Chris Wilson

A SURVEY OF PLAINS RIPARIAN VEGETATION

IN

BOULDER COUNTY, COLORADO

Prepared By:

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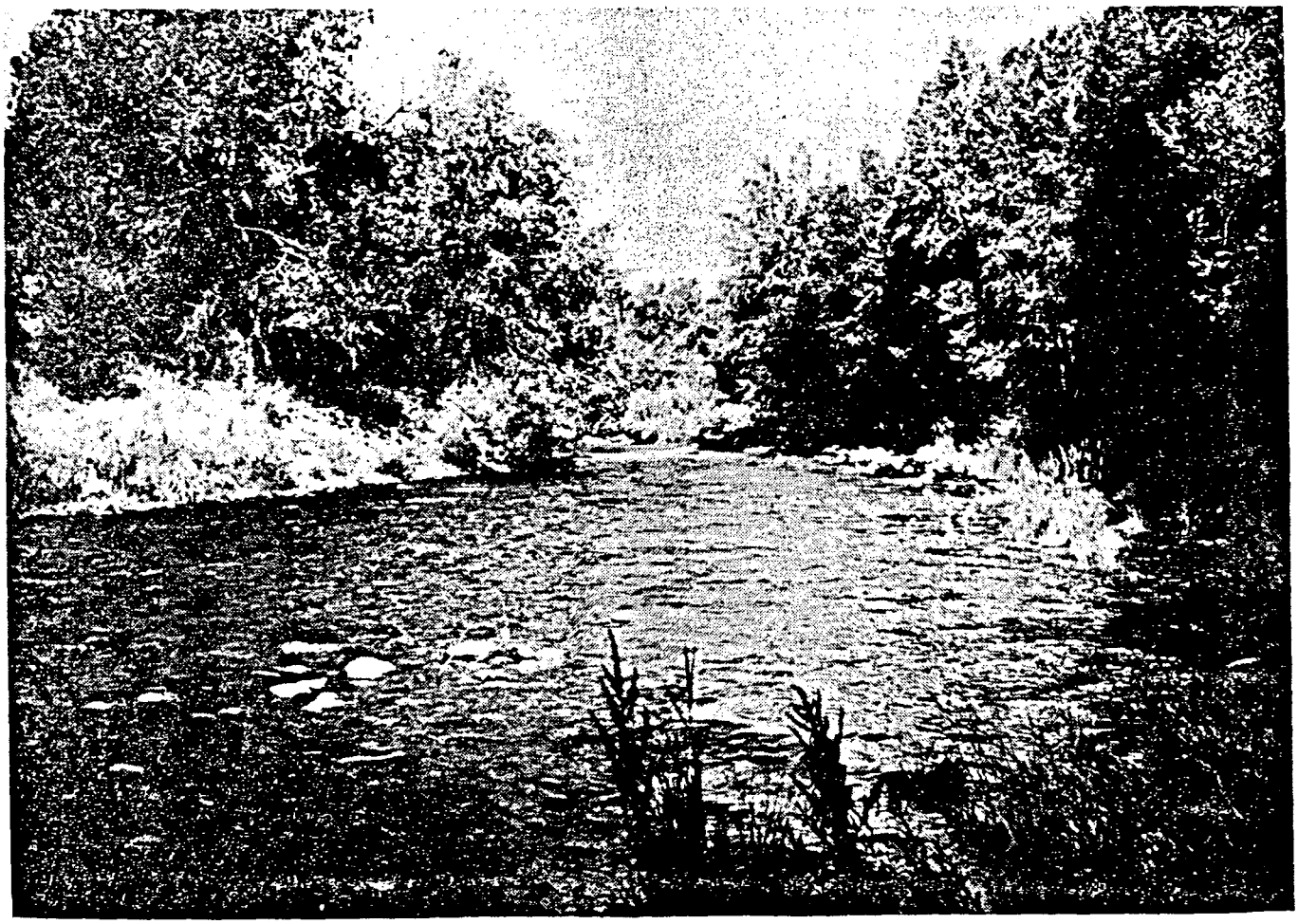

May 1988
Boulder County Nature Association Publication No. 9
3893 North 75th Street, Boulder, Colorado, 80301

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INTRODUCTION

Plains riparian habitats, characterized by mature cottonwood stands and dense shrub understories, are some of the richest wildlife habitats in Colorado as more than 43% of the wildlife species found in the state have been recorded there (Scott 1986). Wildlife disproportionately use riparian zones more than other habitat types (Thomas et al. 1979, Beidleman 1954). These areas are also important for a host of other values such as water quality, flood control, and erosion control (Tiner 1984).

Studies conducted by the Colorado Division of Wildlife indicate that the cottonwood-willow association along most of Colorado's rivers are in a state of decline (Scott 1986). Impacts from farming, grazing, woodcutting, and control of stream water have decreased both mature trees and regeneration. A comparison of 1937 and 1985 aerial photos of a portion of the St. Vrain Creek in Boulder County revealed a 48% decline in riparian habitat, much of the loss caused by sand and gravel operations (McKinley et al. 1986). Furthermore, an historical review of the status of breeding birds in Boulder County revealed that willow flycatcher, loggerhead shrike, northern mockingbird and brown thrasher, all breeders in shrub understories of riparian zones, have numerically declined (Boulder County Parks and Open Space Department 1988).

PURPOSE OF STUDY

The study had two main purposes. The first was to quantify the amount of riparian vegetation existing along the major streams of Boulder County.

The second purpose was to measure the quality of the riparian vegetation relative to tree canopy, shrub understory and tree regeneration. It has been suggested that there is a relationship between wildlife species diversity (particularly birds) and foliage height diversity, foliage volume and other habitat characteristics (Willson 1974, Balda 1969, MacArthur and MacArthur 1961).

METHODS

Study Area

A study was conducted of the plains riparian zones of the following streams in Boulder County, CO: Boulder Creek, Coal Creek, Fourmile Creek, Lefthand Creek, Rock Creek, St. Vrain Creek and South Boulder Creek (see Figure 1). Using 1984 aerial photos (scale 1"=400'), stands of riparian vegetation were identified. Notices were sent to property owners of these stands and studies were conducted in those areas where opposition to the study was not expressed.

Aerial Photo Survey

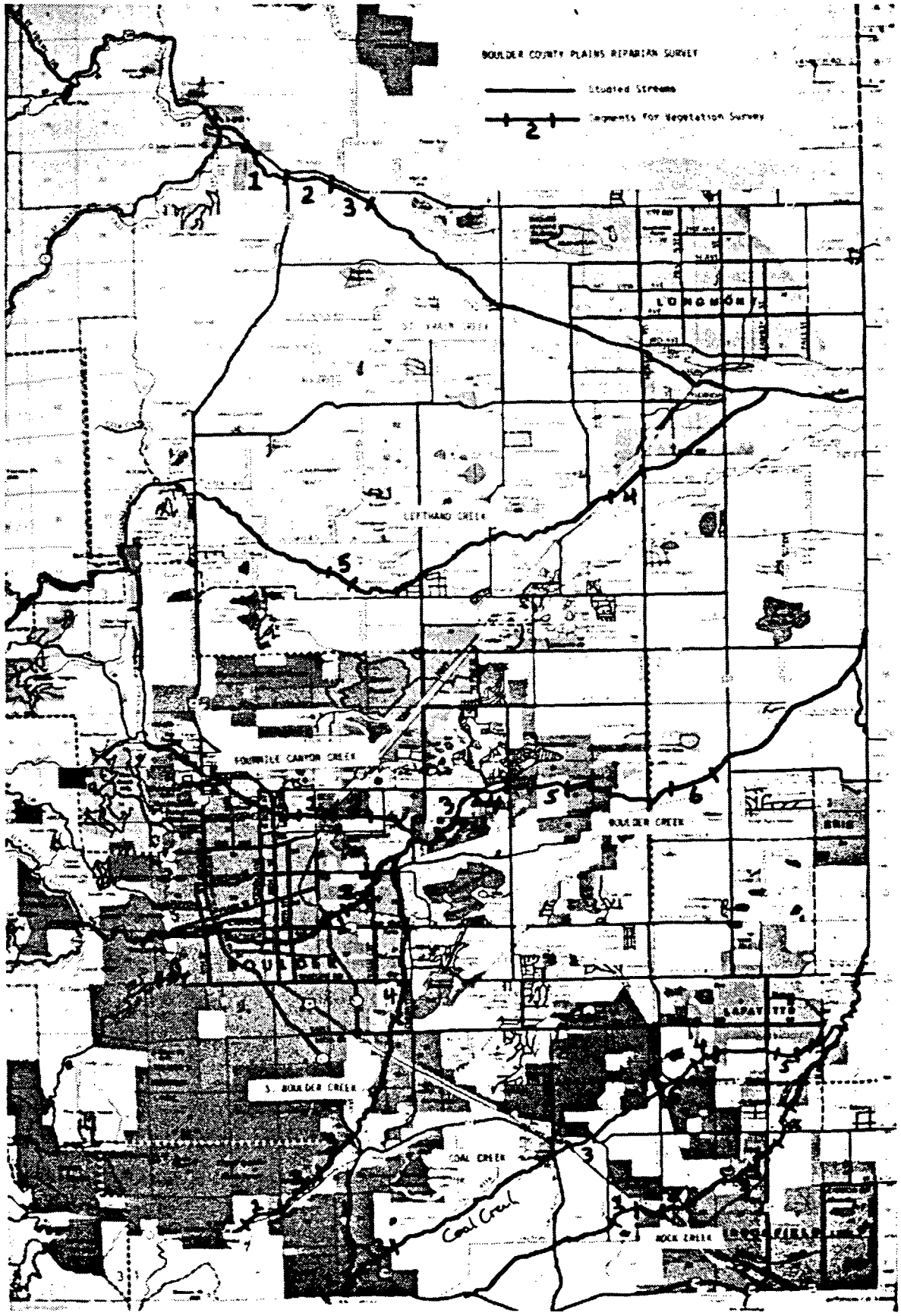
Using the 1984 aerial photos, linear measurements were made of the extent of riparian forests existing along the seven streams. Forests were not considered to exist along the stream if, for more than a 100 m length, tree density was less than .5/100 m^2.

Vegetation Survey

Within each surveyed riparian stand, vegetation was sampled at 25 m intervals (minimum of 20 points surveyed in each stand) along both sides of the stream. Survey lines perpendicular to the stream were established at the 25 m interval points. The point-centered quarter method was used to measure overstory species composition, size-class distribution and basal area. The method was used at the stream bank and every 25 m along each survey line perpendicular to the stream until the edge of riparian vegetation was reached. Additionally, within a 2 m band centered on the survey lines, all saplings (less than 10 cm dbh) were identified and measured for height while shrubs were identified, measured for height and stems counted. Due to difficulties in identifying willow (Salix spp) tree saplings from shrubs, they were lumped into a single category. Dominant ground cover vegetation was estimated and notes were made regarding presence or impacts from agriculture, recreation, dwellings, grazing and channelization.

The field work was conducted by teams of 1-6 individuals during the summer of 1985 and 1986 (see acknowledgements). Teams were comprised of staff from Boulder County Parks and Open Space Department or volunteers from Boulder County Nature Association or the Volunteer Naturalist program of Boulder County Parks and Open Space.

Figure 1



A Survey of Plains Riparian Vegetation

If this map is not good enough, I have original. Dave H 444-3850

RESULTS AND DISCUSSION

The seven creeks studied totaled over 74 miles of stream on the plains of Boulder County (Table 1). Boulder Creek was the longest and Fourmile Creek the shortest. Forested riparian habitat existed along 60% of the total stream mileage. Over 90% of Fourmile and Lefthand Creeks exhibited forest habitat. Only 25% of the length of Rock Creek had adjacent riparian forests while other streams ranged from 50-70%.

The vegetation of 27 stream segments was surveyed by volunteers with the number of sampled areas on each stream as follows: Boulder Creek - 6, Coal Creek - 6, Fourmile Creek - 2, Lefthand Creek - 2, Rock Creek - 4, St. Vrain Creek - 3, South Boulder Creek - 4. The surveyed segments equaled almost 40% of the forested riparian plains habitat in Boulder County.

The forests were dominated by plains cottonwood, narrowleaf cottonwood and willow (crack, golden and peachleaved). St. Vrain and Coal Creeks showed heavy dominance by cottonwoods, Boulder Creek's tree overstory was primarily willows, and the remaining creeks were co-dominated by cottonwoods and willows.

The widest riparian zones were found along Boulder Creek, Coal Creek and South Boulder Creek. Rock Creek was the narrowest zone.

Approximately half of the surveyed segments had a significant shrub understory. Willow, chokecherry, hawthorn, plum and boxelder were the most common tall shrubs (greater than 1 m) that provided vegetative diversity to the forested riparian areas.

Rose, snowberry and locust were actually the most dominant shrubs throughout all the segments. They were particularly common in heavily grazed or disturbed plots and added little structural diversity to the vegetation due to their low-lying growth forms.

The segments along South Boulder Creek, St. Vrain Creek and the west half of Coal Creek exhibited the best examples of shrub understory.

Almost half of the surveyed segments showed signs of regeneration of cottonwoods or willows (in willow dominated stands). South Boulder Creek, St. Vrain Creek, Lefthand Creek, Coal Creek and the central portion of Boulder Creek had the greatest amount of regeneration. Most regeneration was occurring in those segments closest to the foothills.

Table 2 attempts to numerically summarize the data gathered from the vegetation surveys in terms of structural diversity. The best stands for wildlife have an overstory (ideally many sizes of trees including large-diameter trees important to nesting raptors and cavity-nesters), a shrub understory (willows and/or other shrubs), regeneration and good width. The data for each surveyed plot was placed into a 0-2 scale, with 2 being the higher tree, willow, shrub and regeneration densities or zone width, and 0 the lower.

The surveyed plots of South Boulder Creek, St. Vrain Creek, Lefthand Creek, the western half of Coal Creek, and the central part of Boulder Creek exhibited the best structural diversity. Rock Creek exhibited poor development of riparian vegetation which may be related to the small size and low water flow of the stream.

SUMMARY

There has been an expressed concern about the decline of plains riparian vegetation in Colorado. Studies in Boulder County, CO, have shown some significant losses of vegetation adjacent to streams and a general decline in breeding birds dependent on riparian shrub vegetation.

This study examined seven plains streams in Boulder County. Analyzing aerial photos, it was found that only 60% of stream length was bordered by riparian forests. This ranged from over 90% on Lefthand and Fourmile Creeks to only 25% on Rock Creek. Vegetation analysis of structural diversity in 27 stream segments (minimum 2 segments on each stream) resulted in half showing signs of shrub understory and half showing signs of regeneration. In general, this indicates that only 30% of the plains riparian zone in Boulder County has good structural diversity or signs of regeneration. The segments on South Boulder Creek, St. Vrain Creek, Lefthand Creek, the western half of Coal Creek, and the central portion of Boulder Creek exhibited the best examples of structural diversity while Rock Creek had the poorest development of riparian vegetation.

ACKNOWLEDGEMENTS

This study was financially supported by Boulder Audubon Society, Boulder County Nature Association and Boulder County Parks and Open Space Department. Special thanks to the following individuals who volunteered their time to conduct the field survey: Ann Armstrong, Carolyn Beezley, Garret Campbell, Kathy Carsey, Ann Cooper, Lin Folsom, Dave Hallock, Tina Jones, Laura McKinley, Nita Rauch, Ellen Steiner, Dave Wilkerson, and Diane Woelfel. Thanks to the following Boulder County Parks and Open Space staff for field work, organization and typing: Randy Coombs, Doug DeVries, Sue Galatowitsch, Pam Leland, Pat Reed, and Barry Shook. Thanks to Nancy Lederer for assistance in editing this report.

Table 1

Length of Stream
and Forested Vegetation
for Seven Creeks in Boulder County

Creek	Total Length On Plains (miles)	Length of Forested Vegetation (miles)	(%)	Forested Plots Surveyed (miles)
Boulder	15.8	8.0	51%	4.5
Coal Creek	12.0	6.9	57	2.8
Fourmile	4.8	4.4	92	1.6
Lefthand	10.4	9.5	91	1.3
Rock Creek	10.4	2.6	25	2.1
St. Vrain	13.6	8.2	60	2.4
South Boulder	7.3	5.1	70	3.1
TOTAL	74.3	44.7	60%	17.8

Table 2

Vegetation Ratings
in 27 Plots
on 7 Streams in Boulder County

Plot	Width	Trees	Regeneration	Willows	Shrubs	Total
Boulder Cr. 1	0	2	0	0	0	2
Boulder Cr. 2	2	2	0	0	1	5
Boulder Cr. 3	1	2	0	1	1	5
Boulder Cr. 4	0	2	1	2	1	6
Boulder Cr. 5	2	2	0	2	0	6
Boulder Cr. 6	1	2	0	0	0	3
Coal Cr. 1	1	1	2	1	2	7
Coal Cr. 2	1	1	2	1	2	7
Coal Cr. 3	2	1	2	1	0	6
Coal Cr. 4	2	1	1	0	0	4
Coal Cr. 5	1	1	1	0	0	3
Coal Cr. 6	2	1	0	0	2	5
Fourmile Cr. 1	1	1	0	0	0	2
Fourmile Cr. 2	2	2	0	0	2	6
Lefthand Cr. 4	1	2	1	0	1	5
Lefthand Cr. 5	1	2	2	1	0	6
Rock Cr. 1	0	0	1	0	1	2
Rock Cr. 2	0	1	0	2	1	4
Rock Cr. 3	0	1	0	0	1	2
Rock Cr. 4	0	1	0	2	1	4
St. Vrain Cr. 1	0	2	2	0	2	6
St. Vrain Cr. 2	1	1	2	2	2	8
St. Vrain Cr. 3	1	1	2	2	1	7
S. Boulder Cr. 1	1	2	2	2	2	9
S. Boulder Cr. 2	1	2	2	2	2	9
S. Boulder Cr. 3	1	2	1	2	1	7
S. Boulder Cr. 4	2	2	2	1	1	8

Table 2 (continued)

Criteria

Average width of riparian zone:	>40 m = 2
	20 - 40 m = 1
	<20 m - 0
Tree Canopy Structure:	All ages present = 1
	Less than 40% of points without trees = 1
Regeneration Density:	>5/100 m^2 = 2
	2-5/100 m^2 = 1
	<2/100 m^2 = 0
Willow Density:	>10/100 m^2 = 2
	4-10/100 m^2 = 1
	<4/100 m^2 = 0
Shrub Density:	>20/100 m^2 = 2(1)
	10-20/100 m^2 = 1(2)
	<10/100 m^2 = 0(3)

(1) If 75% <1 m tall, then = 1

(2) If 50% >1 m tall, then = 2
if 75% <1 m tall, then = 0

(3) If 50% >1 m tall, then = 1

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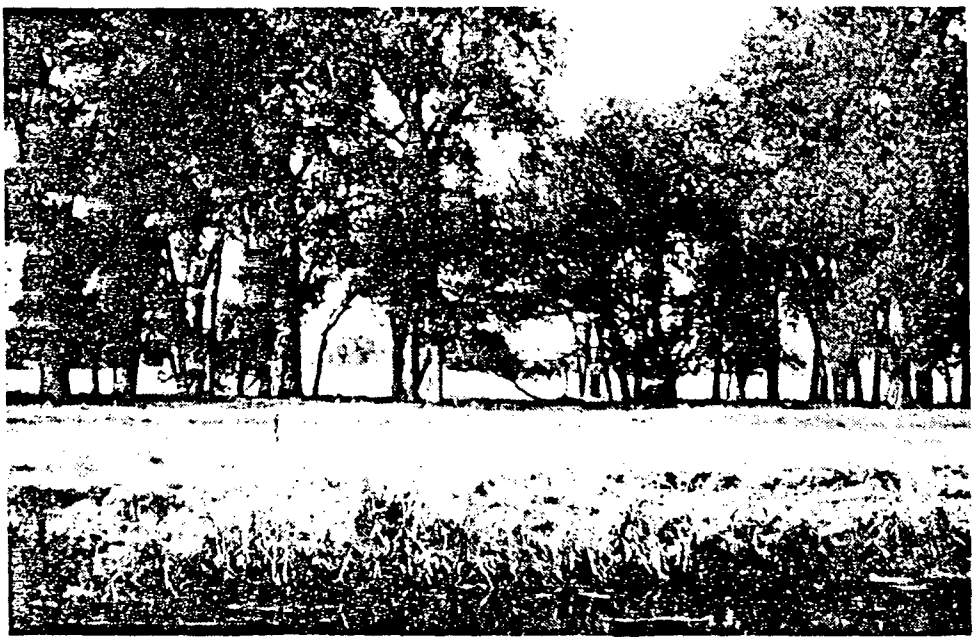
Areas with dense vegetation are considered good wildlife habitat as the structural diversity provides a variety of niches. The vegetation also shades the stream, producing better water quality for fish.



Many cottonwood stands exhibit a mature overstory with little shrub understory or regeneration, often due to grazing practices.

Appendix I

Vegetation Survey Data

Boulder Creek #1

1. Width of Riparian Area
   Average - 11 m Range - 1-29 m

2. Absolute Density of Trees
   Mean Distance - 8.37 m
   Trees/100m^2 - 1.43 3% without trees

3. Relative Frequency of Tree Species
   Willow - 94%
   P. Cottonwood - 6%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
Willow	5%	7%	45%	33%	5%	5%
Pl.Cotton			50%	50%		
TOTAL	5%	6%	45%	34%	5%	5%

5. Number of Cottonwood Saplings/100m^2 0.0
   Height: >2m 0% 1-2m 0% <1m 0%

6. Number of Willows/100m^2 0.28
   Height: >2m 100% 1-2m 0% <1m 0%

7. Number of Shrubs/100m^2 2.89
   Height: >2m 5% 1-2m 33% <1m 62%

8. Relative Frequency of Shrubs
   Ash - 62% Boxelder - 5%
   Juniper - 28% Russian Olive - 5%

Boulder Creek #2

1. Width of Riparian Area
   Average - 110 m Range - 40-204 m

2. Absolute Density of Trees
   Mean Distance - 6.8 m
   Trees/100m^2 - 2.16 13% without trees

3. Relative Frequency of Tree Species

Willow	- 72%	Black Locust	- 2%
Boxelder	- 14%	Am. Elm	- 1%
Green ash	- 5%	N. Cottonwood	- 1%
P. Cottonwood	- 5%	Other	- 1%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
Willow	13%	54%	18%	13%	1%	1%
Boxelder	95%	5%				
Green Ash	100%					
P. Cotton.	8%	31%	23%	31%	8%	
B. Locust	83%	17%				
Am. Elm	100%					
N. Cotton.		100%				
Other	100%					
TOTAL	32%	41%	14%	10%	1%	1%

5. Number of Cottonwood Saplings/100m^2 0.01
   Height: >2m 0% 1-2m 50% <1m 50%

6. Number of Willows/100m^2 0.86
   Height: >2m 14% 1-2m 44% <1m 42%

7. Number of Shrubs/100m^2 29.85
   Height: >2m 5% 1-2m 4% <1m 91%

8. Relative Frequency of Shrubs

Snowberry	- 58%	Boxelder	- 3%
Raspberry	- 18%	Sage	- 2%
Rose	- 9%	Gooseberry	- 1%
Green Ash	- 7%	Other	- 1%

Boulder Creek #3

1. Width of Riparian Area
   Average - 25 m Range - 1-68 m

2. Absolute Density of Trees
   Mean Distance - 9.20 m
   Trees/100m² - 1.18 26% without trees

3. Relative Frequency of Tree Species

Willow	- 69%	Apple	- 1%
P. Cotton	- 22%	Hackberry	- 1%
Boxelder	- 5%	B. Locust	- 1%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
Willow	31%	31%	24%	10%	2%	2%
P. Cotton			56%	25%	19%	
Boxelder	75%		25%			
Apple		100%				
Hackberry	100%					
B. Locust	100%					
TOTAL	28%	23%	30%	12%	5%	1%

5. Number of Cottonwood Saplings/100m² 1.07
   Height: >2m 69% 1-2m 23% <1m 8%

6. Number of Willows/100m² 8.66
   Height: >2m 48% 1-2m 17% <1m 35%

7. Number of Shrubs/100m² 62.38
   Height: >2m 1% 1-2m 3% <1m 96%

8. Relative Frequency of Shrubs

Snowberry	- 91%	Rose	- 1%
Currant	- 4%	Boxelder	- 1%
Locust	- 1%	Other	- 2%

Boulder Creek #4

1. Width of Riparian Area
   Average - 17 m Range - 1-76 m

2. Absolute Density of Trees
   Mean Distance - 7.32 m
   Trees/100m^2 - 1.87 22% without trees

3. Relative Frequency of Tree Species

P. Cottonwood	- 56%	S. Poplar	- 3%
Willow	- 30%	Boxelder	- 1%
R. Olive	- 6%	G. Ash	- 1%
C. Elm	- 3%	N. Cottonwood	- 1%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton	71%	17%	1%	7%		3%
Willow	55%	26%	11%	6%	2%	
R. Olive	80%	20%				
C. Elm	100%					
S. Poplar	100%					
Boxelder	100%					
G. Ash	100%					
N. Cotton	100%					
TOTAL	69%	19%	4%	6%	1%	2%

5. Number of Cottonwood Saplings/100m^2 3.29
   Height: >2m 98% 1-2m 0% <1m 2%

6. Number of Willows/100m^2 39.45
   Height: >2m 37% 1-2m 44% <1m 19%

7. Number of Shrubs/100m^2 13.27
   Height: >2m 12% 1-2m 18% <1m 70%

8. Relative Frequency of Shrubs

Snowberry	- 64%	Gooseberry	- 3%
Rose	- 10%	G. Ash	- 2%
R. Olive	- 7%	S. Poplar	- 2%
Boxelder	- 5%	Other	- 7%

Boulder Creek #5

1. Width of Riparian Area
   Average - 40 m Range - 1-130 m

2. Absolute Density of Trees
   Mean Distance - 7.41 m
   Trees/100m^2 - 1.82 35% without trees

3. Relative Frequency of Tree Species

Willow	- 69%	Am. Elm	- 5%
P. Cottonwood	- 10%	C. Elm	- 3%
N. Cottonwood	- 8%	Hackberry	- 1%
R. Olive	- 5%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
Willow	74%	24 %	1%	1%		
P. Cotton	90%	10%				
N. Cotton.	50%	25%	13%	12%		
R. Olive	100%					
Am. Elm	100%					
C. Elm	100%					
Hackberry	100%					
TOTAL	77%	19%	2%	2%		

5. Number of Cottonwood Saplings/100m^2 .71
   Height: >2m 17% 1-2m 59% <1m 24%

6. Number of Willows/100m^2 22.03
   Height: >2m 15% 1-2m 30% <1m 55%

7. Number of Shrubs/100m^2 2.86
   Height: >2m 9% 1-2m 4% <1m 87%

8. Relative Frequency of Shrubs

Snowberry	- 81%	Gooseberry	- 4%
Am. Elm	- 4%	Hackberry	- 4%
G. Ash	- 4%	R. Olive	- 1%

Boulder Creek #6

1. Width of Riparian Area
   Average - 37 m Range - 1-69 m

2. Absolute Density of Trees
   Mean Distance - 9.84 m
   Trees/100m² - 1.03 38% without trees

3. Relative Frequency of Tree Species
   P.Cottonwood - 91% R. Olive - 1%
   Willow - 8%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton	4%	53%	38%	3%	1%	1%
Willow	40%	50%	10%			
R. Olive	100%					
TOTAL	7%	52%	35%	4%	1%	1%

5. Number of Cottonwood Saplings/100m² .05
   Height: >2m 0% 1-2m 0% <1m 100%

6. Number of Willows/100m² 0.00
   Height: >2m 0% 1-2m 0% <1m 0%

7. Number of Shrubs/100m² 11.61
   Height: >2m 0% 1-2m 0% <1m 100%

8. Relative Frequency of Shrubs
   Snowberry - 84% Rose - 5%
   Sage - 11%

Coal Creek #1

1. Width of Riparian Area
   Average - 25 m Range - 12-39 m

2. Absolute Density of Trees
   Mean Distance - 8.14 m
   Trees/100m^2 - 1.51 31% without trees

3. Relative Frequency of Tree Species
   N. Cottonwood - 64%
   P. Cottonwood - 36%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
N. Cotton	96%	4%				
P. Cotton	77%	23%				
TOTAL	89%	11%	0	0	0	0

5. Number of Cottonwood Saplings/100m^2 9.80
   Height: >2m 65% 1-2m 59% <1m 12%

6. Number of Willows/100m^2 7.68
   Height: >2m 28% 1-2m 59% <1m 12%

7. Number of Shrubs/100m^2 15.94
   Height: >2m 28% 1-2m 59% <1m 12%

8. Relative Frequency of Shrubs

Locust	- 41%	Gooseberry	- 5%
Chokecherry	- 21%	Ash	- 1%
Hawthorn	- 20%	Skunkbrush	- 1%
Shrub Sp.	- 11%		

Coal Creek #2

1. Width of Riparian Area
   Average - 28 m Range - 14-50 m

2. Absolute Density of Trees
   Mean Distance - 6.38 m
   Trees/100m^2 - 2.46 14% without trees

3. Relative Frequency of Tree Species
   N. Cottonwood - 100%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
N. Cotton	79%	21%				

5. Number of Cottonwood Saplings/100m^2 17.45
   Height: >2m 62% 1-2m 30% <1m 8%

6. Number of Willows/100m^2 7.55
   Height: >2m 43% 1-2m 38% <1m 19%

7. Number of Shrubs/100m^2 43.70
   Height: >2m 40% 1-2m 26% <1m 33%

8. Relative Frequency of Shrubs

Serviceberry	- 42%	Locust	- 7%
Hawthorn	- 26%	Skunkbrush	- 4%
Shrub Sp.	- 11%	Ash	- 1%
Rose	- 10%		

Coal Creek #3

1. Width of Riparian Area
   Average - 94 m Range - 52-125 m

2. Absolute Density of Trees
   Mean Distance - 5.48 m
   Trees/100m^2 - 3.33 6% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 70% P. Willow - 12%
   N. Cottonwood - 16% Ash - 2%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
P. Cotton	90%	9%		1%		
N. Cotton	86%	14%				
P. Willow	100%					
Ash	100%					
TOTAL	90%	9%		1%		

5. Number of Cottonwood Saplings/100m^2 12.56
   Height: >2m 97% 1-2m 3% <1m 0%

6. Number of Willows/100m^2 4.72
   Height: >2m 84% 1-2m 8% <1m 8%

7. Number of Shrubs/100m^2 4.95
   Height: >2m 0% 1-2m 15 % <1m 85 %

8. Relative Frequency of Shrubs
   Locust - 82% Rose - 7%
   Ash - 11%

Coal Creek #4

1. Width of Riparian Area
   Average - 51m Range - 29-75 m

2. Absolute Density of Trees
   Mean Distance - 7.21 m
   Trees/100m^2 - 1.92 4% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 77% R. Olive - 3%
   N. Cottonwood - 11% Ash - 4%
   P. Willow - 5%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
P. Cotton	91%	7%	2%			
N. Cotton	100%					
P. Willow	33%		67%			
Ash	67%	33%				
R. Olive	100%					
TOTAL	89%	7%	4%			

5. Number of Cottonwood Saplings/100m^2 3.66
   Height: >2m 100% 1-2m 0% <1m 0%

6. Number of Willows/100m^2 1.88
   Height: >2m 58% 1-2m 21% <1m 21%

7. Number of Shrubs/100m^2 5.24
   Height: >2m 13% 1-2m 25% <1m 62%

8. Relative Frequency of Shrubs
   Honeysuckle - 60% R. Olive - 11%
   Locust - 26% Shrub Sp. - 2%

Coal Creek #5

1. Width of Riparian Area
   Average - 24 m Range - 18-28 m

2. Absolute Density of Trees
   Mean Distance - 7.25 m
   Trees/100m^2 - 1.90 0% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 100%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
P. Cotton	72%	28%				

5. Number of Cottonwood Saplings/100m^2 3.11
   Height: >2m 100% 1-2m 0% <1m 0%

6. Number of Willows/100m^2 0
   Height: >2m 0% 1-2m 0% <1m 0%

7. Number of Shrubs/100m^2 1.55
   Height: >2m 0% 1-2m 17% <1m 83%

8. Relative Frequency of Shrubs
   Locust - 67% Rose - 16%
   Honeysuckle - 17%

Coal Creek #6

1. Width of Riparian Area
   Average - 66m Range - 45-95 m

2. Absolute Density of Trees
   Mean Distance - 7.77 m
   Trees/100m² - 1.65 11% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 74% P. Willow - 6%
   Boxelder - 19% R. Olive - 1%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
P. Cotton	83%		4%	4%	9%	
Boxelder	100%					
P.Willow	100%					
R. Olive	100%					
TOTAL	88%		3%	3%	6%	

5. Number of Cottonwood Saplings/100m² .57
   Height: >2m 100% 1-2m 0% <1m 0%

6. Number of Willows/100m² 0
   Height: >2m 0% 1-2m 0% <1m 0%

7. Number of Shrubs/100m² 10.9
   Height: >2m 33% 1-2m 22% <1m 45%

8. Relative Frequency of Shrubs
   Honeysuckle - 45% Boxelder - 10%
   Plum - 41% R. Olive - 3%

Four Mile Creek #1

1. Width of Riparian Area
   Average - 26 m Range - 20-30 m

2. Absolute Density of Trees
   Mean Distance - 11.00 m
   Trees/100m^2 - .83 5% without trees

3. Relative Frequency of Tree Species
   P. Willow - 68%
   P. Cottonwood - 32%

4. D.B.H. Size Classes (inches)

Species	4-10"	11'20"	21-30"	31-40"	41-50"	50+
P. Willow	62%	38%				
P. Cotton	33%	67 %				
TOTAL	53%	47 %				

5. Number of Cottonwood Saplings/100m^2 0

6. Number of Willows/100m^2 0

7. Number of Shrubs/100m^2 .77
   Height: >2m 0% 1-2m 0% <1m 100%

8. Relative Frequency of Shrubs
   Locust - 100%

Four Mile Creek #2

1. Width of Riparian Area
   Average - 62 m Range - 15-90 m

2. Absolute Density of Trees
   Mean Distance - 6.93 m
   Trees/100m² - 2.08 8% without trees

3. Relative Frequency of Tree Species

P. Willow	- 57%	Boxelder	- 11%
P. Cottonwood	- 30%	Elm	- 1%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Willow	40%	32%	20%	4%	4%	
P. Cotton		8%	54%	31%	8%	
Boxelder	100%					
Elm	100%					
TOTAL	36%	20%	27%	11%	4%	

5. Number of Cottonwood Saplings/100m² 0

6. Number of Willows/100m² .32
   Height: >2m 100% 1-2m 0% <1m 0%

7. Number of Shrubs/100m² 22.43
   Height: >2m 11% 1-2m 33% <1m 56%

8. Relative Frequency of Shrubs

Currant	- 60%	Boxelder	- 4%
Honeysuckle	- 24%	Ash	- 3%
Serviceberry	- 9%	Elm	- 1%

Left Hand Creek #4

1. Width of Riparian Area
   Average - 22m Range - 2-68m

2. Absolute Density of Trees
   Mean Distance - 6.02m
   Trees/100m^2 - 2.76 38% without trees

3. Relative Frequency of Tree Species
   C. Willow - 47%
   P. Cottonwood - 31%
   R. Olive - 20%
   P. Willow - 2%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
C. Willow	54%	39%	7%			
P. Cotton.	39%	17%	22%	17%	6%	
R. Olive	83%	17%				
P. Willow	1%					
TOTAL	56%	27%	10%	5%	2%	

5. Number of Cottonwood Saplings/100m^2 2.28
   Height: >2m 73% 1-2m 7% <1m 20%

6. Number of Willows/100m^2 3.41
   Height: >2m 38% 1-2m 36% <1m 27%

7. Number of Shrubs/100m^2 10.55
   Height: >2m 59% 1-2m 26% <1m 59%

8. Relative Frequency of Shrubs
   Snowberry - 61% Lead Plant - 1%
   Chokecherry - 16% Rose - 1%
   R. Olive - 16% Poplar - 1%
   Elm - 4%

Left Hand Creek #5

1. Width of Riparian Area
   Average - 21m Range - 0-50m

2. Absolute Density of Trees
   Mean Distance - 7.56m
   Trees/100m^2 - 1.75 32% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 55% P. Willow - 9%
   R. Olive - 23% Elm - 2%
   Honeylocust - 11%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton.	8%	21%	25%	25%	8%	12%
R. Olive	60%	40%				
Honeylocust	100%					
P. Willow	75%		25%			
Elm	100%					
TOTAL	39%	20%	16%	14%	5%	7%

5. Number of Cottonwood Saplings/100m^2 7.86
   Height: >2m 0% 1-2m 0% <1m 100%

6. Number of Willows/100m^2 9.05
   Height: >2m 0% 1-2m 66% <1m 34%

7. Number of Shrubs/100m^2 6.67
   Height: >2m 0% 1-2m 21% <1m 79%

8. Relative Frequency of Shrubs
   Shrub Sp. - 93% Honeylocust - 3%
   Rose - 4%

Rock Creek #1

1. Width of Riparian Area
   Average - 2 m Range - 1-5 m

2. Absolute Density of Trees
   Mean Distance - 7.7 m
   Trees/100m^2 - 1.69 62% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 100%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton		13%	57%	26%		4%
TOTAL		13%	57%	26%		4%

5. Number of Cottonwood Saplings/100m^2 4.39
   Height: >2m 0% 1-2m 40% <1m 60%

6. Number of Willows/100m^2 0
   Height: >2m 0% 1-2m 0% <1m 0%

7. Number of Shrubs/100m^2 144.74
   Height: >2m 0% 1-2m 22% <1m 78%

8. Relative Frequency of Shrubs
   Snowberry - 52% Other - 2%
   Locust - 46%

Rock Creek #2

1. Width of Riparian Area
   Average - 2 m Range - 1-14 m

2. Absolute Density of Trees
   Mean Distance - 6.79 m
   Trees/100m² - 2.17 70% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 54% R. Olive - 1%
   C. Willow - 45%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P.Cotton	14%	17%	36%	25%	6%	2%
C. Willow	40%	57%	3%			
R. Olive		100%				
TOTAL	25%	36%	21%	13%	3%	2%

5. Number of Cottonwood Saplings/100m² .23
   Height: >2m 0% 1-2m 100% <1m 0%

6. Number of Willows/100m² 15.72
   Height: >2m 4% 1-2m 27% <1m 69%

7. Number of Shrubs/100m² 360.80
   Height: >2m 1% 1-2m 20% <1m 79%

8. Relative Frequency of Shrubs
   Snowberry - 54% W. Plum - 1%
   Locust - 38% Hawthorn - 1%
   Rose - 6%

Rock Creek #3

1. Width of Riparian Area
   Average - 3 m Range - 1-10 m

2. Absolute Density of Trees
   Mean Distance - 5.61 m
   Trees/100m^2 - 3.18 78% without trees

3. Relative Frequency of Tree Species
   C. Willow - 68%
   P. Cottonwood - 32%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
C. Willow	32%	64%	4%			
P. Cotton		8%	15%	31%	38%	8%
TOTAL	22%	46%	7%	10%	12%	3%

5. Number of Cottonwood Saplings/100m^2 .36
   Height: >2m 0% 1-2m 50% <1m 50%

6. Number of Willows/100m^2 1.06
   Height: >2m 100% 1-2m 0% <1m 0%

7. Number of Shrubs/100m^2 334.62
   Height: >2m 8% 1-2m 9% <1m 83%

8. Relative Frequency of Shrubs

Snowberry	- 66%	W. Plum	- 5%
Hawthorn	- 9%	W. Cherry	- 3%
Rose	- 9%	Currant	- 1%
Locust	- 8%		

Rock Creek #4

1. Width of Riparian Area
   Average - 6 m Range - 1-20 m

2. Absolute Density of Trees
   Mean Distance - 7.33 m
   Trees/100m^2 - 1.86 59% without trees

3. Relative Frequency of Tree Species
   P. Cottonwood - 87%
   G. Willow - 13%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton	71%	10%	5%	9%	5%	
G. Willow	100%					
TOTAL	75%	8%	4%	8%	4%	

5. Number of Cottonwood Saplings/100m^2 1.46
   Height: >2m 0% 1-2m 40% <1m 60%

6. Number of Willows/100m^2 41.23
   Height: >2m 11% 1-2m 44% <1m 45%

7. Number of Shrubs/100m^2 142.40
   Height: >2m 3% 1-2m 8% <1m 89%

8. Relative Frequency of Shrubs
   Snowberry - 78% Rose - 1%
   Locust - 21% Other - 1%

St. Vrain #1

1. Width of Riparian Area
   Average - 19 m Range - 5-50 m

2. Absolute Density of Trees
   Mean Distance - 5.01 m
   Trees/100m^2 - 3.98 29% without trees

3. Relative Frequency of Tree Species

N. Cotton	- 50%	Honeylocust	- 9%
Boxelder	- 24%	Elm	- 6%
P. Cotton	- 12%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
N. Cotton	47%	41%	6%		6%	
Boxelder	50%	50%				
P. Cotton			75%	25%		
Honeylocust	100%					
Elm	50%	50%				
TOTAL	44%	29%	15%	3%	3%	

5. Number of Cottonwood Saplings/100m^2 5.32
   Height: >2m 15% 1-2m 25% <1m 60%

6. Number of Willows/100m^2 2.92
   Height: >2m 18% 1-2m 82% <1m 0%

7. Number of Shrubs/100m^2 25.80
   Height: >2m 26% 1-2m 60% <1m 14%

8. Relative Frequency of Shrubs

Chokecherry	- 41%	Plum	- 9%
Snowberry	- 15%	Honeylocust	- 3%
Other	- 15%	Locust	- 2%
Boxelder	- 12%	Currant	- 1%

St. Vrain #2

1. Width of Riparian Area
   Average - 27 m Range - 5-55 m

2. Absolute Density of Trees
   Mean Distance - 4.95 m
   Trees/100m^2 - 4.08 14% without trees

3. Relative Frequency of Tree Species

N. Cotton	- 47%	Elm	- 5%
P. Cotton	- 21%	Birch	- 4%
Boxelder	- 8%	Hybrid Cotton	- 3%
Locust	- 6%		
Crack Willow	- 6%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
N.Cotton	57%	32%	11%			
P.Cotton	69%	25%				6%
Boxelder	83%	17%				
Locust	60%	40%				
C. Willow	60%	40%				
Elm	50%	50%				
Birch	33%	67%				
Hy.Cotton	50%		50%			
TOTAL	60%	32%	6%			1%

5. Number of Cottonwood Saplings/100m^2 13.10
   Height: >2m 42% 1-2m 35% <1m 23%

6. Number of Willows/100m^2 19.20
   Height: >2m 35% 1-2m 48% <1m 16%

7. Number of Shrubs/100m^2 13.59
   Height: >2m 51% 1-2m 7% <1m 42%

8. Relative Frequency of Shrubs

Chokecherry	- 32%	Elm	- 11%
Locust	- 29%	Snowberry	- 4%
Boxelder	- 25%		

St. Vrain #3

1. Width of Riparian Area
   Average - 23 m Range - 0-62 m

2. Absolute Density of Trees
   Mean Distance - 5.56 m
   Trees/100m^2 - 3.23 13% without trees

3. Relative Frequency of Tree Species

N. Cotton	- 46%	P. Willow	- 4%
P. Cotton	- 19%	C. Willow	- 2%
Honeylocust	- 12%	Alder	- 2%
Elm	- 7%	B. Locust	- 1%
R. Olive	- 6%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
N. Cotton	71%	24%	5%			
P. Cotton	87%	13%				
Honeylocust	100%					
Elm	100%					
R. Olive	100%					
P. Willow	33%	67%				
C. Willow	100%					
Alder	100%					
B. Locust	100%					
TOTAL	82%	16%	2%			

5. Number of Cottonwood Saplings/100m^2 6.29
   Height: >2m 71% 1-2m 21% <1m 7%

6. Number of Willows/100m^2 28.77
   Height: >2m 25% 1-2m 30% <1m 44%

7. Number of Shrubs/100m^2 2.96
   Height: >2m 75% 1-2m 10% <1m 15%

8. Relative Frequency of Shrubs

Alder	- 30%	Honey Locust	- 10%
Snowberry	- 22%	Elm	- 8%
R. Olive	- 17%	Hawthorn	- 3%
B. Locust	- 10%		

South Boulder Creek #2

1. Width of Riparian Area
   Average - 22 m Range - 2-120m

2. Absolute Density of Trees
   Mean Distance - 4.90 m
   Trees/100m² - 5.25 25% without trees

3. Relative Frequency of Tree Species

P. Cottonwood	- 45%	Hybrid Cottonwood	- 6%
N. Cottonwood	- 20%	Alder	- 6%
C. Willow	- 18%	Boxelder	- 4%

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton	14%	45%	18%	14%	9%	
N. Cotton	100%	%				
C. Willow	33%	22%	22%	11%	11%	
Hyb.Cotton	67%	33%				
Alder	100%					
TOTAL	47%	27%	12%	8%	6%	

5. Number of Cottonwood Saplings/100m² 8.24
   Height: >2m 37% 1-2m 26% <1m 37%

6. Number of Willows/100m² 23.16
   Height: >2m 5% 1-2m 56% <1m 39%

7. Number of Shrubs/100m² 74.43
   Height: >2m 9% 1-2m 31% <1m 60%

8. Relative Frequency of Shrubs

Chokecherry	- 27%	Sumac	- 5%
Lead Plant	- 17%	Raspberry	- 1%
Hawthorn	- 14%	Alder	- 1%
Rose	- 13%	Boxelder	- 1%
Plum	- 11%	Skunkbrush	- 1%
Snowberry	- 10%		

South Boulder Creek #3

1. Width of Riparian Area
   Average - 25 m Range - 5-50m

2. Absolute Density of Trees
   Mean Distance - 8.71m
   Trees/100m^2 - 1.32 22% without trees

3. Relative Frequency of Tree Species

P. Cottonwood	- 60%	C. Willow	- 4%
N. Cottonwood	- 16%	Elm	- 2%
P. Willow	- 12%	Apple	- 2%
Hyb.Cottonwood	- 4%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
P. Cotton.	3%	43%	33%	10%	10%	
N. Cotton	50%	37%	13%			
P. Willow	17%	83%				
Hyb.Cotton	100%					
C. Willow	100%					
Elm	100%					
Apple	100%					
TOTAL	24%	42%	22%	6%	6%	

5. Number of Cottonwood Saplings/100m^2 2.38
   Height: >2m 12% 1-2m 41% <1m 47%

6. Number of Willows/100m^2 15.13
   Height: >2m 0% 1-2m 52% <1m 48%

7. Number of Shrubs/100m^2 35.43
   Height: >2m 2% 1-2m 19% <1m 79%

8. Relative Frequency of Shrubs

Rose	- 51%	Snowberry	- 5%
Lead Plant	- 25%	Hawthorn	- 4%
Plum	- 10%	Birch	- 1%
Chokecherry	- 5%	Skunkbrush	- 1%

South Boulder Creek #4

1. Width of Riparian Area
   Average - 46 m Range - 13-113m

2. Absolute Density of Trees
   Mean Distance - 7.13m
   Trees/100m^2 - 1.97 13% without trees

3. Relative Frequency of Tree Species

N. Cottonwood	- 44 %	P. Willow	- 11%	Boxelder	- 1%
P. Cottonwood	- 20%	H. Cottonwood	- 10%	Apple	- 1%
Alder	- 11%	R. Olive	- 2%		

4. D.B.H. Size Classes (inches)

Species	4-10"	11-20"	21-30"	31-40"	41-50"	50+
N. Cotton	82%	13%	4%			
P. Cotton	58%	26%	3%	3%	6%	3%
Alder	94%	6%				
P. Willow	62%	38%				
H. Cotton	53%	33%	7%			7%
R. Olive	33%	67%				
Boxelder	100%					
Apple	100%					
TOTAL	73%	20%	3%	1%	1%	1%

5. Number of Cottonwood Saplings/100m^2 9.66
   Height: >2m 57% 1-2m 13% <1m 30%

6. Number of Willows/100m^2 5.54
   Height: >2m 16% 1-2m 30% <1m 54%

7. Number of Shrubs/100m^2 90.72
   Height: >2m 2% 1-2m 2% <1m 96%

8. Relative Frequency of Shrubs

Snowberry	- 71%	Chokecherry	- 1%	Hawthorn	- 1%
Rose	- 24%	Currant	- 1%	Plum	- 1%
Amarpha	- 2%	Elm	- 1%	R. Olive	- 1%
Apple	- 1%	G. Ash	- 1%	R. Birch	- 1%
Alder	- 1%	Honeysuckle	- 1%		

Appendix II

Common and Scientific Names of Plants Found in Text*

Common Name	Scientific Name
Plains Cottonwood	Populus sargentii
Narrowleaf Cottonwood	Populus angustifolia
Crack Willow	Salix fragilis
Golden Willow	Salix alba
Peachleaved Willow	Salix amygdaloides
Locust	Robinia neomexicana
Rose	Rosa spp.
Snowberry	Symphoricarpos occidentalis
Box-elder	Acer negundo
Hawthorn	Crataegus succulenta
Choke Cherry	Prunus virginiana
Plum	Prunus americana
Honeysuckle	Lonicera involucrata
Ash	Fraxinus pennsylvanica
Russian-olive	Elaeagnus angustifolia
Elm	Celtis reticulata
Alder	Alnus tenuifolia
Lead Plant	Amorpha fruticosa
River Birch	Betula fontinalis
Skunkbrush	Rhus trilobata
Current	Ribes cereum
Gooseberry	Ribes inerme
Raspberry	Rubus idaeus
Serviceberry	Amelanchier alnifolia
Poplar	Populus balsamifera
Sumac	Rhus glabra
Cherry	Prunus besseyi
Juniper	Juniperus communis

* Names follow Weber 1976

What is BCNA ?

The BCNA is a non-profit, public charity organization dedicated to fostering an awareness, understanding and appreciation for the natural history and heritage of Boulder County. Associated with the County Parks & Open Space Department, BCNA will help collect, interpret and disseminate natural and cultural resource information about features which contribute to the desirable environment and life-style in the Boulder County region.

Activities

Three functions have been identified as the basis of activity for the BCNA:

- Natural and Cultural History Data Base -

  One of our continuing tasks is gathering current knowledge about Boulder County's natural and cultural history. This includes a bibliography of such materials as natural area studies, flora and fauna studies, historical research, wildlife inventories, weather phenomena and geology research. Copies are available to members.

- Environmental and Cultural Research -

  By piecing together what is known comes the ability to discover what is not known. BCNA identifies informational needs, encourages and supports new scientific investigation and research. Studies are conducted by BCNA members, other individuals, or non-profit groups such as universities.

- Environmental Education -

  A major function is dissemination of natural and cultural history information to the public through such avenues as nature hikes, slide programs, publications, seminars, and support for interpretive facilities in the County. Many of the educational activities support the existing County Parks & Open Space "Discover Nature" program.

Your role in BCNA

The strength of BCNA lies in active member support. All members have a vote in the Association and can become involved in the various committees - from data collection, to research, to interpretive services. The membership also elects a Board of Directors which provides guidance for the Association and sets priorities. Members can take advantage of publications, nature classes, and seminars at discount rates.

Financial Support

BCNA funds come entirely from member dues, donations and publication sales. As a non-profit corporation, BCNA also has the ability to acquire and hold real and personal property as appropriate toward furthering the objectives of the Association.

MEMBERSHIP APPLICATION
Boulder County Nature Association

Name _____

Address _____

City _____ State _____ Zip _____

Telephone # _____

___ Student and Senior Citizen (65+) _____ $5
___ General Member _____ $10
___ Family _____ $15
___ Subscribing Member _____ $30
___ Life Member _____ $300
___ Corporate Member _____ $500

Members receive a quarterly newsletter and discounts on BCNA publications. Additionally, there are quarterly seminars and outings. Subscribing members receive publications free of charge.

The membership year is January 1 through December 31. Make check or money order payable to *Boulder County Nature Association* and mail to: BCNA, 3893 North 75th Street, Boulder, CO 80301

BCNA Publications Available

No. 2 Status of Nesting Golden Eagles in Boulder County and Adjacent Areas of the Front Range in Colorado: a Preliminary Report. By Mike Figgs and Nancy Lederer. 1986 update of ongoing project monitoring nest success of golden eagles and impacts of human disturbance. 19 pp. incl. photos. $1.50 memb., $2.00 non-memb.

No. 4 Ecology, Status and Avifauna of Willow Carrs in Boulder County. By Dave Hallock, Nancy Lederer and Mike Figgs. 1986. Discusses one of the most productive and threatened habitat types for breeding birds. 38 pp. incl. maps and photos. $2.50 memb., $3.00 non-memb.

No. 5 The Diets and Breeding Biology of Red-tailed Hawks in Boulder County: 1985 Nesting Season. By Daniel T. Blumstein. 1986. Includes literature review and extensive bibliography. 78 pp. $3.50 memb., $4.00 non-memb.

No. 6 Habitat Use by Breeding Birds on City of Boulder Open Space, 1985. By Richard W. Thompson and Joseph G. Strauch. 1986. Study contracted by Open Space Dept. Includes discussions of species found, use of various habitat types, management recommendations, maps. 131 pp. $5.00 memb., $5.50 non-memb.

No. 7 Indian Peaks Four Season Bird Counts: a Five Year Retrospective 1982-1986. By Dave Hallock. 1987. What has been learned from our mountain bird counts. Includes discussions on cavity nesters, forest structure and management, photos. 69 pp. $3.50 memb., $4.00 non-memb.

No. 8 Hawks, Eagles, and Prairie Dogs: Wintering Raptors in Boulder County, Colorado. By Stephen R. Jones. 1987. Seven years' worth of information from an ongoing study of populations, habitat use and prey of our wintering buteos and eagles. 30 pp., incl. photos and maps. $2.50 memb., $3.00 non-memb.

Special Publication. The Notebooks of Denis Gale. Edited by Junius Henderson. Field notes of one of Boulder County's earliest ornithologists; valuable historical information from the late 1800's. Photocopy of microfilm. 310 pp. $15.00 memb., $17.50 non-memb.

Also Available

A Field Guide to Mammal Tracking in Western America. By James Halfpenny. How to understand tracks, interpret clues, and read trails of wildlife. Includes numerous illustrations, a section on scatology, and graphic exercises in reading tracks. $10.95 memb., $11.95 non-memb.

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