12 Brush Control

Brush control is a potential water management strategy that could create additional water supply in the Brazos G Area. The Texas Brush Control Program, created in 1985 and operated by the Texas State Soil and Water Conservation Board (TSSWCB), served to study and implement brush control programs until September 2011. HB1808 established a new program in 2012, the Water Supply Enhancement Program (WSEP), with the purpose and intent of increasing available surface and ground water supplies through the selective control of brush species detrimental to water conservation. The WSEP program is described in the January 2017 *State Water Supply Enhancement Plan*[1].

The TSSWCB collaborates with soil water conservation districts and other local, regional, state, and federal agencies to identify watersheds across the state where it is feasible to implement brush control to enhance water supplies. The TSSWCB uses a competitive grant process to rank feasible projects and allocate WSEP grant funds, giving priority to projects that balance the most critical water needs with the highest projected water yield from brush control.

For a watershed to be considered eligible for allocation of WSEP cost-share funds, a feasibility study must demonstrate runoff increases in project post-treatment conditions. At this time, two feasibility studies have been completed in the Brazos G Region, resulting in on-going projects:

- Lake Fort Phantom Hill watershed – in FY 2018 the TSSWCB provided $250,000 in matching funds Subbasin 15.
- Lake Palo Pinto watershed – in FY 2018 the TSSWCB provided $200,000 in matching funds for Subbasin 2210808[2].

Proposed feasibility studies in Brazos G include the Carrizo-Wilcox Aquifer Recharge Zone in Burleson, Lee, Milam and Williamson Counties, Hubbard Creek Reservoir (saltcedar specific), Lake Graham, Lake Whitney including Steele Creek, Stillhouse Hollow Reservoir, Upper Brazos River above Possum Kingdom Reservoir (saltcedar specific), and the White River Reservoir (saltcedar specific).

Eligible species under the WSEP program that are of concern in the Brazos G area include:

- mesquite (*Prosopis spp*.)
- juniper (*Juniperus spp*.)
- saltcedar (*Tamarix spp*.)

Other species of interest that could be eligible include:

- huisache (Acacia smallii)
- Carrizo cane (Arundo donax)

[1] State Water Supply Enhancement Plan, TSSWCB, January 2017.

[2] Annual Report, January 1, 2019, Texas State Soil and Water Conservation Board.

Studies have shown that brush management can yield additional runoff from a treated watershed. However, most experts agree that this benefit is limited during an extended drought cycle when rainfall is below normal. Because the firm supply of brush control during a drought is likely to be very small, brush control generally is not included as a recommended water management strategy since it would not be able to demonstrate an actual water supply benefit on a firm yield basis. For this reason, the Brazos G Regional Water Planning Group identified brush control as a recommended water management strategy in the 2016 Brazos G Regional Water Plan but acknowledged that the firm supply benefit was zero during drought of record conditions.

12.1 General Description of Brush Control

Since the European settlement of Texas, overgrazing, fire suppression and droughts have led to the increase and dominance of noxious brush species such as juniper and mesquite over the native grasses and trees. This noxious brush utilizes much of the available water resources with little return to the watershed.[3] Brush control is a land management practice that converts land that is covered with brush (such as juniper, mesquite, and salt cedar) back to grasslands. This practice can potentially increase water availability through reduced extraction of soil water for transpiration and increased recharge to shallow groundwater and emergent springs. There is also the potential for increased runoff during rainfall events.[4]

The actual supply benefit resulting from a brush control project is site specific. Under most circumstances, the additional runoff or recharge attained from a brush control project is not sustained during a prolonged drought because recharge to shallow aquifers feeding emergent springs is greatly diminished or nonexistent during a drought. Thus, the supply benefit to be obtained from this particular water management strategy will be considered to be zero for supply purposes. However, the potential positive impacts of rangeland management during other times makes this a recommended policy by the Brazos G Water Planning Group.

An analysis of climate, evapotranspiration, and runoff in the western United States indicated that sites with tree and shrub communities need to have an evapotranspiration rate of 15 inches per year and need to receive over 18 inches of precipitation per year to yield significantly more water if converted to grassland.[5] All ecoregions in Texas have a potential evapotranspiration rate of over 15 inches per year, and the average annual rainfall in almost all of the Brazos G Region is greater than 18 inches per year, so the entire region meets the climatic requirements for brush control.

There are three primary methods to remove upland brush: mechanical removal, chemical removal, and prescribed burning. Bio-control through Asian leaf beetles is limited to salt cedar removal, which generally occurs in riparian zones and lakes, and may be an option for some areas in the upper portion of the Brazos River Basin. The rate of brush

[3] Fort Phantom Hill Watershed: Brush Control Assessment and Feasibility Study, Prepared for TSSWCB, Brazos River Authority, 2003.

[4] Brush Control and Range Management: 2011 Brazos G Regional Water Plan.

[5] Hibbert, A.R. 1983. Water Yield Improvement by Vegetation Management on Western Range lands. Water Resources Bulletin. 19:375-381.

regrowth and brush control maintenance is important to maintaining stable, long-term water yield. Control methods that kill and remove the entire brush plant are more desirable than simply killing the brush.

12.2 Brush Control in the Fort Phantom Hill Watershed

Lake Fort Phantom Hill is one of the primary sources of water for the City of Abilene. The reservoir is located on Elm Creek, a tributary of the Clear Fork of the Brazos River, in Jones County. The WSEP is currently sponsoring brush control activities in Subbasin 15 in the watershed[2]. This watershed is upstream of Lake Abilene, and most of the water supply benefit will be to that source.

12.2.1 Watershed Characteristics

In response to declining water supply the City of Abilene began a period of reservoir and diversion construction in the Clear Fork watershed beginning in 1918 and ending in 1954. The first reservoir to be constructed was Lake Abilene, a 11,868 acre-feet capacity reservoir begun in 1918. Next came Lake Kirby, constructed in 1927, the lake impounds 8,500 acre-feet of water. The final reservoir constructed in the watershed is Fort Phantom Hill. Construction on the dam began in 1937. According to the latest volumetric survey, this reservoir has a capacity of 74,300 acre-feet[6]. To supply additional water to the City, diversion facilities were constructed in 1954 to divert flows into Fort Phantom Hill Reservoir from the Clear Fork of the Brazos River and Deadman's Creek.

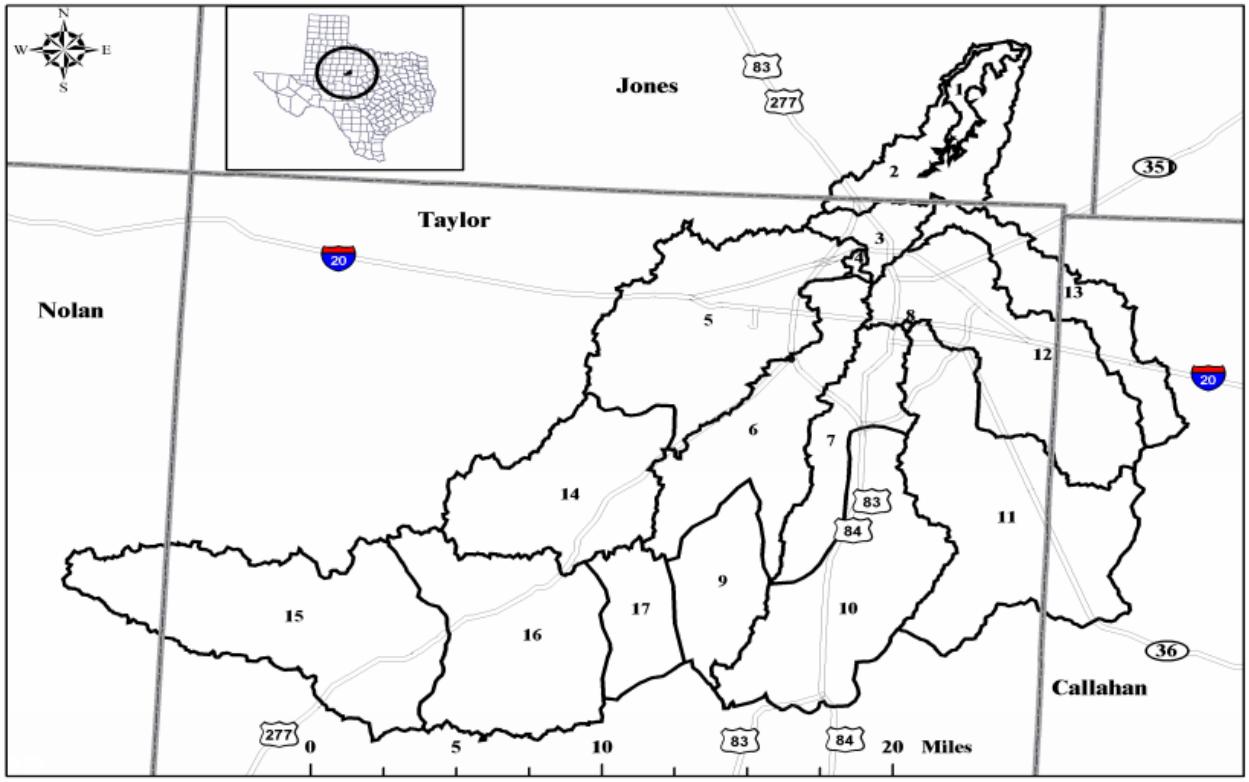
Figure 12-1 is a map of the Lake Fort Phantom hill watershed with various subbasins delineated.

Climate

The climate of the watershed is classified as subtropical sub-humid. The watershed is characterized by hot summers and dry winters. The average annual rainfall is approximately 24 inches, but the amount of rainfall varies considerably from year to year. In exceptionally wet years, much of the rain comes within short periods and causes excessive runoff. The annual rainfall distribution in the watershed has two peaks. Spring is typically the wettest season, with a peak occurring in May. These spring rains are caused by convective thunderstorms, which produce high intensity, short-duration storm events. The second peak which is generated by the tropical cyclone season is usually in September. The Fort Phantom Hill Reservoir watershed is in the region that the TSSWCB has defined as generally suitable for brush control projects, based on rainfall and brush infestation.

[6] Volumetric Survey of Fort Phantom Hill Reservoir, prepared for the City of Abilene, Texas Water Development Board, March 2003.

Figure 12-1. Sub basin Map of the Fort Phantom Hill Watershed



Large evaporative rates occur in the summer months due to high temperatures, high light intensities, low humidity, and high wind speeds. The wide range between maximum and minimum temperatures in the watershed is characteristic of the Rolling Plains. Temperature changes are rapid, especially in winter and early spring when cold, dry polar air replaces the warm, moist tropical air. Periods of very cold weather are short and fair, mild weather is frequent. High daytime temperatures prevail for a long period in the summer, but rapid cooling occurs after nightfall.[3]

Land Use

The land use in the watershed is dominated by agribusiness including feedlots, rangeland, and row-crop agriculture. Rangeland is used mainly for cattle, goats, and sheep. Crop production is largely dominated by wheat, cotton, sorghum, and hay. Urban land use includes the City of Abilene and the towns of Potosi, Buffalo Gap, and Tye. Dyess Air Force Base lies west of the City of Abilene in the watershed and the oil industry is prominent in the watershed with exploration, drilling, refining, and oil field service industries.[3]

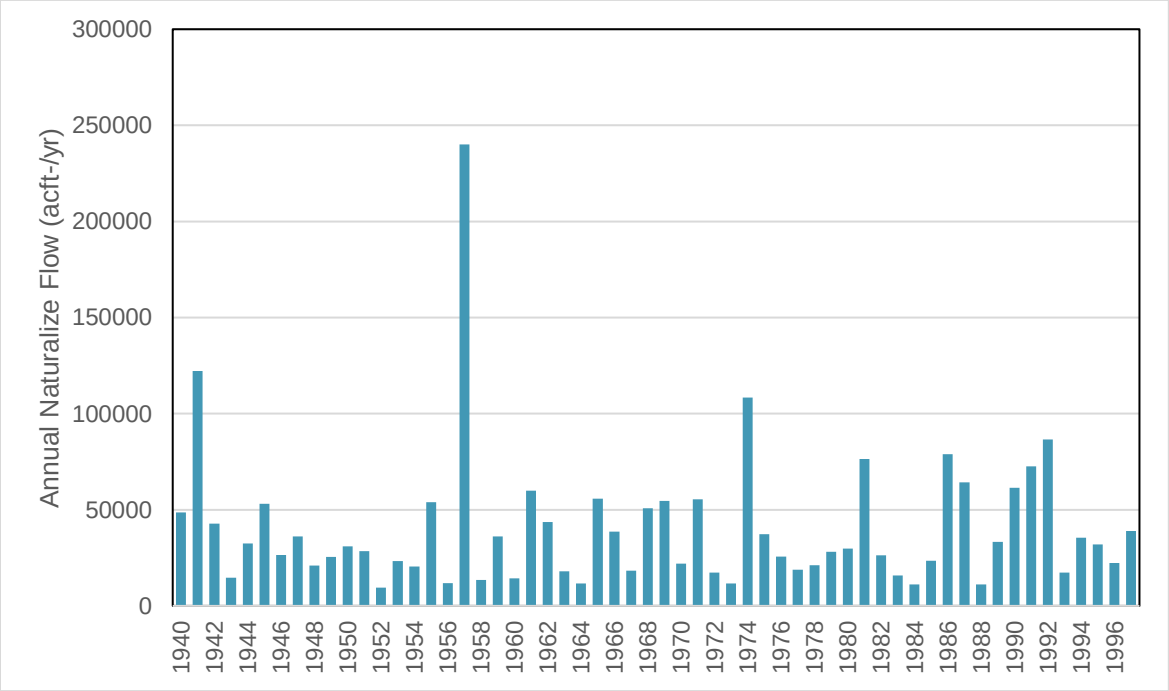
Hydrology

Precipitation enters the watersheds hydrologic system as runoff or infiltrates surface soil or bedrock and recharges the underlying aquifers. Nearly all of the initial flow in the tributaries to Fort Phantom Hill Reservoir is derived from precipitation. Discharge from the watershed occurs as spills and releases from Lake Fort Phantom Hill into the Clear Fork of the Brazos River, as artificial surface water and groundwater withdrawals, as groundwater crossing the downgradient boundary of the watershed, and as returns to the

atmosphere through evapotranspiration. Additionally, as alluvial water levels decline, water may flow from the streams and reservoirs into the alluvial deposits.

The hydrologic characteristics of the Fort Phantom Hill Reservoir watershed are closely linked to precipitation patterns in the river basin, especially the cycles of floods and droughts. Figure 12-2 shows the annual naturalized flow at Lake Fort Phantom Hill, which demonstrate these cycles of high and low flows. Annual flows vary from a minimum of 9,502 acft/yr in 1952 to a maximum of 240,006 acft/yr in 1957.

Figure 12-2: Annual Naturalized Flow at Lake Fort Phantom Hill



12.2.2 Potential Brush Control Project

Currently the TSSWCB is funding brush control activities in subbasin 15 of the Lake Fort Phantom Hill watershed. For this plan, a strategy evaluation was performed for a program that expands these activities to 9 more subbasins. For this project it was assumed that landowner participation would be approximately 50 percent of the total watershed. Subbasins with the highest projected amount of water generated from brush removal per acre were targeted for inclusion in the project. It was also assumed that 75 percent of the brush within the targeted subbasins would be removed. Table 12-1 shows the subbasin data from the feasibility study and the assumed acreage of treated brush. Watersheds are organized by the potential for water production, with the watersheds with the highest potential listed first.

Table 12-1. Subbasins Targeted for Potential Brush Control Project

Subbasin[1]	*Total Area (acres)*	*Total Brush Area (acres)*	*Treated Brush*[2] *(acres)*
1	2,540	537	403
8	68	28	21
15	36,789	24,241	18,181
2	12,087	3,735	2,801
3	4,451	1,114	836
10	27,797	12,690	9,518
5	30,985	9,356	7,017
9	11,914	5,931	4,448
4	453	149	112
6	21,928	7,275	5,456
16	28,340	19,218	NI
14	23,069	12,073	NI
17	8,803	6,102	NI
7	12,483	4,431	NI
12	28,282	11,245	NI
11	38,084	14,597	NI
13	13,045	5,672	NI
Total - Watershed	301,118	138,394	n/a
Total - Project	149,012	65,056	48,792

[1]Listed in order of projected water production
[2]75 percent of the Total Brush Area
NI – Not included in potential brush control project.

12.3 Environmental Issues

12.3.1 Existing Environment

The Lake Fort Phantom Hill Watershed Brush Control Study Area includes portions of Jones, Taylor, Callahan and Nolan Counties. The central and western portions of the study area are within the Edwards Plateau Vegetational Area, while the northern and eastern portions of the study area are within the Rolling Plains Vegetational Area.[7] The physiography of the study area includes recharge sands, massive limestone, caliche with some soil cover, severely eroded lands, and undissected red beds.[8] Topography varies from rough, rolling hills to nearly level terrain. This diverse area contains several soil associations including the Tarrant-Tobosa association which consists of well-drained upland soils that are very shallow to steep calcareous and cobbly clays. The Tillman-Vernon association consists of deep, nearly level to sloping, well-drained upland soils that include non-calcareous to calcareous clay loams and clays. The Sagerton-Rowena-Rotan association includes deep, nearly level to gently sloping, well-drained soils that are comprised of noncalcareous to calcareous clay loams.[9] Major aquifers that are minimally represented in the study area include the Edwards-Trinity Aquifer in the western portion and the Trinity Aquifer in the eastern portion.[10] Area climate is characterized as subtropical, sub humid, with hot summers and dry winters and average annual precipitation ranges between 23 and 25 inches.[11]

Vegetation and resulting wildlife habitats within the study area have been greatly affected by human activities over the last 200 years. The prairie grasslands once covering a large portion of the area have gradually changed to shrub and brush land communities as a result of fire suppression and intensive livestock grazing. Five major vegetation types now occur in the study area,[12] including: Mesquite-Lotebush Shrub, Mesquite-Juniper Brush, Mesquite Juniper Live Oak Brush, Crops and Urban. Major land uses in the area include cattle ranches and farms, oil fields, hunting leases, and minerals.[13]

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[7] Gould, F.W., G.O. Hoffman, and C.A. Rechenthin. *Vegetational Areas of Texas*. Texas A&M University, Agricultural and Experiment Station Leaflet 492, 1960.

[8] Kier, R.S., L.E. Garner, and L.F. Brown, Jr. *Land Resources of Texas – A map of Texas Lands Classified According to Natural Suitability and Use Considerations*. University of Texas, Bureau of Economic Geology, Land Resources Laboratory Series, 1977.

[9] Soil Conservation Service. *Soil Survey of Taylor County, Texas*. U.S. Department of Agriculture Soil Conservation Service, 1976.

[10] Texas Water Development Board. *Major Aquifers of Texas, 1990*. A map.

[11] Larkin, T.J., and G.W. Bomar. *Climatic Atlas of Texas*. Texas Department of Water Resources LP-192, 1983.

[12] McMahan, C.A., R.G. Frye, and K.L. Brown. *The Vegetation Types of Texas including Cropland*. Texas Parks and Wildlife Department Bulletin 7000-120, 1984.

[13] Telfair, R.C. II. *Ecological Regions of Texas: Description, Land Use, and Wildlife*. In Ray C. Telfair, Editor, *Texas Wildlife Resources and Land Uses*. University of Texas Press. Austin, Texas, 1999.

12.3.2 Potential Impacts

Threatened & Endangered Species

The Texas Parks and Wildlife Department (TPWD) maintains a list of Rare, Threatened, and Endangered Species of Texas by County. This list includes the federal and state listing status and a habitat description for each species which may be a resident or migrant through the county. TPWD regularly updates the listing status, range data, and habitat descriptions on their published county lists, based on the most recently available data. The current list of rare, threatened and endangered species for Jones, Taylor, Nolan and Callahan counties can be found at https://tpwd.texas.gov/gis/rtest/.

The endangered bird species include the whooping crane (*Grus americana*) and the least tern (*Sterna antillarum*). These birds are seasonal migrants that could pass through the project area. The whooping crane could potentially use area water sources for food acquisition and rest during their migratory trips to and from the Gulf Coast. The whooping crane would not likely be directly affected by brush control practices. According to the U.S. Fish and Wildlife Service's Information for Planning and Consultation website, the least tern should only be considered in these counties for wind energy projects[14]. Potential impacts on this species by brush control should be confirmed before initiating the project.

The sharpnose shiner (*Notropis oxyrhynchus*) and smalleye shiner (*Notropis buccula*) are listed as endangered by the USFWS.[15] These two minnows are native to the arid prairie streams of Texas and are considered to be in danger of extinction. The USFWS has designated portions of the Upper Brazos River Basin as critical habitat for these two fish. Critical habitat for the sharpnose shiner does not include the study area[16]. However, the study area does include critical habitat for the smalleye shiner[17]. Potential impacts on the smalleye shiner will need to be evaluated before initiating the proposed brush control project.

There are five additional species which are listed as threatened by the state of Texas within the project counties. These include the piping plover (*Charadrius melodus*), Texas fatmucket (*Lampsilis bracteate*), Texas fawnsfoot (*Truncilla macrodon*), Brazos water snake (*Nerodia harteri*), Texas horned lizard (*Phrynosoma cornutum*), and the Timber (canebrake) rattlesnake (*Crotalus horridus*). The piping plover is a migrant within the project area and are not anticipated to be adversely affected by the project. The Texas fatmucket and the Texas fawnsfoot are freshwater mussel species found in rivers and larger streams and are intolerant of impoundment. The Brazos water snake is known to inhabit rocky areas along waterways within the Brazos River Basin. Changes in aquatic habitat within the study area could potentially affect these three species. The Texas

[14] USFWS IPaC Information for Planning and Consulting, https://ecos.fws.gov/ipac/.

[15] USFWS. 2014. *Sharpnose Shiner and Smalleye Shiner Protected under the Endangered Species Act*. News Release, August 4, 2014.

[16] U.S. Fish and Wildlife Service, ECOS Environmental Conservation Online System, Sharpnose Shiner (Notropis oxyrhynchus), available on-line at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=6492

[17] U.S. Fish and Wildlife Service, ECOS Environmental Conservation Online System, Smalleye Shiner (Notropis buccula), available on-line at https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=1774

horned lizard is normally found in varied and sparsely vegetated uplands. Suitable habitat for the Texas horned lizard may exist within the study area and possible impacts to this species should be assessed during project planning. Timber rattlesnakes are usually found in moist lowland forest and hilly woodlands or thickets near water sources[18]. These habitats are limited in the study area, but those that do exist could be affected by the brush control project.

The information presented in this strategy evaluation is based on general data for the project area. Prior to implementing the brush control project, on-site evaluations by qualified biologists will be needed to confirm the occurrence of sensitive species or habitats within the affected area.

Wildlife Habitat

The project area is located within the Kansan biotic province. The Kansan Province is divided into three districts that include (from west to east) the short-grass plains, mixed-grass plains, and the mesquite plains. The project area is situated within the mesquite plains district. Within this district the typical vegetation community generally consists of clusters of mesquite and other shrubs interspersed with open areas of grasses. Common wildlife species found in the Kansan Biotic Province include the Great Plains toad (Anaxyrus cognatus), turkey vulture (Cathartes aura), scaled quail (Callipepla squamata), big brown bat (Eptesicus fuscus) and eastern collared lizard (Crotaphytus collaris) among others. Wildlife species inhabiting the project area utilize it to varying extents depending on their specific biologic needs.

Cultural Resources

Cultural resources protection on public lands in Texas is regulated by the Antiquities Code of Texas (Title 9, Chapter 191, Texas Natural Resource Code of 1977), the National Historic Preservation Act (Pl96-515), and the Archeological and Historic Preservation Act (PL93-291). Based on the review of available GIS datasets provided by the Texas Historical Commission (THC), there are no State Historic Sites within the study area. However, 52 National Register Properties, 9 National Register Districts, 17 cemeteries and 38 historical markers are located within the study area. The owner or controller of the project would be required to coordinate with the Texas Historical Commission regarding potential impacts to cultural resources.

Specific project activities generally have sufficient flexibility to avoid most impacts or to mitigate unavoidable impacts to geographically limited environmental and cultural resource sites. Field surveys conducted at the appropriate phase of development should be employed to minimize the impacts of project activities on sensitive resources.

Threats to Natural Resources

Impacts of brush control can positively or negatively affect the existing terrestrial and aquatic environments depending on the type of control method used and the location, and extent of application. If brush removal is planned and implemented as part of a

[18] Texas Parks and Wildlife Department, Timber Rattlesnake (Crotalushorridus), available on-line at https://tpwd.texas.gov/huntwild/wild/species/timberrattlesnake/

comprehensive range management strategy, then positive environmental benefits can result. Properly planned and applied brush control using mechanical, chemical, or prescribed fire can enhance soil conditions, increase water tables, provide greater streamflow thus improving water quantity and quality, provide higher energy and nutrient inputs, increase vegetation diversity, and enhance the quality of wildlife habitat with resulting higher abundance and diversity of wildlife species. However, removal of established of brush on uplands or removal of riparian woody vegetation along stream courses without consideration of a comprehensive long-term management strategy can be detrimental to wildlife and associated habitats. Other adverse impacts could occur depending on the type of control method employed.

Mechanical treatment using equipment to root plow, brush mow, bulldoze or scrape the ground surface could result in moderate to high levels of soil disturbance that could result in erosion and sedimentation into adjacent streams and water bodies. There would also be a change in vegetation communities toward earlier succession species. Soil disturbance would favor both re-establishment of both grasses and forbs (herbaceous) in addition to re-invasion of woody brush and shrub species, prompting the need for re-treatment in future years. Soil disturbance would also have the potential of disturbing cultural or archeological artifacts, if present, within 12 inches of the ground surface. The probability of cultural and archeological artifacts being present is higher for sites along water courses, and old homesteads and settlements.

The use of herbicides for brush control must to follow the current recommended practices for their application. Some of these chemicals are to be used only on upland areas and are not approved for use in or near water. If improperly applied, aerial or ground spraying could have possible biological impacts to wildlife through direct contact and/or potential pollution of surface water. There could also be effects to non-target plant species from broadcast applications.

The use of prescribed fire provides many ecological benefits. Historically, prairie wildfires were a major factor is suppressing invasion of woody vegetation among the prairie grassland communities. Other benefits include increased soil fertility through release of organic nutrients, stimulated growth of new plant material, and greater diversity of herbaceous plants tolerant to fire. Prescribed fire could adversely affect other vegetation such as damaging or killing established trees not intended for treatment, can be difficult to control if applied during the wrong season or during improper weather conditions, and could affect air quality regulated under federal and state laws.

12.4 Engineering and Costing

Costs associated with brush control in each subbasin were assessed using the cost estimates developed for the feasibility study, as shown in Table 12-2. The total cost for each subbasin includes costs typically attributed to the landowner, as well as State participation costs. To assess the cost for the brush control project, the total cost was amortized over a 10-year period at an annual interest rate of 3.5 percent. Ten years were selected because the removal cost includes 10 years of maintenance activities and that is equivalent to the life of the project.

Table 12-2. Cost Estimate Summary for Brush Control Project

Item	Estimated Costs for Facilities
Chemical and Mechanical Brush Treatment (48,792 acres)	$6,524,000
TOTAL COST OF FACILITIES	**$6,524,000**
Interest During Construction (3% for 10 years with a 0.5% ROI)	$1,794,000
TOTAL COST OF PROJECT	**$7,308,000**
Debt Service (3.5 percent, 10 years)	$1,000,168
TOTAL ANNUAL COST	**$1,000,168**
Available Project Yield (acft/yr)[1]	0
[1] The yield of brush control during a drought is likely to be zero.	

12.5 Implementation Issues

The extent of implementation of brush control will depend on the amount of funding available for state cost-sharing with landowners. State funding would be contingent upon following provisions of the Water Supply Enhancement Program. Other funding may be available through federal and local agencies, which may have additional provisions. The extent of brush control that may be desired by landowners will depend on how they plan to manage their land for wildlife and how the brush control will affect the value of the land for wildlife recreation purposes. In recent years, the value of ranch lands which have sufficient brush cover to support wildlife populations, particularly white-tailed deer, wild turkey, bobwhite and scaled quail, has increased at a faster rate than the value of those lands which are void of brush or woody vegetation. Consequently, many landowners can be expected to support brush control to the extent that it does not exclude wildlife populations.

Other implementation issues for landowner participation include the perceived economic benefit of brush control. If the land is currently not actively managed for ranching or wildlife recreation the owner may chose not to participate. Decreased profitability of sheep, goat and cattle grazing systems will influence the economics of brush control by ranchers, and consequently their willingness to participate. Also, the size of the land tracts can affect the total amount of brush removed and the effectiveness of a program. Watersheds that contain many small tracts, which is likely to be the case in some of the target watersheds, are less likely to have the contiguous landowner participation that is needed to realize the water supply benefits associated with brush control. No land acquisition or relocations would be required for this water management strategy.

Brush control can positively affect the environment depending on the type of control method used, location, and extent of application. However, if brush removal is not planned properly or implemented as part of a comprehensive range management strategy, negative environmental impacts can result.

Grazing management is very important following any type of upland brush control to allow the desirable forages to exert competition with the brush plants and to maintain good herbaceous groundcover, which hinders establishment of woody plant seedlings. Continued maintenance of brush is necessary to ensure the benefits of this potential strategy.

On specific tracts where brush control would incorporate state or federal funding, regulatory compliance with the Texas Antiquities Code and National Historic Preservation Act may be required that may involve cultural resource surveys and incorporation of preservation measures. The Texas Commission on Environmental Quality has established regulations governing prescribed burning. There may also be local and county regulations associated with burning practices.

Since some of the subbasins may include urban and suburban areas, impacts to residents must be considered as well, particularly when considering chemical controls or prescribed burning. The watershed also serves as a drinking water supply, so water quality impacts must be considered as well.

The success of such a program for providing increased water supplies is dependent on climatic conditions and significant landowner participation. It should be noted that public benefit in the form of additional water depends on proper implementation and maintenance of the appropriate brush control practices. It is also important to understand that landowner participation in a brush control program can depends on the landowner's expected economic benefits from the program. The primary benefits of brush control might not lie with increased surface water runoff but with increased deep soil percolation and improved land management. Significant landowner participation will require adequate external funding on a continuous basis because the benefits of brush control are lost if the maintenance activities are not continued. Securing these funds will depend upon the success of on-going pilot studies and brush programs. Support of the on-going brush programs with continued data collection is necessary to demonstrate the realized water benefits of brush control.

This water supply option has been compared to the plan development criteria, as shown in Table 12-3.

Table 12-3. Evaluations of Brush Control Option to Enhance Water Supplies

Impact Category	Comment(s)
A. Water Supply	
1. Quantity	1. Uncertain
2. Reliability	2. Low reliability during drought conditions
3. Cost	3. Reasonable
B. Environmental factors	
1. Environmental Water Needs	1. Negligible impact
2. Habitat	2. High positive or negative impact
3. Cultural Resources	3. Negligible to low impact
4. Bays and Estuaries	4. Negligible impact
5. Threatened and Endangered Species	5. High positive or negative impact
6. Wetlands	6. Negligible impact
C. Impact on Other State Water Resources	• No apparent negative impacts on state water resources; no effect on navigation
D. Threats to Agriculture and Natural Resources	• None
E. Equitable Comparison of Strategies Deemed Feasible	• Option is considered to meet municipal and industrial shortages
F. Requirements for Interbasin Transfers	• Not applicable
G. Third Party Social and Economic Impacts	• None

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