



Assessment of White-tailed Deer (*Odocoileus virginianus*) Impacts on the Woody Plant Community on Selected Travis County BCP Properties, 2001

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INTRODUCTION

This report presents the results of a deer browse study conducted at Hamilton Pool Preserve and tracts of the Jollyville Unit by Travis County Natural Resources and Parks field staff from July to November 2001. The purpose of the study was two-fold: 1) to determine white-tailed deer (*Odocoileus virginianus*) herd size relative to the carrying capacity on these properties; and 2) to establish the need to maintain or reduce herd numbers.

BACKGROUND

Central Texas currently has the highest population density of white-tailed deer in the United States (Richards 2000). Data collected by TPWD (1984) indicates that, despite hunting pressure, this population continues to increase. White-tailed deer have become a serious management problem for preserve managers and other land stewards in Travis County. With no significant limiting factor on herd numbers, deer can cause extensive damage to native plant communities, affecting long-term changes in the floral landscape. Deer foraging habits adversely affect native plant communities by eliminating some species, diminishing or enhancing the regeneration of others, and affecting changes in plant size and biomass production.

These problems can be critical on lands managed to protect endangered species. Overbrowsing by white-tailed deer significantly reduces understory vegetation and thus available nesting cover for the black-capped vireo (*Vireo atricapillus*). Deer foraging habits also impact the golden-cheeked warbler (*Dendroica chrysoparia*) by inhibiting regeneration of hardwood species that are important components of golden-cheeked warbler habitat.

White-tailed deer feed on forbes, mast, grasses, and browse. Browse is defined as the leaves and tender twigs of woody plants that are used as forage. Although deer prefer forbes, browse actually makes up the greatest part of their diet, constituting a dependable food source throughout the year (Armstrong 1991; Nelle 1994). Because browse is such an important part of the white-tailed deer diet, utilization of browse species can provide information on relative herd size and condition (Armstrong 1991; Nelle 1994). The presence or absence of certain browse species, the degree to which deer are utilizing these resources, and the extent of species regeneration, can all indicate whether deer numbers are too high relative to the carrying capacity of the local habitat.

In this study, our approach was to measure the impact of white-tailed deer on the local plant communities. Three plant community characteristics were of particular interest: 1) woody plant species composition; 2) the degree of woody plant use by deer, or degree of browsing; and 3) the degree to which woody species are regenerating. We also collected data on the density and frequency of woody plant species.

METHODS

DATA COLLECTION AND ANALYSIS

Circular quadrats were used to ascertain woody species composition, density, relative density and frequency. Plots with a radius of eight meters each were randomly established within each property. At each study site, points were limited to a specific soil type in order to eliminate variables. Seven plots, totaling .35 acres, were established at Hamilton Pool Preserve on Tarrant soils. Fifteen plots, at two sites, were established at the Jollyville Unit (five at the Lake Perspectives tract and ten within the Vireo Ridge and Grandview Hills tracts). Both Jollyville Unit sites were on Volente soils and totaled .25 and .50 acres, respectively. Each woody plant within a plot was recorded. Density was calculated as the total number of individuals of species *i* (including seedlings and saplings) divided by the total number of acres sampled. Relative density is the total number of individuals of species *i* divided by the total number of all species. Frequency is the number of plots in which a species occurred divided by the total number of plots sampled. Because an exact count of live oak seedlings and root sprouts was impossible, numbers for these were estimated.

Following TPWD (2001) guidelines for evaluating browse intensity, each individual woody plant was classified as severely browsed, moderately browsed, or not browsed at all. The age of each individual plant was also recorded. Shrubs were classified as seedlings or mature plants. Trees were placed into one of three categories: 1) seedlings and suppressed seedling-sized saplings 0 – 50 cm high; 2) young trees (including saplings) 51 cm high – 15 cm dbh; and 3) mature trees > 15 cm dbh. Root sprouts of live oaks were not differentiated from seedlings for purposes of age classification.

Woody plant species were then categorized according to deer browse preference based on research by Armstrong (1991) and Nelle (1994). For our purposes, the designations “low quality browse” and “little utilized browse” used by Armstrong (1991) were combined into one category. Additional species listed by Nelle (1994) as “low quality browse” were included in this category as well. Browse species that were not listed by either researcher were designated as “other species.”

RESULTS

Hamilton Pool Preserve

Important woody plants of the upland plateau at Hamilton Pool Preserve include live oak (*Quercus fusiformis*), Ashe juniper (*Juniperus ashei*), Mexican persimmon (*Diospyros texana*), prickly pear (*Opuntia engelmannei*), tasajillo (*O. leptocaulis*), agarita (*Berberis trifoliata*), and lace cactus (*Echinocereus Reichenbacii*) (Table 1). Cedar elm (*Ulmus crassifolia*), hackberry (*Celtis sp.*), mesquite (*Prosopis glandulosa*), twisted-leaf yucca (*Yucca rupicola*), *Echinocereus spp.*, and myrtle croton (*Bernardia myricaefolia*) also occur here. The total number of woody species observed equals 14. Live oak and Ashe juniper had the highest relative density (0.54 and 0.31, respectively), followed by prickly pear and Mexican persimmon (0.07 and 0.03, respectively). Tasajillo had a relative density of 0.02. Species occurring frequently were prickly pear and tasajillo, which were found in every sample plot, followed by agarita, Ashe juniper, and Mexican persimmon, all of which had a frequency of 0.86 (**Table 1**).

A majority of shrub species had a relatively high ratio of seedling to mature individuals, indicating adequate regeneration (**Table 2**). This group includes agarita, tasajillo, Mexican persimmon, horse crippler (*Echinocereus texensis*), and lace cactus. Twenty-four percent of all prickly pear individuals were seedlings.

Seedlings comprised 98% of all live oak individuals sampled (**Table 3**). Ninety-six percent of cedar elm plants and 100% of hackberry plants were also seedlings. Twenty-six percent of all Ashe junipers sampled fell into this category. No young trees were observed for three of the five tree species occurring here: live oak, cedar elm, and hackberry. One mature cedar elm and no mature hackberries were observed. Thirty-three mature live oaks were located. Seventy-four percent of all Ashe junipers were saplings or young trees, but only five were found to be mature junipers (0.0%).

A number of low quality browse species were found to be moderately or even severely browsed (**Table 4**). These include Ashe juniper, live oak, mesquite, Mexican persimmon, prickly pear, and twisted-leaf yucca. No browsing was evident on tasajillo, horse crippler, lace cactus, or claret cup (*Echinocereus triglochidiatus*). Moderate and severe browsing was observed on eight cedar elm seedlings (out of 23), and the single mature cedar elm was severely browsed. No evidence of browsing was observed on a localized population of very young hackberry seedlings.

Jollyville Unit (Lake Perspectives tract)

Dominant woody plant species of the Lake Perspectives tract on the Volente (VoD) soil type include live oak, cedar elm, hackberry, Texas oak (*Quercus buckleyi*), Ashe juniper, Texas ash (*Fraxinus texensis*), Mexican persimmon, evergreen sumac (*Rhus virens*), yaupon (*Ilex vomitoria*), prickly pear, greenbriar (*Smilax bona-nox*), poison ivy (*Toxicodendron radicans*) and possumhaw (*Ilex decidua*). Other important woody species include agarita, wafer ash (*Ptelea trifoliata*) and southern dewberry (*Rubus trivialis*) (Table 5). In total, thirty-three woody plant species were observed. Live oak and Ashe juniper had the highest relative density (0.28 and 0.32, respectively) followed be greenbriar (0.13). Species found to occur in every plot were greenbriar, poison ivy, ash juniper, live oak, Texas oak and yaupon (**Table 5**).

A majority of shrub species had a high ratio of seedling to mature individuals (>20%). This group includes Texas sophora *(Sophora affinis)*, bumelia *(Bumelia lanuginosa)*, elbowbush *(Forestiera pubescens)*, greenbriar, poison ivy, possumhaw, wild grape *(Vitis sp.)*, agarita, Mexican persimmon, silktassel *(Garrya lindheimeri)*, wafer ash, southern dewberry, and yaupon (**Table 6**). Tree species with a high percentage of seedlings (>40% of all individuals observed), include cedar elm, Texas oak, Ashe juniper, live oak and Texas oak (**Table 7**). 74% of all Ashe junipers found, along with 95% of all live oaks were seedlings.

Tree species with a high number of young individuals (>19% of all individuals observed), were cedar elm, Texas oak, Ashe juniper, and Texas ash. Out of the 1140 Ashe juniper trees found, 240 of them were young. Texas ash trees totaled to 194, 72 of those were young.

A number of low quality browse species were found to be moderately or even severely browsed. These include live oak, evergreen sumac, fragrant sumac, mountain laurel, silktassel, and wafer ash (**Table 8**). However, browsing was not evident on a majority of individual plants observed in the low quality browse group. Moderate and severe browsing of good or preferred species was observed on Texas sophora, bumelia, greenbriar, and possumhaw in addition to other, relatively less dense species. Cedar elm, Texas oak and poison ivy had a majority of individuals not browsed.

Jollyville Unit (Vireo Ridge and Grandview Hills tracts)

Important woody plants of the bottomland areas of the Vireo Ridge and Grandview Hills tracts on the Volente (VoD) soil type include Ashe juniper, cedar elm, hackberry, and greenbriar (**Table 9**). These species had high densities and frequencies. Texas oak, live oak,

Mexican persimmon, wafer ash, Texas ash, bumelia, and fragrant sumac also occur here. Total number of woody species observed equals 37. Cedar elm, live oak and greenbriar had the highest relative densities (0.28, 0.17 and 0.16, respectively), followed by Ashe juniper and Southern dewberry (0.10 and 0.07, respectively) (**Table 9**).

A majority of shrub species had a relatively high ratio of seedling to mature individuals, indicating adequate regeneration (**Table 10**). This group includes Carolina buckthorn (*Rhamnus caroliniana*), elbowbush, Virginia creeper (*Parthenocisscus quinquefolia*) and Mexican persimmon .

Seedlings constituted of over 95% of all cedar elm, hackberry and live oak individuals sampled (**Table 11**). Thirty-two percent of all Ashe junipers sampled fell into this category. Young individuals were observed for all eight tree species. All tree species had a high ratio of young to mature individuals, indicating adequate regeneration.

Thirty-three percent of low and poor browse species, with sample sizes greater than 20 were moderately browsed (**Table 12**). Of these, only live oak and Mexican persimmon showed evidence of moderate browsing and none showed signs of severe browsing. Combining the preferred and good browse categories revealed 75% of the species with sample sizes greater than 20 showed signs of moderate browsing and 56% showed some signs of severe browsing. Texas oak, Southern blackhaw (*Viburnum rufildum*), black cherry, bumelia and greenbriar were species browsed upon most frequently, with bumelia and greenbriar being severely browsed.

DISCUSSION

Hamilton Pool Preserve

The majority of woody plant species observed at Hamilton Pool Preserve are low and poor quality browse species. Woody species with the highest densities and frequencies (live oak, Ashe juniper, agarita, and prickly pear) fall into this category. Concurrently, a number of woody species that are highly palatable to deer (preferred and good quality browse species) are absent from the preserve. It is likely that at least some of these species have been eliminated through long-term heavy browsing.

According to NRSC (1994) research, dominant shrub species for the Low Stony Hills range site include *Eysenhardtia texana*, *Sumac spp.*, *Bumelia sp.*, *Smilax bona-nox,* and *Sophora sp.* These are all preferred and good-quality browse species. However, none of these were

found to occur at our study site. Only two of the 14 woody species observed fall into the preferred or good quality browse categories: cedar elm and hackberry. These, however, do not represent viable populations. Hackberry individuals were isolated to 29% of plots, and all samples were very young seedlings. Similarly, the cedar elm population consisted of 23 seedlings, one-third of which were moderately or severely browsed, and one severely browsed mature individual.

In addition, there is evidence of moderate browsing on 87% of species in the low and poor quality browse category. Forty-three percent of these species exhibit signs of severe browsing. Evidence of moderate to heavy grazing of low and poor quality browse species, combined with the relative absence of palatable woody species, clearly indicates an overpopulated deer herd.

White-tailed deer also appear to be inhibiting the regeneration of live oaks. Age class results suggest that this population is in decline. There were a high number of individuals in the seedling category; however, this was due in large part to the inclusion of root sprouts in the count total. Root sprouts remain about the same size for the life of a tree and do not significantly increase recruitment into the sapling age class (Russell and Fowler 1999). Thus, due to the inclusion of root sprouts in our count and the high rate of oak seedling mortality, a more significant statistic is the complete absence of any sapling or young live oaks at our study site. The absence of these age classes suggests that the existing population of mature live oaks will not be replaced. Russell and Fowler (1999) found this tree species to be in decline at a majority of sites they studied in western Travis County. They attribute the relative absence of saplings and young live oaks to herbivory by white-tailed deer on seedlings and small saplings. This pattern appears to be replicated at Hamilton Pool Preserve. Eighty-two percent of all live oak seedlings, root sprouts, or suppressed seedling-sized saplings were moderately to severely browsed.

In brief, our study suggests that the plant species composition of the upland plateau has been altered in historic times. A number of woody species, primarily understory shrubs, vines, and small trees, have been eliminated from the plateau. Other species, such Ashe juniper and members of the family Cactaceae, have become more dominant over time. These alterations are a result of man-made disturbances that include—but are not limited to—long-term overbrowsing by white-tailed deer. The pressures exerted by high deer numbers on the local habitat inhibits the regeneration of this grassland in the absence of grazing by livestock.

In conclusion, woody plant species composition and evident browse patterns at Hamilton Pool Preserve strongly suggest that current deer numbers are too high for the carrying capacity of the local habitat. It is probable that this range site will not recover from past mismanagement in the continued presence of high deer numbers. White-tailed deer will continue to inhibit or suppress the regeneration and recovery of a number of species, affecting an overall decline in the diversity and species richness of the native plant community. Therefore, a reduction in deer herd numbers is warranted and highly recommended.

Jollyville Unit (Lake Perspectives tract)

The composition of woody plant species on Volente soils of the Lake Perspectives tract suggests that deer numbers are moderate to high relative to the carrying capacity of the habitat. Excluding species which were not included in research by Armstrong (1991) or Nelle (1994), over half of all species (56%) sampled were low and poor quality deer browse species. Our study suggests the condition of the woody plant community on Volente soils is in relatively poor condition. There was a high percentage of moderate and severe browsing that occurred in the vegetation sampled.

According to NRSC (1974) research, Ashe juniper, Mexican persimmon and agarita are invader species on this range site in poor conditions. Ashe juniper is a common component of the community although its presence here maybe attributed more to past land management practices than to overbrowsing of other preferred plants by deer. Mexican persimmon and agarita had high relative densities.

Dominant shrub species for the Clay Loam range site include sumac species, bumelia and elbowbush (Soil Conservation Service 1974). Bumelia and elbowbush are good quality browse species and both occur at the Lake Perspectives tract. Viable populations of preferred and good quality browse species are present. Over half of all shrub species have a seedling to adult ratio greater than 40%. There also appears to be adequate regeneration of most tree species based on the ratio of young to mature trees, although live oak had very low percentage of young to mature individuals.

Preferred and good quality browse species do show signs of both severe and moderate browsing. Cedar elm, Texas oak, bumelia and green briar exhibit severe signs of browsing. Concurrently, the extent of browsing on low and poor quality browse species is substantial. Wafer ash, silktassel and live oak show signs of heavy browsing. Although the majority of

woody plants show adequate regeneration, browse patterns indicate that deer numbers are too high relative to the carrying capacity of the local habitat. (Armstrong 1994).

Jollyville Unit (Vireo Ridge and Grandview Hills tracts)

The composition of woody plant species on Volente soils of the Vireo Ridge and Grandview Hills tracts suggests that deer numbers are low to moderate relative to the carrying capacity of the habitat. Excluding species which were not included in Armstrong (1991) or Nelle (1994), almost half of all species sampled were preferred or good quality deer browse species. Cedar elm, greenbriar, and hackberry, all good quality browse species, had high relative densities and a high frequency of occurrence.

Our study suggests that the woody plant community on Volente soils is in relatively good condition. Although there is some severe browsing, it was limited to a small percentage of the vegetation sampled. According to the Soil Conservation Service (1974) research, Ashe juniper, Mexican persimmon and agarita are invader species on this range site in poor conditions. Similar to the Lake Perspectives tract, Ashe juniper is a common component of the community although its presence here maybe attributed more to past land management practices (land clearing, fire suppression) than to over browsing of competitor plant species by deer. Mexican persimmon and agarita, however had low relative densities.

NRSC (1974) research also states that dominant shrub species for the Clay Loam range site include sumac species, bumelia and elbowbush. Bumelia and elbowbush are good quality browse species and both occur at Jollyville Unit. Viable populations of preferred and good quality browse species are present. Half of all shrub species have a seedling to adult ratio greater than 40%. There also appears to be adequate regeneration of most tree species based on the ratio of young to mature trees.

As expected, preferred and good quality browse species do show signs of moderate browsing. Excluding species with low relative densities, only bumelia and greenbriar exhibit moderate to severe signs of browsing. More importantly, the extent of browsing on low and poor quality browse species is negligible. Of the species with higher relative densities, only live oak, Mexican persimmon and wafer ash show signs of browsing. The adequate regeneration of the majority of good quality browse species combined with evident browse patterns indicate that deer numbers are low to moderate on this soil type (Armstrong 1994).

RECOMMENDATIONS

Fencing Professionals in the field of wildlife management concur that white-tailed deer management is ineffective without deer-proof fencing of properties. This is due to the ingress and egress of deer between populations on adjacent properties. As long as deer from surrounding properties can migrate into the preserve, no amount of culling will adequately reduce overpopulated herds.

Culling There are a number of options for reducing herd numbers once the need has been established. Experts recommend culling on preserve properties as the most effective management strategy. It allows a large number of deer to be harvested by expert sharpshooters in one season.

Exclosure studies Further study of plant community characteristics at Hamilton Pool Preserve is necessary to better understand the impact of white-tailed deer on the native flora. Exclosures allow biologists to quantify plant community characteristics in the absence of herbivory by deer.

Plant monitoring Annual plant monitoring programs, such as the current browse study, will allow managers to assess the effectiveness of deer management strategies on a yearly basis.

Deer censusing TPWD recommends that a deer census be completed each year on lands where deer are harvested. Feeder counts are recommended for Hamilton Pool Preserve. An annual census will allow managers to evaluate the effectiveness of management strategies, determine whether desired deer densities have been attained, and calculate future harvest recommendations.

LITERATURE CITED

Armstrong, W.E. 1991. Managing habitat for white-tailed deer in the Hill Country area of Texas. Texas Parks and Wildlife Department, Austin. 18pp.

Carr, W.R. 1996. [1996]. Rare plant survey and general plant inventory of Travis County parks west of the Balcones Escarpment, summer 1996. Travis County Natural Resources, unpublished document.

Gore, H.G., and J.M. Reagan. 1984. White-tailed deer population trends. Texas Parks and Wildlife Department. W-109-R-7. 78pp.

Richards, B. 2000. The deer dilemma: to fence or not to fence? Conference sponsored by Texas Parks and Wildlife Department. Reicher Ranch. June 15, 2001.

Russll, F.L., and N.L. Fowler. 1999. Rarity of oak saplings in savannas and woodlands of the Eastern Edwards Plateau, Texas. Southwestern Naturalist 44: 31-41.

Texas Parks and Wildlife Department. 2001. Browse Resource Evaluation. Texas Parks and Wildlife Department, Austin. 3pp.

USDA. 1974. Soil Survey of Travis County, Texas. United States Department of Agriculture, Soil Conservation Service, Washington, D.C. 123pp.

——. 1984. Soil Survey of Comal and Hays Counties, Texas. United States Department of Agriculture, Soil Conservation Service, Washington, D.C. 136pp.

——. 1994. The use and management of browse in the Edwards Plateau of Texas. United States Department of Agriculture, Natural Resources Conservation Service, Temple, Texas. 7pp.

——. 1994. Range Site Description (Low Stony Hill). United States Department of Agriculture, Natural Resources Conservation Service, Section II-E, Austin Field Office, Austin. 10pp.

——. n.d. Evaluating rangeland and deer habitat in the Edwards Plateau. United States Department of Agriculture, Natural Resources Conservation Service, Washington D.C. 2pp.

Table 1. Species composition, density, and frequency of woody plants in study plots at Hamilton Pool Preserve, July-August 2001. Species arranged in order of browse preference by white-tailed deer, *Odocoileus virginianus,* (Armstrong 1991; Nelle 1994).

		density/acre[1]	**relative density**[2]	**frequency**[3]
Preferred Browse Species				
Cedar Elm	*Ulmus crassifolia*	69	0.01	0.71
Good Browse Species				
Hackberry	*Celtis sp.*	77	0.01	0.29
Low and Poor Quality Browse Species				
Agarita	*Berberis trifoliata*	140	0.01	0.86
Ashe Juniper	*Juniperus ashei*	2971	0.31	0.86
Live Oak	*Quercus fusiformis*	5249	0.54	0.71
Mesquite	*Prosopis glandulosa*	6	0.00	0.14
Mexican Persimmon	*Diospyros texana*	251	0.03	0.86
Prickly Pear	*Opuntia lindheimeri*	669	0.07	1.00
Tasajillo	*Opuntia leptocaulis*	163	0.02	1.00
Twisted-leaf Yucca	*Yucca rupicola*	6	0.00	0.29
Other				
Claret Cup	*Echinocereus triglochidiatus*	3	0.00	0.14
Horse Crippler	*Echinocereus texensis*	11	0.00	0.14
Lace Cactus	*Echinocereus Reichenbacii*	100	0.01	0.43
Myrtle Croton	*Bernardia myricaefolia*	6	0.00	0.14
Total		**9720**	**100.00**	

[1] density per acre = no. of individuals per acre

[2] relative density = no. individuals of species *i* / total of all species

[3] frequency = no. of plots where species *i* occurs / total no. of plots

Table 2. Regeneration of shrub species in study plots at Hamilton Pool Preserve, July-August 2001. Arranged according to browse preference by white-tailed deer (Armstrong 1991; Nelle 1994).

		no. of seedlings	**no. of adults**	**total**	**% of seedlings ***
Low and Poor Quality Browse Species					
Agarita	*Berberis trifoliata*	15	34	49	0.31
Mexican Persimmon	*Diospyros texana*	40	48	88	0.45
Prickly Pear	*Opuntia Lindheimeri*	56	178	234	0.24
Tasajillo	*Opuntia leptocaulis*	19	38	57	0.33
Twisted-leaf Yucca	*Yucca rubicola*	0	2	2	0.00
Other					
Claret Cup	*Echinocereus triglochidiatus*	0	1	1	0.00
Horse Crippler	*Echinocereus texensis*	2	2	4	0.50
Lace Cactus	*Echinocereus Reichenbacii*	21	14	35	0.60
Myrtle Croton	*Bernardia myricaefolia*	0	2	2	0.00
Total		**153**	**319**	**472**	

* percent of seedlings = number of seedlings / by total number of individuals

Table 3. Regeneration of tree species in study plots at Hamilton Pool Preserve, July-August 2001. Seedlings = plants 0 - 50cm high; young trees = plants 51cm - 15cm dbh; mature trees = plants >15cm dbh (after Russell and Fowler, 1999). Raw numbers for each age class follow in parentheses. Note: absence of young trees indicates population not adequately regenerating (Russell and Fowler, 1999).

		n	% seedlings	% young trees	% mature trees
Preferred Browse Species					
Cedar Elm	*Ulmus crassifolia*	24	0.96 (23)	0.00 (0)	0.04 (1)
Good Browse Species					
Hackberry	*Celtis sp.*	27	1.00 (27)	0.00 (0)	0.00 (0)
Low and Poor Quality Browse Species					
Ashe Juniper	*Juniperus ashei*	1040	0.26 (270)	0.74 (765)	0.00 (5)**
Live Oak	*Quercus fusiformis*	1837	0.98 (1804)*	0.00 (0)	0.02 (33)
Mesquite	*Prosopis glandulosa*	2	0.00 (0)	1.00 (2)	0.00 (0)

*includes root sprouts and suppressed seedling-sized saplings

**Ashe juniper were considered mature if they had attained their adult growth form

Table 4. Browse pressure by white-tailed deer (Odocoileus virginianus) on woody plants in study plots at Hamilton Pool Preserve, July-August, 2001. Browse pressure was evaluated for each plant and classified as not evident, moderate, or severe. Percent in each class is given followed by number of individuals in each age class.

		Not evident				**Moderate**				**Severe**			
			no.				no.				no.		
		% of total	seedling	young	mature	% of total	seedling	young	mature	% of total	seedling	young	mature
Preferred Browse Species													
Cedar Elm	*Ulmus crassifolia*	0.63	15	0	0	0.29	7	0	0	0.08	1	0	1
Good Browse Species													
Hackberry	*Celtis sp.*	1.00	27	0	0	0.00	0	0	0	0.00	0	0	0
Low and Poor Quality Browse Species													
Agarita*	*Berberis trifoliata*	-	-	-	-	-	-	-	-	-	-	-	0
Ashe Juniper	*Juniperus ashei*	0.74	235	501	0	0.25	35	263	1	0.00	1	0	4
Live Oak	*Quercus fusiformis*	0.19	322	0	7	0.74	1368	0	12	0.07	114	0	14
Mesquite	*Prosopis glandulosa*	0.00	0	0	0	1.00	0	2	0	0.00	0	0	0
Mexican Persimmon	*Diospyros texana*	0.38	31		2	0.47	9		34	0.16	0		12

Prickly Pear	*Opuntia Lindheimeri*	0.84	56		141	0.11	0		26	0.05	0		11
Tasajillo	*Opuntia leptocaulis*	1.00	19		38	0.00	0		0	0.00	0		0
Twisted-leaf Yucca	*Yucca rupicola*	0.50	0		1	0.50	0		1	0.00	0		0
Other													
Claret Cup	*Echinocereus triglochidiatus*	1.00	0		1	0.00	0		0	0.00	0		0
Horse Crippler	*Echinocereus texensis*	1.00	2		2	0.00	0		0	0.00	0		0
Lace Cactus	*Echinocereus Reichenbacii*	1.00	21		14	0.00	0		0	0.00	0		0
Myrtle Croton	*Bernardia myricaefolia*	0.00	0		0	0.00	0		0	1.00	0		2

**Berberis trifoliata* was not evaluated for browse due to pyralid moth infestation

Table 5. Species composition, density, and frequency of woody plants in study sites at Lake Perspectives tract, October 2001.

		density/acre[1]	relative density[2]	frequency[3]
Preferred Browse Species				
Cedar Elm	*Ulmus crassifolia*	240	0.02	0.80
Texas Oak	*Quercus buckleyi*	384	0.03	0.80
Texas sophora	*Sophora affinis*	104	0.01	0.40
Good Browse Species				
Hackberry	*Celtis sp.*	44	0.00	0.80
Black Cherry	*Prunus serotina*	4	0.00	0.20
Bumelia	*Bumelia lanuginosa*	224	0.02	0.40
Elbowbush	*Forestiera pubescens*	48	0.00	0.20
Greenbriar	*Smilax bona-nox*	1864	0.13	1.00
Poison Ivy	*Toxicodendron radicans*	464	0.03	0.80
Possumhaw	*Ilex decidua*	576	0.04	1.00
Wild Grape	*Vitis* sp.	44	0.00	0.20
Low and Poor Quality Browse Species				
Ashe Juniper	*Juniperus ashei*	4560	0.32	1.00
Live Oak	*Quercus fusiformis*	3992	0.28	1.00
Mesquite	*Prosopis glandulosa*	4	0.00	0.20
Prickly Pear	*Opuntia lindheimeri*	64	0.01	0.80
Agarita	*Berberis trifoliolata*	100	0.01	0.60
Catclaw Acacia	*Acacia roemeriana*	24	0.00	0.20
Catclaw Mimosa	*Mimosa biuncifera*	8	0.00	0.20
Evergreen Sumac	*Rhus virens*	32	0.00	0.80
Fragrant Sumac	*R. aromatica*	16	0.00	0.20
Mexican Persimmon	*Diospyros texana*	164	0.01	1.00
Mountain Laurel	*Sophora secundiflora*	8	0.00	0.40
Silktassel	*Garrya lindheimeri*	144	0.01	0.40
Twisted-leaf	*Yucca rubicola*	20	0.00	0.40

Yucca				
Wafer Ash	*Ptelea trifoliata*	156	0.01	0.60
Other[4]				
Texas Ash	*Fraxinus texensis*	776	0.06	1.00
American Beautyberry	*Callicarpa americana*	16	0.00	0.40
Buttonbush	*Cephalanthus occidentalis*	28	0.00	0.20
Rattan-vine	*Berchemia scandens*	4	0.00	0.20
Red Buckeye	*Aesculus pavia*	20	0.00	0.20
Rough-leaf Dogwood	*Cornus drummondii*	4	0.00	0.20
Southern Dewberry	*Rubus trivialis*	60	0.00	0.60
Yaupon	*Ilex vomitoria*	164	0.01	1.00
Total		**14120**	**0.98**	

[1] density per acre = no. of individuals per acre

[2] relative density = no. individuals of species *i* / total of all species

[3] frequency = no. of plots where species *i* occurs / total no. of plots

[4] Refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 6. Regeneration of shrub species in study sites at Lake Perspectives tract, October 2001. Arranged according to browse preference.

		no. of seedlings	no. of adults	total	% of seedlings[1]
Preferred Browse Species					
Texas sophora	*Sophora affinis*	7	19	26	0.26
Good Browse Species					
Bumelia	*Bumelia lanuginosa*	27	29	56	0.48
Elbowbush	*Forestiera pubescens*	4	8	12	0.33
Greenbriar	*Smilax bona-nox*	166	300	466	0.36
Poison Ivy	*Toxicodendron radicans*	110	6	116	0.90
Possumhaw	*Ilex decidua*	100	42	144	0.69
Wild Grape	*Vitis sp.*	9	2	11	0.81
Low and Poor Quality Browse Species					
Agarita	*Berberis trifoliolata*	19	6	25	0.76
Catclaw Acacia	*Acacia roemeriana*	1	5	6	0.16
Catclaw Mimosa	*Mimosa biuncifera*	2	0	2	1.00
Evergreen Sumac	*Rhus virens*	8	0	8	1.00
Fragrant Sumac	*R. aromatica*	4	0	4	1.00
Mexican Persimmon	*Diospyros texana*	31	10	41	0.75
Mountain Laurel	*Sophora secundiflora*	1	1	2	0.50
Prickly Pear	*Opuntia lindheimeri*	4	12	16	0.25
Silktassel	*Garrya lindheimeri*	11	25	36	0.30
Twisted-leaf Yucca	*Yucca rubicola*	0	5	5	0.00
Wafer Ash	*Ptelea trifoliata*	17	22	39	0.43
Other[2]					
American Beautyberry	*Callicarpa americana*	1	3	4	0.25
Buttonbush	*Cephalanthus occidentalis*	2	5	7	0.28
Rattan-vine	*Berchemia scandens*	0	1	1	0.00
Red Buckeye	*Aesculus pavia*	0	5	5	0.00

Rough-leaf Dogwood	*Cornus drummondii*	0	1	1	0.00
Southern Dewberry	*Rubus trivialis*	14	1	15	0.93
Yaupon	*Ilex vomitoria*	11	30	41	0.26
Total		**549**	**538**	**1089**	

[1] percent of seedlings = number of seedlings / by total number of individuals

[2] refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 7. Regeneration of tree species in study sites at Lake Perspectives tract, October 2001. Seedlings = plants 0 - 50cm high; young trees = plants 51cm - 15cm dbh; mature trees = plants >15cm dbh (after Russell and Fowler, 1999). Raw numbers for each age class follow in parantheses. Note: absence of young trees indicates population not adequately regenerating (Russell and Fowler, 1999).

		n	% seedlings	% young trees	% mature trees
Preferred Browse Species					
Cedar Elm	*Ulmus crassifolia*	60	0.41 (25)	0.37 (22)	0.22 (13)
Texas Oak	*Quercus buckeyli*	96	0.76 (73)	0.20 (19)	0.04 (4)
Good Browse Species					
Black Cherry	*Prunus serotina*	1	1.00 (1)	0.00 (0)	0.00 (0)
Hackberry	*Celtis sp.*	11	1.00 (11)	0.00 (0)	0.00 (0)
Low and Poor Quality Browse Species					
Ashe Juniper	*Juniperus ashei*	1140	0.74 (846)	0.21 (240)	0.05 (54)[2]
Live Oak	*Quercus fusiformis*	998	0.95 (949)[1]	0.01 (14)	0.04 (35)
Mesquite	*Prosopis glandulosa*	1	0.00 (0)	1.00 (1)	0.00 (0)
Other[3]					
Texas Ash	*Fraxinus texensis*	194	0.58 (113)	0.37 (72)	0.05 (9)

[1] includes root sprouts and suppressed seedling-sized saplings

[2] Ashe juniper were considered mature if they had attained their adult growth form

[3] refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 8. Browse pressure by white-tailed deer (*Odocoileus virginianus*) on woody plants in study sites at Lake Perspectives tract, October, 2001. Browse pressure was evaluated for each plant and classified as not evident, moderate, or severe. Percent in each class is given followed by number of individuals in each age class.

		Not evident				**Moderate**				**Severe**			
			no.				no.				no.		
		% of total	seedling	young	mature	% of total	seedling	young	mature	% of total	seedling	young	mature
Preferred Browse Species													
Cedar Elm	*Ulmus crassifolia*	0.65	21	13	5	0.15	2	1	6	0.20	2	8	2
Texas Oak	*Quercus buckeyli*	0.65	44	14	4	0.21	15	5	0	0.14	14	0	0
Texas Sophora	*Sophora affinis*	0.12	2		1	0.85	5		17	0.03	0		1
Good Browse Species													
Black Cherry	*Prunus serotina*	1.00	1	0	0	0.00	0	0	0	0.00	0	0	0
Hackberry	*Celtis sp.*	1.00	11	0	0	0.00	0	0	0	0.00	0	0	0
Bumelia	*Bumelia lanuginosa*	0.22	7		5	0.48	7		20	0.30	13		4
Elbowbush	*Forestiera pubescens*	1.00	4		8	0.00	0		0	0.00	0		0
Greenbriar	*Smilax Bona-nox*	0.10	44		2	0.51	59		181	0.39	63		117
Poison Ivy	*Toxicodendron radicans*	0.72	79		5	0.27	31		0	0.01	0		1
Possumhaw	*Ilex decidua*	0.37	45		8	0.62	55		35	0.01	0		1
Wild Grape	*Vitis sp.*	1.00	9		2	0.00	0		0	0.00	0		0

Low and Poor Quality Browse Species													
Ashe Juniper	*Juniperus ashei*	0.98	846	220	54	0.02	0	23	0	0.00	0	0	0
Live Oak	*Quercus fusiformis*	0.49	473	1	17	0.48	455	11	15	0.03	21	2	3
Mesquite	*Prosopis glandulosa*	1.00	0	1	0	0.00	0	0	0	0.00	0	0	0
Agarita	*Berberis trifoliata*	0.88	18		4	0.12	2		1	0.00	0		0
Catclaw Acacia	*Acacia roemeriana*	1.00	1		5	0.00	0		0	0.00	0		0
Catclaw Mimosa	*Mimosa biuncifera*	1.00	2		0	0.00	0		0	0.00	0		0
Evergreen Sumac	*Rhus virens*	0.63	5		0	0.37	3		0	0.00	0		0
Fragrant Sumac	*R. aromatica*	0.00	0		0	0.00	0		0	1.00	4		0
Mexican Persimmon	*Diospyros texana*	0.83	31		3	0.12	0		5	0.05	0		2
Mountain Laurel	*Sophora secundiflora*	0.50	1		0	0.50	0		1	0.00	0		0
Prickly Pear	*Opuntia lindheimeri*	1.00	4		12	0.00	0		0	0.00	0		0
Silktassel	*Garrya lindheimeri*	0.50	7		11	0.47	4		13	0.03	0		1
Twisted-leaf Yucca	*Yucca rupicola*	1.00	0		5	0.00	0		0	0.00	0		0
Wafer Ash	*Ptelea trifoliata*	0.54	17		4	0.10	0		4	0.36	0		14
Other*													
Texas Ash	*Fraxinus texensis*	0.20	17	14	8	0.55	51	55	1	0.25	45	3	0

American Beautyberry	*Callicarpa americana*	1.00	1		3	0.00	0		0	0.00	0		0
Buttonbush	*Cephalanthus occidentalis*	1.00	2		5	0.00	0		0	0.00	0		0
Rattan-vine	*Berchemia scandens*	0.00	0		0	1.00	0		1	0.00	0		0
Red Buckeye	*Aesculus pavia*	1.00	0		5	0.00	0		0	0.00	0		0
Rough-leaf Dogwood	*Cornus drummondii*	0.00	0		0	1.00	0		1	0.00	0		0
Southern Dewberry	*Rubus trivialis*	1.00	14		1	0.00	0		0	0.00	0		0
Yaupon	*Ilex vomitoria*	0.41	8		9	0.27	3		8	0.32	0		13

* refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 9. Species composition, density, and frequency of woody plants in study plots at the Jollyville Unit (Vireo Ridge andGrandview Hills sections), October/November 2001. Species arranged in order of browse preference by white-tailed deer, *Odocoileus virginianus*, (Armstrong 1991; Nelle 1994).

		density/acre[1]	relative density[2]	frequency[3]
Preferred Browse Species				
Carolina Buckthorn	*Rhamnus caroliniana*	248	0.01	0.40
Cedar Elm	*Ulmus crassifolia*	4986	0.28	0.90
Southern Black-haw	*Viburnum rufidulum*	56	0.00	0.20
Texas Oak	*Quercus buckleyi*	348	0.02	0.80
Texas sophora	*Sophora affinis*	6	0.00	0.20
Good Browse Species				
Black Cherry	*Prunus serotina*	58	0.00	0.60
Bumelia	*Bumelia lanuginosa*	140	0.01	0.70
Carolina Snailseed	*Cocculus carolinus*	10	0.00	0.10
Elbowbush	*Forestiera pubescens*	406	0.02	0.50
Flameleaf Sumac	*Rhus lanceolata*	6	0.00	0.20
Greenbriar	*Smilax bona-nox*	2852	0.16	0.90
Hackberry	*Celtis sp.*	788	0.05	0.90
Poison Ivy	*Toxicodendron radicans*	74	0.01	0.60
Possumhaw	*Ilex decidua*	44	0.00	0.60
Virgina Creeper	*Parthenocissus quinquefolia*	228	0.01	0.50
Wild Grape	*Vitis sp.*	120	0.01	0.50
Low and Poor Quality Browse Species				
Agarita	*Berberis trifoliolata*	8	0.00	0.20
Ashe Juniper	*Juniperus ashei*	1684	0.10	1.00
Evergreen Sumac	*Rhus virens*	110	0.01	0.10
Fragrant Sumac	*R. aromatica*	24	0.00	0.20
Live Oak	*Quercus fusiformis*	2982	0.17	0.70
Mexican Persimmon	*Diospyros texana*	240	0.01	0.80

Mountain Laurel	*Sophora secundiflora*	2	0.00	0.10
Prickly Ash	*Zanthoxylum hirsutum*	6	0.00	0.30
Prickly Pear	*Opuntia lindheimeri*	2	0.00	0.10
Sacahuista	*Nolina texana*	38	0.00	0.10
Silktassel	*Garrya lindheimeri*	6	0.00	0.10
Texas Black Walnut	*Juglans microcarpa*	32	0.00	0.40
Twisted-leaf Yucca	*Yucca rubicola*	22	0.00	0.40
Wafer Ash	*Ptelea trifoliata*	194	0.01	0.70
Western Soapberry	*Sapindus drummondii*	6	0.00	0.20
Other[4]				
American Beautyberry	*Callicarpa americana*	20	0.00	0.30
Rough-leaf Dogwood	*Cornus drummondii*	10	0.00	0.10
Southern Dewberry	*Rubus trivialis*	1142	0.07	0.60
Texas Ash	*Fraxinus texensis*	612	0.03	0.80
Turk's Cap	*Malvaviscus arboreus*	14	0.00	0.10
Yaupon	*Ilex vomitoria*	176	0.01	0.80
Total		**17700**	**1.00**	

[1] density per acre = no. of individuals per acre

[2] relative density = no. individuals of species i / total of all species

[3] frequency = no. of plots where species i occurs / total no. of plots

[4] refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 10. Regeneration of shrub species on study sites at the Jollyville Unit (Vireo Ridge and Grandview Hills tracts), October/November 2001. Arranged according to browse preference by white-tailed deer (Armstrong 1991; Nelle 1994).

		no. of seedlings	**no. of adults**	**total**	**% of seedlings**[1]
Preferred Browse Species					
Carolina Buckthorn	*Rhamnus caroliniana*	74	50	124	0.60
Southern Black-haw	*Viburnum rufidulum*	15	13	28	0.54
Texas sophora	*Sophora affinis*	3	0	3	1.00
Good Browse Species					
Bumelia	*Bumelia lanuginosa*	33	37	70	0.47
Carolina Snailseed	*Cocculus carolinus*	0	5	5	0.00
Elbowbush	*Forestiera pubescens*	74	129	203	0.36
Flamelesf Sumac	*Rhus lanceolata*	0	3	3	0.00
Greenbriar	*Smilax bona-nox*	282	1144	1426	0.20
Poison Ivy	*Toxicodendron radicans*	10	27	37	0.27
Possumhaw	*Ilex decidua*	6	16	22	0.27
Virginia Creeper	*Parthenocissus quinquefolia*	95	19	114	0.83
Wild Grape	*Vitis sp.*	26	34	60	0.43
Low and Poor Browse Species					
Agarita	*Berberis trifoliolata*	0	4	4	0.00
Evergreen Sumac	*Rhus virens*	49	6	55	0.89
Fragrant Sumac	*R. aromatica*	11	1	12	0.92
Mexican Persimmon	*Diospyros texana*	102	18	120	0.85
Mountain Laurel	*Sophora secundiflora*	0	1	1	0.00
Prickly Pear	*Opuntia lindheimeri*	1	0	1	1.00
Prickly-ash	*Zanthoxylum hirsutum*	0	3	3	0.00
Sacahuista	*Nolina texana*	3	16	19	0.16
Silktassel	*Garrya lindheimeri*	0	3	3	0.00
Twisted-leaf Yucca	*Yucca rubicola*	6	5	11	0.55

Wafer Ash	*Ptelea trifoliata*	66	31	97	0.68
Western Soapberry	*Sapindus drummondii*	1	2	3	0.33
Other[2]					
American Beautyberry	*Callicarpa americana*	4	6	10	0.40
Rough-leaf Dogwood	*Cornus drummondii*	1	4	5	0.20
Southern Dewberry	*Rubus trivialis*	260	311	571	0.46
Turk's Cap	*Malvaviscus arboreus*	7	0	7	1.00
Yaupon	*Ilex vomitoria*	52	36	88	0.59
Total		**1181**	**1924**	**3105**	

[1] percent of seedlings = number of seedlings / by total number of individuals

[2] refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 11. Regeneration of tree species on study sites at the Jollyville Unit (Vireo Ridge and Grandview Hills tracts), October/November 2001. Seedlings = plants 0 - 50cm high; young trees = plants 51cm - 15cm dbh; mature trees = plants >15cm dbh (after Russell and Fowler, 1999). Raw numbers for each age class follow in parentheses. Note: absence of young trees indicates population not adequately regenerating.

		n	% seedlings	% young trees	% mature trees
Preferred Browse Species					
Cedar Elm	*Ulmus crassifolia*	2493	0.97 (2415)	0.02 (62)	0.00 (16)
Texas Oak	*Quercus buckeyli*	174	0.82 (144)	0.13 (23)	0.05(7)
Good Browse Species					
Black Cherry	*Prunus serotina*	58	0.61 (37)	0.31 (16)	0.08 (5)
Hackberry	*Celtis sp.*	394	0.96 (379)	0.04 (14)	0.00 (1)
Low and Poor Quality Browse Species					
Ashe Juniper	*Juniperus ashei*	842	0.32 (268)	0.64 (543)	0.04 (31)[2]
Texas Black Walnut	*Juglans microcarpa*	16	0.59(9)	0.29(5)	0.12(2)
Live Oak	*Quercus fusiformis*	1491	0.99 (1461)[1]	0.01 (22)	0.00 (8)
Other[3]					
Texas Ash	*Fraxinus texensis*	306	0.75 (228)	0.25 (78)	0.00 (0)

[1] includes root sprouts and suppressed seedling-sized saplings

[2] Ashe juniper were considered mature if they had attained their adult growth form

[3] refers to species not listed in Armstrong (1991) or Nelle (1994)

Table 12. Browse pressure by white-tailed deer (*Odocoileus virginianus*) on woody plants in study plots at the Jollyville Unit (Vireo Ridge and Grandview Hills tracts), October/November, 2001. Browse pressure was evaluated for each plant and classified as not evident, moderate, or severe. Percent in each class is given followed by number of individuals in each age class.

		Not evident				**Moderate**				**Severe**			
			no.				no.				no.		
		% of total	seedling	young	mature	% of total	seedling	young	mature	% of total	seedling	young	mature
Preferred Browse Species													
Cedar Elm	*Ulmus crassifolia*	0.78	1939	1	14	0.18	417	25	0	0.04	59	36	2
Texas Oak	*Quercus buckleyi*	0.68	103	8	7	0.25	29	15	0	0.07	12	0	0
Carolina Buckthorn	*Rhamnus caroliniana*	0.92	70		44	0.07	4		5	0.01	0		1
Southern Blackhaw	*Viburnum rufildum*	0.68	11		8	0.25	4		3	0.07	0		2
Texas Sophora	*Sophora affinis*	0.00	0		0	0.33	1		0	0.67	2		0
Good Browse Species													
Black Cherry	*Prunus serotina*	0.54	20	6	5	0.41	14	10	0	0.05	3	0	0
Hackberry	*Celtis sp.*	0.77	296	7	1	0.21	75	6	0	0.02	8	1	0
Bumelia	*Bumelia lanuginosa*	0.43	18		12	0.29	5		15	0.29	10		10

Carolina Snailseed	*Cocculus carolinus*	1.00	0		5	0.00	0		0	0.00	0		0
Elbowbush	*Forestiera pubescens*	0.90	74		108	0.10	0		21	0.00	0		0
Flameleaf Sumac	*Rhus lanceolata*	1.00	0		3	0.00	0		0	0.00	0		0
Greenbriar	*Smilax bona-nox*	0.23	63		261	0.50	160		548	0.27	59		335
Poison Ivy	*Toxicodendron radicans*	0.78	9		20	0.22	1		7	0.00	0		0
Possumhaw	*Ilex decidua*	0.82	5		13	0.14	1		2	0.05	0		1
Virgina Creeper	*Parthenocissus quinquefolia*	1.00	95		19	0.00	0		0	0.00	0		0
Wild Grape	*Vitis sp.*	0.98	25		34	0.02	1		0	0.00	0		0
Low and Poor Browse Species													
Ashe Juniper	*Juniperus ashei*	0.99	268	540	30	0.01	0	3	1	0.00	0	0	0
Live Oak	*Quercus fusiformis*	0.74	1086	8	8	0.26	369	12	0	0.00	6	2	0
Texas Black Walnut	*Juglans microcarpa*	0.82	9	3	2	0.06	0	1	0	0.06	0	1	0
Agarita	*Berberis trifoliata*	1.00	0		4	0.00	0		0	0.00	0		0

Evergreen Sumac	*Rhus virens*	0.89	43		6	0.11	6		0	0.00	0		0
Fragrant Sumac	*R. aromatica*	0.92	11		0	0.08	0		1	0.00	0		0
Mexican Persimmon	*Diospyros texana*	0.80	85		11	0.18	16		6	0.02	1		1
Mountain Laurel	*Sophora secundiflora*	0.00	0		0	1.00	0		1	0.00	0		0
Prickly Ash	*Zanthoxylum hirsutum*	0.00	0		0	0.67	0		2	0.33	0		1
Prickly Pear	*Opuntia lindheimeri*	1.00	1		0	0.00	0		0	0.00	0		0
Sacahuista	*Nolina texana*	1.00	3		16	0.00	0		0	0.00	0		0
Silktassel	*Garrya lindheimeri*	0.67	0		2	0.33	0		1	0.00	0		0
Twisted-leaf Yucca	*Yucca rupicola*	0.82	5		4	0.18	1		1	0.00	0		0
Wafer Ash	*Ptelea trifoliata*	0.90	58		29	0.10	8		2	0.00	0		0
Western Soapberry	*Sapindus drummondii*	1.00	1		2	0.00	0		0	0.00	0		0
Other*													
Texas Ash	*Fraxinus texensis*	0.73	166	58	0	0.25	55	20	0	0.02	7	0	0

American Beautyberry	*Callicarpa americana*	1.00	4		6	0.00	0		0	0.00	0		0
Rough-leaf Dogwood	*Cornus drummondii*	0.80	0		4	0.00	0		0	0.20	1		0
Southern Dewberry	*Rubus trivialis*	0.86	237		252	0.14	23		59	0.00	0		0
Turk's Cap	*Malvaviscus arboreus*	1.00	7		0	0.00	0		0	0.00	0		0
Yaupon	*Ilex vomitoria*	0.50	29		15	0.40	17		18	0.10	6		3

*refers to species not listed in Armstrong (1991) or Nelle (1994)