

# PHYSICAL, BIOLOGICAL AND SOCIAL ASPECTS OF ENVIRONMENTAL ISSUES IN THE BAY AREA

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Cleared Eucalyptus Groves

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## STATEMENT ABOUT THE AUTHORS

This study was undertaken by seniors in the Environmental Sciences Group Major in the College of Letters and Sciences at the University of California, Berkeley. The Environmental Sciences major offers three fields of specialization, biological science, physical science, and social science, from which each student selects an area of concentration. In their senior year students in the major participate in a year-long Senior Seminar, investigating an environmental topic of current concern. This project gives the students experience in field work, general research techniques and report writing.

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## After the Eucalyptus: Avian Species in Cleared Eucalyptus Groves

Amy Wiens

### Introduction

The University of California at Berkeley is responsible for 15 thousand acres in the Berkeley and Oakland hills, much of which are considered to be a fire hazard. One third of this land is covered with large stands of eucalyptus which were planted at the beginning of this century for lumber. These eucalyptus have become a major fire hazard in the East Bay Hills (Rice, 1990). During the past two decades there has been increasing pressure on the University to manage this land to prevent fire disasters. Responsible management of the eucalyptus as a fire hazard includes maintaining the diversity and health of the ecosystems. Until recently, the fire management plan was only concerned with clearing the hills of the eucalyptus without studying the effect of the clearing on the natural resources.

This project studied the effect of such clearing on one aspect of the natural resources in the Berkeley hills, the birds. Clearing trees greatly affects birds because nesting sites, roosting sites and food sources are lost. Since birds are an indicator of the health of an ecosystem (Peterson, 1990) their rehabilitation of cleared lands reflects the health of the community. This study focused on the differences in avian populations between two sites cleared of eucalyptus in 1989 and in 1990. The sites show the differences between the age of the eucalyptus regrowth and the bird populations that accompany that transition. I will refer to the site cleared of eucalyptus in 1990 as the one-year site and the 1989 stand as the two-year site.

This project is one of three that will give a clearer understanding of the environment that is created after eucalyptus has been cleared. Eagan (this report) is studying the plants of the cleared eucalyptus sites and Robles (this report) is studying the rodents found at the same sites.

### Past Studies

Stebbins (1990) surveyed the vertebrate population of Tilden Park through a series of paths with specific stops for data collection. I adopted my methodology from Stebbin's survey and used his bird list as a reference. I also used Morrison's (1988) bird list from the Angel Island restoration which included a description of which birds are common to various habitats.

Rice (1990) was responsible for creating and implementing the new fire management plan. Her plan included clearing the eucalyptus on the sites that were studied in this report. Her report describes the habitat before it was cleared and her clearing methods. Rice explains the motives and importance of clearing the eucalyptus to prevent major fires: this provided the main impetus for my study.

## Background

In 1973 the University of California at Berkeley began cutting down eucalyptus to reduce the fire hazard in the East Bay hills (McBride, 1979). When healthy, the eucalyptus are a hazard because of the flammable oils in their sap and the amount of litter they produce. The eucalyptus are particularly hazardous after a freeze because they shed dry dead branches, leaves, and bark that can fuel a fire. The eucalyptus were a major fuel source in the disastrous fire that consumed parts of the Berkeley and Oakland hills on October 20, 1991.

In 1975, there were unsuccessful attempts to clear the eucalyptus from the University's land, resulting in massive regrowth (Rice, 1990). Due to the regrowth, the Office of Environmental Health and Safety (EH&S) implemented a five-year fire hazard reduction program, which began in 1987. In 1989 and 1990 EH&S cut the 17-year old regrowth and sprayed the stumps with herbicide, decreasing the ability of the trees to resprout. Their attempts have been only marginally effective: the sites already have sprouts up to 10 feet tall.

Despite all the interest and action in cutting down the eucalyptus, there have been no studies conducted by the University characterizing the ecosystems formed after the removal of the eucalyptus. This study tries to understand the role that birds play in a cleared environment. The cleared habitat provides the birds with a different ecosystem than the eucalyptus. Clearing the eucalyptus opens up the land to other plant species previously unable to compete with the mature eucalyptus; this new vegetation provides habitat for birds that could not utilize the mature eucalyptus. Ideally, research would compare bird use of mature eucalyptus with the use of the cleared area. However, due to time constraints, this survey was limited only to areas cleared of eucalyptus.

**Site Location:** the two-year site was cleared of eucalyptus in 1989 by Rice as the first phase of the Fire Hazard Reduction Plan (Rice, 1990). The site covers 27 acres of the Ecological Study Area west of Grizzly Peak Road and west of the Tilden Park Trails (Fig. 1). It is near the top of a hill with multiple slopes facing mostly east or west. A fire trail runs through the middle of the site. The two-year site is 65 percent grassland, 10 percent chaparral, 11 percent eucalyptus sprouts, 10 percent bay woodland and 4 percent pine.

In 1990 Rice cleared the one-year site, a 22-acre plot of eucalyptus west of the Animal Behavior and Research Laboratory on the west side of the upper Fire Trail, below Grizzly Peak Blvd. (Fig. 1). The site has northwestern and southwestern-facing slopes and is bisected by a gully. The gully is a natural underground watercourse that drains the area of water. Next to the gully is a rarely used dirt road that intersects the fire trail at the eastern side of the site. This disturbed habitat along this road is similar to the habitat along the fire trail in the two-year site. The

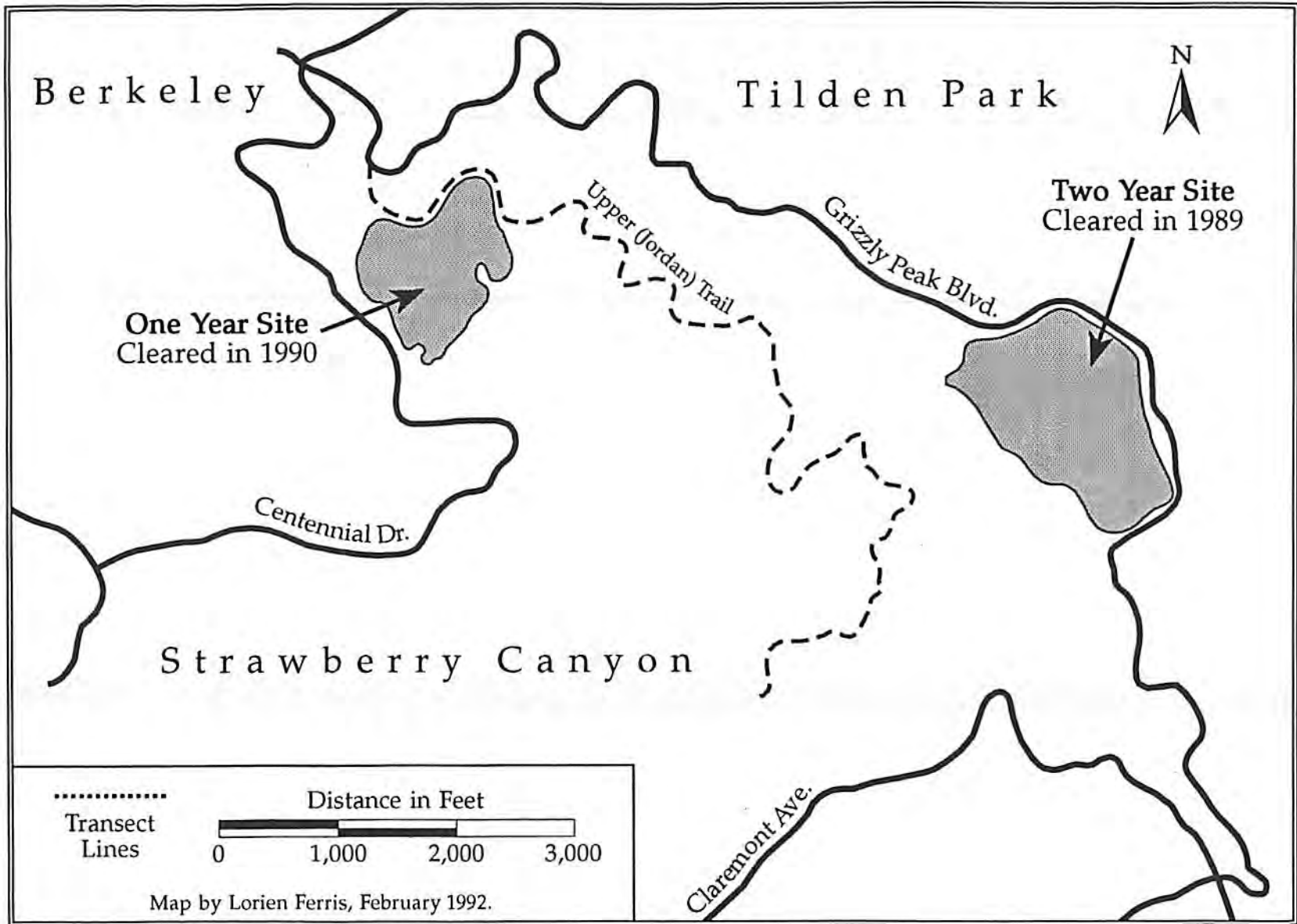


Figure 1. Eucalyptus Groves Cleared in 1989 and 1990.

one-year site is 70 percent grassland, 12 percent chaparral, 10 percent eucalyptus sprouts, and 8 percent bay woodland. A major difference in vegetation between the one and two-year sites is the composition of the grassland. The grassland in the one-year site consisted mainly of grasses whereas what I classified as grassland on the two-year site was largely thistle (Eagan, this report).

### **Methodology**

**Survey Techniques:** at each site I walked a predetermined path through the various habitats making four stops (Stebbins, 1990). Each stop on the one-year site corresponds with another stop of similar habitat on the two-year site. The first stop on both sites was in the chaparral habitat, the second stop was in the bay habitat, the third stop was in the eucalyptus and the fourth stop was in the chaparral. The stops were used as specific data collection points where I watched and listened for eight minutes. After the initial eight minutes, I wrote down every bird I had seen within that area, not counting the birds that flew over the site.

I kept my observations within a 20 meter radius of where I was standing. I stayed within this circle of observation because I was able to pay closer attention when my range of vision was limited. Between stops I walked for no more than 15 minutes and continued to notice the birds that I saw along the path. When walking I kept my eyes within about a five-meter range so that I could remember every sighting between stops. I kept the time between the stops consistent because it was important that the starting times were comparable to the finishing times throughout the study (Stebbins, 1990): I did not want to bias my results by taking 30 minutes between some stops and five minutes between other stops. I wrote down all information at the end of each walk and at the end of each eight-minute stop.

My survey period ran from October 30, 1991 through January 24, 1992 and spanned the majority of the winter bird season (November through February). Due to time constraints I was unable to survey for the entire season nor do comparisons with other seasons. I visited each site five times within this period for a total of 10 visits in 13 weeks.

Each site was checked at the same time each week but at different times throughout the study. Both sites were checked at 8:00 am in the first two weeks. In the following two weeks the sites were checked around 2:00 pm. The fifth and sixth weeks the sites were surveyed at 10:00 am. In the final four weeks all the sites were surveyed at 8:00 am. This staggering of data collection times insured that both crepuscular and diurnal birds would be noted.

### **Data**

In ten weeks of field observation, I observed a total of 135 individual birds of 16 different species in both the one-year and two-year site. In the one-year site 50 percent of the birds were cited in the eucalyptus sprouts, 20 percent in the chaparral, 17 percent in the bays and 13 percent of

the individuals were spotted in the grassland (Table 1). The greatest variety of species was found in the eucalyptus habitat, with 11 different species cited. The bay habitat had six different species, chaparral and grassland both had five different species.

The two-year site had 75 individuals of 10 different species. The most individuals on the two-year site were spotted in the chaparral, 54 percent; the bays had 25 percent while eucalyptus supported 12 percent, and the grassland had 8 percent of individuals (Table 1). The greatest diversity of species was seen in the chaparral with seven species cited, the bays had five species, grassland had four and eucalyptus had the least diversity with two species.

Species Common Name	Latin Name	Bay	Woodland	Chapparel	Grassland	Eucalyptus
<b>ONE-YEAR SITE</b>						
American kestrel	<i>Falconidae sparverius</i>	2				
bush tit	<i>Psaltriparus minimus</i>					6
California towhee	<i>Pipulo fuscus</i>	5		3		2
dark eyed junco	<i>Junco hyemallis</i>	11		6	1	9
golden crowned sparrow	<i>Zonotrichia albicollis</i>			13	8	6
Hutton's vireo	<i>Vireo huttoni</i>	1				1
mourning dove	<i>Zenaida macroura</i>					1
northern flicker	<i>Colaptes auratus</i>					1
red breasted nuthatch	<i>Sitta canadensis</i>					1
ruby crowned kinglet	<i>Regulus calendula</i>	4				23
scrub jay	<i>Aphelocoma coerulescens</i>				2	
sharp shinned hawk	<i>Accipiter striatus</i>				1	
Stellar's jay	<i>Cyanocitta cristata</i>	5		3		4
Townsend's warbler	<i>Dendroica townsendi</i>					1
turkey vulture	<i>Cathartes aura</i>				5	
yellow rumped warbler	<i>Dendroica coronata</i>			2		
<b>TOTAL FOR ONE-YEAR</b>		<b>28</b>	<b>27</b>	<b>17</b>	<b>17</b>	<b>55</b>
<b>TWO-YEAR SITE</b>						
California towhee	<i>Pipulo fuscus</i>			2		
chestnut backed chickadee	<i>Parus rufescens</i>	1				
dark eyed junco	<i>Junco hyemallis</i>	2		14	1	
fox sparrow	<i>Passerella iliaca</i>			1		
golden crowned sparrow	<i>Zonotrichia albicollis</i>	2		27		1
house finch	<i>Carpodacus mexicanus</i>				1	
northern flicker	<i>Colaptes auratus</i>	1				
red tailed hawk	<i>Buteo jamaicensis</i>				1	
ruby crowned kinglet	<i>Regulus calendula</i>	7				8
scrub jay	<i>Aphelocoma coerulescens</i>	2			1	
turkey vulture	<i>Cathartes aura</i>			1	2	
<b>TOTAL FOR TWO-YEAR</b>		<b>15</b>	<b>45</b>	<b>6</b>	<b>9</b>	<b>9</b>

Table 1. Species found on one and two-year sites.

The two-year site had 41 percent fewer birds than the one-year site, although this site is five acres, or 19 percent, larger. The one and two-year sites shared all but 13 of the same species. There were more species unique to the one-year site than the two-year site. There were nine species found only on the one-year site and four species found only on the two-year site. The golden crowned sparrow was the most abundant bird at both sites and it occurred most often in chaparral. The species that were shared by both sites were seen consistently in the same type of habitat at both sites.

In the one-year site all species that were found in the eucalyptus were found in the other habitats except the sharp shinned hawk, the turkey vulture and the American kestrel—all birds that soar when searching for food. These birds need large areas to scan for food, which the eucalyptus does not provide.

Five different cats were spotted in the grassland on the two-year site. No cats were spotted on the one-year site. The cats were definitely feral because of their unkempt and wild appearance. The cats always ran away as soon as they spotted me.

### **Discussion and Analysis**

I believe there are three reasons for the differences in bird populations between the two sites: an island effect on the one-year site, vegetational differences between the sites, and the feral cats on the two-year site.

One of the reasons for the 41 percent fewer birds on the two-year site is that it sits among the laboratories that cover the Berkeley hills. It is surrounded by large eucalyptus to the east and south, Lawrence Berkeley Lab to the west and the Mathematical Sciences buildings to the north. The land surrounding the one-year site is heavily trafficked by people and cars, which also act as a barrier. I believe these structures have created an isolated island of good habitat for the avian species that utilize bay trees, grassland, chaparral or immature eucalyptus. The birds have been forced off the developed land into the remaining available habitat, creating a high density of species and individuals on the one-year site.

Although birds are physiologically capable of flying over barriers, they may not have the genetic predisposition for long flights (Fancy, 1992). In fact, it is known that many birds are particularly site-tenacious and will not move a great distance from their home range. This site tenacity only applies to the smaller birds (sparrows, juncos, vireos), not to the large soaring birds (kestrel, hawk, vulture). It would be interesting to band some birds found on the one-year site to determine how far they disperse from that area in a given season.

Unlike the one-year site, the two-year site is part of a continuous habitat that stretches east to Tilden Park and west to the Ecological Study Area. The island effect found on the one-year site is minimized on the two-year site because the uninterrupted habitat surrounding the two-year area



would decrease the density of birds. The number of birds seen is fewer because the birds have more habitat to choose from when nesting and feeding. The birds are not confined to the two-year site by barriers such as buildings, human disturbances, and eucalyptus stands as they are on the one-year site.

Vegetation differences between the two sites also affect the avian use of the two habitats. The age of the eucalyptus has a major impact on the birds' ability to use that habitat. Eucalyptus supported the greatest number of individuals as well as the greatest diversity of species in the one-year site even though the eucalyptus habitat was only 11 percent of total land area: it obviously satisfies a specific bird need. By contrast, eucalyptus was the least used habitat on the two-year site; I believe that the age of the eucalyptus affects the suitability of the bird habitat. The eucalyptus sprouts were taller and had fewer new shoots on the two-year site because the trees were a year older than those found on the one-year site. As the trees get older they drop more allelopathic litter and are able to shade out more competition. The species lost to competition may be more suited to the birds needs than the eucalyptus. In addition, the overall age difference of the habitats may affect bird distribution. The grassland, oak, bay and chaparral are more mature on the two-year site and should positively affect bird populations although this is not reflected in my data (McBride, 1992). The older habitat should have more seeds, more nest building material and more protection from predators.

Another vegetational difference is the grassland composition. The grassland of the two-year site was composed mainly of Italian thistle which may not be as beneficial to the birds as the grasses that were found on the one-year site. The thistle might offer poor nest building material and food causing the birds to move in search of better material and food.

The third difference between the two sites was the feral cats seen only on the two-year site. Although they were only sighted on the two-year site, that does not mean they are not living in the one-year site; any cats there may just be more cautious. The five cats I observed on the two-year site indicate a large cat population that might greatly impact the bird population. There have been many instances of cats eliminating entire populations of island birds in a matter of years (Rauzon, 1983). This study focused on a noninsular habitat, but feline feeding habits might still devastate the bird populations. Feral cats have a considerable impact on bird populations (Rauzon, 1983) which may partially explain the smaller population on the two-year site.

Lastly, human impact must be considered. Human disturbances during surveying create a false correlation between birds and their habitats. Disturbances can be minimized by treading lightly and wearing unobtrusive clothing but the nature of surveying leads to disruptions of the birds normal feeding and roosting habits. In my study these disruptions may have caused me to see more birds in the eucalyptus and chaparral than I would have seen otherwise. The birds may use the eucalyptus and chaparral as protection against predators because the trees and bushes offer more

protection than grassland. I think my approach had a high impact on the bird locations and activities because there was always increased bird activity when I started moving after sitting very still for eight minutes.

### Conclusion

The one-year site may be seen as an island, a refuge in an area dominated by people and buildings, forcing the birds to live in the remaining habitat. The two-year site is adjacent to the largest park in the East Bay with many acres of suitable habitat allowing the birds greater choice in roosting and feeding sites. Although the type of vegetation is similar, the age of the eucalyptus and the composition of the grassland is different, and affects the ability of the birds to roost and feed. The two-year site also has feral cats, which might greatly reduce the bird populations, this subject requires a more intensive study.

The one-year site, though 19 percent smaller, had almost twice the number of individuals as the two-year site. The one-year area is a more recently cleared habitat which shows greater signs of recent disturbance: soil erosion, patchy ground cover and seedlings. The sparrows and the juncos prefer disturbed habitat because seeds are more accessible. Based on the data from this study I believe there is a strong correlation between disturbed habitat and the number of individual birds and the variety of bird species. I do not mean to imply that disturbed habitat is better for birds than mature habitat; that discussion is beyond the scope of this paper.

In light of the controversy over clearing the eucalyptus for fire control and aesthetic reasons it is interesting to note the most used habitat in the one-year site was the eucalyptus sprouts. Although this implies that the eucalyptus are a favored habitat, the data seem to show that the eucalyptus are only used by the birds when they are sprouts. I feel that although the young sprouts have the most diversity in species and individuals, the University will not be able sustain the habitat because of the amount of time and money involved. As the eucalyptus get older they support less and less diversity (Morrison, 1988). This is an excellent reason to clear them and allow non-eucalyptus habitat to return because in the long run, I feel, it is more beneficial than allowing the eucalyptus to mature.

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