

**BREEDING BIRDS OF THE CORNISH HARDWOOD MANAGEMENT AREA:  
AITKIN COUNTY, MINNESOTA 1998-2000**

Report To:  
Aitkin County Forestry Department  
Aitkin, MN  
Minnesota Department of Natural Resources, Non-game Division  
Grand Rapids, MN

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**SUMMARY**

Breeding bird surveys were conducted for the third consecutive year in the Cornish Hardwood management area (CHMA), located in northeast Aitkin County. The objectives of this project are to: 1) establish a long-term breeding bird monitoring program in the CHMA to detect annual changes in species abundances, 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) compare the bird community in the CHMA with other northern hardwood stands in northern Minnesota. This report provides a summary of bird surveys completed in June of 2000 and also compares 1998, 1999 and 2000 survey results.

Twenty-six individual stands that were greater than 40 acres were selected for monitoring. Eight stands were harvested within the past 10 years (managed), eight stands were in the management area, but had not been recently managed (unmanaged), and 10 sites were located in Savannah Portage State Park. One breeding bird survey was conducted at each point with an unlimited radius 10 minute point count in June of 1998, 1999 and 2000. A total of 25 bird species were observed in 26 stands (52 points) in 1998, 32 species were counted in 1999, and 27 species were tallied in 2000. Over all years, a total of 38 species have been observed in this area.

On average, we observed 22 individuals and 7 to 8 species in each stand (total of two point counts) in 1998, a slightly higher number, 25 individuals and 8 species in 1999, and an average of 26 individuals and 8 species in 2000. Results of a two-way analysis of variance of bird community variables indicated that the total number of individuals varied annually ( $P < 0.001$ ), increasing from 1998 to 2000. We also found a significant difference in number of species observed in stands with different management history with unmanaged stands having fewer species ( $P < 0.01$ ) than managed or reference stands.

Three of 12 species tested with two-way analysis of variance indicated a significant difference ( $P \leq 0.05$ ) in abundance among management types or year. No significant interactions were found for year and treatment indicating that patterns of abundance on different management types have changed consistently over time. We found a significant annual difference in numbers of Ovenbirds, with numbers increasing from 1998 to 2000 ( $P < 0.01$ ). In addition, both the Hermit Thrush and Eastern Wood-Pewee showed significant treatment effects ( $P < 0.02$ ). More Hermit Thrushes were found in unmanaged stands than in either managed or reference stands. The opposite pattern was found for the Eastern Wood-Pewee. This species was more abundant in reference and managed stands than in unmanaged stands.

A study on the Black-throated Blue Warbler in northeast Minnesota in 1999 quantified habitat for this species and compared sites occupied by singing males to random sites in northern hardwood forests in the same area. Results indicated that bird and non-bird sites had similar tree species composition, densities, basal area, canopy height and canopy cover (personal data). The only difference identified between bird and non-bird areas was in the amount of shrub coverage in the 0.5 to 1.5 m height range. Occupied areas had significantly higher percent of shrub cover in this layer. The stand in the CHMA where we observed Black-throated Blue Warblers in 1999 was recently harvested and had a dense shrub layer (approximately 1-3 m in height). Because this species responds to shrub growth after the canopy is opened, creation of small gaps with forest management activities is likely beneficial to this species population. Small gap formation in northern hardwood forests with forest management treatments, versus overall thinning is a practice that will benefit this species.

Three years of baseline data, especially in habitats where annual variation in abundance of many species is minimal (as observed here) is likely sufficient information to meet objectives of this project. It is likely that the majority of species occurring in this area have been observed on the surveys conducted over the past three years. Depending on future management activities, additional surveys could be conducted at a two or three year interval to assess both long- and short-term effects of management activities on breeding birds in this area.

### **BACKGROUND**

Breeding bird surveys were conducted for the third consecutive year in the Cornish Hardwood management area (CHMA), located in northeast Aitkin County. The objectives of this project are to: 1) establish a long-term breeding bird monitoring program in the CHMA to detect annual changes in species abundances, 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) compare the bird community in the CHMA with other northern hardwood stands in northern Minnesota. This report provides a summary of bird surveys completed in June of 2000 and also compares 1998 and 1999 survey results. Please refer to the 1998 report for more detail on methods and rationale for this study.

### **STUDY AREA**

Twenty-six individual stands that were greater than 40 acres were selected for monitoring in spring of 1998, following protocol by Hanowski and Niemi (1995). Eight stands were harvested within the past 10 years (managed), eight stands were in the management area, but had not been recently managed (unmanaged), and 10 sites were located in Savannah Portage State Park (reference sites). Sites within Savannah Portage State Park are used as reference sites here, but did receive some harvest treatments in the early 1950's (personal communication with Park personnel). Because these sites have been disturbed since stand origination, they do not meet the old-growth criteria (e.g., >120 years and no significant human disturbance). These sites will not receive harvest treatments in the near future. Two points were established in each stand and were permanently marked with a metal fence post. The points are at least 250 m apart from each other

and 100 m from the stand edge. Point locations were recorded with a GPS and coordinates are available from the Aitkin County Forestry office.

## METHODS

One breeding bird survey was conducted at each point between 8 and 16 June 1998, between 10 and 28 June 1999, and between 1 and 15 June 2000. We used an unlimited radius 10 minute point count that was conducted between one half hour before and four hours after sunrise. Counts were only done on days with good weather conditions (no precipitation and wind < 20 kph) by one observer who has had over 20 years experience in collecting point count data.

We totaled number of species, individuals, and numbers of each species from the two points in each stand. Data were examined for normality and appropriate transformations were done for those variables that did not have normal distributions or homogeneous variances. Two-way analysis of variance (ANOVA) was used to determine whether total number of species, total number of individuals, or numbers of each species were different between three management groups and between years. Species that occurred on sites within at least two management groups were tested.

Tests on individual species (e.g., ANOVA) do not always reveal differences or similarities in bird community composition between treatment groups. Therefore, we used discriminant function analysis (DFA) which is a multivariate statistical technique that maximizes the differences between sites within different management groups. This method groups sites that have similar bird communities and also predicts or classifies each site to a management group based on bird community composition.

## RESULTS AND DISCUSSION

*Bird communities.* A total of 39 bird species were observed in 26 stands (52 points) in 1998, 1999, and 2000 (Table 1). Of the 39 species observed, 23 were observed in all three years, six species were counted in two of three years, and 10 species were observed in only one year (Table 1). Species accumulation curve (Figure 1) indicates that the rate that new species were detected

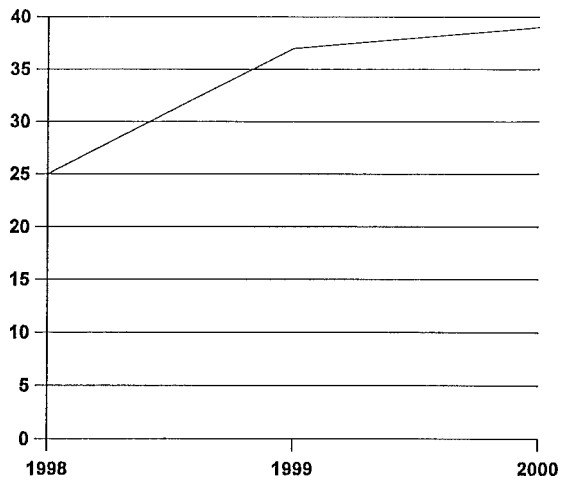
decreased substantially over the three year period. It is likely that the majority of species that occur in this area have been identified with the three years of surveys conducted to date.

On average, we observed 22 individuals and 7 to 8 species in each stand (total of two point counts) in 1998, a slightly higher number, 25 individuals and 8 species in 1999, and an average of 26 individuals and 8 species in 2000 (Figure 2). Results of a two-way analysis of variance of bird community variables indicated

that the total number of individuals varied annually ( $P < 0.001$ ), increasing from 1998 to 2000.

We also found a significant difference in number of species observed in stands with different management history with unmanaged stands having fewer species ( $P < 0.01$ ) than managed or reference stands (Figure 2). Because species diversity is typically highly correlated with forest structural diversity, this result indicates that the unmanaged stands likely have less diverse structure than the managed and reference stands. The difference between managed and unmanaged stands is reflected in the amount of understory vegetation (managed stands have more; personal observation). Reference stands surveyed in this area generally had more conifer trees (personal observation) than the unmanaged stands which likely explains the higher species diversity in these sites. For example, two conifer associated species, the Pine Warbler and Northern Parula were observed in the reference sites but not in the unmanaged stands (Appendix 1).

**Individual species.** Three of 12 species tested with two-way analysis of variance indicated a significant difference ( $P \leq 0.05$ ) in abundance among management types or year. No significant interactions were found for year and treatment indicating that patterns of abundance on different management types have changed consistently over time. We found a significant annual difference



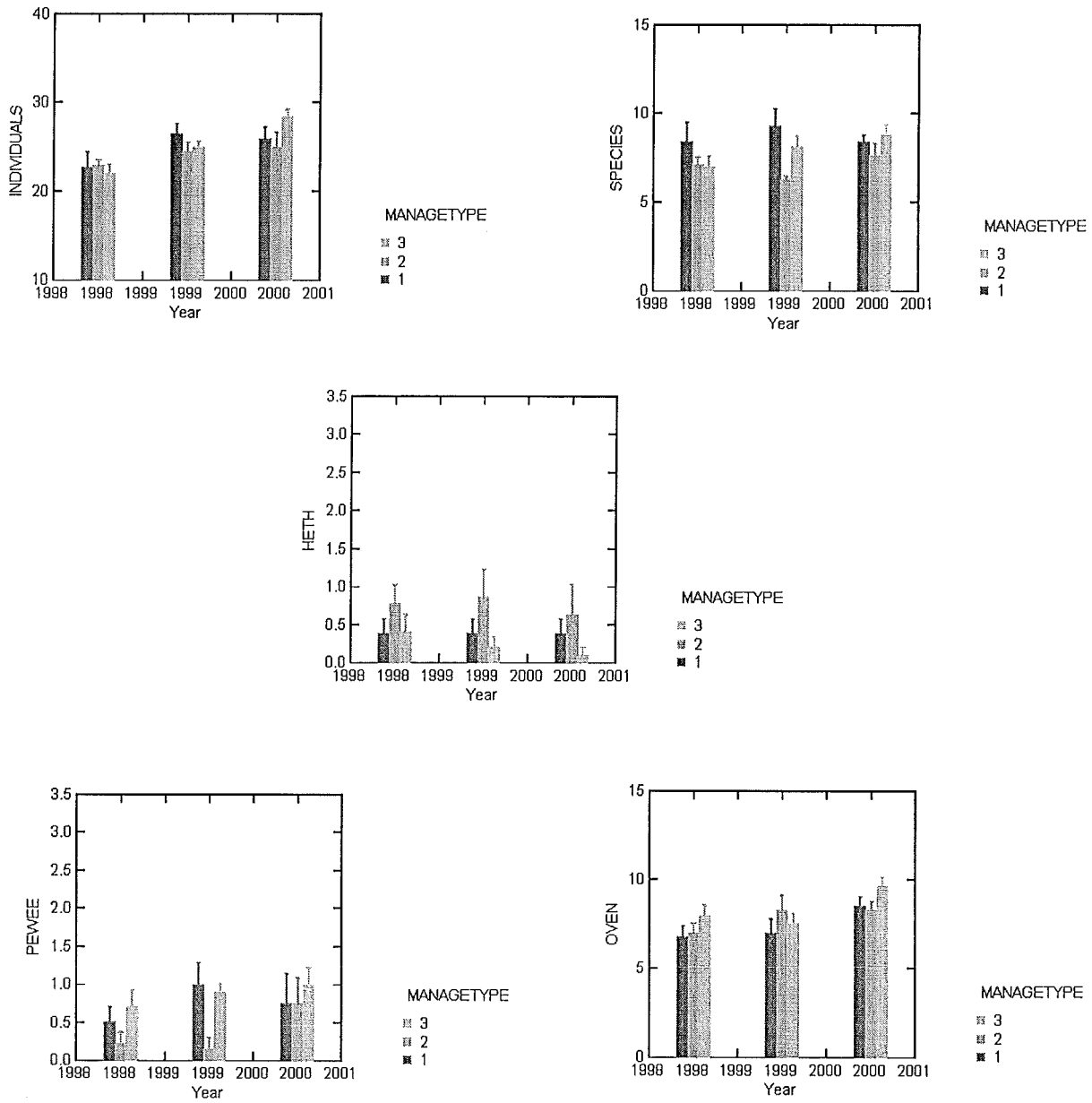
**Figure 1.** Accumulation of number of species observed in the study area from 1998 to 2000.

in number of Ovenbirds, with numbers increasing from 1998 to 2000 ( $P < 0.01$ ) (Figure 2). This result is in contrast to abundance patterns found in other surveys conducted in northern Minnesota over the same time period (personal data). The Ovenbird declined in surveys conducted in the Chippewa and Superior National Forests as well as the East Central region of Minnesota from 1998 to 2000. A slight increase in number of Ovenbirds was observed for surveys conducted in Southeast Minnesota. Overall, this species has illustrated significant declines in numbers in northern Minnesota and Wisconsin since the early 1990's. A positive population trend in the Cornish Hardwood area over this same time period, especially if the trend continues, may be something interesting to further investigate.

In addition to the Ovenbird, both the Hermit Thrush and Eastern Wood-Pewee showed significant treatment effects ( $P < 0.02$ ) (Figure 2). More Hermit Thrushes were found in unmanaged stands than in either managed or reference stands. This species nests on the ground and is a habitat generalist, occupying both upland and lowland conifer and deciduous habitat types. Because it is a habitat generalist, it is difficult to determine why it was more abundant in unmanaged stands in this region. However, it is likely due to some more suitable microhabitat conditions that occur on the unmanaged stands which have not been identified or that are immediately evident.

The opposite pattern in treatment effects was found for the Eastern Wood-Pewee. This species was more abundant in reference and managed stands than in unmanaged stands (Figure 2). This species nests in canopy or subcanopy layer of forests and is an upland forest habitat generalist (occurs in both conifer and deciduous forests). Again, the reason why this species was more abundant in reference and managed stands is not obvious, but is likely due to some microhabitat conditions that this species prefers.

Figure 2. Mean and standard errors for number of individuals, species, Eastern Wood-Pewee, Hermit Thrush and Ovenbird for 1998, 1999 and 2000 (dates 1,2 and 3 respectively on x-axis) and management type (1=managed, 2=unmanaged, 3=reference).



**Bird community differences.** The discriminant function analysis results indicated that bird communities among management types were significantly different ( $P < 0.001$ ). Sites were distributed along axis 1 responding to a gradient of sites with more species that require open forest floor conditions (negative associations) to sites with more bird species associated with shrubs (positive associations) (Figure 3). Along axis 2, sites with more shrub birds had a negative association and sites with more mature forest bird species were positively associated with axis 2. The percent of sites that were classified as belonging to the same group ranged from 90% correct classification for the reference group (Savannah Portage group) to 71% for both the managed and unmanaged groups. Of the managed and unmanaged sites that were misclassified, about half were classified as belonging to the reference group.

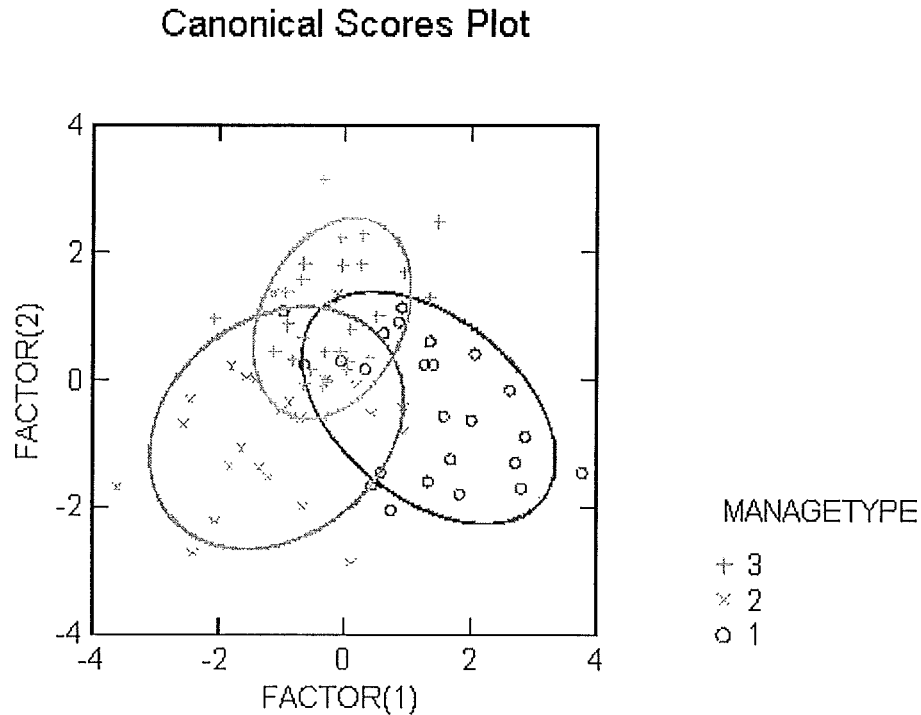


Figure 3. Location of sites from bird surveys in 1998, 1999 and 2000 in a discriminant function space. Positive factor 1 and negative factor 2 scores are sites that had more shrub associated bird species. Negative factor 1 and positive factor 2 scores are sites that had more mature and open forest floor bird species.



Results of the DFA suggest that management has some effect on bird communities in this region, but that the effect is generally short-lived. Management opens the canopy and results in an increase in the amount of shrub in these areas. Our observation of more shrub bird species in recently managed areas supports this result. In contrast, the reference sites tend to have more bird species and individuals that are classified as requiring mature forest conditions. In short, management has a short-lived effect in this area and results in an increase in bird diversity.

***Black-throated Blue Warbler.*** A species that was absent in northern hardwood stands in this region in 1998, present on one stand in 1999 and again absent in 2000 was the Black-throated Blue Warbler. This species is rarely found in northern hardwoods in north central Minnesota but occurs in selected northern hardwood stands in northeast Minnesota, primarily in the Lake Superior highlands. This species has a high priority ranking in the Great Lakes region, primarily because a large percentage (29%) of its range occurs here. A study on the Black-throated Blue Warbler in northeast Minnesota in 1999 quantified habitat for this species and compared sites occupied by singing males to random sites in northern hardwood forests in the same area. Results indicated that bird and non-bird sites had similar tree species composition, densities, basal area, canopy height and canopy cover (personal data). The only difference identified between bird and non-bird areas was in the amount of shrub coverage in the 0.5 to 1.5 m height range. Occupied areas had significantly higher percent of shrub cover in this layer. The stand in the CHMA where we observed Black-throated Blue Warblers in 1999 was recently harvested and had a dense shrub layer (approximately 1-3 m in height). Because this species responds to shrub growth after the canopy is opened, creation of small gaps with forest management activities is likely beneficial to this species population. Small gap formation in northern hardwood forests with forest management treatments, versus overall thinning is a practice that will benefit this species.

## REFERENCES

Hanowski, J.M. and G.J. Niemi. 1995. Experimental design for establishing an off-road, habitat specific monitoring program using point-counts. In: USDA Forest Service Gen. Tech. Rep. PSW-GTR-149. Pgs. 145-149.

Appendix 1. Mean and standard deviations of breeding birds observed in managed, unmanaged, and old growth hardwood sites in northern Aitkin County. P-values from 2-way analysis of variance tests are also included for those species that were abundant enough to test.

	Managed (n=8)						Unmanaged (n=8)						Reference (n=10)				P-value				
	1998		1999		2000		1998		1999		2000		1998		1999		2000		Year	Type	Int
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD			
<b>Individuals</b>	22.6	4.6	26.4	3.2	25.9	3.5	22.6	1.6	24.5	2.4	24.9	4.9	21.9	3.3	24.9	2.0	28.3	2.7	0.00	0.49	0.19
<b>Species</b>	8.4	2.9	9.3	2.4	8.4	1.1	7.3	1.2	6.3	0.5	7.6	1.8	7.0	1.8	8.0	1.8	8.8	1.7	0.32	0.01	0.26
Broad-winged Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	-	-	-
Barred Owl	-	-	-	-	-	-	-	-	-	-	0.1	0.4	-	-	-	-	-	-	-	-	-
Ruby-throated Hummingbird	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	0.1	0.3	-	-	-
Chimney Swift	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	-	-	-
Northern Flicker	0.1	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow-bellied Sapsucker	0.8	0.9	0.9	0.8	1.4	0.5	1.3	0.7	0.6	0.9	0.6	0.9	1.1	1.0	0.6	0.7	1.3	0.8	0.55	0.64	0.41
Pileated Woodpecker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	-	-	-
Downy Woodpecker	-	-	0.1	0.4	0.1	0.3	0.1	0.4	0.1	0.4	0.3	0.5	0.2	0.4	-	-	0.1	0.3	0.73	0.64	0.59
Hairy Woodpecker	-	-	0.3	0.7	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	-	-	-
Unidentified Woodpecker	0.3	0.5	0.5	0.8	0.3	0.5	0.1	0.4	0.5	0.9	0.4	0.7	-	-	0.1	0.3	1.7	1.6	-	-	-
Great Crested Flycatcher	0.1	0.3	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.3	0.1	0.3	-	-	-
Least Flycatcher	3.8	3.2	4.5	3.9	4.0	3.3	3.3	1.9	4.3	3.2	3.6	2.1	2.5	2.8	3.1	2.6	2.2	1.8	0.89	0.28	0.98
Eastern Wood-Pewee	0.5	0.5	1.0	0.8	0.8	1.0	0.3	0.5	0.1	0.4	0.8	0.9	0.7	0.7	0.9	0.3	1.0	0.7	0.24	0.01	0.43
Blue Jay	0.2	0.5	0.1	0.4	0.1	0.4	0.1	0.4	-	-	-	-	-	-	0.5	0.9	0.6	1.1	-	-	-
American Crow	-	-	0.4	0.7	0.1	0.4	-	-	-	-	-	-	-	-	-	-	0.1	0.3	-	-	-
Black-capped Chickadee	-	-	-	-	0.1	0.4	-	-	-	-	-	-	0.2	0.4	-	-	-	-	-	-	-
White-breasted Nuthatch	-	-	0.1	0.4	-	-	-	-	-	-	0.3	0.5	-	-	0.2	0.4	0.2	0.6	-	-	-
Brown Creeper	0.1	0.3	-	-	0.3	0.5	-	-	0.5	0.8	0.4	0.8	0.1	0.3	0.1	0.3	0.7	0.5	0.14	0.34	0.32
Winter Wren	0.6	0.7	0.5	0.5	0.4	0.5	-	-	0.4	0.7	0.1	0.4	0.2	0.4	0.6	0.8	0.1	0.3	0.17	0.07	0.71
Hermit Thrush	1.5	0.7	0.4	0.5	0.4	0.5	0.8	0.7	0.8	0.8	0.6	1.1	0.4	0.7	0.2	0.4	0.1	0.3	0.53	0.02	0.95

