 7,571, but senior to the water right which is the median between that file and MDS (37,164), should receive their commensurate share of the remaining quantity.
  - Group c. Water rights junior to the median water right number identified above through MDS (37,164), should receive a reduction equal to 2.5 times greater reduction than Group B.
  - Group d. All water rights junior to MDS (37,164) are the most junior group and should receive a reduction equal to 5 times greater than Group B.
  - Group e. Water rights junior to MDS (37,164) that participated in the removal of end guns strategy should receive a reduction equal to 2.5 times greater than Group B.
3. The terms described in this section would be considered and re-evaluated each year in March of implementation of the alternative action. If necessary, revisions would be made.

### **Groundwater Unit**

If stabilization of groundwater level declines and over the long term improvement of groundwater level trends does not occur, mandatory conservation controls would be proposed. Past 10 year water use, groundwater level changes and other hydrologic data would be used to determine the extent of these controls. If necessary, water use reductions should then be imposed on all users in the groundwater management unit, with an emphasis on the highest decline areas (shown as the yellow area in Figure 2). A more detailed process, similar to the stream corridor, would be constructed during the 4-year evaluation, when more detailed data and information are available from the enhanced monitoring of this area installed by the subbasin program.

It should be noted that the Rattlesnake basin boundary was changed in 1998 to exclude the Mystery River drainage area. (See Figure 6 - Mystery River Drainage Areas Map) The incentive-based management options are available to the water users in that area for the first 12 years. However, if any alternative action is required to meet the overall target goal, this area would not be subject to the regulatory activities implemented to achieve the water use reductions necessary. The long-term sustainable management for the Mystery River drainage area would be determined by the working group in the Middle Arkansas River Basin.

## **IX. Implementation Plan and Schedule**

This management program is composed of various types of management strategies. The variety contained in this plan makes a quick and easy implementation plan a challenge. Some are complete programs within themselves, such as the Water Rights Purchase Program and Water Banking Program. The Water Rights Purchase Program is a current program that has existed for about 10 years, but has never been used. It is estimated that the Water Banking Program and the Water Rights Purchase Program should become available during the next couple of years. Improved water conservation techniques and compliance and enforcement are already in the implementation stages and would be enhanced over time. Voluntary removal of end guns can be accomplished according to the program description using existing DWR procedures.

The GMD Five-Year Water Rights Program, management related to the drought contingency plan, and mineral intrusion can be implemented almost immediately through Groundwater Management District No. 5. The entire package of management strategies should be up and running by the end of the second year. If any of the potential options, such as the use of the Water Rights Purchase Program and the Water Banking Program do not come to fruition, then the Partnership would evaluate all options, including implementation of the alternative action. The management program should be fully implemented by year 2012.

### **Funding Issues**

A spreadsheet summarizing all funding aspects of this management program is attached. It should be noted that the format of the spreadsheet is such that each management strategy which requires funding is listed under the applicable management unit. All costs are related to the amount of water use savings achieved with each management strategy.

# Rattlesnake Creek Subbasin

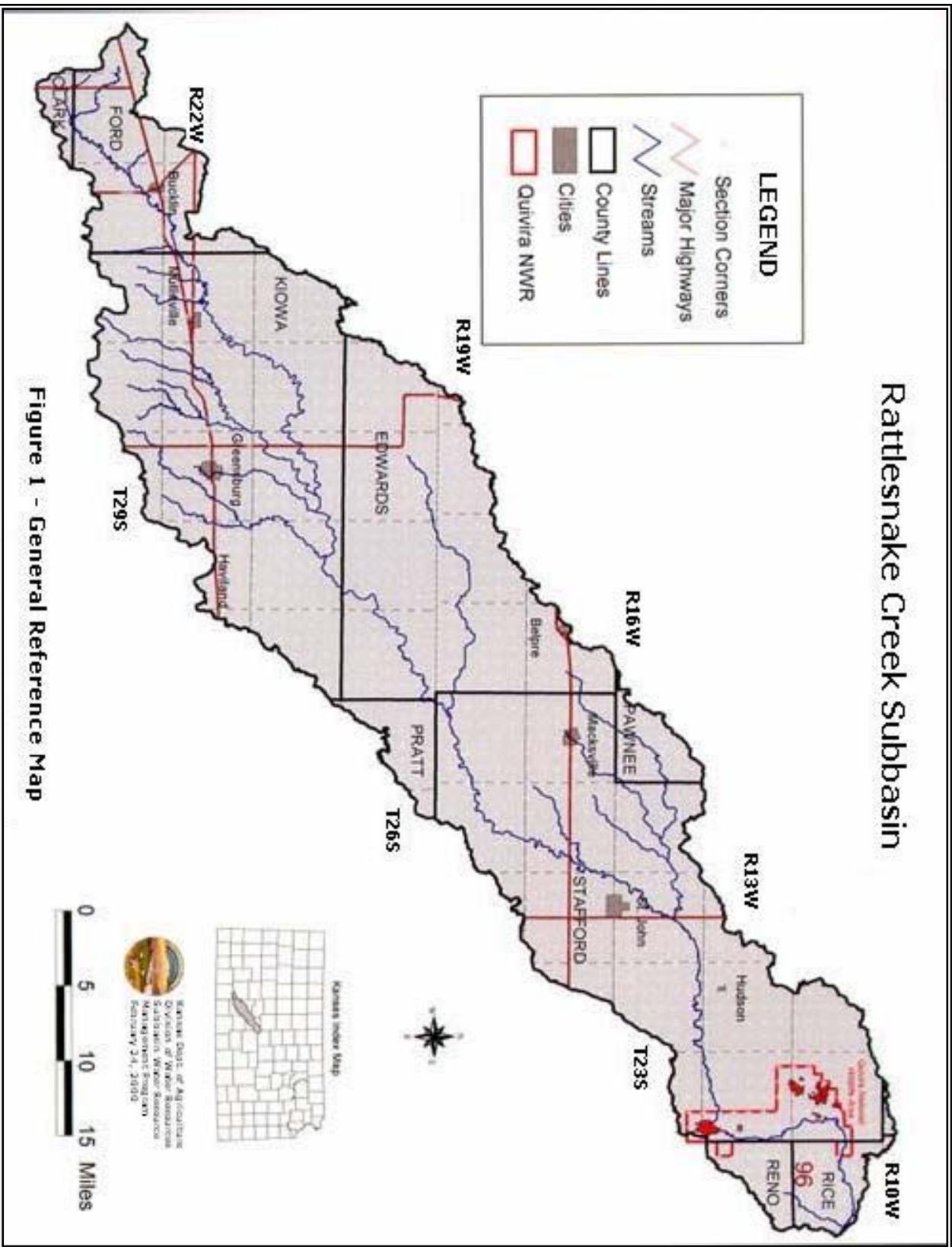


Figure 1 - General Reference Map

# Priority Management Areas

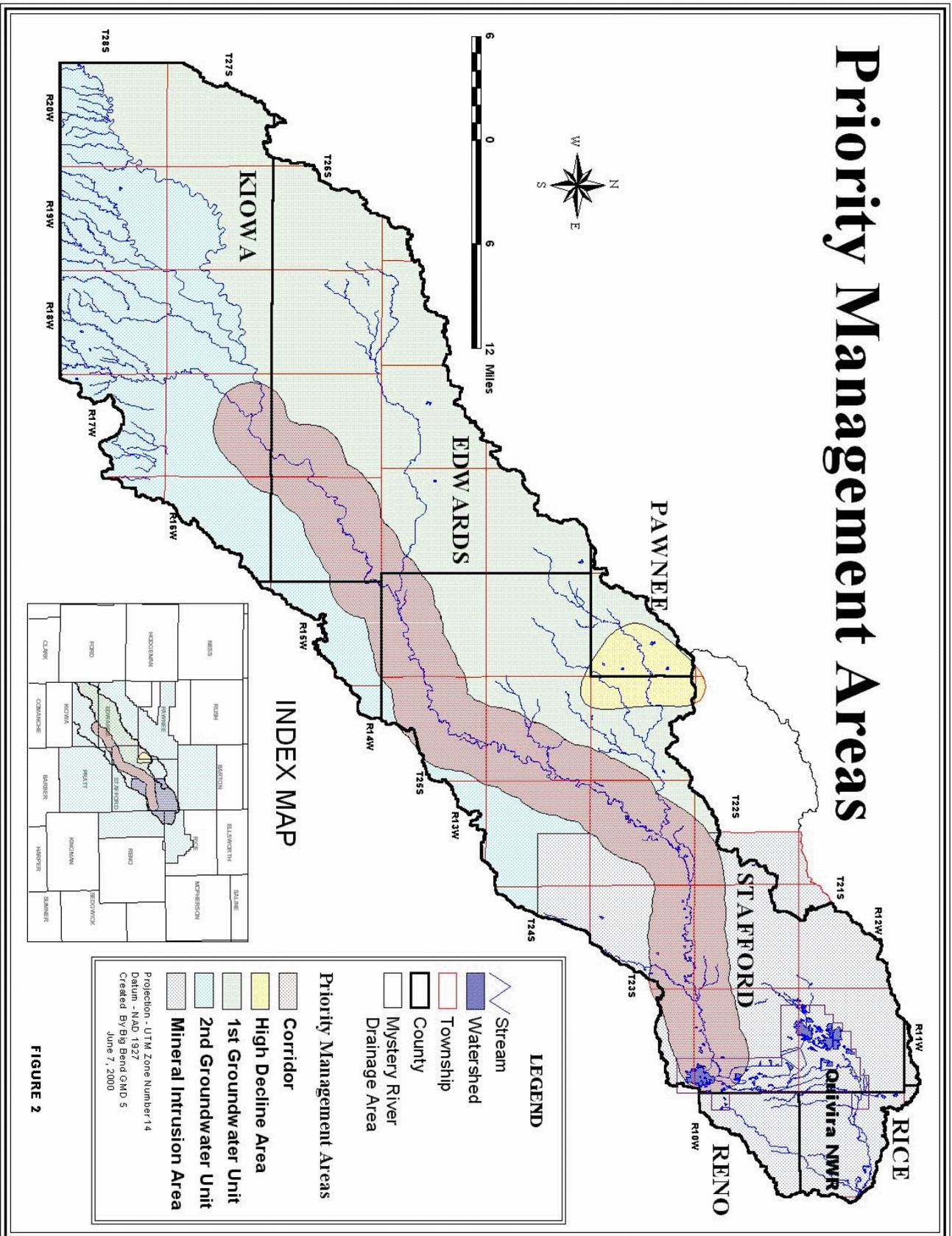
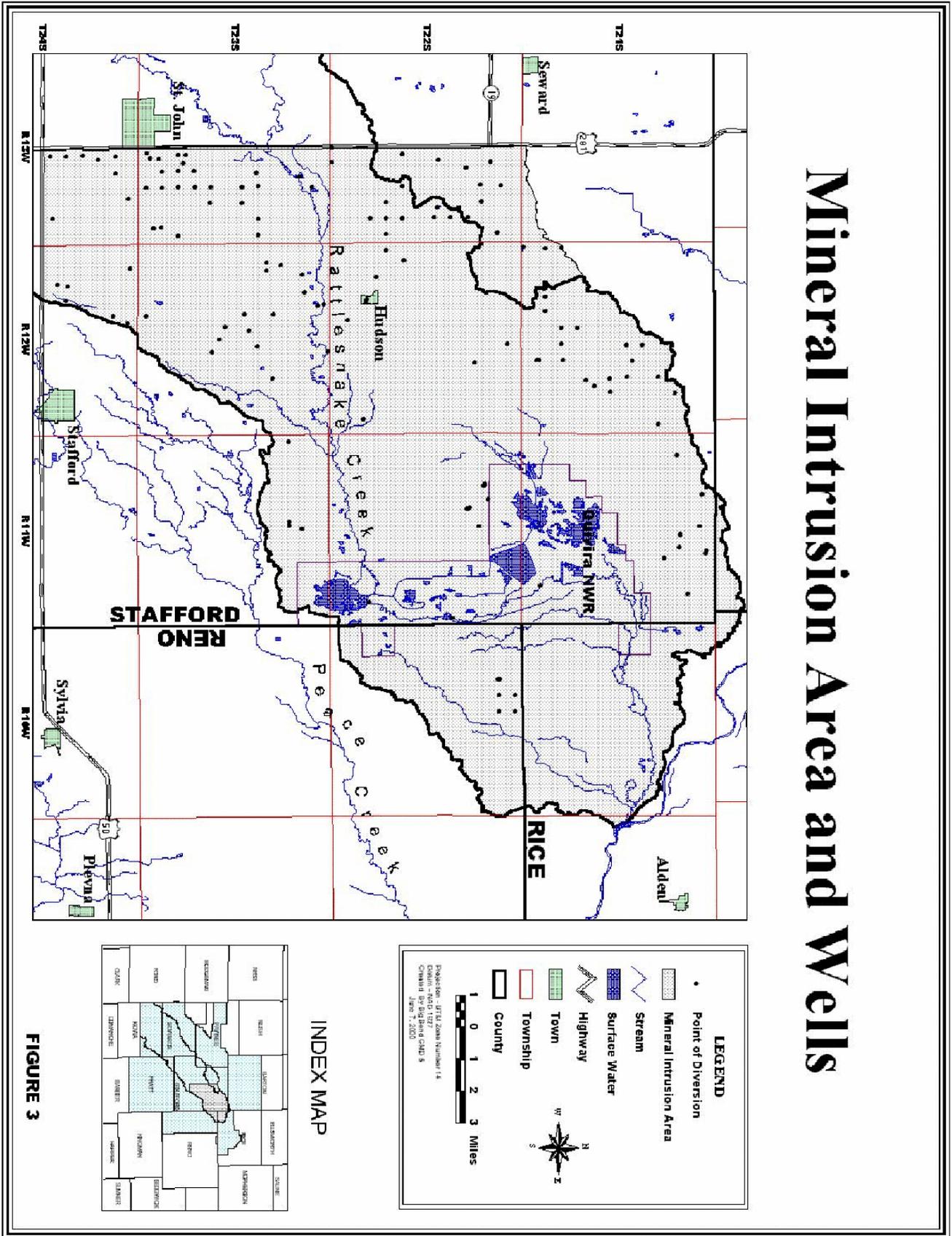


FIGURE 2

# Mineral Intrusion Area and Wells



# PRIORITY AREAS FOR WATER RIGHT PURCHASE PROGRAM

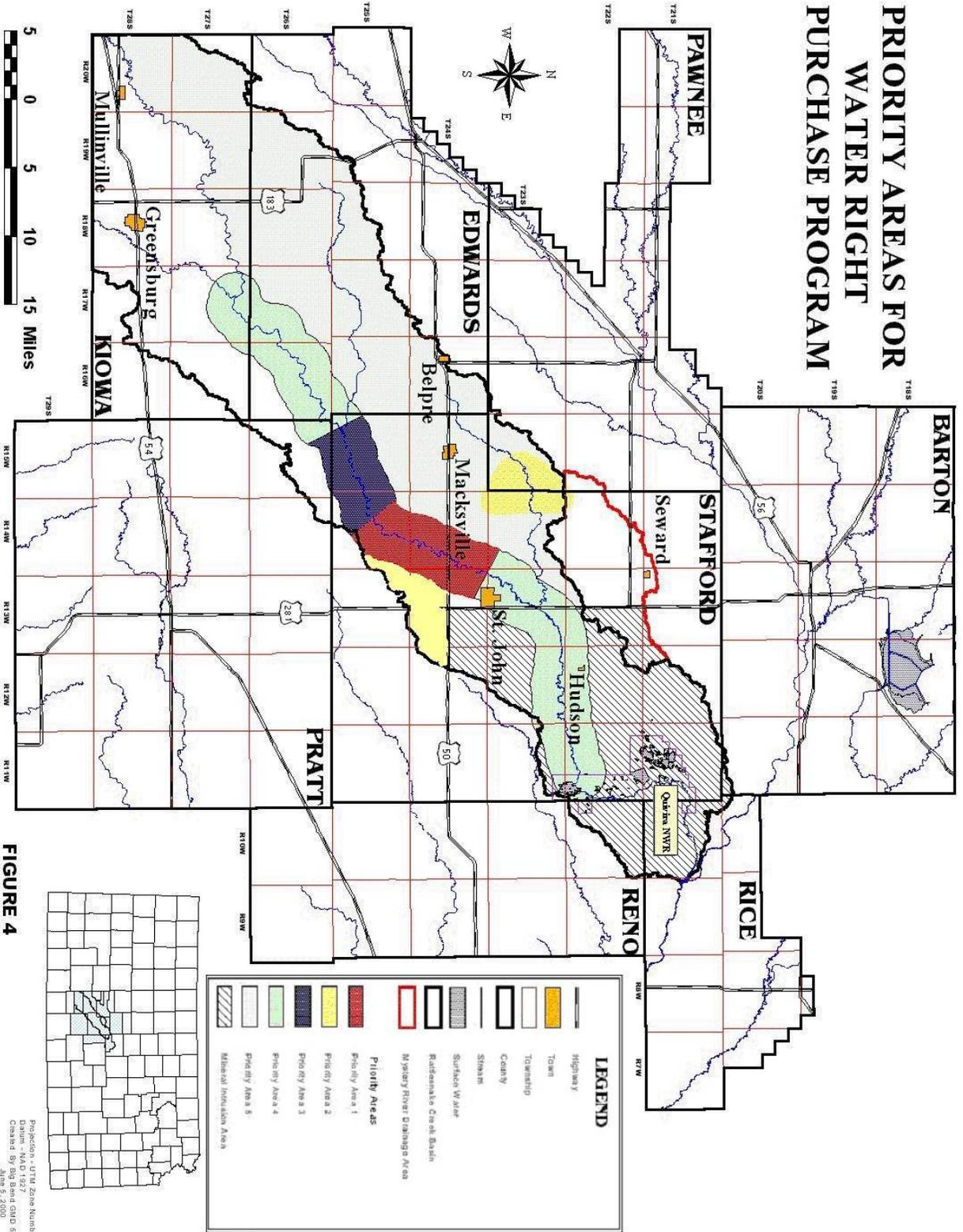


FIGURE 4

# Monitoring Network

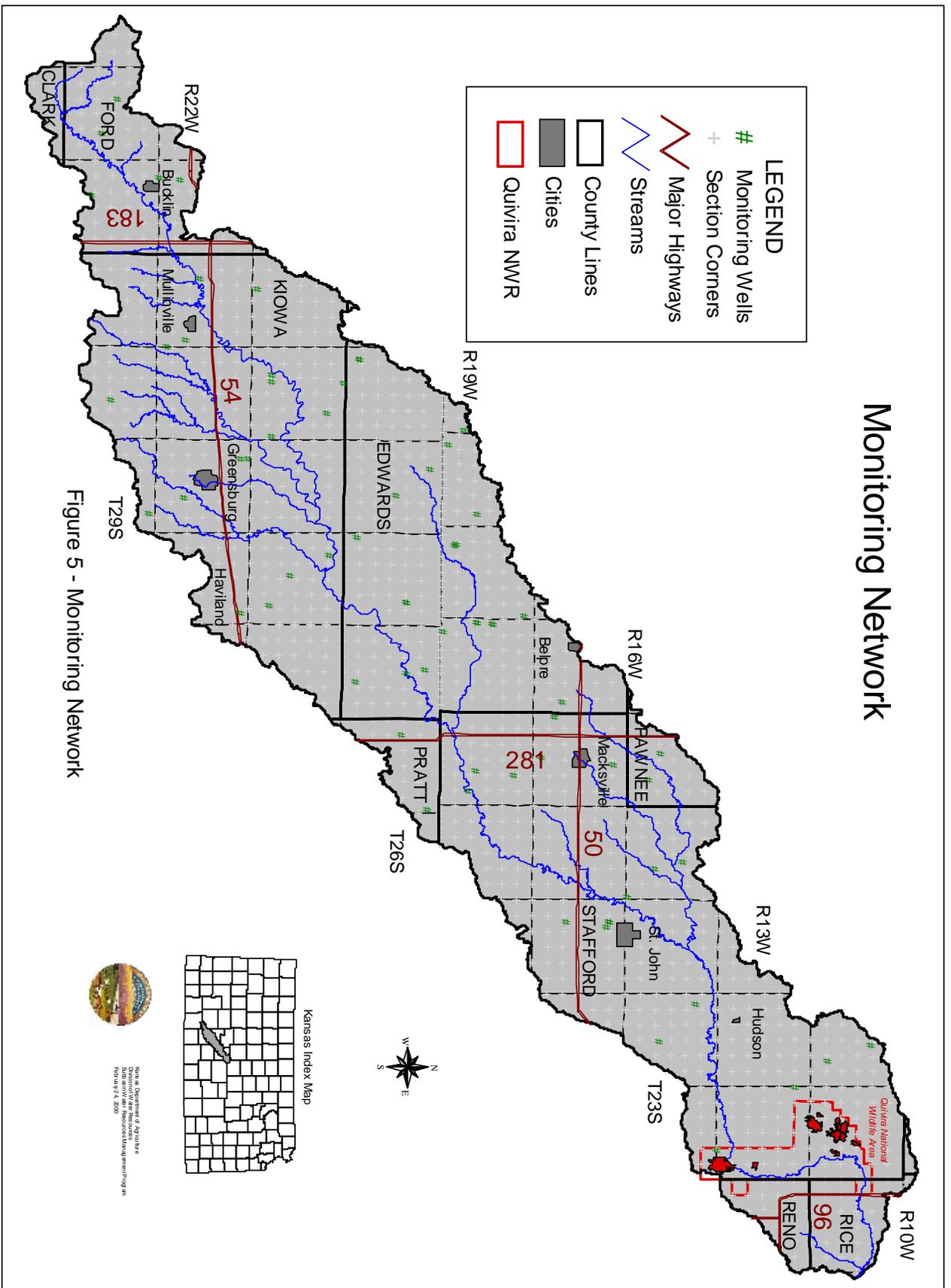
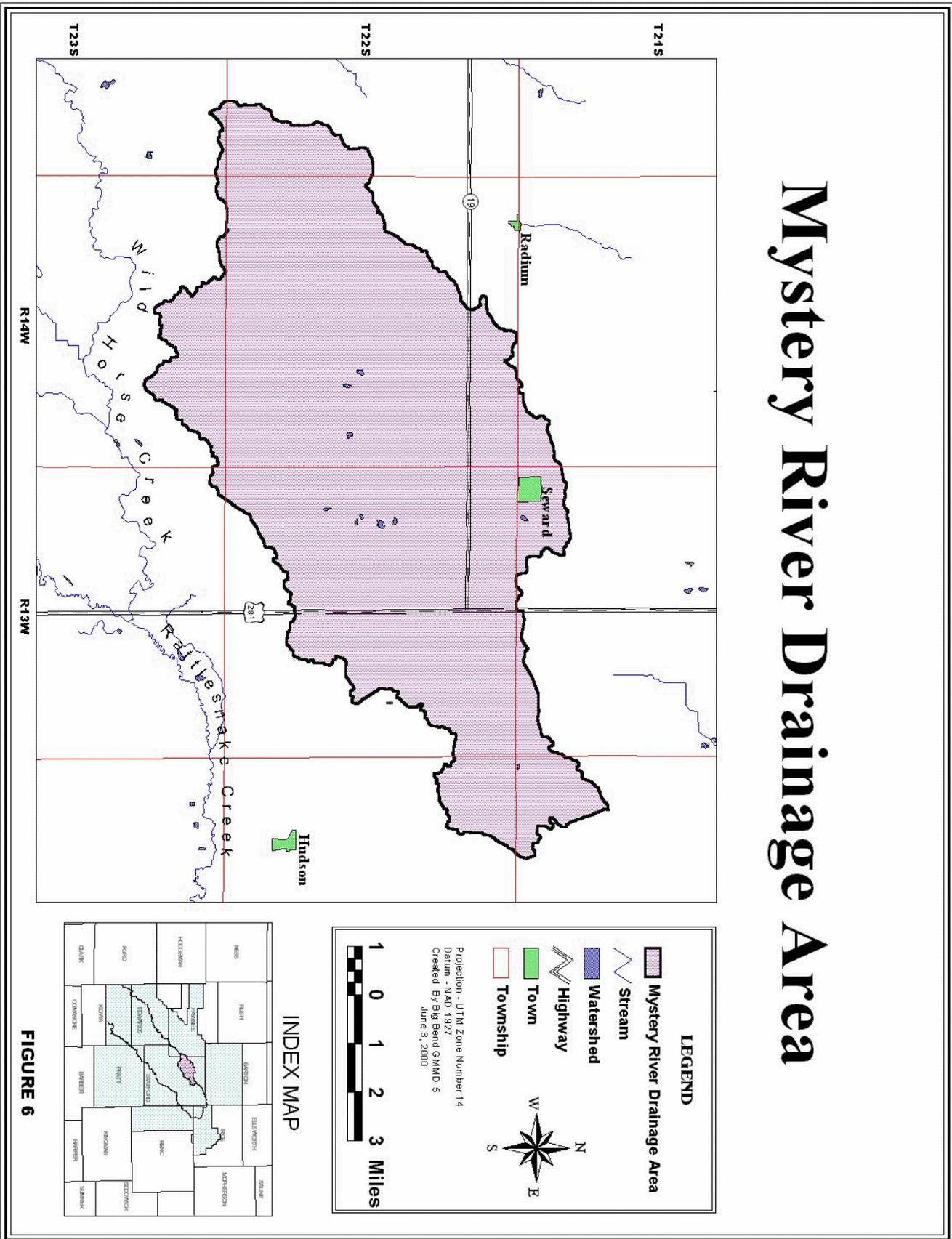


Figure 5 - Monitoring Network

# Mystery River Drainage Area



**Table 1 - Rattlesnake Management Alternative Numbers and Funding**

	Groundwater Unit	4-mile Corridor	Basinwide	Totals
<b>Program Goals</b>				
Total Appropriations within Target Area	140,939 AF	46,117 AF	70,430 AF	257,486 AF
Avg. WU/Yr. (72% of Total Apprn)	101,476 AF	33,204 AF	50,709 AF	185,390 AF
Total Appropriations Goal in Target Area	118,051 AF	40,673 AF	65,147 AF	223,870 AF
Average Water Use per Year Goal (72% of Appropriations)	84,996 AF	29,284 AF	46,906 AF	161,187 AF
Savings Needed From Current Appropriations to Reach Goal	22,889 AF	5,444 AF	5,282 AF	33,616 AF
Water Use Savings Needed to Reach Goal	16,480 AF	3,920 AF	3,803 AF	24,203 AF
<b>Improved Water Conservation</b>				
Objective: Water Use Reduction of 5%				
Avg. WU/Yr. (72% of Total Apprn)	101,476 AF	33,204 AF	50,709 AF	185,390 AF
Savings From Current Appropriations	7,047 AF	2,306 AF	3,521 AF	12,874 AF
Water Use Savings	5,074 AF	1,660 AF	2,535 AF	9,269 AF
<b>Compliance and Enforcement</b>				
Objective: Water Use Reduction of .5%				
Avg. WU/Yr. (72% of Total Apprn)	101,476 AF	33,204 AF	50,709 AF	185,390 AF
Savings From Current Appropriations	705 AF	231 AF	352 AF	1,287 AF
Water Use Savings	507 AF	166 AF	254 AF	927 AF
<b>Water Rights Purchase Program</b>				
Objective: Reduce Appropriations				
Total Appropriation within Target Area	140,939 AF	46,117 AF		187,056 AF
Average Water Use (72% of Apprn)	101,476 AF	33,204 AF		134,681 AF
Total Quantity to Buy Back for 12 years	8,333 AF	2,083 AF		10,416 AF
Percent of Total Apprn in Target Area	5.91 %	4.52 %		5.57 %
Estimate of Cost per AF	500 \$	500 \$		500 \$
12 year Program Total	4,166,500 \$	1,041,500 \$		5,208,000 \$
Total Local/GMD Cost = 20%	833,300 \$	208,300 \$		1,041,600 \$
Total State Cost = 80%	3,333,200 \$	833,200 \$		4,166,400 \$
Annual Cost of Program From Local/GMD Interests	69,442 \$	17,358 \$		86,800 \$
Annual Cost of Program From State	277,767 \$	69,433 \$		347,200 \$
Authorized Quantity of Water Remaining in Target Area If Objective is Met	132,606 AF	44,034 AF		176,640 AF
Savings From Current Appropriations	8,333 AF	2,083 AF		10,416 AF
Water Use Savings	6,000 AF	1,500 AF		7,500 AF
<b>Water Banking</b>				
Objective: Water Use Reduction of 10 %				
Anticipate ~ 15% Participation				
Total Appropriation within Target Area	140,939 AF	46,117 AF		187,056 AF
15% of Appropriations	21,141 AF	6,918 AF		28,058 AF
Average WU/Yr. (72% of Participants Apprn)	15,221 AF	4,981 AF		20,202 AF
Conservation Component	10 %	10 %		10 %
Savings From Current Appropriations	2,114 AF	692 AF		2,806 AF
Water Use Savings	1,522 AF	498 AF		2,020 AF
<b>Five Year Water Right Program</b>				
Objective: Water Use Reduction of 5%				
Anticipate ~ 11% Participation				
Total Appropriation within Target Area	140,939 AF		70,430 AF	140,939 AF
15% of Appropriations	21,141 AF		10,564 AF	21,141 AF
Average WU/Yr. (72% of Participants Apprn)	15,221 AF		7,606 AF	15,281 AF
Conservation Component	5.0 %		5.0 %	5.0 %
Savings From Current Appropriations	1,057 AF		528 AF	1,585 AF
Water Use Savings	761 AF		380 AF	1,141 AF
<b>Voluntary Removal of End Guns</b>				
Objective: Water Use Reduction of 10%				
Anticipate ~ 30% Participation				
Total Appropriation within Target Area	140,939 AF	46,117 AF	70,430 AF	257,486 AF
30% of Appropriations	42,282 AF	13,835 AF	21,129 AF	77,246 AF
Average WU/Yr. (72% of Participants Apprn)	30,443 AF	9,961 AF	15,213 AF	55,617 AF
Conservation Component	10 %	10 %	10 %	10 %
Savings From Current Appropriations	4,228 AF	1,384 AF	2,113 AF	7,725 AF
Water Use Savings	3,044 AF	996 AF	1,521 AF	5,562 AF
<b>Water Appropriation Transfers</b>				
Objective: Water Use Reduction of 5%				
Anticipate ~ 10% Participation				
Total Appropriation within Target Area	140,939 AF	46,117 AF	70,430 AF	257,486 AF
10% of Appropriations	14,094 AF	4,612 AF	7,043 AF	25,749 AF
Average WU/Yr. (72% of Participants Apprn)	10,148 AF	3,320 AF	5,071 AF	18,539 AF
Conservation Component	5 %	5 %	5 %	5 %
Savings From Current Appropriations	705 AF	231 AF	352 AF	1,287 AF
Water Use Savings	507 AF	166 AF	254 AF	927 AF
<b>Totals</b>				
Conservation Practices WU Savings	5,074 AF	1,660 AF	2,535 AF	9,269 AF
Compliance and Enforcement WU Savings	507 AF	166 AF	254 AF	927 AF
Water Rights Purchase WU Savings	6,000 AF	1,500 AF	0 AF	7,500 AF
Water Banking WU Savings	1,522 AF	498 AF	0 AF	2,020 AF
Five Year Water Right Program	761 AF	0 AF	380 AF	1,141 AF
Voluntary Removal of End Guns	3,044 AF	996 AF	1,521 AF	5,562 AF
Water Appropriation Transfers	507 AF	166 AF	254 AF	927 AF
Savings From Current Appropriations	24,189 AF	6,925 AF	6,867 AF	37,981 AF
Savings From Current Appropriations Balance Remaining to Reach Goal	-1,300 AF	-1,481 AF	-1,585 AF	-4,365 AF
Water Use Savings	17,416 AF	4,986 AF	4,944 AF	27,346 AF
Water Use Balance Remaining to Reach Goal	-936 AF	-1,066 AF	-1,141 AF	-3,143 AF