

A GUIDE TO THE MANAGEMENT OF  
CARMEL'S FOREST, PARKS AND BEACHES

by

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## FOREWARD

In 1957 several visiting forestry experts declared that the urban forest of Carmel was headed for disaster. It was predicted that by 1962 the entire area south of Fourth Avenue and west of Junipero would be a field of barren rooftops void of trees. Experts stated that the trees were sick and declining because the forest was even aged and over-mature, therefore, susceptible to attack by insects and disease. A newspaper article indicated that the trees were dying and that nothing could be done about it. It was also concluded that there was a shortage of young trees available to replace dead trees.

In 1965 a survey of the entire forest was undertaken. A systematic examination of the forest revealed that it was healthy and that we had a minor percentage of over-mature and poor vigor trees. Very little analysis of the survey data was made until 1971 as there was no one who had the time to dig into the material and sort out the data. When a City Forester was finally employed late in 1968, he was immediately put to work on a backlog of cutting, trimming, and day-to-day maintenance. He did not have the time to thoroughly analyze the data.

One thing is certain: a forester cannot manage a forest until he has examined it. He cannot write a management plan on the basis of someone else's survey, unless he has the time to dig into the data, work the figures, walk the individual blocks, relate the information to what he finds, and then plan what needs to be done. It was at this point that the Carmel Forestry Commission began to aid in the development of this Forest Management Plan.

For fifteen years there was talk of a forest management plan. But, this is not a forest management plan in the traditional sense. We are not growing a lumber product for market. We do not even have a real forest. We are dedicated to the protection and development of a new concept, an Urban Forest. That is why we have this management plan. The work consists mainly of cutting dead and dying trees, planting additional trees where needed, trimming off dead branches, and trying to prevent damage by insects, disease and people. Our goal is simple. We want to keep the Urban Forest of Carmel healthy so that people can look at it and enjoy it. The care that the City has given to its forest is justified. The trees of Carmel are famous. Without them we would just be another coastal community.

The City Fathers put it another way. In the Municipal Code it states that it is necessary to maintain the existing Urban Forest in order to preserve the windbreak protection, abate soil erosion and enhance the natural beauty of the City.

May 1981

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## INTRODUCTION

The following foreward and Section I of the Management Plan for Carmel's Forest Parks and Beaches were written in 1970, and they remain a satisfactory introduction to the Plan, although a few corrections have been made to bring them up-to-date. The original Section II, "Present Condition of the Forest" has been filed for reference. As of 1980 we have data supplied by all four segments of the Continuous Inventory on private as well as public property and for the five-year remeasurement of all segments.

In 1971 when the Continuous Inventory began, a 16-block rectangle of the business district was given a 100 per cent count of City-owned trees. This was re-surveyed in 1975, adding the privately-owned trees. Then four blocks were added. Section II, CBD-1 through 4 describes the findings of the four-year survey and of the remeasurements.

Previous to the Continuous Inventory a survey of public trees had been made in 1965-66. This was supervised by Hugh Smith, then part-time City Forester. An additional analysis of the data was made, and a report written by R. F. Taylor, then Vice-Chairman of the Forestry Commission. The report was approved after some additions and corrections by then Chairman Bernard Anderson, Hugh Smith, City Forester Robert Tate and the other members of the Commission - Matt Smith, Gene Ricketts and Donn Medalie. This report has also been filed.

The 1971 survey of the first segment of the total forest was started by then City Forester Tate, and continued each year by his replacement, Gregory D'Ambrosio. Each tree was tallied on a field card, the information then transferred to punch cards and run through a computer under the direction of D'Ambrosio. The print-outs were analyzed and summarized, and the first two sections of the Management Plan were revised each year by R. F. Taylor as new data became available.

Section III was updated in 1975 and again revised in May, 1981 by the City Forester and the Forestry Commission.

Section IV is kept up-to-date yearly because of the Continuous Inventory.

Section V was revised and part of it removed as not pertinent, in April, 1981.

Section VI is added to as needed.

Section VII, the Appendix, was revised in May, 1981. Some additions were made and some pages removed.

Committee on Management Plan and  
Forest Survey  
Ray Taylor, Chairman  
David Maradei  
Greg D'Ambrosio, City Forester



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## SECTION I

### THE FOREST TO BE MANAGED

Although some of the streets of Carmel, notably Ocean Avenue, were planted to trees, most of the village was tree-covered long before there was a Carmel. Robert Louis Stevenson walked through these forests. David Starr Jordan in 1885, or thereabouts, reported forests extending to the white beach of Carmel. In 1902, Frank Devendorf filed the first map of a subdivision to which he gave the same name as the nearby river. The following year, he and a partner formed the Carmel Development Company, whose holdings approximated the present area of the City of Carmel-by-the-Sea.

There are numerous records by early travelers passing through Carmel-by-the-Sea which mention a "village in a forest above a white ocean beach"; "a town whose citizens love trees". Many of the trees are older than the town.

The 1965-66 survey showed there were 10,515 trees on the streets and other City property, and pine, oak, acacia and cypress comprised 85 percent of the total.

The present completed survey (the Continuous Inventory now used) indicates there are 12,166 trees two-inches in diameter and larger, and pine, oak, acacia and cypress comprise 89 percent of the total.

The general impression of a forest comes from more than just the trees on the City streets. It includes those on private property, and the impression is created by fair-sized trees, not by tall shrubs. Some "trees" listed in the 1966 survey are merely tall shrubs, such as the wild lilac or Carmel Ceanothus which seldom becomes more than eight feet tall. Toyon, usually six to ten feet tall, occasionally becomes 20 to 25 feet tall and is called a tree. Even the mirror plant (Coprosma sp.) sometimes reaches a height of ten feet.

The private property adjoining City streets and parks has many species not listed by the survey, but by and large, for the purpose of management, the whole tree complex is one of pine, oak, acacia, cypress, eucalyptus and redwood. The forest thrives, or does not thrive, depending on the health of these trees, not on the health of the occasional species.

This is an interesting group of trees. Monterey Pine (Pinus radiata) has a limited natural range, but no western conifer has been so abundantly planted all over the world. It has been planted as a valuable timber tree in Australia and South Africa, and for over a hundred years as an ornamental in England. It is the fastest growing of all pines, attaining a height of 60 to 80 feet in 30 or 40 years. The largest diameter in Carmel is

usually 40-inches at perhaps 100 years of age. Monterey Pine does not reach a great age. At 100 years, it is apt to be over-mature and decadent. Many of our most stately pines have lost the vigor required to fight off their natural enemies and will soon have to be replaced by young thrifty trees.

The Pine occurs naturally only from Pescadero in San Mateo County to Cambria, but is most abundant on the narrow strip of ocean bluffs as far south as Malpas Creek. About 60 miles south, a small stand is found on the Cambria Hills. It also occurs on Guadalupe Island, Mexico. It is a fog-belt tree, has always been a maritime tree as shown by fossil remains along the Coast.

Monterey Cypress (Cupressus macrocarpa) is relatively free of insect and disease problems. In its native habitat it is confined to two groves, one at Cypress Point and one at Point Lobos State Park, but it has been planted in Europe, Australia, New Zealand and South America, as well as along the Coast of California. All plantings are descendants of the two groves. The tree is most spectacular along the rocky shores between Monterey and Point Lobos, but is never more than a half mile from the shore, as it does not thrive except where the fog reaches. When not exposed to salt spray and ocean winds, it loses its fantastic shape and becomes just another fast-growing symmetrical tree. The twisted, stunted, wind-warped cypresses are what make the shoreline of Carmel so interesting.

The Monterey Cypress may live to be two or three hundred years old. Age is difficult to determine on the distorted trees along the rocky shores. These trees, with their trailing lichens (not moss), look ancient at an early age. Even when dead they remain picturesque, for the wood resists decay, the leaves fall, the bark drops off and the tree turns bone white.

The oaks of Carmel are the oaks of much of California, mostly the California Live Oak (Quercus agrifolia). It is one of the best known of trees as it appears in so many motion pictures. Like the cypress, it is a picturesque tree. Its trunk leans at grotesque angles and its limbs twist and turn, sometimes touching the ground. It almost never grows tall or straight. Where it is exposed to sea winds it will have fantastic forms; on better sites the oaks grow taller and the crown is more circular. It may reach 75 feet in height, but it is the girth of some of these oaks that is impressive. The habit of branching near the base prevents it from being a timber tree although the wood is strong and hard. Large trees are apt to be partly hollow, caused by dry rot or termites. But for fuel it is excellent. Few trees have the heat value of seasoned live oak. Logs burn with a steady flame and form a bed of coals that have a sweet odor.

Carmel is lucky to have its oaks. Santa Barbara lost their groves to the sailing ships for fuel. In 1855, the Town

Council of Santa Barbara passed an ordinance prohibiting the cutting of trees or shrubs belonging to the City, but most of the wooded land was privately owned and the price of fuel was high. Its original oak groves swept away, the town of Santa Barbara is now planted with exotic trees.

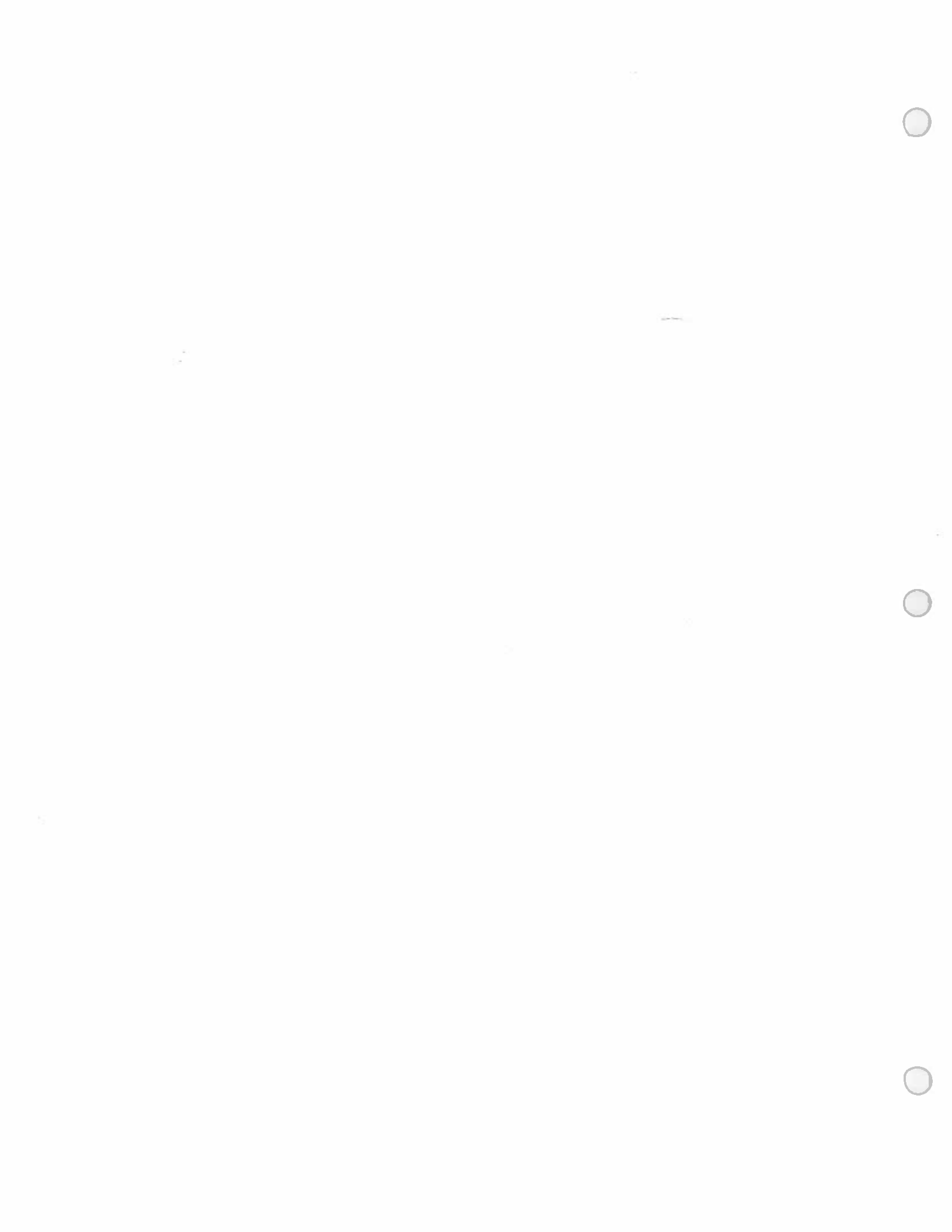
Many towns along the California Coast had a similar history and now as the population explodes, the tremendous use of water is lowering the water table and this is taking its toll of oaks.

Probably few streets in Carmel are without an acacia. Over 400 species are known in different parts of the world. Three-fourths of them are native to Australia, but many of these have been brought to Southern California. About a dozen species, trees and shrubs, occur in the Southwestern United States.

True acacias have astringent bark which when punctured exudes a sticky gum; gum arabic comes from a foreign species of acacia. As a rule, most acacias do not grow to timber tree size, and this is true in Carmel. Its pale blue-green color makes it a decorative tree or shrub, but its limbs are apt to break in a strong wind. It is hard to get rid of as it sprouts from the stump or roots.

There are a few other trees, some of large size, but comprising only a small part of the Carmel Forest. The Coast Redwood occurs here and there, some of small size in yards, others of large size. The Giant Eucalyptus occurs in rows along North San Antonio Street and Fourth Avenues. Other species include some sycamores and a few palms, and in some yards, trees from other lands or other states, such as the Monkey-Puzzle, Ginkgo, Vine Maple, Norway Maple, Cedar, Spruce, Locust and many more.

The towering, open-topped pines, the grotesque-shaped cypress and the wavy-limbed oaks, with the under story of acacias -- these are what we must deal with for the most part in the management of Carmel's forest.



## SECTION II

### PRESENT CONDITION OF THE FOREST

January 1980

#### The Continuous Inventory

A random sample of 38 blocks scattered over the residential sections of the City was inventoried in 1971. In addition, a Central Business District of 16 blocks was surveyed. This was the beginning of the Continuous Inventory of Carmel's Urban Forest. A random sample of 42 blocks in 1972, and of 41 in 1973, made up a total of about three-fourths of the Residential Forest. In 1974, the remaining blocks, including the two Forest Hill Parks, completed the four segments of the Forest. The Central Business District has been treated as a separate unit. (See IV PLANS and IICBD)

The inventory was planned this way in order to give a general picture of the entire forest each year. An epidemic starting in one section of the City would show up in the random blocks in that area, whereas if the inventory covered a contiguous set of blocks, say the Northeast quarter of the City, conditions in the other three-fourths would not be indicated in that year's inventory.

In 1976, the first segment of the inventory was resurveyed. This gave a picture of the changes in five years in the blocks of the 1971 sample, and some indication of any changes in the City as a whole.

In revising the "Present Condition of the Forest" now that all four segments have been re-inventoried, it should be noted that we are using a one-sheet tally form for each block instead of a card for each tree. (See IV-1). Also some troublesome blocks have been removed from the four segments because of confused boundaries of private land along City Limits. It is reasoned that the exact number of trees in Carmel is not the aim of the inventory so much as the changes taking place within the segments. Altogether the equivalent of 19 normal-sized blocks (9%) were dropped. More efficient surveys should result.\*

\* If the average number of trees per block in our reduced survey is multiplied by the original number of blocks and the Parks and City Business District trees added the result would be 33428 trees in Carmel. The 1975 report showed 32360.

In order to accomplish this all previous surveys had to be revised. However, the reports on Segments 1 and 2 need no revision as changes were insignificant. The long report on Segment 3 in the Forester's files has a memo attached explaining changes. The short report on Segment 3 uses the revised figures to conform to the reduced number of blocks. All such reports should now be put in the City Forester's files, as this report, based on the re-measurement of all four segments, replaces these individual reports in the Guide to the Management of Carmel's Forest, Parks and Beaches.

The separate report on the remeasurement of Segment 4 is not included in the Management Plan except as a part of this report.

### Results of Remeasurement of All Four Segments

#### Number and Percentage of Trees - Residential Area

As Public pine and oak made up 78 per cent of all species in the first five-year period and 77 per cent in the second, the remainder of the species were grouped under "Other" to make less complicated tables. These "Others" are Acacia 6%, Cypress 5%, Eucalyptus 1%, Redwood 1%, Douglas Fir and Plane 1%, and miscellaneous other species 9%.

Pine and oak form 60 per cent of all Private trees at the end of the first 5-year period and 58 per cent in 1979.

Table 1 and accompanying Figure 1 show the totals for the first period, 1971 through 1974 (revised 1975 and remeasurements put on a 5 year basis) and the second period (all segments remeasured) in number of trees and percentage of trees by diameter classes. The two Forest Hill Parks are not included in Table 1 (See Table 5).

A gain of 1934 trees (7.6%) reflects changes in both Public and Private trees; pine losing 165 trees (2%), oak gaining 746 trees (8.4%) and "Other Species" gaining 1353 trees (16%).

The number of trees cut includes those removed by the City because of beetles, storms, traffic damage, etc. plus removal of Private trees that were condemned or were cut in connection with construction. Note that although pine lost 428 trees through cutting, there were only 165 less than in 1974. The losses are all in the first three diameter classes.



The survey of 1979 (Segment 4) included a count of "future trees", or those too small to include in Class 1 (1.6" - 6.5"). For all blocks in Segment 4 there were some 3800 of these. As each segment is close to one-fourth of all the segments it is estimated there are approximately 15220 such little trees, soon to enter the 2 - 6 inch class. These ran about 26% City pine, 33% City oak and 41% City "Other". Private minus two-inch trees were 11% pine, 19% oak and 60% "Other".

#### Public Trees

Further investigation of the changes in number and percentage of trees is shown for Public trees in Table 2 and Figure 2. Here again the losses are mostly in pine in the first two diameter classes. The loss of only 74 with a cut of 211 indicates a gain over the 5-year period and as there is reason to believe that some Public pines were listed as Private, there may have been no loss at all. As in Table 1, the gains were in oak and "Others". The percentage of trees in the diameter classes changed very little (Fig. 2).

#### Private Trees

Table 3 and Figure 3 give the same information as Table 2 and Figure 2 but for the privately owned trees. Here again the loss was mostly in pine. The recorded cut of pine was 209 trees and the loss only 91 (2.3%) but the recorded cut is only for condemned trees and those cut on vacant lots or for construction. No record exists for trees removed by private owners who do not come under these categories. Recently, however, the Coastal Commission is requiring a permit for private tree removal not controlled by the City Forester.

#### Gains and Losses by Segments

Figure 4 compares Public versus Private gains and losses of pine in number of trees. It is of some interest, but to run down the changes in these over-all groups it is necessary to go back to the individual segments. Table 4 shows the gains and losses by segments and species. It will be seen here that the gains of Segments 1 and 2 offset the losses of Segments 3 and 4.

Segment 3 blocks went through about 2 years of drought; Segment 4 through 3 years of very dry conditions which seem to have affected pine more than other species. Tables 1, 2 and 3 all show these pine losses mostly in the lower diameter classes. Figures 1, 2 and 3 are for all species -- not for pine alone, so they do not show this loss. Figure 4 does.

In examining the gains and losses for individual blocks it is found that the losses in Segment 4 can be accounted for by 3 of the 41 blocks; one making up 46% of the total loss.

Per cent of Trees Gained or  
Lost in 5 years by segments

	<u>Segments</u>			
	1	2	3	4
<u>Pine</u>				
Public	+2.6	-3.5	-2.6	-3.8
Private	+18.5	-3.7	-6.5	-13.1
 <u>Oak</u>				
Public	-4.3	+12.1	+1	-1.3
Private	+30	+49	-5	-12.
 <u>Other</u>				
Public	+ 8.3	+10.7	-5.8	+6
Private	+34	+51	-2	+8.7
 <u>Total</u>				
Public	+1.2	+4.5	-2.2	-1.2
Private	+28.9	+35.7	-4	-4.5
 <u>Total Public &amp; Private</u>	+17.4	+23.5	-3.6	-3.4

Condition of Trees

Vigor

Judging the vigor of trees even with frequent reference to the description of vigor in Section IV-4 is not too accurate. Few can agree as to whether a tree is excellent or just good and there is much variation in the idea of good versus fair. However, there is general agreement on what constitutes a poor vigor tree and these are the ones we need to know about.

We are, of course, more interested in the condition of the trees now rather than in the past and as each segment is a grid of blocks over Carmel, the judgment of tree vigor in the latest segment of the Continuous Inventory is more indicative than vigor last year or the year before. The report of 1979 made by a crew with some expertise is the most up-to-date. This shows for City low vigor trees (Vigor 4) pine had 7%, oak 1%, acacia 3%, and "others" 4%. Of the Private low vigor trees, pine had 3%, oak 1%, acacia 1%, and "others" 2%.

Vigor 4, regardless of the crew making the estimate never has exceeded 10% for pine and has usually been below 8%. The "Other Species" have always had even fewer poor vigor trees.

#### Insects, Diseases, etc.

Here again we need to rely on the latest survey, but even the 1979 tally of these tree troubles is not a picture of what is going on now. The crew reports the things that need attention as they are spotted and the Forester's crew attends to the troubles at once.

The 1979 survey covered 41 blocks, not counting two Forest Hill Parks. Of a total of 2075 pines only 19 were hit by bark beetles; 10 on private land with 958 pines and 9 on City land with 1117 pines.

The following lists are of some interest as they show what a small number of trees are reported as having anything wrong with them. Although 7% of the 6545 trees of Segment 4 were of poor vigor, only 2% were listed as having insect, disease and other troubles severe enough to report for immediate attention. A summary follows:

Asphalt	32	Pine Scale	5
Mistletoe	23	Spittle Bug	4
Pine midge		Sooty Mold	4
& aphids	20	Stem canker	4
Bark beetles	19	Root damage	2
Wounds	9	Termites	1
Fomes sp.	6		

The Forest Management Plan describes all the major and minor insects and diseases but an observer on the ground can only see evidence of scale, mites, aphids, twig beetles, etc. when there is considerable damage by these small insects. It would seem that the survey crew would do as well to confine itself to such easy-to-recognize items as the following unless there is reason to believe that other items are causing major damage:

- Bark beetle hits
- Wounds needing repair
- Trees that could benefit by removing asphalt
- Root damage, recent and severe
- Obvious indications of rot
- Oak moth larvae emerging in considerable numbers
- Cypress bark moth and tip moth larvae  
needing attention

The Forest Hill Parks

The table below shows that 93% of the trees in Park 1 (Tennis Courts) are pine and oak. Park 2 (now being developed) has 77% in pine and oak. Compared to 1974 the change in percentage is small except in "Other" species and in Park 2 this too will change as the new park takes shape.

The percentage of diameter classes change very little but Park 2 has more small trees. Here again pine lost some trees but this is accounted for by silvicultural cutting. Park 1 has the characteristics of a forest and diseased and dying trees are removed to give growing space for healthy trees.

FOREST HILL PARKS

(a) Number and per cent of trees in 1974 and 1979 by species

<u>Species</u>	<u>Park 1</u>				<u>Park 2</u>			
	<u>1974</u>	<u>%</u>	<u>1979</u>	<u>%</u>	<u>1974</u>	<u>%</u>	<u>1979</u>	<u>%</u>
Pine	451	85	407	73	135	70	116	64
Oak	54	10	114	20	37	19	23	13
Acacia	1		2		6	4	8)	
Cypress	0		0		2		2)	5
Other	26	5	33	7	14	7	33	18
<b>TOTAL</b>	<b>532</b>		<b>556</b>		<b>194</b>		<b>182</b>	

(b) Number and per cent of trees by dbh class

<u>Diameter Class</u>	<u>Park 1</u>				<u>Park 2</u>			
	<u>1974</u>	<u>%</u>	<u>1979</u>	<u>%</u>	<u>1974</u>	<u>%</u>	<u>1979</u>	<u>%</u>
2-6	144	27	161	29	88	45	90	49
7-12	125	23	146	26	47	24	42	23
13-18	115	22	111	20	21	11	16	9
19-24	89	17	74	13	20	10	19	10
25-30	43	8	50	9	9	5	6	4
31-36	16	3	13	3	9	5	7	4
37-42	0		1		0		2	1
<b>TOTAL</b>	<b>532</b>		<b>556</b>		<b>194</b>		<b>182</b>	

SUMMARY

The four segments of the Continuous Inventory remeasured at five year intervals were combined and compared with the original measurements of these segments. During the second five year period several years of severe drought caused stress and a slight reduction in vigor especially of the pines. Bark beetle attacks on pine and increased building activity caused removal of many trees. The following tabulation summarizes the results:

	<u>1971-1974</u>	<u>1976-1979</u>	
Total Trees	25477	27413	+7.6%
Public Trees	8792	8862	+0.77%
Private Trees	16685	18552	+11.2%
Public Pine	4144	4070	-1.8%
Private Pine	3937	3846	-2.3%
Public Trees	32%	32%	of all trees
Private Trees	68%	68%	of all trees

Past 5 years:

Public Trees cut	393
Public Trees planted	1040
Private Trees recorded cut	428
Private Trees planted:	
at least 1 for each cut	
Other Private Trees cut or planted:	No record

Poor Vigor Trees (1979 Survey)	City Pine	1%
	Private Pine	3%
	Other Species	less

Insects and Diseases (1979 Survey)	Public Trees	2%
	Private Trees	0.7%

TABLE 1 Number of Public plus Private Trees  
as Remeasured for All Four Segments

dbh Class	Pine		Oak		Other		Total	
	71-74	76-79	71-74	76-79	71-74	76-79	71-74	76-79
2-6	1528	1323	2367	2934	4826	6749	8721	11006
7-12	1404	1193	3898	3990	2419	1745	7721	6928
13-18	1855	1611	2180	2168	670	531	4705	4310
19-24	1599	1639	321	461	249	313	2169	2413
25-30	995	1160	66	60	154	204	1215	1424
31-36	469	627	25	4	88	140	582	771
37-42	142	242	9	3	50	65	201	310
43+	89	121	8	0	66	130	163	251
<b>Total</b>	<b>8081</b>	<b>7916</b>	<b>8874</b>	<b>9620</b>	<b>8522</b>	<b>9877</b>	<b>25477</b>	<b>27413</b>
+ or -		-165		+746		+1355		+1935
No. Cut		416		136		176		728

\* All figures in this and other tables reflect the reduced number of blocks so do not compare with 1975 report figures.

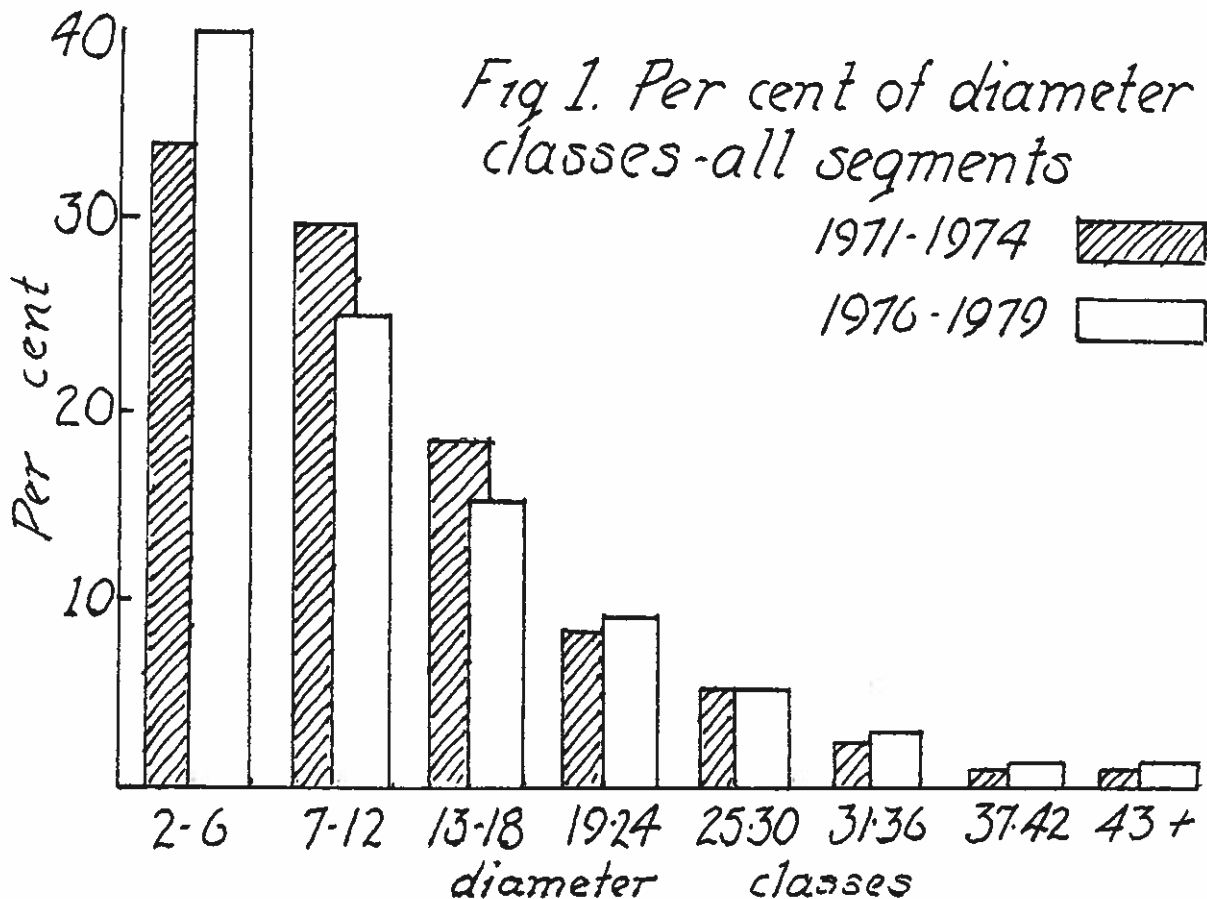


TABLE 2 Number of Public Trees as Remeasured  
for All Four Segments

dbh Class	Pine		Oak		Other		Total	
	71-74	76-79	71-74	76-79	71-74	76-79	71-74	76-79
2-6	960	798	1139	1178	993	1170	3092	3146
7-12	820	763	1124	1103	431	374	2375	2240
13-18	876	871	365	445	212	154	1453	1470
19-24	721	795	75	60	104	103	900	958
25-30	433	499	25	8	41	63	499	570
31-36	221	236	17		37	32	275	268
37-42	59	67	4		29	25	92	92
43+	54	41	5		47	75	106	116
<b>Total</b>	<b>4144</b>	<b>4070</b>	<b>2754</b>	<b>2794</b>	<b>1894</b>	<b>1996</b>	<b>8792</b>	<b>8860</b>
+ or -		-74		+40		+102		+68
No. Cut		211		24		65		300

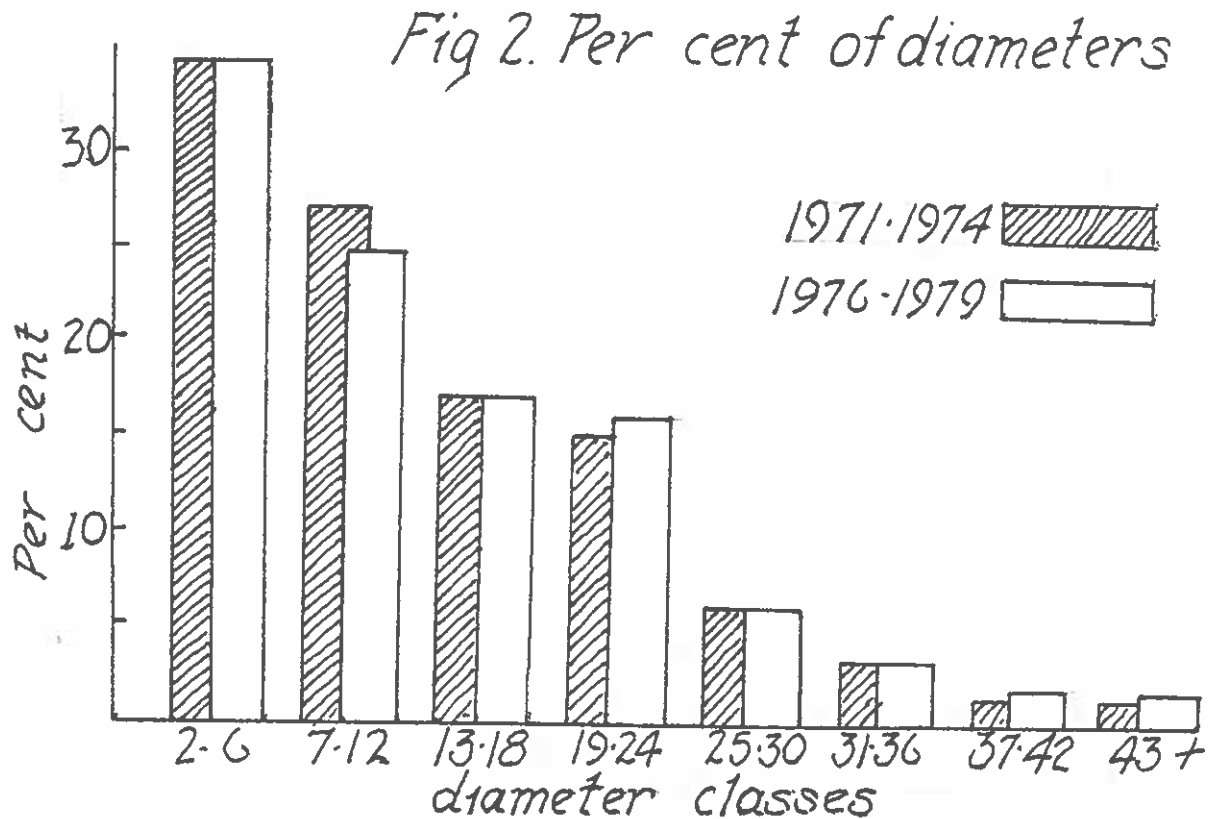


TABLE 3 Number of Private Trees as Remeasured  
for All Four Segments

dbh Class	Pine		Oak		Other		Total	
	71-74	76-79	71-74	76-79	71-74	76-79	71-74	76-79
2-6	568	525	1228	1756	3833	5579	5629	7860
7-12	584	430	2774	2887	1988	1369	5346	4686
13-18	979	740	1815	1723	458	378	3252	2841
19-24	878	844	246	401	145	210	1269	1455
25-30	562	661	41	52	113	141	716	854
31-36	248	391	8	4	51	108	307	503
37-42	83	175	5	3	21	40	109	218
43+	35	80	3	0	19	55	57	135
<b>Total</b>	<b>3937</b>	<b>3846</b>	<b>6120</b>	<b>6826</b>	<b>6628</b>	<b>7880</b>	<b>16685</b>	<b>18552</b>
+ or - Recorded Cut		-91		+706		+1252		+1867
		205		112		111		428

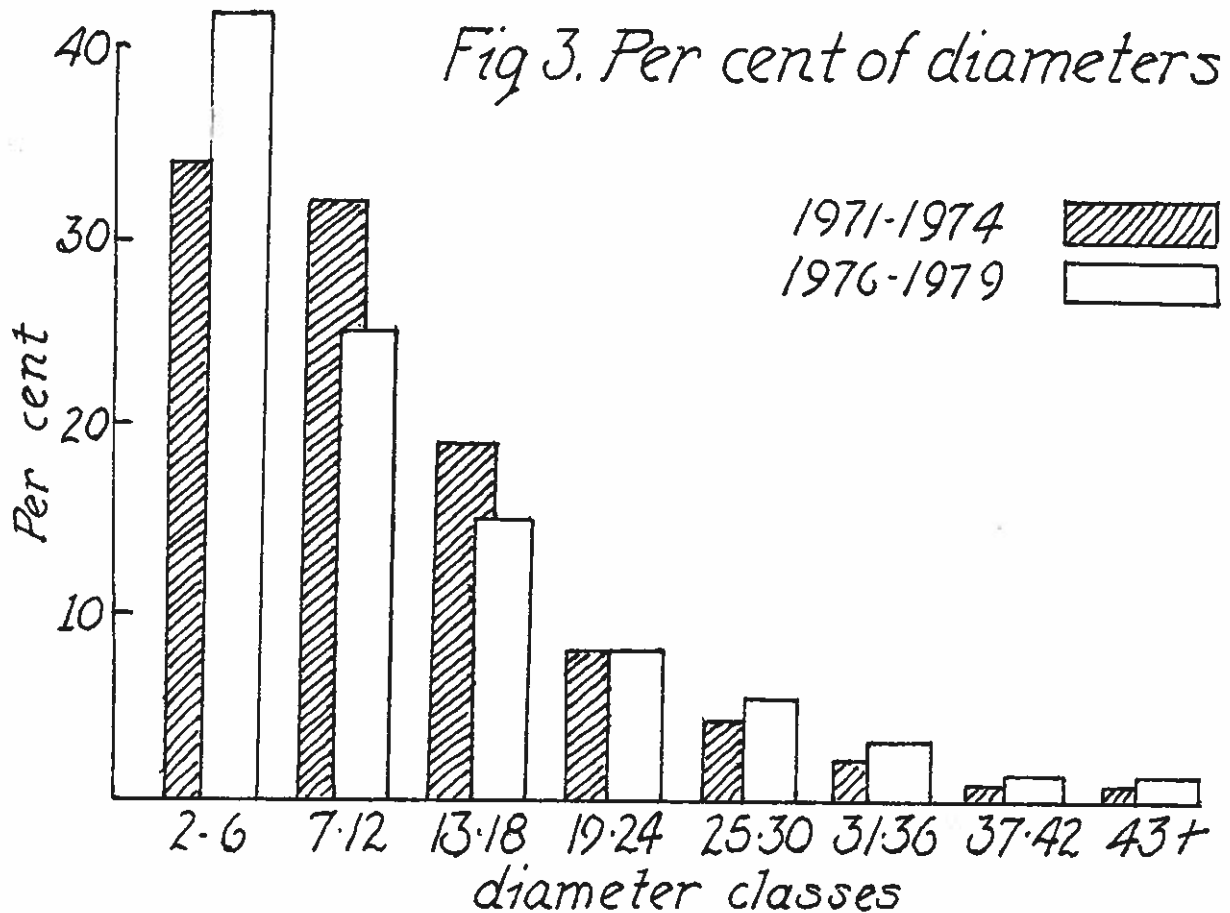
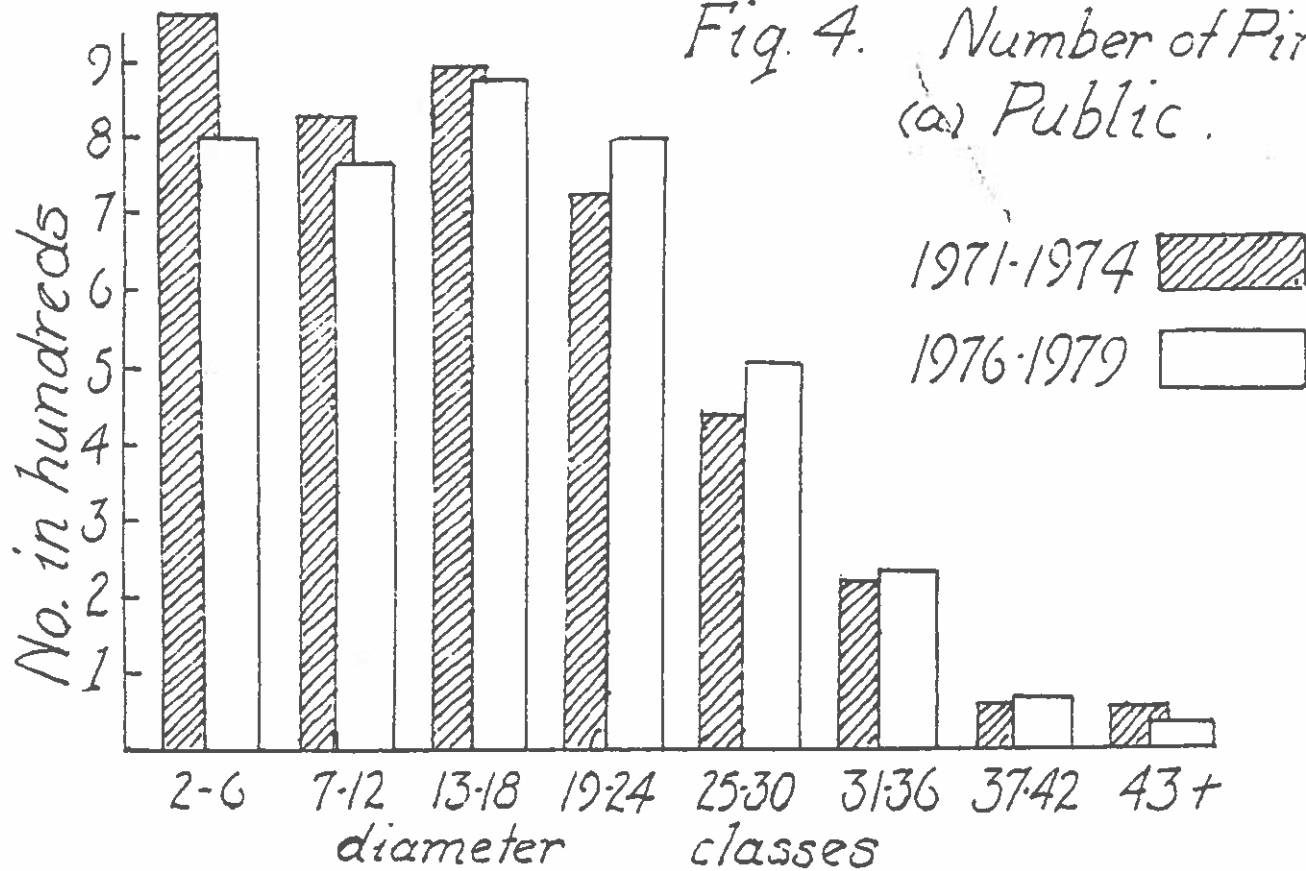
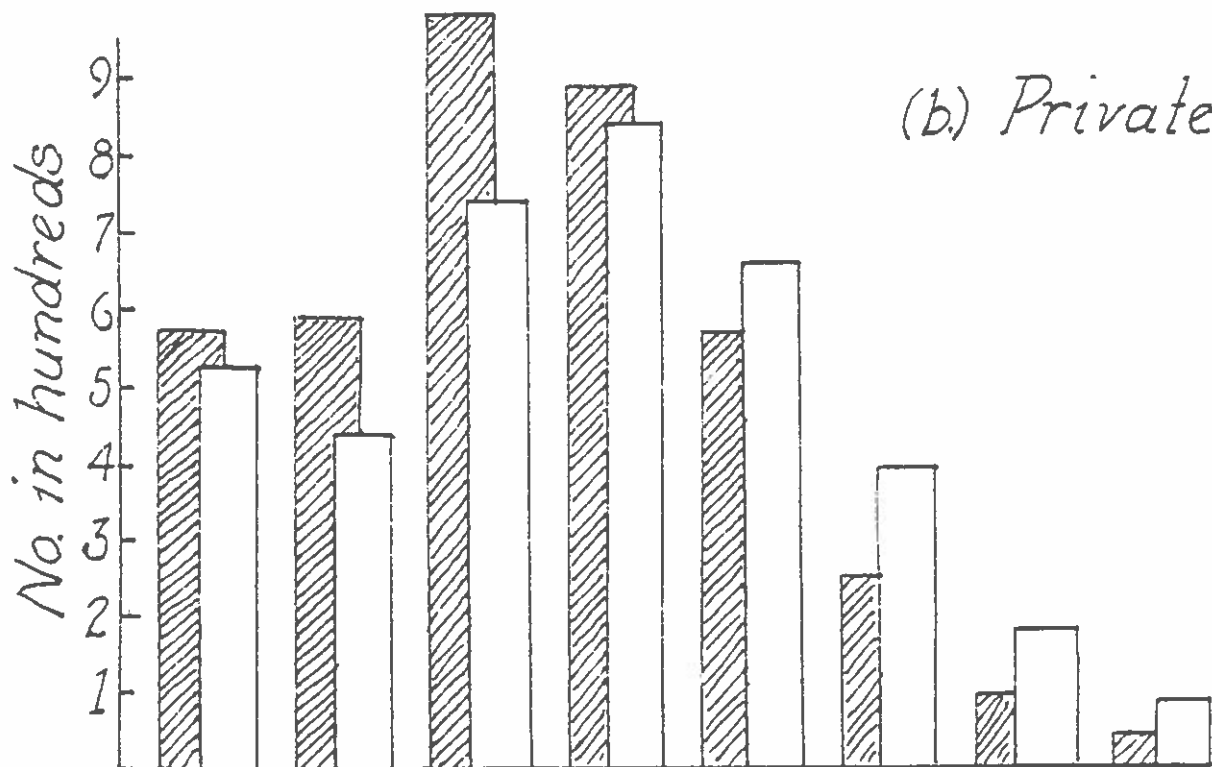




Fig. 4. Number of Pines  
(a) Public.



(b) Private



ITEMS RELATED TO THE CONTINUOUS INVENTORY

## Relation of Age to Diameter

Figure 7 of the 1975 report on "Present Condition of the Forest" showed the wide range of ages for any one diameter. It showed it better than the new Figure 7. However, the Management Plan now is spread around where experts can see that according to the rules of graphic representation Figure 7 should have shown the diameter on the vertical scale and age on the horizontal scale. Age does not increase because of diameter: diameter increases because of age.

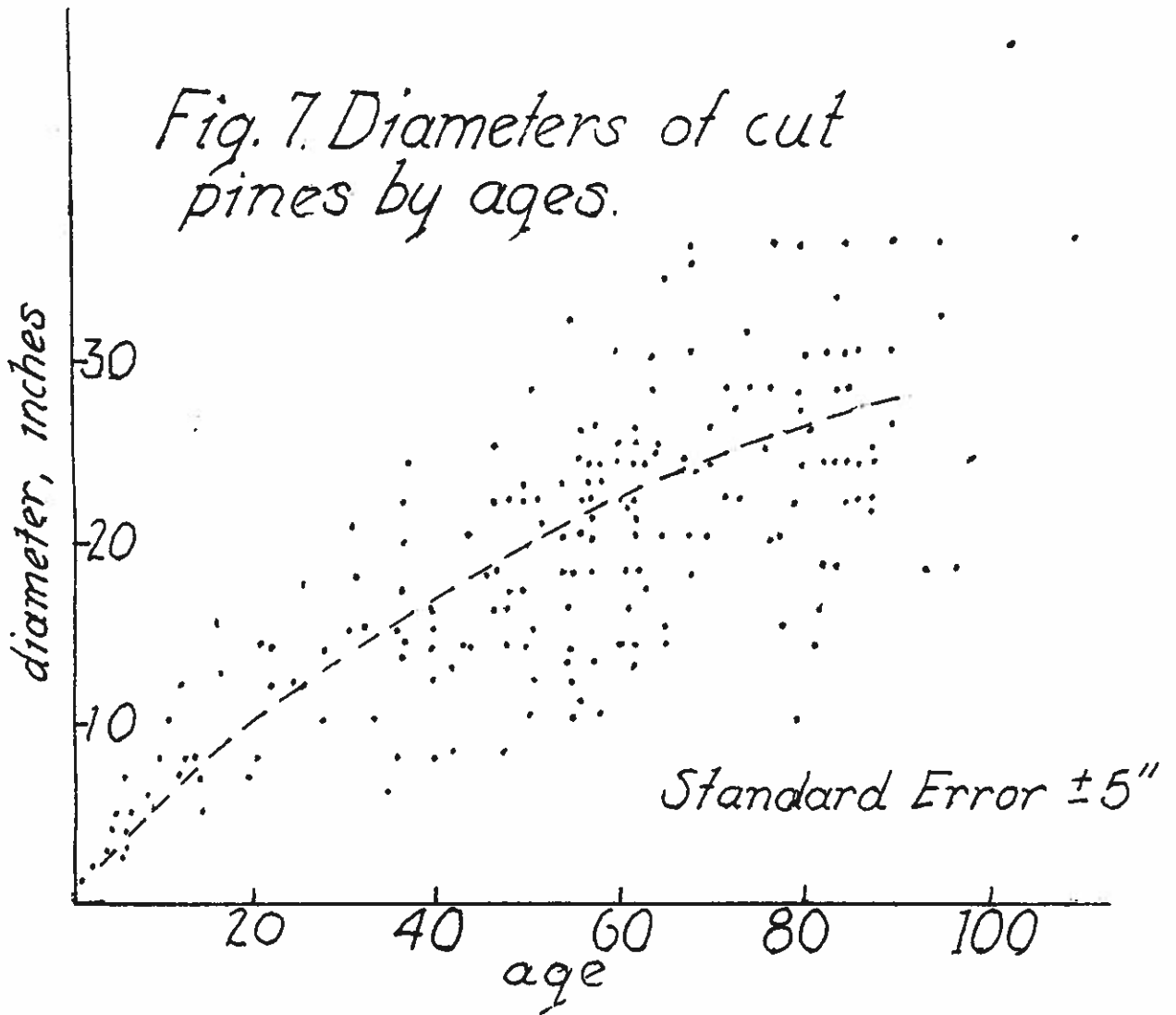
When diameters of cut trees are plotted over age as in the new Figure 7 the result is a regression line that is almost straight. The standard error of estimate is + or - 5 inches of diameter and the Alienation Index is 65%, meaning that age accounts for only 35% of the factors affecting diameter growth for these trees. (Moisture, temperature, light, mechanical and chemical factors).

The original Figure 7 was used because one can see the diameter but not the age. The whole idea was to show the large dispersion of ages for any diameter. This new graph shows it pretty well. It isn't meant for predicting growth - the standard error is too large.

Ray Taylor

April 1, 1979

Fig. 7. Diameters of cut pines by ages.



Concerning Beetle Attack on Carmel's Monterey Pine

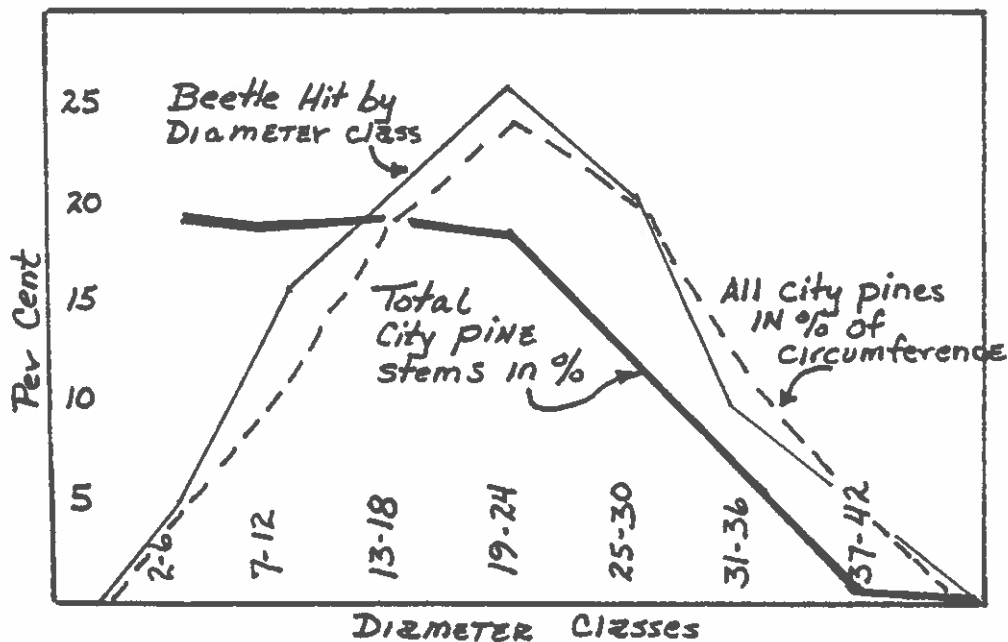
Last February Page 15 of Section II was added to Carmel's Management Plan. This showed two graphs, one the "ski" slope of the number of Carmel's city pines plotted over diameter classes; the other an almost perfect normal frequency curve of beetle-killed trees.

Since then more pines have been cut or beetles traced out because of Dendroctonus valens followed by Ips radiata. In adding these cut pines and other pines hit but the beetles traced out, an alternate reason for the normal frequency curve of beetle attack was revealed. The city-owned pines of Carmel have no tendency to group around an average diameter but the diameters of the beetle-hit pines definitely do.

The curve of all Carmel city-owned pines merely shows the number of pines. The beetles, flying or crawling at random hit a wall of pine bark surface, and as there is much more of this in the middle diameters than in the two end zones, that area receives the largest attack. Curving the total circumference of each diameter class results in a frequency curve similar to the curve of beetle kill.

So the last paragraph of II-15 of the 1979 memo might better read "The central tendency is in the area of tree bole exposed". A lesser number of beetles will hit pines below 12 inches or larger than 30 inches than those in the middle diameters where the bulk of the bole surface is found.

It is still possible that the beetles prefer these middle diameters knowing the available bole surface is greatest there.





FIVE YEAR RE-INVENTORY OF THE ZA TRACTS

October 1981

These tracts, re-inventoried every 5 years with Segment 1 of the Continuous Inventory of Carmel's Urban Forest, are not typical of the average segment blocks. One abnormally large area, the Carmel Mission, ZA-5, has been taken out of both the 1976 and 1981 surveys.

TABLE 1 COMPARISON OF NUMBER OF TREES  
IN 1976 AND 1981

	1976		1981		Gains or Losses	
	City	Private	City	Private	City	Private
ZA-1	126	174	167	144	+41	+30
2	47	154	54	159	+7	+5
3	30	338	55	845	+25	+507
4	11	190	6	239	-5	+49
6	0	17	6	10	+6	-7
7	3	33	25	46	+22	+13
Total	217	906	313	1443	+96	+537
% of						
Total	19.3	80.7	17.8	82.2		

Although the percentages of City Trees and Private Trees in 1976 and in 1981 remain about the same, the individual tracts vary widely in this respect. ZA-3 had a tremendous increase in private trees. This tract borders Mission Trail Park and its boundaries were in doubt in 1976.

SPECIES AND DIAMETER CLASSES

In comparing Tables 2 and 3, the changes in number of City trees in five years is gratifying but the gain of 38 per cent amounts to only 20 trees on the total of 6 tracts. There aren't many City trees in the ZA areas. City trees were only 19.6 per cent in 1976 and 17.5 per cent in 1981 of the total of City and private trees. Property line changes may account for some of this. The changes in number of trees in five years in the large private areas were as follows:

Pine gained 87, Oak increased 382, Acacia had only 6 more, Cypress only 20 more, and the "Other" class increased 41. However, 70 per cent of the large increase in Oaks occurs in the 1 - 6 inch class (103 in 1976 and 370 in 1981). In fact, most of the gains in number of trees are in this 1 - 6 inch class.

The 1981 inventory showed so many 1 - 6 inch trees in the "Other" slot, both City and Private, that several ZA tracts were investigated to see what kind of small trees made up such a large number. Seventy three per cent of ZA trees were listed as "Other". Minus 1 inch seedlings and saplings listed this year for the first time numbered 606 on private land, but here again 31% were in the "Other" class. Eliminating this 1 - 6 "Other" box makes the totals more believable. This was explained more fully in this year's report on the ten-year remeasurement of Segment 1.

### Vigor

In 1976, according to that year's crew, more than 95 per cent of City trees and almost 98 per cent of Private trees were of Good or Fair vigor. In 1981 the figures were 96 per cent and 98 per cent -- almost the same.

### Trees Needing Work

ZA-3, bordering Mission Trail Park, and having more than half of the trees on all ZA blocks, had 13 beetle trees and 2 dead. On all of the other ZA blocks there were only 3 beetle trees, 1 dead and 1 wound needing repairing.

### Summary

The ZA areas have only an average 18 per cent of City trees, whereas the Segment blocks average about 33 per cent. These averages remain fairly consistent in 1976 and 1981. City pines form only 24 per cent of the total in 1976 and in 1981. Private Pine runs 15 per cent of the total number of trees in 1976 and also stays the same in 1981. All species gained in number of trees but privately owned Oaks in the 1 - 6 inch class doubled its number. The 1981 count shows 269 of the 370 private Oaks (73%) were in one block: ZA-3.

In general vigor stayed high and there was very little beetle tracing or repair work to do.



TABLE 2 COMPARISON OF SPECIES BY DIAMETER CLASSESCITY VS. PRIVATE IN 1976

dbh Class	Pine		Oak		Acacia		Cypress		All Other		Total	
	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.
1-6	8	30	38	103	18	59	8	8	--	--	72	200
7-12	4	24	42	197	5	18	2	3	12	62	65	304
13-18	5	17	29	202			3		2	17	39	236
19-24	14	18	8	71			1	1		1	23	91
25-30	10	16		16			1	1		2	11	35
31-36	8	16				1				2	8	19
37-42	1	8						2			1	10
43+	2	6						1			2	7
<b>Total</b>	<b>52</b>	<b>135</b>	<b>117</b>	<b>589</b>	<b>23</b>	<b>78</b>	<b>15</b>	<b>16</b>	<b>14</b>	<b>84</b>	<b>221</b>	<b>902</b>

VIGOR IN PER CENT

Good	94	96	67	82	100	98	100	100	89	94	80	88
Fair	6	4	27	15	0	2	0	0	6	4	15.4	9.9
Poor	0	0	6	3	0	0	0	0	5	2	4.6	2.1

TABLE 3 COMPARISON OF SPECIES BY DIAMETER CLASSESCITY VS. PRIVATE IN 1981

dbh Class	Pine		Oak		Acacia		Cypress		All Other		Total	
	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.	City	Pvt.
-1	22	32	50	307	10	74	0	6	33	187	115	606
1-6	18	57	48	370	32	57	13	12	--	--	111	496
7-12	10	37	47	236	8	19	6	13	15	97	86	402
13-18	6	42	31	252	1	6	3	9	11	23	52	332
19-24	12	23	14	88		1	1			3	27	115
25-30	9	18	1	17			3			1	13	36
31-36	13	23		6				2			13	31
37-42	2	10		2		1					2	13
43+	2	12		0						1	2	13
<b>Total</b>	<b>72</b>	<b>222</b>	<b>141</b>	<b>971</b>	<b>41</b>	<b>84</b>	<b>26</b>	<b>36</b>	<b>26</b>	<b>125</b>	<b>306</b>	<b>1438</b>

VIGOR IN PER CENT

Good	68	63	77	71	95	94	100	92	89	91	82	82.2
Fair	28	34	17	27	5	6		8	8	8	14.3	16.1
Poor	4	3	6	2	0	0		0	3	1	3.7	1.7

TEN YEAR INVENTORY OF SEGMENT 1  
OF CARMEL'S URBAN FOREST

October 1981

This report covers the third measurement of Segment 1 of the Continuous Inventory. It is probably the most accurate of the three but in comparing the 1971 and 1976 figures with the 1981 survey it was discovered that the 1971 and 1976 computer print-outs included the trees of the City Business District. Obviously corrections had to be made before going ahead with this report. Later the figures in the 1980 report covering the remeasurement of all four segments may have to be slightly revised. Future segment comparisons can be on a ten-year as well as a five-year basis.

HAVE WE LOST OR GAINED TREES IN THE  
PAST TEN YEARS?

City Trees

One encouraging fact stands out in the 1981 results -- City Pines have increased. Previous remeasurements of other segments have shown a slight loss of Pines on City land. Table 1 shows an increase of 192 trees of all species since 1971. These are mostly in the small diameter classes. There were 127 more Pines.

After field inspection of several blocks, the 1 - 6 inch "Other" space with its great number of tall shrubs was eliminated. There is good reason to drop this class. The most significant trees, Pine and Oak, have their own columns. Other approved species, such as Cypress, Redwood, Eucalyptus, Fir, etc., will appear in the 7 - 12 inch class in due course and be counted. But in this 1 - 6 inch "Other" slot are listed many shrubs and stems of a variety of species; many of which are one or two inches in diameter and perhaps six to eight feet tall.

If any of these grow into the 7 - 12 inch class instead of remaining shrub growth they will appear in later surveys. If they are decorative shrubs they will probably remain just that even though they become several inches in diameter. As Carmel Tree Cover they are not significant. Until these small trees reach the 7 - 12 inch diameter class there is no reason to include them.

## Trees Needing Treatment

Considering the number of trees in the 37 blocks of Segment 1 only a tiny percentage needed attention. The crew found 20 beetle-hit Pines, 10 dead and 4 dying trees. Eight had fruiting bodies of wood-rotting fungi. It is the policy to report trees needing treatment to the City Forester at once. Minor troubles such as small numbers of midge, scale, spider mites, etc. are not reported. Turpentine beetles are traced out and killed by the survey crew.

## Vigor

In general the trees gained in vigor, which is to be expected as intensive forestry has increased over the past ten years. Poor vigor trees have decreased from 17 per cent in 1971 to 3 per cent in 1981.

Figures 1 and 3 illustrate the changes in City Pine and Oak by diameter classes.

## Private Trees

Table 2 and Figure 2 show a slight loss of private Pines, a gain for Oaks and a loss for "Others", over a 10 year period. However, the 1981 survey indicated that the "Other" class of 1 - 6 inch trees had almost four times as many as there were in 1971. An inspection of some of the blocks with the greatest number of trees in the 1 - 6 inch "Other" class made it evident that the 1 - 6 inch "Other" space should be dropped in Table 2 as it was in Table 1 and for the same reasons given under City Trees.

It is impossible to say what happened to the 276 Pines lost to the 7 - 12, 13 - 18 and 19 - 24 inch classes of Table 2. It might be that the gain of 193 in the larger classes leaves only 83 missing, and as 95 Pines were cut in Segment 1 since 1971 that might be the answer. Considering all the Pines given to private owners on Tree Day over the years, there should be more Pines on private land.

There were 127 Pine seedlings and saplings (-1 inch) on the much larger area of private land compared with 264 on City land. Of the 172 trees reported removed from private land, mostly in connection with building, more than half were Pines.

### Trees Needing Attention

The same number of beetle-hit trees (20) was reported on private land in 1981. Residents were informed of these and of dead or diseased trees. Eleven Pines, two Oaks, and eleven "Others" were dead. Only four trees with trunk rot were reported.

No doubt many private owners give their trees professional care. This is indicated by the small number reported to the residents as needing attention.

### Vigor

Just as beauty is in the eye of the beholder, vigor classification depends on the viewer's idea of Good, Fair and Poor. These classifications are described in the Management Plan, but the "Poor" class is the easiest to identify by the survey crew.

According to the tallies of 1971, 1976 and 1981 the number of poor vigor trees on private land increased between 1971 and 1976, then dropped to only two per cent in 1981.

### City plus Private Trees

Segment 1, covering most of Carmel in a grid of 37 blocks, had a total of 5034 trees, public and private, in 1971. Now in 1981 it has 5523 trees, as shown below:

	<u>1971</u>	<u>1976</u>	<u>1981</u>
Pine	1703	1689	1786
Oak	1961	2385	2454
Acacia	711	551	684
Others	659	416	599
Total	<u>5034</u>	<u>4490</u>	<u>5523</u>

TABLE 1 SEGMENT 1 PUBLIC TREES

IN 1971, 1976 AND 1981

Diam. Class	Pine			Oak			Acacia			Other			Total		
	1971	1976	1981	1971	1976	1981	1971	1976	1981	1971	1976	1981	1971	1976	1981
1-6	190	112	258	260	291	383	38	74	117	--	--	--	488	477	758
7-12	180	190	219	280	268	308	41	25	32	46	20	55	547	503	614
13-18	170	188	202	111	180	100	23	8	9	28	22	23	332	398	334
19-24	150	174	143	18	12	20	11	0	1	15	23	16	194	209	180
25-30	110	104	92	17	0	2	2	0	2	12	23	12	141	127	108
31-36	30	27	43	13	7	2	1	3	8	8	10	7	52	40	52
37-42	18	8	22	7	7	2	9	16	9	9	16	9	34	24	31
43+	12	12	8	0	0	0	21	29	7	21	29	7	33	41	15
Total	860	815	987	706	751	815	116	110	161	139	137	129	1821	1819	2092

% of

Total	47	45	47	39	41	39	6	6	8	8	8	6
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VIGOR IN PER CENT

Good	26	87	55	55	83	68	62	95	75	63	88	70	46	85	68
Fair	42	9	41	41	14	29	31	3	23	31	7	20	37	11	29
Poor	32	4	4	4	3	3	7	2	2	6	5	3	17	4	3

Seedlings & Saplings (-1 inch)

	264	400	189	163	1016
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Trees Cut since 1971

	72	6	23	9	110
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TABLE 2  
SEGMENT 1 PRIVATE TREES  
IN 1971, 1976 AND 1981

Diam. Class	Pine		Oak		Acacia		Other		Total	
	1971	1976	1971	1976	1971	1976	1971	1976	1971	1976
1-6	80	135	115	467	236	335	--	--	431	937
7-12	173	143	557	695	301	101	330	105	1361	1044
13-18	349	205	533	356	47	5	98	30	1027	596
19-24	166	178	34	106	6	4	32	37	238	321
25-30	41	136	9	10	1	1	30	41	81	187
31-36	22	55	4	4	1	1	14	43	41	98
37-42	7	22	3	0	1	1	7	11	18	33
43+	5	0	0	1	2	1	9	12	16	12
<b>Total</b>	<b>843</b>	<b>874</b>	<b>1255</b>	<b>1634</b>	<b>595</b>	<b>441</b>	<b>520</b>	<b>279</b>	<b>3213</b>	<b>3228</b>

% of Total	Pine		Oak		Acacia		Other		Total	
	1971	1976	1971	1976	1971	1976	1971	1976	1971	1976
	26	27	23	48	19	14	16	8	14	14

VIGOR IN PER CENT

Good	22	89	42	97	14	95	28	95	24	74
Fair	67	8	54	2	75	3	63	3	65	3
Poor	11	3	4	1	11	2	9	2	10	23

Seedlings & Saplings (-1 inch)	127	571	175	917	1790
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Trees Cut since 1971	95	35	42	172
			(includes Acacia)	

## SUMMARY

City trees have increased in number over the past ten years but mostly in the lower diameter classes. Pine gained 139 trees in those less than 19 inches in diameter and those above 30 inches in diameter gained 13 trees. With 264 Pine seedlings soon to be in the 1 to 6 inch class, the future range of diameters of the Pines will be much improved. Vigor is reported as much improved also; 96 per cent of the Pines being reported as Good or Fair. Oak and "Others" have a greater number of trees and show a gain in vigor.

Private trees are still losing some Pines, but as there are only 44 fewer than 10 years ago and 95 are reported cut in that period, the loss may be caused by construction cutting. There is no record of private trees removed except in connection with construction of some sort, or diseased and dangerous trees ordered cut by the City Council. However, for every tree cut there are usually at least two large ones planted.

FIGURE 1. NUMBER OF CITY PINE  
IN 1971, 1976 AND 1981

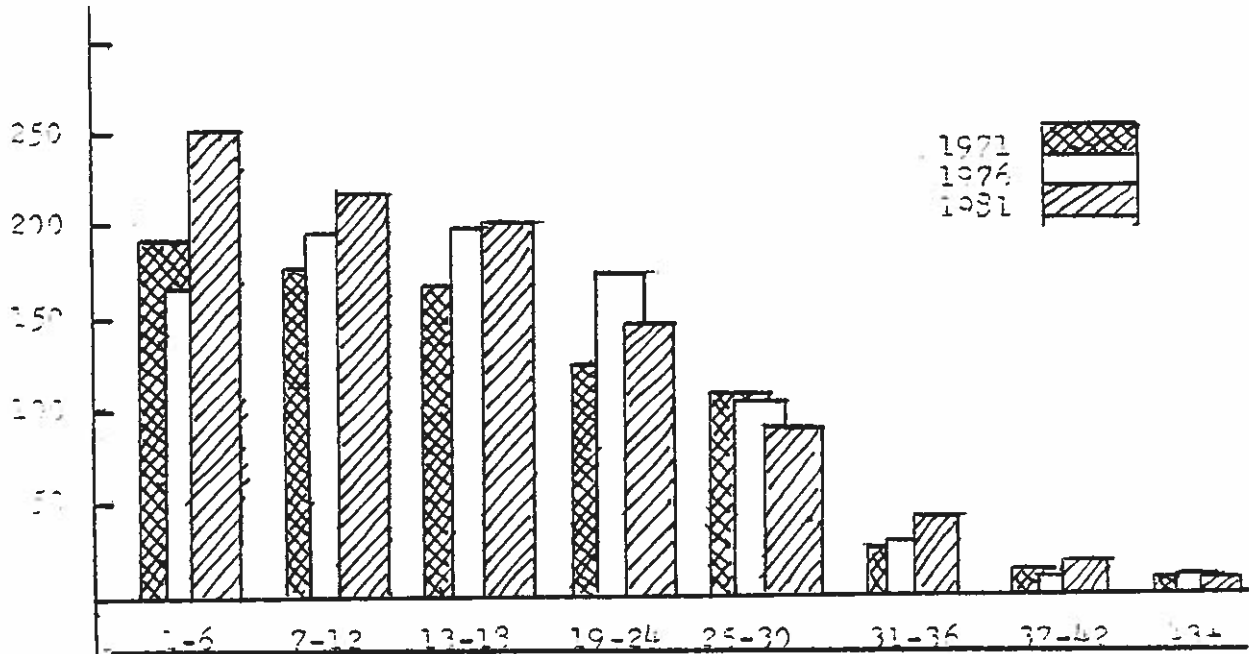


FIGURE 2. NUMBER OF PRIVATE PINE  
IN 1971, 1976 AND 1981

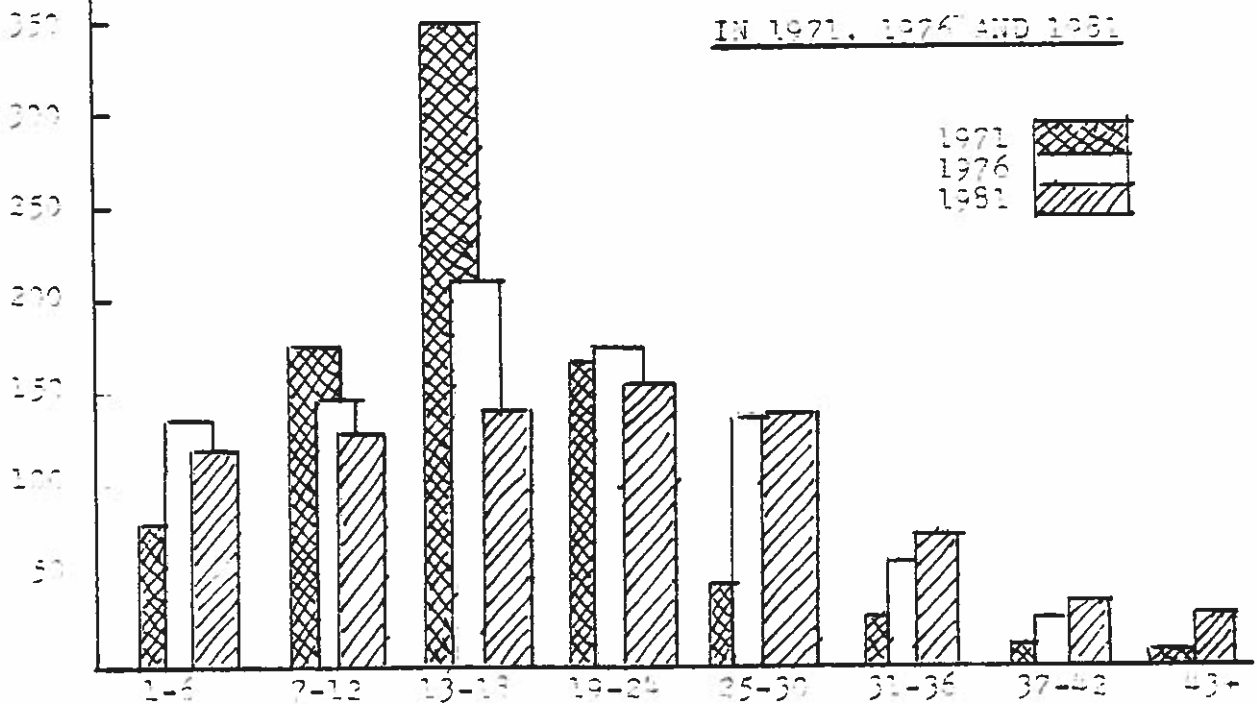




FIGURE 3. NUMBER OF CITY OAKS  
IN 1971, 1976 AND 1981

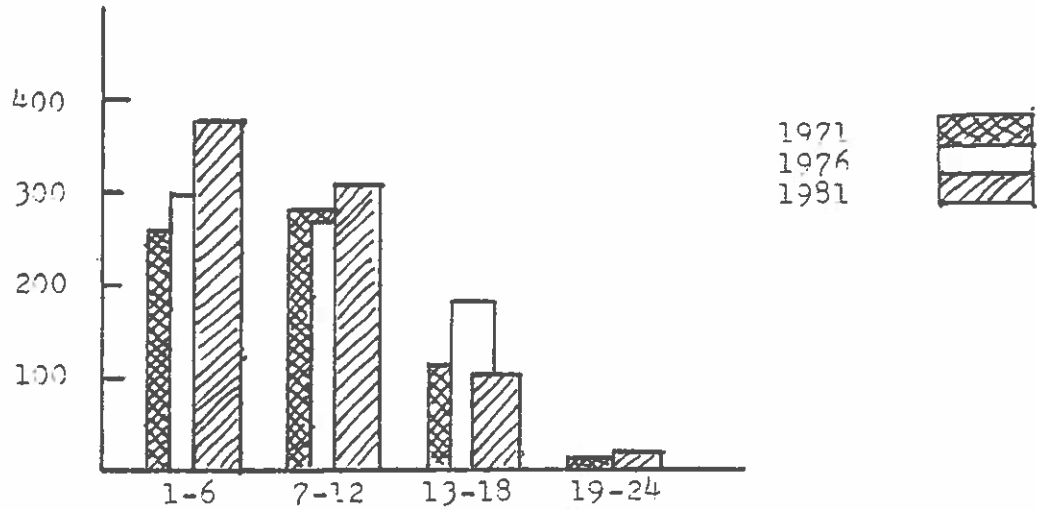
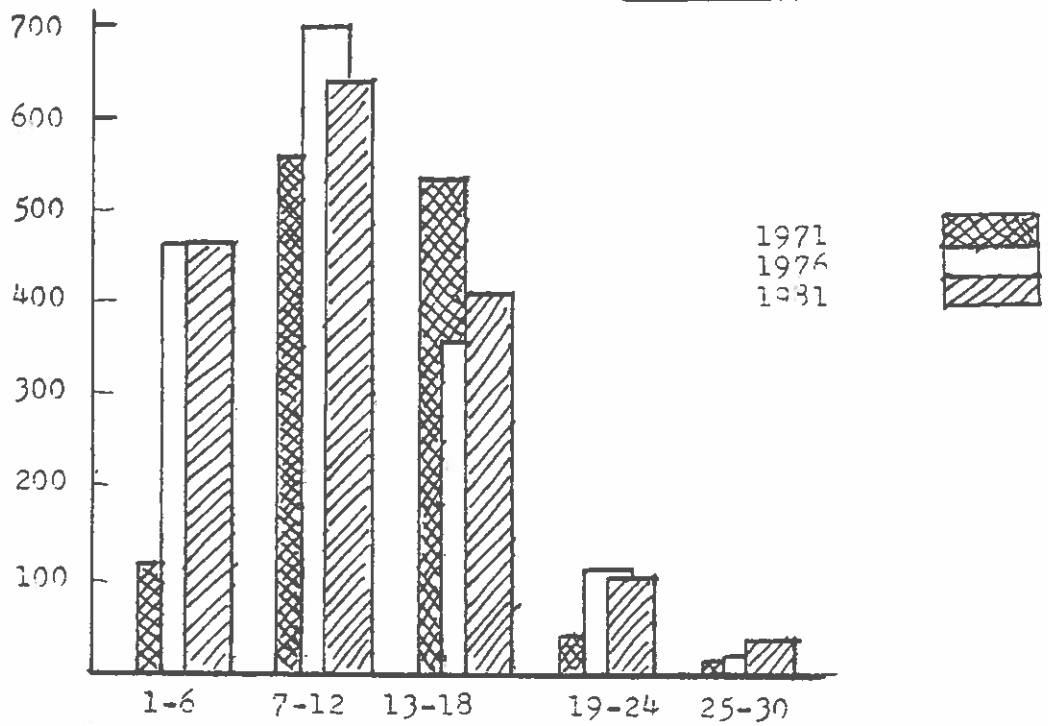


FIGURE 4. NUMBER OF PRIVATE OAKS  
IN 1971, 1976 AND 1981



II- 28 thru  
II-30  
blank temporary  
6/82

7 February 1979

THE CITY BUSINESS DISTRICT

RESULTS OF THE 1980 REMEASUREMENTS  
OF THE CARMEL BUSINESS DISTRICT TREES

The original City Business District included Devendorf Park, the blocks between 4th and 7th Streets, and extended from Junipero to Lincoln Streets. The 1980 remeasurements exclude Devendorf Park. The trees of this park were taken out of the 1971 count in order to properly compare 1971 with 1980. The 1971 survey had no 2-6 class, but counted an "Under 6-inch Class". This included trees from about 0.6 inches to 5.5 inches, so the 1980 survey followed this system. There were no private trees listed in 1971.

This report should replace pages CBD I through IX of Section II. These were reports dated 9/30/76, 8/15/77 and 8/78, which should be placed in the City Forester's files.

1. ORIGINAL CITY BUSINESS DISTRICT.      PUBLIC TREES.

Table 1 and accompanying graph compare the 1971 and 1980 counts by diameter classes, species and vigor. Obviously the more intensive management which began in 1971 has maintained the trees of the commercial area in good shape. The number of trees has increased 23% but mostly in those below 6 inches in diameter.

Vigor of Pine has improved considerably, but other species have remained about the same.

2. PRESENT CITY BUSINESS DISTRICT.      PUBLIC TREES.

Table 2 compares the 1978 and 1980 surveys of the blocks from 4th to 8th Streets between Junipero and Lincoln Streets. Here we have a gain of 26 trees, but in these two years the "2-6" class has lost 38 trees. This seems to be in the Pine and "Other" species. Running it down further we find the losses are in all blocks and fairly evenly distributed. If the trees less than 2 inches and the 2-6 class are combined, the loss is only 14 trees, indicating that some 2-inch trees were tallied as less than 2 inches.

A glance at the vigor table shows a loss of Good Vigor for all species, but mostly for Oak. The period between 1971 and 1980 had a great increase in vigor but during the past two years there was some loss of vigor. The

TABLE 1. 1980 REMEASUREMENT OF 1971 CITY BUSINESS DISTRICT - PUBLIC TREES.

Diam. Class	PINE		OAK		OTHER		TOTAL		+	-
	'71	'80	'71	'80	'71	'80	'71	'80		
-6	43	65	47	65	33	76	123	206	83	
7-12	72	77	10	20	28	29	110	126	16	
13-18	46	66	17	15	26	15	89	96	7	
19-24	28	42	5	6	6	4	39	52	13	
25-30	31	25	4	2	1	2	36	29		7
31-36	14	17			1	1	15	18	3	
37-42	0	8				1		9	9	
43+	1	2			1	1	2	3	1	
TOTAL	235	302	83	108	96	129	414	539	125	

VIGOR IN PER CENT

GOOD	28	63	64	62	75	74	46	65	+19%
FAIR	52	34	30	32	20	20	40	31	-9%
POOR	20	3	6	6	5	6	14	4	-10%

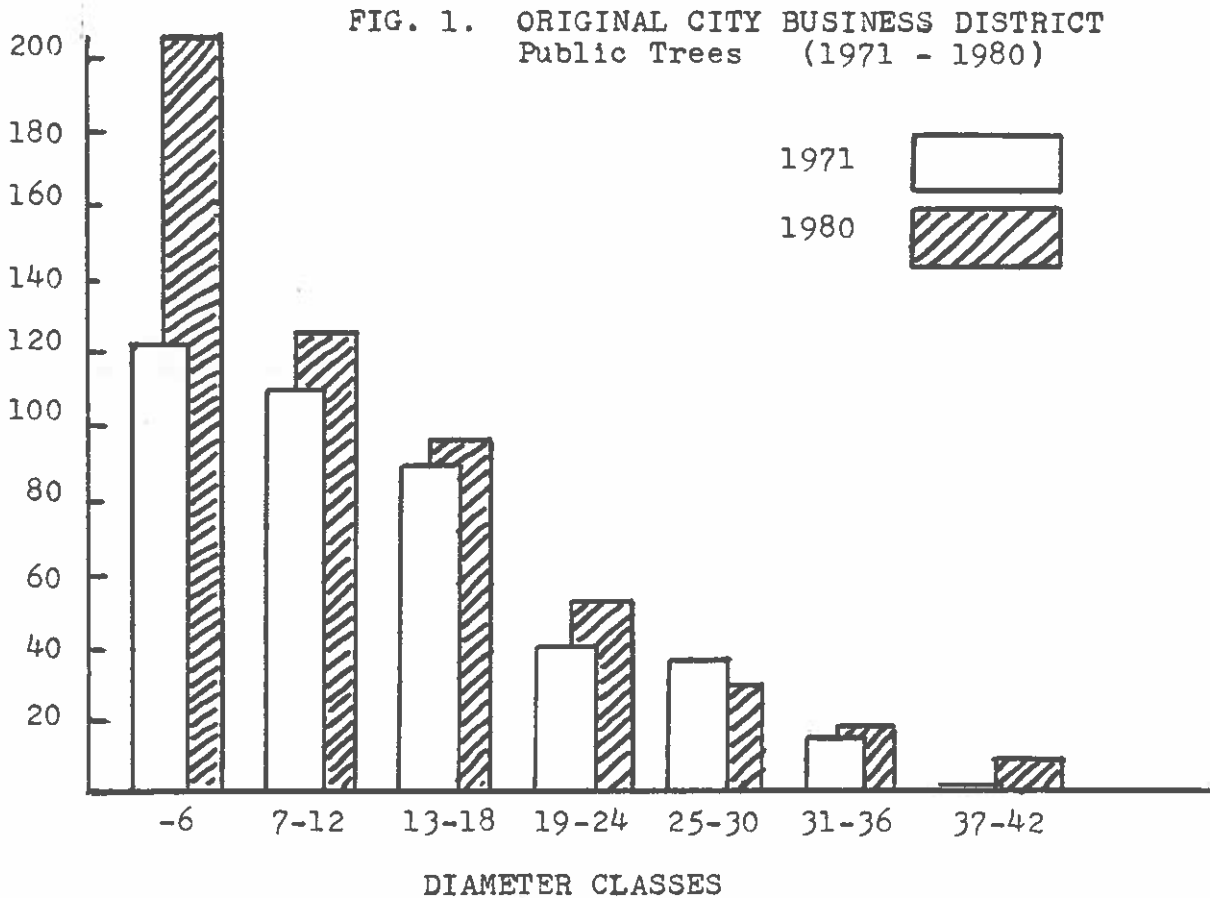


TABLE 2

1980 REMEASUREMENT OF CITY BUSINESS DISTRICT

PUBLIC TREES

(Junipero to Lincoln; 4th to 8th)

<u>Diam.</u> <u>Class</u>	<u>Pine</u>		<u>Oak</u>		<u>Other</u>		<u>Total</u>		+ -
	'78	'80	'78	'80	'78	'80	'78	'80	
-2*	12	30	17	22	12	13	41	65	+24
2-6	90	59	65	69	101	90	256	218	-38
7-12	100	103	25	30	33	37	158	170	+12
13-18	86	92	17	18	10	16	113	126	+13
19-24	40	51	5	6	6	7	51	64	+13
25-30	27	27	1	3	2	3	30	33	+3
31-36	19	19				1	19	20	+1
37-42	12	8				1	12	9	-3
43+	2	2				1	2	3	+1
<b>Total</b>	<b>388</b>	<b>391</b>	<b>130</b>	<b>148</b>	<b>164</b>	<b>169</b>	<b>682</b>	<b>708</b>	<b>+26</b>
<b>%</b>	<b>57</b>	<b>55</b>	<b>19</b>	<b>21</b>	<b>24</b>	<b>24</b>			

VIGOR IN PER CENT

<u>Good</u>	77	65	92	59	81	74	81	67	-14%
<u>Fair</u>	18	31	8	53	17	18	15	27	+12%
<u>Poor</u>	5	4	0	8	2	8	4	6	+2%

species percentage continues about the same as in 1978 - pine, oak and acacias froming 77% in 1978 and 79% in 1980. Thirty species are listed.

### 3. PRIVATE TREES OF THE CITY BUSINESS DISTRICT

In Table 3 the 2-6 inch class has been omitted as it became evident that there were an unbelievable number of decorative tall shrubs that had been tallied as trees.

Although not shown in Table 3, pine and oak in the 2-6 inch class gained enough to offset the 2 to 6 inch apparent loss shown. The "Other" class was impossible to tally accurately.

Vigor of private trees was not taken in 1978 so no comparison can be made with 1980. In 1980 pine averaged 67% Good and 33% Fair; Oak ran 98% Good. The vigor of other species could not be estimated very accurately on these private lots.

TABLE 3            PRIVATE TREES OF THE C.B.D.            1978 and 1980

<u>Diam.</u> <u>Class</u>	<u>Pine</u>		<u>Oak</u>		<u>Other</u>		<u>Total</u>		<u>Per Cent</u>	
	'78	'80	'78	'80	'78	'80	'78	'80	'78	'80
7-12	20	27	60	58	72	53	152	138	50	47
13-18	16	19	55	48	9	10	80	77	25	26
19-24	13	16	13	15	3	7	29	38	10	13
25-30	10	10	6	4	7	3	23	17	7	6
31-36	7	9	3	0	2		10	9	3	3
37-42	3	6			3		6	6	2	2
43+	1	5			2	2	3	7	3	3
<u>Total</u>	70	92	137	125	98	75	303	292		
<u>%</u>	23	31	45	43	32	26				

R.F.T.    Sept. 1980





## SECTION III

### POLICY AND PROCEDURES

#### City Forester's Responsibilities

It shall be the policy of the City Council and the Carmel Forestry Commission to have the City Forester assume full responsibility and give full time to operational as well as administrative tree matters.

In the case of an emergency, such as falling trees during a storm, etc., it will be the City Forester's responsibility to see that prompt and proper action is taken to abate the situation. The City Forester and his crew will also be immediately available to the Superintendent of Public Works in the event of emergencies.

The City Forester will work with the Forest Management Plan Committee to keep the Plan up to date. He will also serve as an ex-officio member of the Forest Survey Committee.

The City Forester will make a monthly report of work done to be sent to the Superintendent of Public Works, the Forestry Commission and the City Council.

The City Forester is expected to keep abreast of current developments in city forest and park management.

#### Tree Removal and Trimming Policies

This is spelled out in detail by Municipal Code Section 1231 with special reference to the handling of permits. (See Section V, "Carmel's Tree Ordinances")

Dead, defective or hazardous trees on City property will normally be removed by the City Forestry crew at City expense as soon as possible after they come to the attention of the City Forester.

Improvement of View--All City Councils and Forestry Commissions have been conservative about granting permits for this purpose on the theory that it will set a precedent difficult to deal with consistently.

Other Reasons--Trees may shade private property, in which case trimming may be substituted for removal if City officials feel that it will solve the problem to the satisfaction of the owner. Frequently, a property owner will ask to have a tree removed because it drops leaves or needles in his yard. These requests are ordinarily denied. Sometimes a City tree is crowding a more desirable private or City tree of the same or different species. This request is decided on its own merits.

### Prevention of Damage to Trees

The City Forester will be consulted wherever construction of roads, paving or building is to be done. He will mark trees to be cut and unmarked trees will not be cut. Further, he will specify measures to be taken to protect City trees from damage. (See Municipal Code Section 1237)

### Improvement of Tree Vigor

Aerating the roots of paved-in trees, feeding the roots, and removing ivy or thinning to improve vigor will be done when in the City Forester's opinion:

1. The tree is valuable and will clearly die if not treated; or
2. The tree or trees could benefit by such treatment and it is possible to do the work without neglecting more important tasks.

### Planting

This is discussed in Section 1235 of the Municipal Code. (See Section V, "Codes Involved")

Planting will be done where there are plantable openings which in the City Forester's opinion should be planted. A "Notice of Tree Planting" may be given out when applicable. (See Appendix)

It will not be the policy to plant Monterey Pines or Cypresses in tubs or other containers on public property, or in spaces on sidewalks where the tree will not have sufficient root space or aeration, or will be subject to physical damage.

Tree Species for Carmel (See also VII)

The goal of the Carmel Forestry Commission and the Carmel Forestry Division is to maintain and increase the Urban Forest of Carmel. The concept of a two-story canopy consisting of an upper story of Monterey Pines, cypresses and other species, and an under story of Coast Live Oak, some species of acacia and numerous varieties of intermediate tree species, is one which the Commission feels is essential for the continuation of the Carmel Forest. The following lists are by no means complete, and are only suggested species which have been found to thrive in the climate of the Carmel area.

Monterey Pine	<u>Pinus radiata</u>
Monterey Cypress	<u>Cupressus macrocarpa</u>
Coast Redwood	<u>Sequoia sempervirens</u>
Douglas Fir	<u>Pseudotsuga menziesii</u>
Bishop Pine	<u>Pinus muricata</u>
Torrey Pine	<u>Pinus torreyana</u>
Giant Sequoia	<u>Sequoiadendron giganteum</u>

A suggested list of shade trees and under story growth of intermediate height has been compiled to supplement the list above. These trees display unusual characteristics deemed desirable for planting. Some suggested species to consider are:

Coast Live Oak <sup>1</sup>	<u>Quercus agrifolia</u>
Liquidambar	<u>Liquidambar "Burgundy"</u>
Liquidambar	<u>Liquidambar "Palo Alto"</u>
London Plane	<u>Platanus acerifolia</u>
Sycamore	<u>Platanus racemosa</u>
Tulip Tree	<u>Liriodendron tulipifera</u>
Avocado	<u>Persea americana</u>
Brazilian Pepper	<u>Schinus terebinthifolius</u>
Fernleaf Catalina	<u>Lyonothamnus floribundus</u>
Ironwood	<u>asplenifolius</u>

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<sup>1</sup>Coast Live Oak is an ideal shade tree when planted in areas with sufficient growing space and well-drained soils. However, when planted in a sidewalk environment, such as we have in the Central Business District, the Coast Live Oak has shown to be very susceptible to disease.

Chinese Elm	<u>Ulmus parvifolia</u>
Grecian Laurel	<u>Laurus nobilis</u>
Flowering Eucalyptus	<u>Eucalyptus ficifolia</u>
Norway Maple	<u>Acer platanoides</u>
Honey Locust	<u>Gleditsia triacanthos inermis</u>
Holly Oak	<u>Quercus ilex</u>
Toyon	<u>Heteromeles arbutifolia</u>

Past experience has shown that even with the excellent growing conditions existing in Carmel, some trees have unsatisfactory growing characteristics. The following list of species are not suggested for shade tree planting.

Bailey Acacia	<u>Acacia baileyana</u>
Blackwood Acacia	<u>Acacia melanoxylon</u>
California Palm	<u>Washingtonia filifera</u>

The trees mentioned in these listings are only suggestions and are not intended to restrict the species to be planted. Still, Monterey Pine and Coast Live Oak are the favored species for Carmel and should be planted wherever space is available.

Note: See Section VII for other information on trees

## Procedures for Storm Damage

In the event storm damage occurs, the Forestry Division is on call around the clock and is prepared to act in an emergency. If damage occurs at a time other than during normal working hours, 7:45 A.M. to 4:30 P.M., Monday through Friday, the Carmel Police Department has a complete list of names and telephone numbers of all Forestry Division personnel. The City Forester will be the first to be contacted. He will make the decision of whom to call, how many of the Forestry personnel should be contacted, and what level of emergency preparation should be administered. If the Forester cannot be contacted, the Forestry Foreman shall then be contacted and he shall decide what preparations should be made.

## Operation

In the event of storm damage or any other such emergency, the Forestry Division will work in conjunction with police and civil defense operations. All emergencies will be handled in a safe manner and all hazards will be deemed safe before the crew leaves the site. If the work load is such that it is impossible to attend to all hazards quickly, safety equipment will be deployed to warn the public of the hazard. It is essential that all work be done in a safe and proper manner to prevent any accidents from occurring to either the public or the members of the Forestry Division.

## Methods of Work

### Planting

Tree seedlings of various species will be cultivated for future planting. These trees will be set out into permanent planting locations before the roots become potbound.

The nursery should have a stock of trees in one, five, 15 and 25-gallon size on hand at all times. A representation of all major Carmel tree species should be available.

Other trees purchased as necessary should be no less than 15-gallon size for the Central Business District. Trees in other areas of the City should be one and five-gallon seedling size.

A comprehensive planting program should begin in late November or mid-December and continue through mid-March.

Sites chosen for planting should be prepared prior to the planting of trees. Consideration of soil quality, drainage and local vegetation should be given careful thought. Trees should be properly spaced with regard to traffic and parking. When planting in tree squares in the Central Business District, the center of the planting square should be four and one-half feet back from the head of the parking square. If possible, planters should be included as part of the requirements for new building landscaping (see illustration on Page III-6a).

If practical, adjacent property owners should be given consideration. Where overhead wires may be a problem, consideration should be given to tree species to be planted.

Mini-parks should be developed wherever possible to insure the continuing survival of the Monterey Pine as the dominant species in the Central Business District. An effort should be made to locate such sites wherever possible with as little hindrance as possible to shops and traffic. (See Section IV, "Forestry and Parks Plan", 1975)

### Care of Young Trees

When a tree is planted, a berm should be built to hold water, and wood chips from the Forestry stockpile should be spread for a three-foot radius around the newly planted tree to eliminate weeds and retain water.

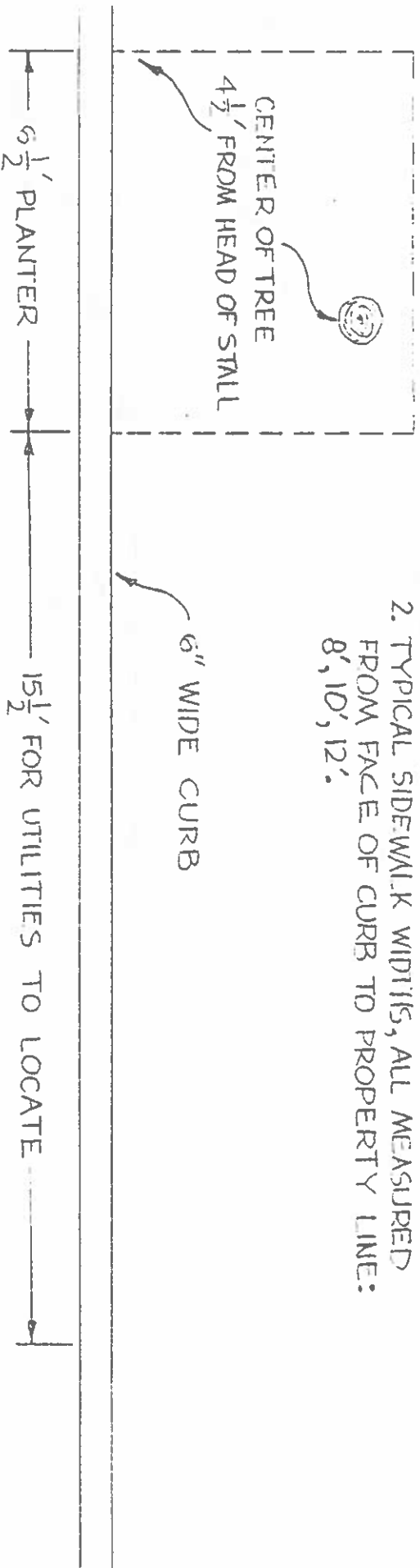
It would be desirable that newly planted trees be watered weekly for the first two months, then as needed.

Fertilizer may be added to the surface around newly planted trees once per year with a balanced commercial material.

# TYPICAL PARKING STALL WITH PLANTER

## NOTES:

1. WIDTH OF PLANTER TO BE  $\frac{1}{2}$  WIDTH OF SIDEWALK, MEASURED FROM FACE OF CURB.
2. TYPICAL SIDEWALK WIDTHS, ALL MEASURED FROM FACE OF CURB TO PROPERTY LINE: 8', 10', 12'.



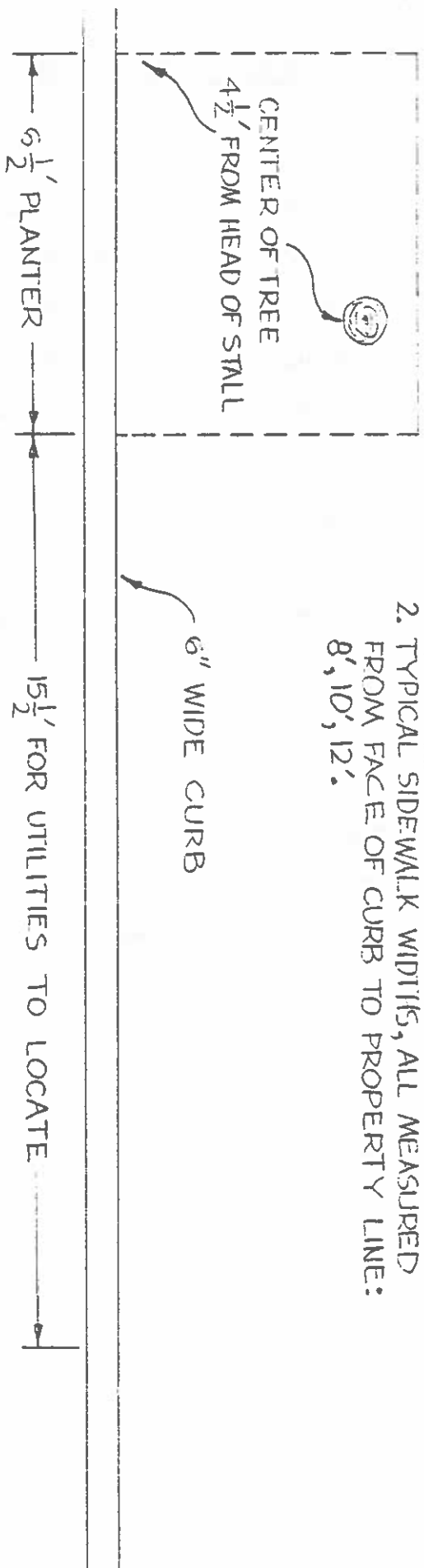
TYPICAL PARKING STALL  
7' x 22'



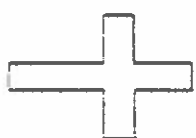


# TYPICAL PARKING STALL WITH PLANTER

- NOTES:
1. WIDTH OF PLANTER TO BE  $\frac{1}{2}$  WIDTH OF SIDEWALK, MEASURED FROM FACE OF CURB.
  2. TYPICAL SIDEWALK WIDTHS, ALL MEASURED FROM FACE OF CURB TO PROPERTY LINE: 8', 10', 12'.



TYPICAL PARKING STALL  
7' x 22'



NOTICE OF TREE PLANTING

The Forestry Division and the Forestry Commission invite you to consider our plan to plant a \_\_\_\_\_ (species) \_\_\_\_\_ tree in front of your property. We have placed a stake at the proposed location. Such plantings are required to maintain the Carmel Forest. However, if you prefer a different kind of tree or a different location, we will be glad to take your wishes into account. If you wish to discuss the proposed planting site, please call the City Forester, Gregory D'Ambrosio, at 624-3543 before \_\_\_\_\_ (date) \_\_\_\_\_.

The entire Monterey Peninsula is a unique ecological niche along the California Coast. Carmel-by-the-Sea is a quaint village located among some of the most majestic Monterey Pines, Coast Live Oaks and Monterey Cypress on the Peninsula. In a city environment of pavement, exhaust fumes and a large population concentration, the forest must be stimulated by planting many more trees in an effort to maintain the high aesthetic standards you desire. No one wants a city of houses with only a few trees! Trees are a necessary part of our daily lives. We of the Forestry Division of the Department of Public Works wish you would help us maintain the Carmel area for the present and the future.

## Tree Removal

The area around a tree removal site will be properly marked and barricaded. If necessary for the safety of passersby, the area will be roped off.

Adjacent property owners will be notified if any tree cutting operation will be likely to interfere with their access or other activities.

## Safety

All safety equipment necessary to the job will be used to protect personnel within the area of work.

Safe and approved methods will be used to conduct the operation in a manner which does not threaten the well-being of the public, workers or property. Particular care will be taken with regard to overhead wires. No employee of the Forestry Division will be permitted within 12 feet of any high voltage line.

Wood and tree cuttings will be removed promptly from the site. If they must be left unattended for any period of time, they will be adequately marked and lighted.

All Forestry personnel must wear:

1. Safety vest when working
2. Hard hat when working
3. Safety glasses and ear protectors when running chipper or any other piece of equipment deemed hazardous to the eyes or ears.

All climbers must wear:

1. Climbing belt
2. Two ropes for support
3. Spurs
4. Hard hat

## Tree Trimming

The same safety procedures will be observed as described in the previous subsection, "Safety".

All cuts will be made flush with the nearest branch or trunk intersection. Cuts will be made with the two or three cut method as necessary to prevent tearing.

All cuts one-inch diameter or larger on conifers, and one-half-inch diameter on broad-leaved trees, shall be treated with an approved sealing compound. This material will be applied the same day cuts are made on broad-leaved trees.

If green branches are to be removed from any tree, care will be taken to stay within the limits of green loss that a tree of that particular species, age and vitality will tolerate (never more than one-third of the green foliage). Care will also be taken to develop or maintain an aesthetic appearance. Unless otherwise indicated, an aesthetic appearance will be assumed to be a shape and density most natural to that particular species.

When trimming by request, consideration for the property should be considered, but no tree will be trimmed for the sole purpose of enhancing view, decreasing shade cover or reducing litter of the adjacent property.

It should be noted that Carmel is a village within a forest, and trimming or removal of trees for the reasons stated in the above paragraph is not considered in keeping with this City's policies.

## Spraying

Wherever possible, the use of chemical sprays will be avoided.

When insects or disease are threatening a tree, chemicals may be used according to approved professional methods and State requirements.

All personnel who spray will have a physical chest test prior to using sprays. Protective clothing and devices will be used by personnel near the operation and all precautions will be taken to prevent chemicals from drifting and causing harm or nuisance to the public or property. (See State and Federal requirements in Forester's Office)

Treatment will be followed at intervals required by the application labels with an inspection to determine whether the spray applications were effective, and reported in the Forester's monthly report.

Spraying for oak moths will be done only in the case of an epidemic or to prevent an epidemic. Spraying for bark beetles will be done in restricted areas as required.

## Fertilizing and Aerating Larger Trees

An approved liquid feeding material may be sprayed on the foliage area of large trees, if it is impossible to ground feed. An approved liquid material may be injected into the ground around large trees where possible.

The area treated should include all open ground available within the drip line of the foliage, but not within two trunk diameters of the base. Tall slim trees should be fed out as far as is reasonable. Injections should be made at random points spaced 12 to 18-inches apart.

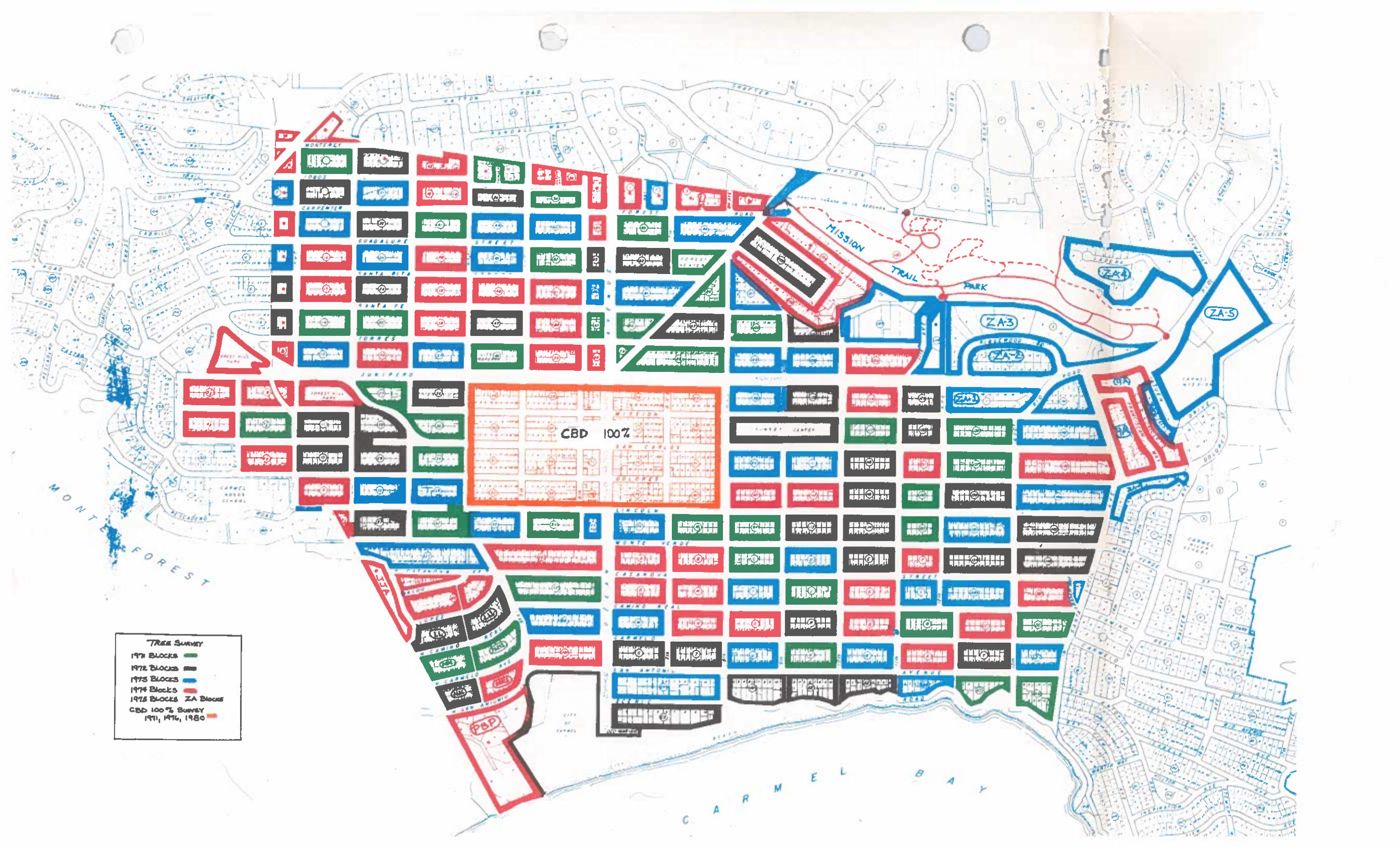
The fertilizing material should be a commercially prepared compound, only part of which is available to the tree immediately. Most components should be such that they become available to the tree only after six months or longer.

## Thinning

Good forest practices may be used to remove small, defective or suppressed trees for the benefit of more healthy or better located trees where necessary. This process, however, should be used conservatively and with careful consideration of the attitudes of nearby property owners.

In many cases this should be avoided. Carmel is an urban forest and is not for commercial gain. Suppressed trees, with no apparent disease or insect problems, are just as important as our stately pines and oaks.





**Tree Survey**

- 1971 Blocks
- 1972 Blocks
- 1973 Blocks
- 1974 Blocks
- 1975 Blocks ZA Blocks
- CBD 100% Survey 1971, 1976, 1980

CBD 100%

Mission Trail Park

ZA-3

ZA-5

PBD

CARMEL BAY

MONT E FOREST

## SECTION IV

### WORK PLANS

#### WORKING PLAN FOR A CONTINUOUS INVENTORY OF

#### CARMEL'S URBAN FOREST (Revision of 1978)

##### Objectives

To know the present condition of the Urban Forest, public and private, at all times.

To know the changes in the forest at five year intervals.

As a result, to have the answers to questions such as the need for control of trees on private land, how much planting is needed, whether too much cutting is being done on City property, and in general, to know what work is needed to keep the Urban Forest in good condition.

##### Revision of original work plan

Because of the long delay in preparing individual tree cards for the computer and waiting for its use, it has been decided to discontinue use of the cards and of the metal tree tags. Most of the tree tags have disappeared, been broken off or grown over. The trees on each City block will be tallied on a single form, as shown, one page for the City trees and one for the Private trees.

The new method will save time and money. It will produce a report giving the same information as the computer sheets and will be by City blocks. The previous work plan and the computer print-out sheets for each year's inventory since 1971 are filed in the City Forester's office.

##### Methods

An inventory of all trees two inches in diameter and larger at four and one-half feet above average ground level, on approximately one-fifth of the City's total blocks will be made each year. The Central Business District, however, will be inventoried every two years. This area is watched over by the Carmel Forestry Commission and has a Master Plan of its own. (IV-7).



## FIELD WORK

### Preparation

Prepare xeroxed block forms for the number of blocks to be inventoried. Outline the blocks on a City map for the survey persons to use.

Mark the boundaries of private land on the ground for the blocks needing it.

### Equipment

Two hard hats and safety vests  
I.D. cards for crew men  
One Biltmore stick  
One diameter tape, to be kept clean  
Block sheets on clip board  
Pencils and sharpener, instructions, notes and map  
Notices of tree problems

### Training

Tallying by dot system  
Identification of trees and vigor classes  
What to tally and what to ignore  
How to use Biltmore stick  
How to use diameter tape  
Identification of insect and disease damage  
How to deal with public  
Safety rules and methods

### Field Survey

Count-down on equipment for the day  
Checking map to be sure of block  
Working around block from NE corner, taking City trees and noting private boundaries  
Stickman to take diameters and look for insect and other damage; tally man to record diameter class, vigor, damage, etc. on form.  
Reworking block on another form for Private trees  
Checking over forms upon completion of block to make sure numbers and remarks are neat and legible  
Return to office and place block forms in loose-leaf book.  
Point out to City Forester trees needing immediate attention.

SEGMENT 1. 1981 BLOCK \_\_\_\_\_ CITY \_\_\_\_\_ PRIVATE \_\_\_\_\_

DBH	PINE		OAK		ACACIA		CYPRESS		REDWOOD		OTHER		TOTAL	
	Main Stem	Xtra	Main Stem	Xtra	Main Stem	Xtra	Main Stem	Xtra	Main Stem	Xtra	Main St.	Xtra	Main St.	Xtr
-1*														
1-6														
7-12														
13-18														
19-24														
25-30														
31-36														
37-42														
43+														
Total														

VIGOR

GOOD														
FAIR														
POOR														
TOTAL														

ITEMS FOR FORESTER'S INSPECTION(Insects, Diseases, Wounds, Roots, etc.)

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GREGORY D'AMBROSIO  
CITY FORESTER

# City of Carmel-by-the-Sea

POST OFFICE BOX 4491  
CARMEL, CALIFORNIA 93921

(408) 624-3543

## URGENT

THE CITY OF CARMEL IS CONDUCTING A COMPREHENSIVE SURVEY OF CITY AND PRIVATELY OWNED TREES. THE SURVEY IS CONDUCTED SO THAT WE CAN OBTAIN A COMPREHENSIVE PICTURE OF JUST HOW HEALTHY OUR FOREST TREES ARE.

DURING THE SURVEY, OUR SURVEY CREW FOUND EVIDENCE OF DISEASE AND/OR INSECT INFESTATION ON YOUR TREES. THIS MAY BE A SERIOUS PROBLEM IF IGNORED. PLEASE CONTACT MY OFFICE AS SOON AS POSSIBLE. WE WILL BE MOST HAPPY TO SHOW YOU HOW TO CORRECT THIS PROBLEM.

PROBLEM: \_\_\_\_\_

TREE SPECIES: \_\_\_\_\_

GREGORY D'AMBROSIO  
CITY FORESTER



GREGORY D'AMBROSIO  
CITY FORESTER

# City of Carmel-by-the-Sea

POST OFFICE BOX 4491  
CARMEL, CALIFORNIA 93921

(408) 624-3543

DATE: \_\_\_\_\_

In order that we may best monitor the growth and health patterns of the trees in Carmel, we are presently conducting a follow up to our previous tree surveys.

As you were not home when we came to survey your yard, we would just like you to know that we were here, and that we measured and noted the relative vigor of all trees growing on your property. This census is general in nature and will not reflect your trees specifically in the final inventory.

If you have any questions regarding this survey, or our activities, please call Gregory D'Ambrosio, City Forester at 624-3543.

CREW: \_\_\_\_\_  
\_\_\_\_\_

## OFFICE WORK

### Assembling Field Sheets

As the block forms accumulate they will be compared with the tally for the same blocks made five years previously, to discover obvious errors. The sheets will then be completed by adding the numbers down and across. (See IV-3-c)

When all blocks are completed the field sheets will be summarized on one sheet for City trees and one for Private trees. These will be the equivalent of the former computer print-outs.

### Yearly Report

From the summary sheets a report will be prepared for the segment involved showing the changes over the 5 year period and outlining any recommendations for needed work. (See previous reports in files). The current report in full will go into Section II but the following year it will be replaced by a one-page summary, making space for the full report of the next year's segment. At five year intervals a Report on the Condition of Carmel's Urban Forest will be made.

## FIELD TECHNIQUES

### Vigor Classification

#### 1. Excellent

<u>Pine</u>	Leaders and candles healthy. Needles deep green. Crown full with few major dead limbs.
<u>Oak</u>	Crown full and green with few brown spots on leaves and few dead twigs.
<u>Cypress</u>	Conical crown when small, full and green, when older, spreading crown but green and healthy.
<u>Other Species</u>	Full green crown, few dead branches.

#### 2. Good

Not quite up to Excellent; between Excellent and Fair

#### 3. Fair

<u>Pine</u>	Leaders short and candles curved or drooped. Needles light green and sparse. Open crown. Many dead branches.
<u>Oak</u>	Many brown, curled and wrinkled leaves. Many dead twigs.
<u>Cypress</u>	Many dead needles, crown open, poor color and some dead limbs.
<u>Other Species</u>	Many brown leaves and open crown in broad-leaved trees. Conifers as in Pine or Cypress above.

#### 4. Poor

<u>Pine</u>	Crown open and needles yellowing. Many dead major branches. Trunk and limbs show structural defects. Bark on branches and trunk may be peeling or loose.
<u>Oak</u>	Tree looks defoliated with gray and open crown.
<u>Cypress</u>	Crown open and yellowish. Dead limbs turning bone white.
<u>Other Species</u>	In broad-leaved trees, many bare twigs and leaves dropping. A half-dead look. Conifers as in pine.

#### Islands

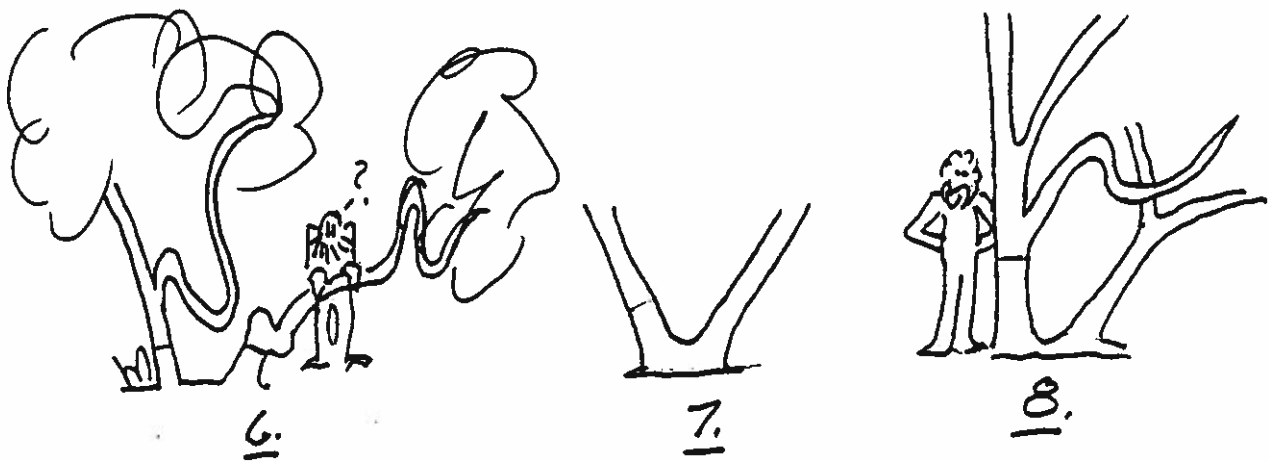
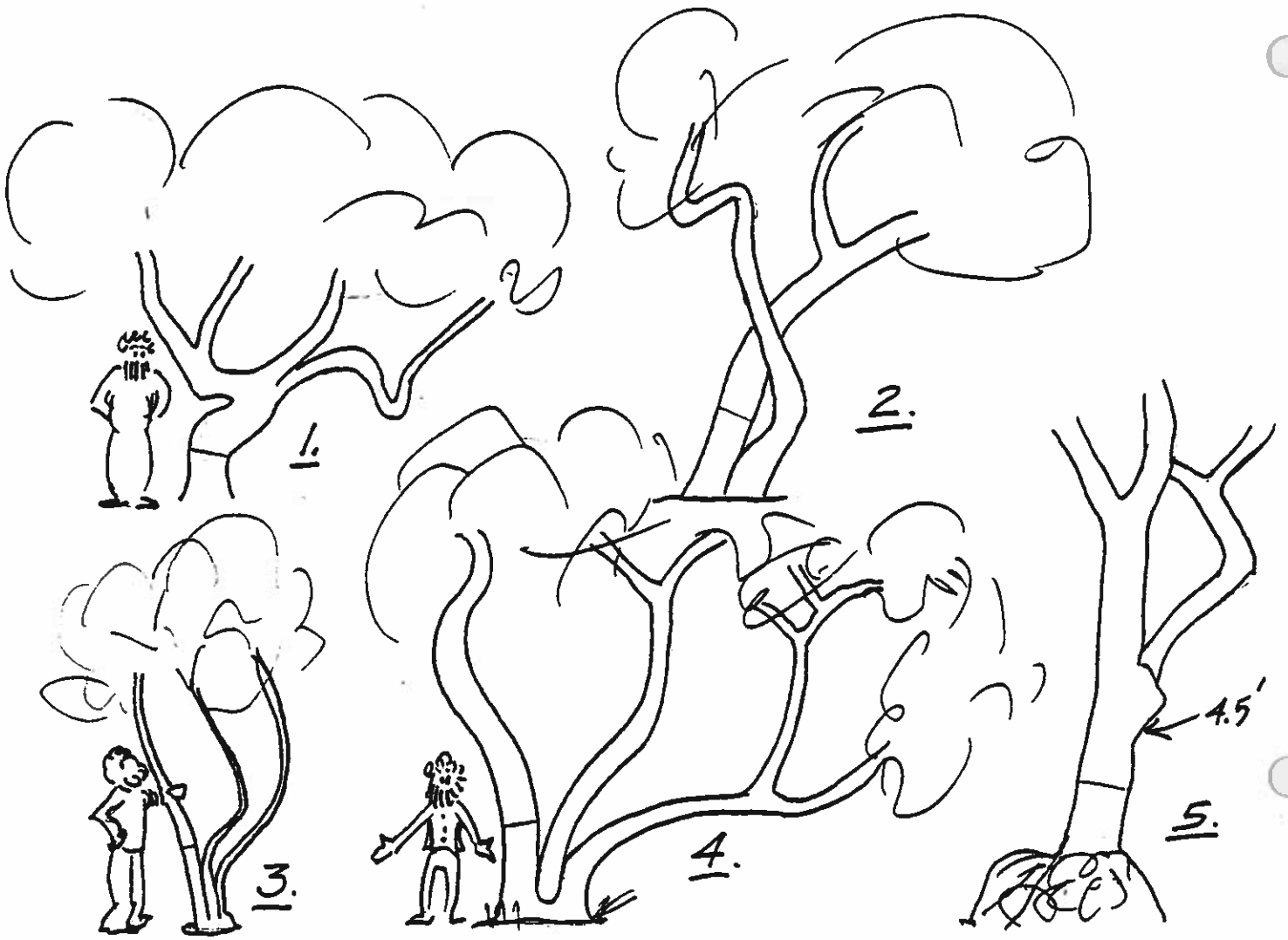
Islands to the north and east of the block being surveyed are to be included. Islands lying south and west will be measured with trees to the adjacent blocks.

#### Diameter Measurements

Where there are two or more stems originating from the same root collar, measure diameter anywhere between 2 feet and 4 feet up the stem, at a point that looks normal. There will not be much difference in diameter in a 2-foot span. The reason is that many oaks and acacias and some pines branch below 4.5 feet. Call it one tree if the stems are actually joined at the same base. Measure the stem with the largest diameter. Thus, in drawing No. 1 measurement would be made at the line shown. Number 2 is one tree. Numbers 3 and 4 are each one tree. Number 5 has a big burl at the base, extending 2 feet up the pole. Measure at about 3 feet. Number 6 is not joined at the base but may be a sprout from the same stump. Measure between 2 and 4 feet. Number 7 is joined at the base so it is considered to be one tree. Number 8 is no problem when measured below 4 feet, but would have been at 4.5 feet as it has an abnormal diameter there.

This system should give results that are not too different from those previously obtained. However, regardless of the system used it is expected that the survey man will continually check his estimates, especially at the edges of diameter classes, with diameter tape or Biltmore stick.

The diameter classes are shown on the tally sheet (IV-3e). The 2 - 6 class is from 1.6 to 6.5 inches; the 7 - 12 class is from 6.6 to 12.5 inches, etc.



MASTER STREET TREE PLAN FOR THE  
CENTRAL BUSINESS DISTRICT

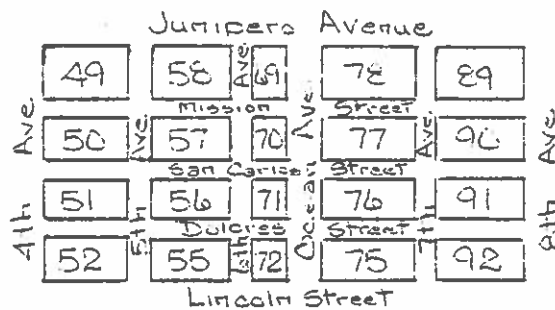
The area under consideration covers 20 blocks as shown below. It is in the heart of the commercial area and all of the blocks are affected by the business district environment. Within these boundaries, almost all blocks have formal sidewalks and gutters, thus reducing the available growing space for trees.

The forms used in the original Master Street Tree Plan as written in 1972, with explanations of work done, needed work, etc., were too difficult to keep up-to-date. As revised, the form consists only of a list of trees for each block, their size and vigor, with space for notes where needed. Its aim is to simplify the entire plan and make it easier to record future work needed or completed under this Plan. It should help the City Forester to keep a close check on what is needed, block by block, in the business district in order to improve its condition. Periodic entries on the block sheets will enable the Forester and the Forestry Commission to keep an up-to-date record of exactly how the business district is being maintained.

The form, or block sheet, is shown here for one block only. The full set of blocks is kept in the City Forester's office, and each Commissioner has his own set of block lists.

As of June 1975, each Forestry Commissioner has taken the responsibility of watching over a set of four blocks, keeping track of growth, diseases, insects, dead limbs, etc, and of informing the City Forester of the need to check on any serious condition developing on his blocks.

The Commissioners walk over their blocks once each month and turn in notes of needed work to the City Forester. The City Forester will notify each Commissioner as the needed work is completed. In July of each year, a remeasurement of diameters will be made and changes in vigor noted.





In 1975, the Central Business District was resurveyed, showing diameters by species, and it was given for both public and private trees in the analysis for the 1975 survey. It included the original Central Business District between Fourth and Seventh Avenues, and between Junipero and Lincoln Streets, as well as the new Central Business District blocks, numbers 89, 90, 91 and 92. The new Central Business District, will include these blocks in the future.

	SPECIES	DIAMETER		VIGOR		REMARKS
		1977	1978	1977	1978	
Dolores	Plane	7	7	2	2	
	Plane	5	5	3	3	
	Plane	4	5	3	3	
	Sycamore	9	9	2	2	
	Sycamore	6	6	1	2	
	Sycamore	8	8	1	1	
	Sycamore	9	10	2	2	
8th	Myoporum	3	5	1	1	
	Eucalyptus	1	2	1	1	
	Oak	0.5	1	2	1	
	Oak	1	2	1	1	
	Oak	2	2	2	1	
Lincoln	Eucalyptus	4	5	1	1	
	Pine	14	16	1	1	
	Pine	5	6	1	1	
	Sycamore	2	2	3	4	
	Pine	8	10	1	2	
	Pine	25	25	3	3	
	Pine	1	2	1	1	
	Pine	1	2	1	1	
	Pine		0		1	3' tall '78
	Oak	1	1	1	3	
	Oak	0	0	2	4	4' tall '78
Pine	2	5	1	1		

Con't:

	SPECIES	DIAMETER		VIGOR		REMARKS
		1977	1978	1977	1978	
-----Lincoln-----	Cypress	2	4	1	1	
	Pine	1	1	1	1	
	Cypress	0.5	-	1	-	Taken out
	Cypress	0.5	1	1	1	
	Pine	0	1	1	1	
	Pine	10	11	2	2	
	Pine	24	24	4	4	
	Cypress	1	1	1	1	
-----7th-----	Pine	11	14	1	1	
	Pine	12	14	1	1	
	Pine	7	8	2	1	
	Pine	6	7	2	2	
	Pine	17	20	1	1	

PUBLIC NOTICE

The City of Carmel, Forestry Division, is planning to donate trees to residents of the City of Carmel. This program is supplementary to the annual tree seedling give-away program that has been carried out each December for many years.

The Forestry Division has been pleased with the seedling give-away program over the past years and intends to continue it. It has not mattered that the majority of the seedlings have gone to distant places. The effectiveness of this program in helping preserve Carmel's important upper story pine forest has been doubted by the Forestry Commission.

Therefore, the Forestry Division will offer for private residential property within the city limits of Carmel, 25 3 to 5 feet tall well developed trees that will help to improve the upper story forest on private property.

Trees will be given away under the following guidelines:

1. Trees must be planted on private residential property within the City of Carmel.
2. A maximum of two trees per private property lot.
3. Planting locations must be reviewed by the City Forester to determine site suitability.
4. The Forestry Division will deliver trees to residents after January 1st.
5. The applicant will be responsible for planting and maintaining trees.
6. This program is on a first come first serve basis and will end for that year when all trees have been distributed.

TREE SPECIES SELECTION

Monterey Pine

Douglas Fir

Torrey Pine

Deodar Cedar

Coast Redwood

Monterey Cypress





BEACH PLAN REPORT: SPECIFIC RECOMMENDATIONS  
AND DESCRIPTIONS WITH PRIORITIES - OCTOBER 17, 1978

Introduction

The Forestry Commission has held three public meetings and study sessions concerning problems of bank erosion, pedestrian pathways from Scenic and 8th to Scenic and the south city limit line, stairway access, protective fence barriers, directional signing, and landscaping on Carmel's beach and slopes.

The purpose of these meetings was to evaluate all the problems and arrive at specific recommendations for controlling the detrimental effects that have occurred due to intensive use by the public.

After public and Forestry Commission input had been considered, the Commission discussed what should be the primary concerns for restoration of the beach and cliff slopes. The second consideration was that if these primary measures were taken, succeeding work may prove to be unnecessary.

There is no question but that the famed white sand of Carmel's beach is getting dirtier. What are the reasons? Bank erosion, dirt and debris from city streets, dog droppings, fires, and over-use are all reasons for the transformation. Depending on the natural winter tides to cleanse the sand was the answer in years past, but no more. High tides clean the beach for a few short months but most of the year the sand remains dirty. If improvements are made to control shortcuts to the beach, bank erosion should not have serious effects on sand color.

The shrubbery and ground covers that grow on our beachfront are hardy species, adaptable to a variety of climatic conditions. Every effort has been made to improve the health of these plantings and to increase their numbers. As yet our efforts have been futile because of the damages caused by foot traffic on beach slopes. When protective measures are completed, landscaping of all barren areas should correct this problem.

Fires and water run-off from city streets will be the most serious problems that remain. Restricting fires on the beach to certain areas or days may be the answer. A total ban would be more effective. Charcoal and fire blackened sand are a primary cause for the change in sand color. Water run-off, in all likelihood, cannot be controlled. Sweeping of all streets is continuing as in the past years. Even with this effort, dirt and debris still settle in large mud flats after each winter rain. The mud flats should be cleaned as soon as possible following each rain to prevent beach users from mixing the silt with the white sand.

If a conscientious effort is made to coordinate all recommendations in this report, improvements in the beach environs should be significant.

PRIORITY I

Pedestrian Walkway

The Forestry Commission recommends that a pedestrian walkway be developed along the west side of Scenic Drive from 8th Avenue to the southern city limit line. The walkway (5 to 6 feet wide) would utilize existing street pavement as well as curbside land at the top of the beach slopes. Where Scenic Drive is 35 feet wide, or more, the walkway would be constructed in the street. This would reduce construction costs by using existing pavement. Parallel parking would be established outside the walk zone and a vehicular travel zone would be approximately 20 feet in width. (See diagram #1). Where the walk is located in the street, construction of a continuous streetside curb would prevent cars from parking within the pedestrian walkway. Where Scenic is less than 35 feet in width, the walkway should either be constructed in the street by eliminating parking in that area, or by constructing the path adjacent to the existing curblines where sufficient space is available at the top of the beach slopes. A survey of Scenic Drive (See map) estimates that approximately 25 to 30 parking stalls would be eliminated if the walks were to be constructed entirely in the street.

Existing parking would be lost at the following locations if the recommended walkway is located entirely in the existing street right-of-way. (See map).

1. (6 stalls) Scenic and 9th
2. (2 stalls) Scenic between 9th and 10th
3. (3 stalls) Scenic 80 feet north of 10th
4. (5 stalls) Scenic between 10th and 11th
5. (8-14 stalls) Scenic between 11th and center island

Existing parking would be lost at the following location if the recommended walkway is located using both street and areas available at top of slope.

1. (2 stalls) Scenic and 9th
2. (2 stalls) Scenic between 9th and 10th
3. (3 stalls) Scenic 90 feet north of 10th
4. (1 stall) Scenic between 10th and 11th
5. (8-14 stalls) Scenic between 11th and center island.

Type of Walkway

Concrete, blacktop and decomposed granite have been considered as construction materials for the walkway. Blacktop would seem to be the most obvious because it is relatively permanent, blends with the



area better than concrete and is easier to repair. Erosion of a blacktop walk is less likely than with the use of decomposed granite.

### Center Island

The width of the center island between 11th and 12th (See map) should be expanded to the west by 5 feet. This would eliminate vehicular travel on the west side of this island and provide enough area for the pedestrian walkway. The lower limb of the Cypress growing in the center island would have to be removed to provide overhead clearance for large vehicles traveling in the lane on the east side of this tree.

### Protective Fencing

Rustic pole and heavy beam fences should be constructed at curbside at key locations to prevent shortcutting to the beach. This would also provide a margin of safety for pedestrians using the walkway. A low fence would not conceal beach views of the residents on the east side of Scenic. (See design and pictorial samples). Areas of primary concern are:

1. West side Scenic between the 12th Street stairway and the 11th Street stairway. A precipitous drop exists for the entire 350 foot length of this area of Scenic Drive.
2. West side of Scenic from the 11th Street stairway north for 60 feet.
3. West side of Scenic Drive, from 10th Street stairway north for 40 feet.
4. West side Scenic at 9th Street walkway. North for 150 feet and south for 100 feet.

### Stairway Accesses to Beach

All existing stairways should be widened eventually to provide adequate space for passing. At present, all stairs are only wide enough to allow movement one way. This inconvenience adds to the problem of people using the slopes to get to and from the beach. Stair widening should coincide with walkway construction. Two new stairways should be constructed, one at 9th Street and one half way between the 11th and 12th Street stairways.

### Directional Signs

Small rustic signs, some stenciled on fence posts, could be located at key points directing pedestrian traffic to stairways. This would reduce the number of sign posts required.

### Sand Cleanup

Following each winter rain period, beach areas should be cleaned where dirt and debris settle in mud flats due to storm water runoff.

## SUMMARY PRIORITY I MEASURES

The Forestry Commission feels that a walkway and additional and improved stairways would reduce the amount of shortcutting that is now taking place by providing well marked accesses to the beach. If the problem of bank erosion continues, then additional steps would be taken (Priority II) to correct the situation. Under Priority I, the following would be accomplished if the proposals are approved:

- A. Scenic Walkways
- B. Stairway widening and construction of two additional stairways.
- C. Construction of rustic protective fences at hazard and eroded locations including followup landscaping.
- D. Center island reconstruction
- E. Directional signs

## PRIORITY II

### Possible Additional Measures

#### Fencing

If Priority I measures are not successful, additional fence construction is recommended to block access to the beach from Scenic Drive. Several types of fence are considered but no decision has been reached.

- 1. Rustic wooden rail fence
- 2. Steel post and wire
- 3. Individual upright posts designed as a maze

Each design proposed would be positioned at the same slope location. Public input and Forestry Commission comments established that the fence, if constructed, should be built at locations where erosion is most critical and could be built down slope from Scenic Drive. This fence placement would avoid objections by residents in the area. The one problem with this proposal is that erosion could still take place if persons taking shortcuts were to traverse the slope before seeing the fence below them. A fence at the top of the slope would be more effective in preventing initial attempts to use the slopes as shortcuts to the beach. If additional fencing is necessary beyond those recommended in Priority I, then barrier fences will probably have to be constructed on the slope along the entire length of the beach from 8th Avenue to Santa Lucia.

#### Signs

Carefully designed rustic signs at top of slopes are included

in Priority I as a combination warning and directional sign to protect fragile plant life as well as supply information on formal accesses to the beach. Although more signs may be objectionable, their benefits as information to visitors would be valuable. In the Forestry Commission discussions, comments were made concerning disbursement of public information. An effort should be made by the City to develop a good public relations campaign directed at all visitors and citizens. This would educate them to the problem of beach erosion and over-use of the beach environs. An appeal using educational materials would produce a more sympathetic attitude and would, in all probability, improve general compliance.

### Trees

There are 86 Monterey Cypress growing on beach property. Forty-two of these trees have been trimmed and cabled to prevent damage from serious wind storms. All cypress trees on Scenic Drive and Del Mar have been watered and fed with slow release fertilizers to improve their vigor. The annual fertilizing program is coincidental with our spray programs for control of Cypress Tip Moth in February of each year. There is no question that the intensive maintenance that these trees have received over the past seven years has improved their health.

Of the seventeen Monterey Cypress trees located in the right-of-way on Scenic Drive, all but eight have had the planters surrounding them increased in size. The remaining eight trees should have new planters constructed around them. The increased size of planters will prevent future vehicular damage and will allow us to fertilize these trees each year.

Efforts to increase the cypress population should be addressed as soon as work is completed under Priority Phase I. The Forestry Division has planted numerous trees, but due to continuing vandalism and trampling by people using the beach, they have not survived.

### Landscaping

Additional landscaping using low ground cover and much larger shrubbery plantings on the slopes adjacent to fences is recommended, if these additional fences are needed. Dense plantings would screen the unnatural fences, but would compound the policing problems of litter, transient use for overnight sleeping and use as outdoor restrooms. Views may be significantly obstructed in later years and severe competition between dense growth and fragile native plant species and our scenic Monterey Cypress can be expected. These are all problems that the Forestry crews have experienced in the past.

### Sea Walls and Retaining Walls

Additional sea walls would be very expensive and definitely places the greatest strain on city labor forces. If the city desires to protect and maintain a beach front that is reasonably natural in appearance, then additional walls should be avoided. As was stated in the Forestry Commission meetings, "if sea walls and retaining walls are constructed as our only way to prevent degradation of the beach

environs, then Carmel's beach will take on the appearance of any waterfront city in Europe".

Sea walls constructed in past years were necessary because of severe bank erosion that had eliminated sub-surface support for Scenic Drive. The sea wall reconstruction at Scenic and 13th Avenue has been finished and placement of large rocks on the embankment at Scenic and 12th Avenue is also completed. Major construction plans have been accomplished. The most critical erosion areas have now been protected by these walls; however, some protection is needed at Scenic and 10th where the stairway has been demolished by wave action. Three large Cypress trees have been undermined at this location.

### Ordinances

New ordinances prohibiting shortcuts to the beach or ordinances that restrict beach use by certain interest groups such as skin divers or surfers are not effective and should not be considered. Such ordinances "only add fuel to the fire" and result in alienating the public. Many ordinances either cannot be enforced due to their broad scale or because of a lack of manpower to make them effective. A good public relations program pointing out the problems and the detrimental results of over use and abuse will get the desired support. The City of Carmel would be far better off developing a good rapport with local organizations and citizens groups to reach their desired goals of improving the conditions on their famed beach.

## FORESTRY AND PARKS PLAN

### MINI-PARKS - GREENBELT IMPROVEMENTS - PARKS AND RECREATION

MAY 1981

A request was made to the City Forester, by the Carmel Planning Commission, for a long-range plan of mini-park development, and roadside, parks and greenbelt improvements. The following plan is aimed at providing a long-range description of proposed open space improvements for existing City trees located in street rights-of-way, parks and recreational lands. The goals of the Forestry Commission and the Forestry Division of the Department of Public Works for general greenbelt improvements will also be explained in this Plan. Greenbelt improvements involve any future park developments in P-1 or P-2 zones, as well as roadside areas where reclamation of greenbelt is needed. Within the three separate elements of circulation, conservation and open space of the General Plan for the City of Carmel, various policies are stated which the Planning Commission feels should be guidelines for the City. These policies are considered throughout this Plan.

#### Mini-Parks

A mini-park is a large planter approximately eight feet by 23 feet, the size of a single parking stall, and generally oval in shape. It is located in the Central Business District or commercial zone where the formal rock curbing and sidewalk blend harmoniously with the mini-park's rock curb borders. All mini-parks in the Central Business District are constructed with a six-inch high permanent rock curbing and an 18-inch wide gutter storm water flow line.

Landscaping materials consist of imported soil, rock and various shrubs, flowers and trees not necessarily indigenous to the Carmel area. Maintenance procedures required for a mini-park include watering, fertilizing, spraying and removing litter during the first calendar year. After the plants have established themselves in the landscape, periodic watering, spraying and cleaning up is accomplished on a "need to" basis.

There are 11 established mini-parks, four of which absorbed existing parking stalls, in the Central Business District at the following locations:

1. W/Monte Verde between Ocean and 7th (mid-block)
2. E/Lincoln between 5th and 6th (mid-block)
3. S/W Dolores and 6th
4. E/Dolores between Ocean and 7th (mid-block) (one stall absorbed)
5. W/Dolores between Ocean and 7th (mid-block) (one stall absorbed)

6. E/San Carlos between Ocean and 7th (mid-block) (one stall absorbed)
7. N/W San Carlos and 5th
8. E/San Carlos between 4th and 5th (mid-block) (one stall absorbed)
9. N/6th between Torres and Junipero
10. S/4th between Dolores and San Carlos (mid-block)
11. E/San Carlos between 7th and 8th (mid-block)

Ten additional mini-parks are proposed for the Central Business District. These new mini-parks will not eliminate any parking stalls and will encompass existing trees now growing in street rights-of-way. They are proposed for the following locations:

1. W/Monte Verde, 50 feet South of 7th (existing Monterey Pine) Completed October 1979.
2. W/Monte Verde, 20 feet North of 7th (existing Monterey Pine and Eucalyptus) Completed September 1979.
3. W/Lincoln, 40 feet North of 6th (two existing Monterey Pines)
4. W/Lincoln between 7th and 8th (existing Monterey Pine) (completed Feb. 1978)
5. W/Lincoln, mid-block between 7th and 8th (two existing Monterey Pines) (Completed Feb. 1978)
6. W/Dolores, 20 feet North of Ocean (existing Monterey Pine) ( Completed Dec. 1977)
7. E/Mission, mid-block between 5th and 6th (existing Monterey Pine) ( Completed Sept. 1976)
8. N/W Junipero and 7th (existing Coast Live Oak and Monterey Pine) (Completed Oct. 1978)
9. N/W Junipero and 6th (existing Coast Live Oak)(Completed Feb. 1978)
10. S/8th, mid-block between Mission and San Carlos (existing Coast Live Oak)(Completed Feb. 1978)

In addition to the mini-parks proposed to protect existing trees in street rights-of-way, additional mini-parks should be developed in the Central Business District to provide large planters for the indigenous Monterey Pine. This particular species requires a much larger planting space than the typical four-foot square sidewalk planter normally provided for street trees.

An examination of the commercial district reveals that there are approximately 97 large City-owned Monterey Pines remaining in the central core. Advancing age and the lack of adequate growing space will rapidly reduce this total until very few, if any, large veteran pines will remain. If this is allowed to occur, the Central Business District will be void of the large Monterey Pines which make our community so uniquely attractive. To retain and improve this unique forest characteristic, a program to establish large planters randomly spaced throughout the Central Business District is needed.

## Residential Tree Planters - Existing Trees in Rights-of-Way

Along many streets throughout the residential zone, there are old established trees located in the middle of the street rights-of-way which need protection. Many of the trees have asphalt pavement to the very edge of the tree's base. There is no delineation between what is growing area and what is roadway or free travel zones for vehicles.

These trees should be freed from unnecessary paving and provided with planter areas of significant size to improve the growing environment. Planter borders would be of blacktop berm to create an informal atmosphere, wherever possible, instead of the formal rock curbing commonly found in the Central Business District. These planters would adequately delineate actual roadway from growing area, thereby creating improved conditions for the motorist.

This plan is in keeping with the recommendations for residential street design set forth in Carmel's General Plan which states:

It should continue to be Carmel's policy to avoid rectilinear streets by diverting pavement around trees and, where feasible, encouraging irregular greenbelts on either side of somewhat curvilinear paved areas. This permits greater diversity of landscaping in the greenbelt areas and produces attractive, meandering streets.

Following is a list of locations of trees in rights-of-way in the residential zones. All the trees on this list need increased growing spaces. (These have all been completed as of June 1978)

1. Camino Del Mar parking lot and Scenic (15 Monterey Cypress) Del Mar Parking lot planters completed Sept 1977
2. Guadalupe and 4th, center of street (oak cluster) (Completed August 1976)
3. S/W Santa Fe and 8th (24-inch Monterey Pine) (Completed Aug. 1977)
4. W/Lincoln at 13th, center of street (38-inch Monterey Pine)
5. E/San Carlos at 10th, center of street (two Monterey Pines) (Completed August 1976)
6. E/San Carlos at 11th, center of street (two 12-inch Monterey Pines) (Completed August 1976)
7. E/Mission, 30 yards South of 10th (24-inch Monterey Pine)
8. Monterey at 2nd, center of street (30-inch Monterey Pine) (Completed Sept. 1977)
9. 2nd between San Carlos and Dolores, center of street (24-inch Monterey Pine) (Completed March 1976)
10. 1st between Dolores and San Carlos, center of street (24-inch Monterey Pine)

11. 4th between Perry Newberry and City limits, center of street (oak cluster) (Completed Sept. 1977)
12. Center of Perry Newberry and Escolle, center of street (oak cluster) Completed August 1979.
13. 10th and Camino Real, center of street (38-inch Monterey Pine) Completed August 1979.
14. Mountain View and Crespi, center of street (24-inch Monterey Pine)
15. E/Guadalupe, 30 feet North of 7th (24-inch Coast Live Oak) (Completed March 1978)
16. 4th between Santa Rita and Santa Fe, center of street (oak cluster and Monterey Pine)(Completed August 1976)
17. 4th between Santa Fe and Torres, center of street (24-inch Monterey Pine)
18. S/E Lorca and Junipero, center of street (24-inch Monterey Pine)
19. E/Carpenter at 6th, center of street (oak cluster)

During the past four years, six residential tree planters were established which encompassed trees growing in street rights-of-way. The locations of these planters are:

1. Lincoln and 3rd, center of street
2. Torres between Mt. View and 8th, center of street
3. N/9th between Lincoln and Monte Verde
4. Guadalupe and 4th, center of streets
5. S/11th between Camino Real and Carmelo
6. N/11th between Carmelo and San Antonio

Since the planters were established at these locations, the traffic flow has improved, the accident rate has decreased and the health of the trees has improved significantly. In some instances, seedlings have been planted near the established trees. The growth habits and health of these trees are exceptionally good, and only minimum maintenance of these small greenbelt zones is necessary.

#### Greenbelt Improvement - Residential Street Design

Members of the Carmel Citizens Committee, the Parking/Traffic Committee and private citizens have requested that a policy or a plan be developed to control high speed vehicular traffic in the residential community. Solutions such as stop signs at all intersections, speed limit signs, roadway bump strips and intensified police surveillance have been suggested to the Forestry Commission.

The reaction of the citizens to these solutions was that they would rather have high speed vehicular traffic than allow the installation of more stop and speed limit signs. The speed bump strips were not considered because of the legal ramifications which might follow if accidents or personal injuries occurred due to the installation of these strips. Further, the Forestry Commission is



fully aware that traffic sign recommendations are not within their jurisdiction, but are the responsibility of the Parking/Traffic Committee.

Combining all the pertinent material, the Forestry Commission developed a plan to improve pedestrian safety in the residential community. The plan involves expanding the greenbelt in the middle of, or along, residential streets, thereby reducing traffic speed and eliminating the need for additional signs. This proposal was designed to meet several recommendations found in both the Carmel General Plan and the Carmel Forest Management Plan.

Specifically, the "Greenbelt Improvements Plan" involves removing pavement along east and west-bound streets in the Southwest portion of the City to reduce traffic speeds to a tolerable level. This portion of the residential community has several specific characteristics which are directly related to high speed traffic. Most east/west streets in this Southwest section are access streets to the beach. These streets parallel Ocean Avenue. Further, these streets are much broader than most streets in the residential district.

The description of Street Design in the General Plan states, "Excluding major routes, a maximum paved width of 30 feet should be established, with the remaining right-of-way devoted to open space and footpaths as far as practicable." With this in mind, the Forestry Commission decided to focus their plan on the idea of removing street pavement in the center of blocks, either on the side of the roadway or in the center between the lanes of traffic. Specifically, they feel the following results will be achieved:

1. A return to the Carmel tradition of diverting pavement around trees.
2. A change from the rectilinear street contours and wide thoroughfares. Street rights-of-way will be kept well within the 30-foot maximum to allow for irregular greenbelt contours.
3. A reduction in street widths between intersections to slow traffic speed.
4. An increase in the planting space for native plant species which will blend into the natural surroundings, and areas returned to uncultivated roadside greenbelt void of parking strips.

On 17 July 1973, the Forestry Commission initiated a plan for Mini-Parks - Center of Streets which involves every east/west street (8th to 13th) between San Carlos and San Antonio. The greenbelt improvements are intended to beautify the streets, as well as slow down speeding vehicular traffic. Not every block is involved, but several locations will be chosen on a particular street. The schedule for development is "as time allows", so the long-range estimate is for ten years, unless some overriding need arises.

## Parks - Greenbelts - Recreation Facilities

Within the City limits, there are several designated greenbelt areas. Forest Hill Park has already been established and serves a few of the needs of the community. However, restrictions for this particular park prevent the development of any facilities other than tennis courts and a playground. It is basically a permanent greenbelt or natural preserve, zoned P-2.

Nearly all the parks presently developed serve the purpose of passive recreation. They do not offer any recreational facilities, rather they provide places for the public to sit on benches or walk about. Undisturbed greenbelt areas are a necessary and integral part of our community park system. But just as important is our responsibility to supply recreational facilities for all our residents - young and old alike. Plans could be formulated to provide recreational facilities or services for all neighborhoods immediately surrounding public park lands. The parks should provide for the needs of all age groups, and should include equipment such as horse shoe pits, playgrounds with wooden swings and climbing apparatus, benches, etc.

Two zoning classifications for Park and Recreational Districts have been established and are defined in the Municipal Code. Zone P-1 is defined as "publicly owned lands, parks or beaches, primarily preserved in their natural state for the enjoyment of present and future generations". Such areas must remain in a natural state "with the addition thereto of only such improvements and maintenance as would enhance such natural state, or enable the better enjoyment thereof".

The five areas zoned P-1 are: Carmel Beach; Block 84, Lot 27 (the corner of Forest Road and Mountain View Avenue); Block 28, portions of Lots 17 and 19; approximately 1.3 acres at Carpenter and Highway One; and Mission Trail Park. The Rowntree Memorial Arboretum was established on 1.3 acres of the Mission Trail Park in August of 1980. The Arboretum is located adjacent to the Flanders Mansion and is part of the Mission Trail Property. These five parklands are designated as permanent greenbelts which cannot be improved except when the City Council determines that such improvements are "essential for public health, safety or welfare".

Zone P-2, Park Recreation Purpose, are those "appropriately located areas for recreation and recreational facilities needed by the residents of the City and the surrounding area". The uses allowed in Zone P-2 are, "All uses permitted in District P-1 and in addition thereto, facilities and structures devoted to public recreation". Of the four areas designated P-2, only Forest Hill Park has been utilized. The southern portion of Forest Hill Park, which was previously used as a city materials yard has been converted to a recreational facility for children and adults. The park was completed in October of 1980. The remaining three P-2 zones provide no recreational facilities and none are planned.

The remaining three P-2 zones which can be developed are Devendorf Park, Forest Theater, and the Picadilly Nursery property. Long range plans and a policy statement describing Carmel's direction in providing recreational facilities for its citizens is sorely needed.

Responsible park planning requires that careful study be made, spelling out the segments of the community to be considered, the facilities appropriate for each segment, and how and where the facilities will be located.

Major publicly owned park lands are fairly evenly distributed throughout the City. Forest Hill Park, in the north section, was developed as a multiple use facility for all age groups and was completed in October of 1980. Situated within a meadow and tree-covered setting, both active and passive recreational facilities are available. This new park still retains the natural greenbelt appearance of the northern portion of the park. Wooden playground equipment constructed from heavy poles, horse shoe pits and park benches fill the needs of the users. Existing footpaths have been improved to make access easier. A Par Course physical fitness trail extends through the entire park. It is 4280 feet in length.

Both Forest Theater and Mission Trail Park are located in the southeast portion of Carmel. Forest Theater could be expanded by adding some recreational equipment such as horse shoe pits and benches. The Mission Trail Park is presently a nature preserve, providing hiking trails for those who wish to walk and observe nature. Carmel Beach, zone P-1, is in the southwest section of Carmel, but there is no area available where a recreational facility can be developed. The beach is to be retained as a natural greenbelt zone, undeveloped except for structures or improvements which would benefit public health, safety or welfare.

#### Neighborhood Parks

Ideally, a parks and recreation system should provide at least one acre of parkland for every one hundred people in a community. Obviously such is not possible in Carmel with its high density population and small land area. An alternative, however, is to provide a series of neighborhood parks located on vacant lots within the residential community. These could be purchased by the City for P-2, Recreational Parks purposes, in each of the four sections of town and developed into modest recreational parks. They could be equipped with some of the facilities previously mentioned, such as shuffleboard courts, horse shoe pits, wooden playground equipment, wooden swings and park benches. A list of vacant lots, centrally located in various sections of the City which could be used as neighborhood parks follows:

#### Southwest Section

1. Block 109, Lots 1-11 and 2, 10, 12 and 14  
9th Avenue easement between Junipero and Mission

#### Southeast Section

1. Block 101, Lot 13  
East side of Santa Fe at 9th

Northeast Section

1. Block 46, Lots 6, 8, 10, 12 and 14  
East side of Santa Fe between 4th and 5th

Northwest Section

1. Block 29, Lots 7, 9, 11, 13 and 15-20  
3rd Avenue easement between Dolores and San Carlos
2. Block 31, Lots 1 and N½ 2  
Southwest corner Lincoln and 2nd
3. Block 32, Lot 20  
Northeast corner Monte Verde and 4th

The General Plan for Carmel, section "Present Open Space", page VIII-3, states, "Forest Hill Park should be developed as a park and playground through community cooperation". Under "Recreation", on page VIII-5, the Plan states, "The majority of open space land in and around Carmel is dedicated to outdoor recreational pursuits... the beach, tennis courts, Forest Hill Park, Devendorf Park, Forest Theater, and Mission Trail Park are all recreation sites". The descriptions of these public lands and ideas for their development have been mentioned. What is needed now is a thorough study of these park lands, and a long-range plan and policy statement for future development.

By December of 1980, the Forestry Commission had implemented all the recommendations in Carmel's General Plan concerning "Present Open Space." Forest Hill Park is now a multi-use recreational facility for the younger and older residents of the community. It was completed in October 1980. The Mission Trail Park was established as a nature preserve and was completed in June of 1979. In August of 1980, the Forestry Commission approved the establishment of a native plant arboretum on 1.3 acres of the park property near the Flanders Mansion. This unique area was opened to the public in April 1981.

Park projects that may be developed in the future are the Forest Theater grounds and the Picadilly Nursery property.

Approved by the Carmel Forestry Commission  
May 1981

## Mission Trail Park

The Carmel Forestry Commission has designated Mission Trail Park as a nature park. All recreational activities are to be passive. Activities such as nature walks, jogging, picnicing, and bicycling are acceptable; other formal or active recreational uses by the public are considered not in keeping with the park's character. The Forestry Commission feels that the designation of Mission Trail Park as a natural forested area providing quiet and aesthetic beauty for the citizens of Carmel is essential. Future additions or inclusions of any formal recreational facilities would detract from the park's character and could institute a policy of increased use. Therefore, the Forestry Commission feels that only those activities designated as proper and consistent with the park's theme of quiet solitude are to be allowed.

In the future, maintenance will be directed at removal of dense thickets of brush, such as genista which pose a fire hazard, reforesting where brush has been removed, maintaining trails in a safe and usable condition and practicing good forestry techniques to keep the park free of disease and/or hazardous trees.

The property south of the Flanders Mansion driveway was rezoned P-2. This location is the site of the City's Arboretum. The site is approximately 1.3 acres in size. In the future it is hoped that the City's nursery will be located south of the arboretum and east of the Flanders Mansion. The arboretum and the proposed nursery will be open to the public. Development of the nursery will require extensive grading and the establishment of a driveway access from Martin Way to the nursery. Footpaths, sprinkler systems, and greenhouse should be constructed to complete this project.

When all required development work is finished, Mission Trail Park will be completed. Maintenance and reforestation projects will be accomplished during each winter season so that the forested character of the park is maintained.

Approved by the Carmel Forestry Commission  
August 1979

## FOR YOUR SAFETY

Poison oak is one of the most abundant plant communities within the park. Stay on the trails to avoid contact with it.

Fires are prohibited anywhere in the park.

Picnicking is allowed in areas where trash containers or benches are located.

Motorized vehicles of any type are prohibited within the park. Bicycles are permitted.

Collecting is not allowed within the park. Preserving the plant and animal communities in their natural state is our most important goal. Please do not remove, collect or disturb any natural objects such as plants, wood, rocks or flowers.

Trails traverse every area of the park. To avoid damage to vegetation please remain on the trails shown on the map.

Gregory D'Ambrosio  
City Forester

*The last remaining example of the natural flora of the Carmel area can be found within the park. Stately pines, oaks and a pure stand of Toyon dominate the northern reaches of the park, while a dense stand of willow shrouds the low-lying flood plain to the south.*

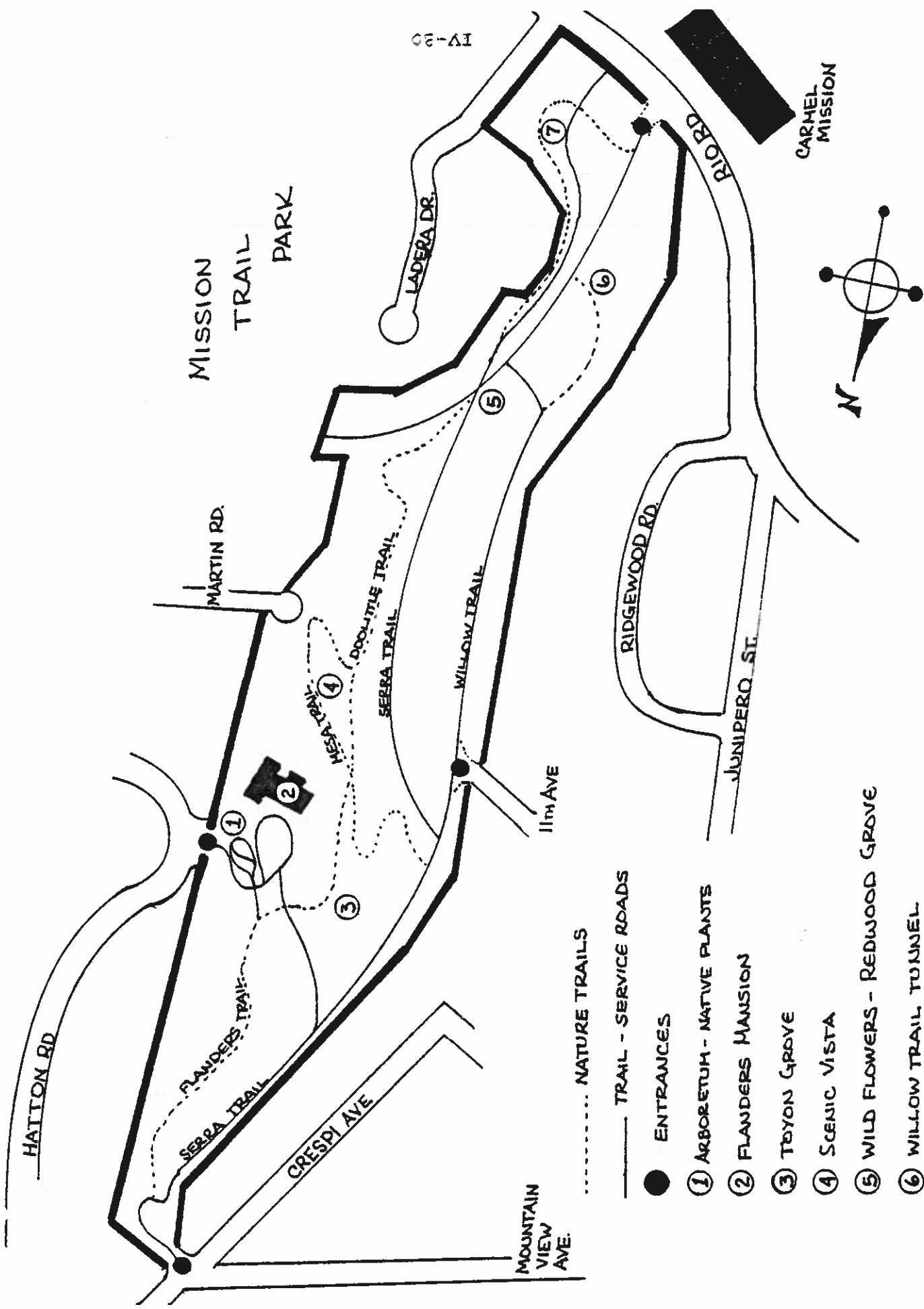
*During any season of the year, displays of native grasses, trees, shrubs and wildflowers can be viewed as one hikes along the five miles of trails within the park boundaries. Each new season announces the coming of subtle alterations in the character of the park's vegetation and provides new color displays for the avid or occasional hiker.*



WELCOME TO

# Mission Trail Park

Mission Trail Park was designated a nature park in 1976. The park boundaries encompass 35 acres of unspoiled native vegetation. Entrances are at Mountain View & Crespi, 11th St. and Junipero, Rio Road across from the Mission, Hatton Road at Flanders Driveway.



..... NATURE TRAILS

— TRAIL - SERVICE ROADS

● ENTRANCES

① ARBORETUM - NATIVE PLANTS

② FLANDERS MANSION

③ TOYON GROVE

④ SCENIC VISTA

⑤ WILD FLOWERS - REDWOOD GROVE

⑥ WILLOW TRAIL TUNNEL

⑦ MISSION VISTA - WILD POPPIES

***Prunus lyonii***

Catalina Cherry  
Evergreen shrub or trained as a tree will reach 45 ft. with a 30 ft. spread. Leaves dark green, smooth margined or faintly toothed. Profusion of creamy white flower spikes 4-6 in. long appear Apr.-May. Large-stoned fruits ripen in Aug.-Sept.

***Rhamnus californica***

Coffeeberry  
Low and spreading or upright evergreen shrub 3-15 ft. tall. Dark green oblong, 3 in. leaves contrast nicely with reddish stems. Insignificant, small flowers in clusters are followed by large green berries, turning red and finally black when mature.

***Rhus ovata***

Sugar Bush  
Upright or spreading shrub 2½-10 ft. high. Glossy, leathery leaves, somewhat trough shaped, have pointed tips. White or pinkish flowers in Mar.-May followed by small reddish hairy fruits coated with a sugary secretion.

***Ribes sanguineum***

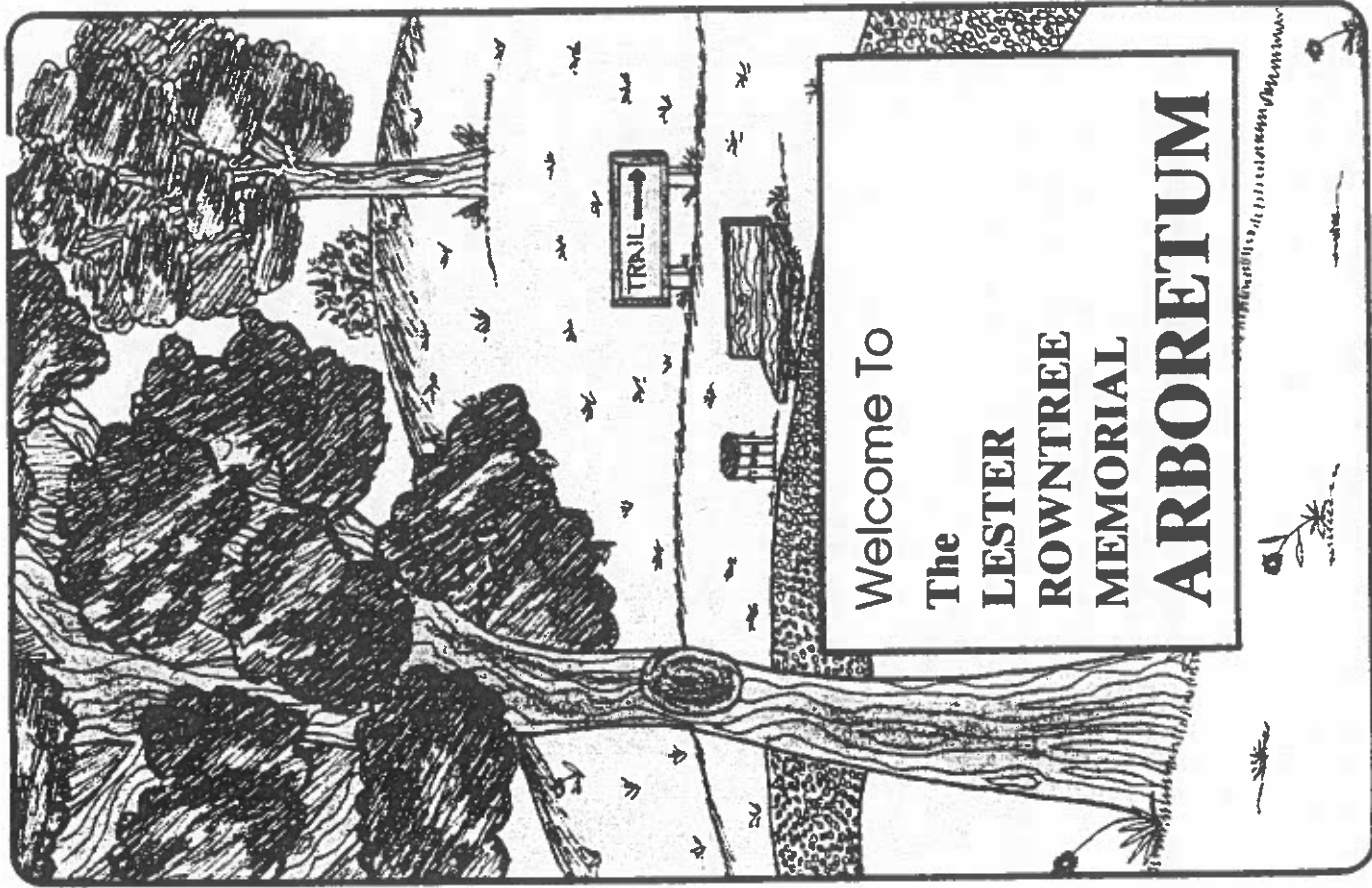
Red Flowering Currant  
Deciduous, multi-stemmed shrub 4-12 ft. tall. Leaves are wide, maple-like. Deep pink or red drooping flower clusters appear Mar.-June, followed by blue-black berries.

***Ribes viburnifolium***

Evergreen Currant  
Low growing evergreen to 3 ft. high, sprawling to 12 ft. wide, with low arching or half-trailing wine-red stems. Leaves leathery, roundish, dark green, 1 in. across. Fragrant after a rain. Flowers light pink to purplish, in Feb.-Apr. Berries red.

***Romneya coulteri***

Mattilija Poppy  
Spectacular, multi-stemmed plant to 8 ft., many stemmed at base. Can be very invasive. Stems and deeply cut leaves are grey-green. Flowers, up to 9 in. across, have white crepe-paper like petals surrounding a large cluster of golden stamens. Fragrant. Blooms June-July.



Welcome To  
**The  
LESTER  
ROWNTREE  
MEMORIAL  
ARBORETUM**



# THE LESTER ROWNTREE MEMORIAL ARBORETUM

Gertrude Ellen Lester Rowntree, born in Penlth, England, in 1879, was a Carmel resident from 1925 until her death in February, 1979. She was a renowned naturalist, gardener, author and lecturer, and a pioneer in cultivation of native plants.

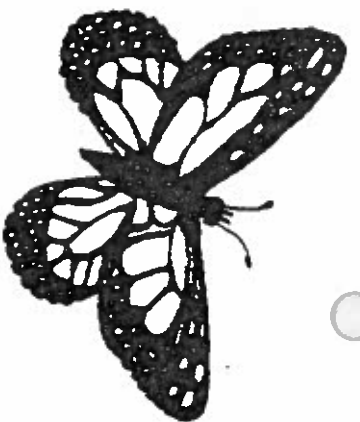
Lester Rowntree was founder and honorary life president of the California Native Plant Society, which was organized for the purpose of educating the public to the importance of preserving our natural flora, and encouraging its propagation. Lester's own Carmel Highlands garden was a testing ground for the seeds and cuttings of natives, which she collected from all over the West.

Memorial contributions in Lester's name were used to start this small native plant arboretum. It is a cooperative project of the Monterey Bay Chapter of the California Native Plant Society and the City of Carmel, under the direction of City Forester Greg D'Ambrasio. It is part of Carmel's Mission Trail Park, which is on land formerly owned by the Flanders and Doolittle families. The garden was designed by Native Plant Society member Alice Mendy. Trail work was done by summer Forestry students, and members of Carmel Boy Scout Troops #3 and #32.

The California native plants listed in this guide and spotted along the trails are only a few of the many now available from most commercial nurseries. Advice in the use of natives in cultivated gardens is available from landscape gardeners and nurseries specializing in this field. A wealth of reading material is also available in libraries and book stores. To name a few:

- SUNSET GARDEN BOOKS, and SUNSET MONTHLY MAGAZINE, Lane Publishing Company.
- GROWING CALIFORNIA NATIVES, Barbara Schmidt. (Paperback)
- HARDY CALIFORNIANS, Lester Rowntree. A paperback reprint.
- FLOWERING SHRUBS OF CALIFORNIA, Lester Rowntree. (Library only)
- FREMONTIA, quarterly journal of the California Native Plant Society.

The office of the California Native Plant Society is at Suite D, 2380 Elsworth, Berkeley, CA 94704. Monterey Bay chapter meetings, field trips and plant sales are publicized in local papers. All activities are open to the public. Mail address is P. O. Box 221303, Carmel, 93922



## *Mimulus bifidus*

Plumas Monkey Flower

Perennial shrub, much branched from base, to 4 ft. high. Narrow, glossy, dark green leaves. Large, pale yellow to peach pink flowers are remindful of a monkey's face.

## *Myrica californica*

Pacific Wax Myrtle

Large shrub or tree to 30 ft. tall with upright trunks. Toothed dark green leaves densely clad the branches. Flowers inconspicuous, forming purplish nuzzets coated with wax.

## *Penstemon heterophyllus purdyi*

Blue Bedder Penstemon

Perennial, upright or spreading 1-2 ft. shrub with narrow, dark-green pointed leaves. Spikelike clusters of flowers vary from rosy lavender to intense gentian blue, April-July.

## *Polystichum munitum*

Swordfern

Forms clumps of leathery, shiny, dark green fronds 2-4 ft. long. Old plants may have 75-100 fronds. Valued as background plant in shady situations.

## *Potentilla fruticosa*

'Gold Drop'

Much branched deciduous shrub 2 ft. high, 3 ft. wide. Leaves are distinct green, divided into 3-7 leaflets. Deep yellow 3/4 in. flowers. June-Oct.

## *Prunus ilicifolia*

Hollyleaf Cherry

Evergreen shrub or small tree of moderate growth to 20-30 ft., usually broader than high. Mature leaves deep, rich green, resembling holly. New leaves from March to May are light green. Creamy white, 1/2 in. flowers in 3-6 in. spikes appear in March followed by small, round green fruits that turn to reddish purple.

## *Fremontodendron mexicanum*

Southern Flannel Bush  
Evergreen shrub or small tree, 6-20 ft. tall. Leathery, dark green 1½ in. leaves are deeply lobed. Yellow tinged orange flowers appear throughout the year but peak in mid-Spring.

## *Gaultheria shallon*

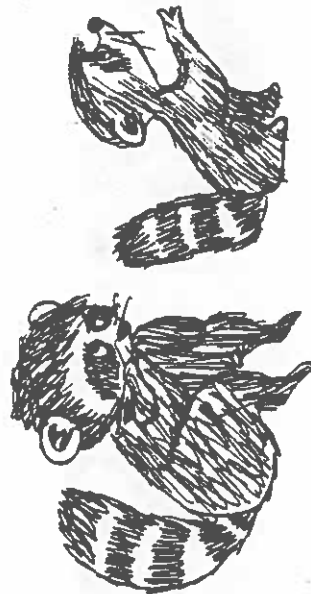
Salal  
Evergreen shrub or shrublet, usually to 2 ft., rarely attaining 5 ft. under ideal coastal fog conditions. Nearly round, bright glossy-green leaves. White or pinkish bell-like flowers in Mar.-June. Edible black fruit resembles large huckleberries, and is favored by birds.

## *Iris douglasiana*

Douglas' Iris  
Forms clump of long, dark green, strappy leaves. Several 2 in. blossoms per stem appear in early Spring. Flowers usually vary between lavender to deep reddish purple, but occasional strains appear paler, including creams and yellows.

## *Lyonothamnus floribundus asplenifolius*

Fernleaf  
Catalina Ironwood  
Evergreen tree of moderate growth to 30-60 ft., with 20-40 ft. spread. Leaves are deep, glossy green above, gray-hairy beneath, and divided into 3-7 deeply notched leaflets. Shredding grey bark peels to expose a twisted, red-brown trunk. Small white blossoms in large clusters in early Summer.



The arboretum is intended as a quiet retreat where we can all enjoy the beauties of nature. Please help us keep it this way by:

- Leashing your dog before entering.
- Staying on the trails.
- Refraining from removing, collecting, or disturbing any natural objects.
- Taking home your picnic litter.

If you can make use of this guide you are welcome to keep it. Otherwise, please replace it in the box at the entrance as you leave.

Plant descriptions were done by *Kandi Holt*, a student in the *Regional Occupation Program at Carmel High School*, assisted by *California Native Plant Society member Frances Ciesla*. *Drawings are also by Kandi.*



# Native Plants

## *Arctostaphylos densiflora*

Vine Hill Manzanita

'Howard McMilln.' Grows in mounds 2½ ft. high and spreads as much as 7 ft. in 5 years. Outer branches take root if in contact with soil. Bark is smooth reddish-black. Leaves light or dark green, glossy. Flowers white or pink.

## *Arctostaphylos hookeri*

Monterey Manzanita

Slow growing to form dense mounds 1½-4 ft. high, spreading to 6 ft. and more. Oval, bright, glossy green leaves. Flowers white to pinkish. Fruit bright red, shiny. Bark reddish-brown, smooth.

## *Arctostaphylos uva-ursi*

Bearberry

Prostrate, spreading and rooting as it creeps to 15 ft. wide. Bright, glossy green, leathery leaves, turning red in winter. Flowers white or pinkish. Fruit bright red or pinkish.

## *Atriplex lentiformis breweri*

Brewer Saltbush

Quail Bush. Almost evergreen, densely branched shrub 5-7 ft. high, 6-8 ft. wide. Valued for its bluish-gray oval leaves. Flowers and seeds attract birds. Fire resistant.

## *Baccharis pilularis*

Dwarf Coyote Brush or Dwarf Chaparral Broom

Dense, rather billowy mat of bright green, small toothed leaves, growing 8-24 in. high and spreading 6 ft. or more. Valued as a ground cover on slopes. Drought tolerant.

## *Calycanthus occidentalis*

Spice Bush

Deciduous shrub 4-12 ft. high. Bright green leaves turn yellow in Fall. Flowers are reddish-brown, like small water-lilies, appearing in April-August.

## *Ceanothus griseus*

'Louis Edmunds'

Grows 5-6 ft. tall, 9-20 ft. wide. Bright glossy-green 1 in. leaves. Flowers in medium sea-blue, 1 in. clusters.

## *Ceanothus*

'Joyce Coulter'

Spreading growth 2-5 ft. high, 7-9 ft. wide. Dark green 1½ in.-long leaves. Flowers deep blue in 1 in. clusters.

## *Ceanothus*

'Julia Phelps'

Grows 4½-7 ft. high with a spread of 7-9 ft. Small dark green crinkled leaves are thickly set on branches. Reddish buds are followed by 1 in. clusters of dark indigo blue flowers that dazzle the eye. One of the best bloomers.

## *Ceanothus*

'Roy Hartman'

One of the largest ceanothus, 10-18 ft. tall, 12-15 ft. wide, may be trained as a small tree. Dark green, 2-3 in. leaves. Flower medium blue in 3-5 in. clusters.

## *Ceanothus rigidus*

'Snowball'

To 6 ft. high, 12-16 wide. Small, dark green leaves. Flowers in white puffs ¾ in. across.

## *Ceanothus thyrsiflorus*

Blue Blossom

One of the large ceanothus, 6-21 ft. tall, 8-30 ft. wide. Leaves glossy, medium green. Flowers light to dark blue in 3 in. clusters.

## *Ceanothus thyrsiflorus repens*

Creeping Blue Blossom

A creeping hardy low growing plant a few inches high and many feet wide. Flowers pale blue, leaves dark green.

## *Crossosoma californicum*

Erect deciduous shrub, somewhat tree-like, 3-15 ft. tall with grey-brown branches, pale green, oblong leaves, with numerous, white 1 in. flowers. Blooms Feb.-May. Native to the California Channel Islands.

## *Dendromecon harfordii*

Island Bush Poppy

Rounded or spreading large shrub or small tree to 20 ft. Leaves deep green, 3 in. long. Flowers are bright yellow and poppylike in appearance. Scattered bloom throughout the year.

## *Eriogonum giganteum*

St. Catherine's Lace

Spreading evergreen shrub with grayish, feltly-white oval leaves. Blossom heads are flatish, 3-6 in. across, of rounded clusters of white or pale-pink flowers held high above the foliage on slender stems, and turn shades of tan or rust in the Fall.

## *Eriophyllum staechadifolium*

Lizard Tail

Many branched shrub 1 to 5 ft. high and as wide, with divided dark green leaves that are white woolly beneath. Golden yellow, ¼ in. daisy like flowers bloom in flatish clusters on the branch tips in late Spring.





### RULES FOR FOREST HILL PARK

Fires are prohibited anywhere in the park. Picnicking is allowed anywhere in the park. Trash containers are available. There are no picnic tables. Collecting is not allowed within the park. Please do not remove, collect or disturb any natural objects such as plants, wood, rocks, or flowers. Dogs are not allowed in the park.

### RULES FOR HORSESHOES AND SHUFFLE BOARD

Horseshoes may be played at any time. Those interested should provide their own equipment. Shuffle Board. Please contact Carmel Forestry Division at 624-3543.

**EMERGENCY CALLS** Ambulance 624-1718  
Police 624-6403  
General 911

A public phone is located at the Shuffle Board Court Club house.

# WELCOME TO Forest Hill Park

LOCATED AT  
INTERSECTION OF CAMINO DEL MONTE AND JUNIPERO

## PARK HISTORY

The land on which the park is located was originally owned by the old Forest Hill School and deeded to the City of Carmel in 1941. The area originally was a shallow forested canyon with a small creek channel running from northeast to southwest. Portions of the old creek still exist in the park today. The city used this property as a land fill site until 1972 when filling was halted. In 1962 the City fathers began discussions on developing this area into a community park but it was not until 1978 that formal drawings were developed. In August 1979, work was begun on the southern portion of the park and it was completed in July of 1980.

## PARK FEATURES

Forest Hill Park was designed as a refuge for young and old alike. The theme is one of natural vegetation settings designed into and around recreational activities. It is the first recreational park in Carmel. The park features shuffle board courts and adjoining club house, horse shoe pits, a 4200 foot par course physical fitness trail, a children's playground, and tennis courts. Tennis courts are located in the northeast portion of Forest Hill Park near Lorca Lane. There are two restroom facilities. One is located near the tennis courts and the other is located in the club house behind the shuffle board courts.

## PARK HOURS

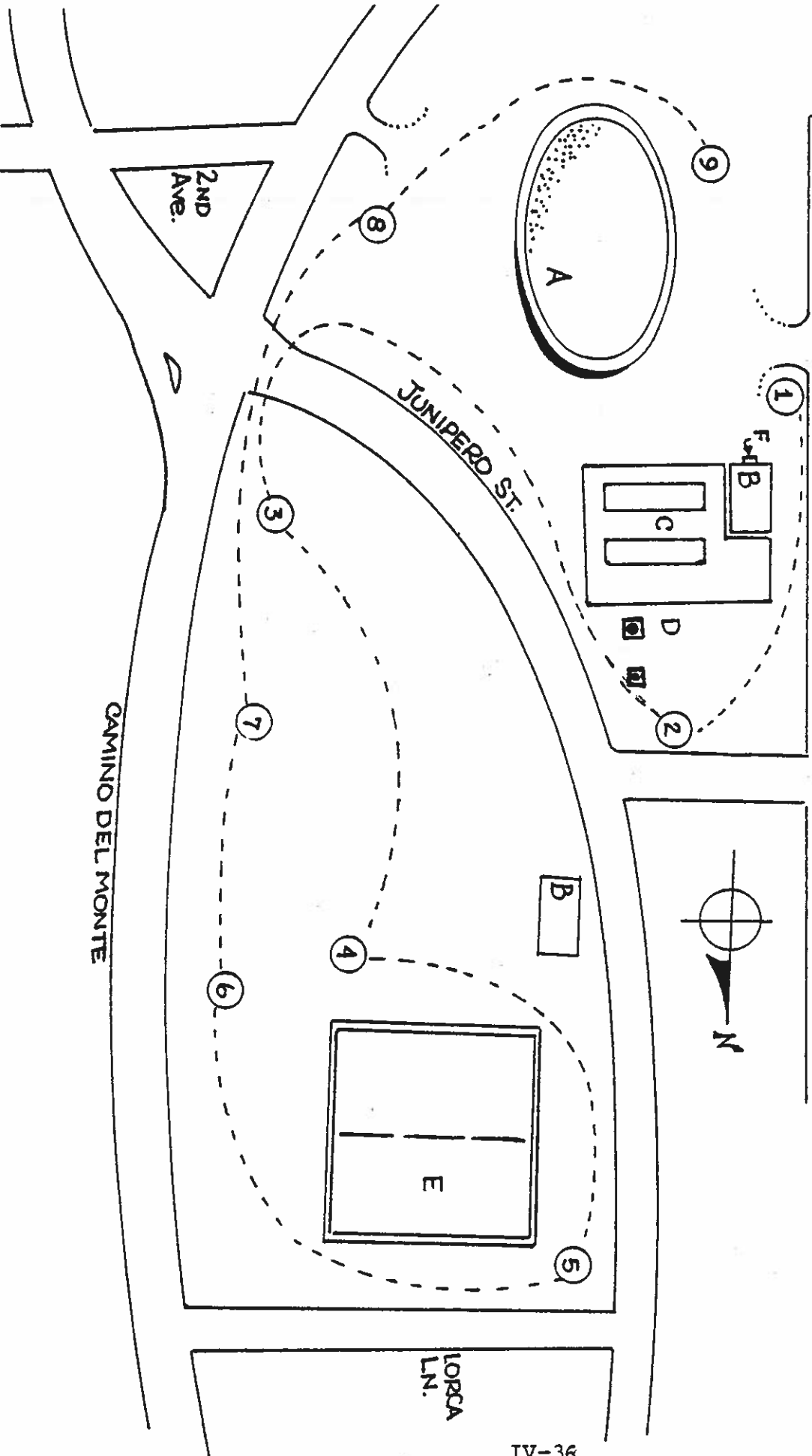
7:00 AM to 6:00 PM

- A. children's playground
- B. restrooms
- C. shuffle board court
- D. horseshoe pit
- E. tennis courts
- F. telephone

MISSION ST.

1ST Ave.

- par Course
- Achilles stretch
- toe touch
- log hop
- step ups
- sit ups
- push ups
- jumping jacks
- leg stretch
- balance beam



SECTION V

CARMEL'S TREE ORDINANCES



DIVISION 6 - CARMEL FORESTRY COMMISSION

270. CREATION OF FORESTRY COMMISSION. The Forestry Commission of the City of Carmel-by-the-Sea is hereby created. (Feb. 1959)
- 270.5 COMPOSITION OF COMMISSION. The Forestry Commission shall be composed of five (5) members, at least two (2) of which shall be professionally identified with Forestry, or an allied field, and at least one (1) lay member. All members shall be citizens of the City, except in the event that no citizen of the City with the required expertise can be found, the appointee may be from outside the City limits, but from within Carmel's zone of influence. In any event, a majority of the Commission shall at all times be composed of residents of the City. The City Forester shall be an ex-officio member of the Commission. (75-7)
- 270.6 TERM OF OFFICE. Appointments shall be for terms of two years beginning and expiring in December, with not more than three terms expiring in any one year. (288 C.S.)
271. DUTIES, RESPONSIBILITIES AND AUTHORITY. The Commission hereinabove established shall be known as the Carmel Forestry Commission, and shall be responsible for the following:
- a. To develop and keep current with the City Forester, a management plan for the urban forest, parks and beaches; and to correlate such plan with the City's General Plan.  
To consider and act on applications
  - b. when called for by the City Forester for tree trimming and tree removal and on matters involving construction in which root cutting or root crown coverage is involved.
  - c. To advise the City Council or other government instrumentalities of the City with respect to specific items of management and technical forestry matters, including the introduction of new species into the urban forest, or the elimination of existing species.
  - d. To provide publicity in regard to the problems of the urban forest, including a public information program concerning care of forest resources, and including cooperation with school programs on conservation, and the like.
  - e. To encourage gifts, bequests and devises to be made to the City in furtherance of any present or future object or project associated with the Commission.
  - f. To review plans and submit comments to the Planning Commission, Design Review Board, Board of Adjustments and Environmental Review Board at the request



of the Building Inspector, Planning Director, or as may otherwise be required. (328 C.S.)

272. AUTHORITY TO EXPEND FUNDS. The Carmel Forestry Commission may incur indebtedness in the name of and on behalf of the City in furtherance of its objectives, provided that funds are appropriated, approved, or budgeted by the City Council in advance, for such purpose.

273. OFFICERS. The Carmel Forestry Commission shall elect from its membership a chairman and shall prescribe rules and regulations for its meetings and method to be employed in calling the same, and notice of any to be given thereof. The secretary shall keep a book of minutes of all such meetings.

6 March 1975

DIVISION 3 - TREES AND SHRUBS:ARTICLE 2 - CUTTING AND TRIMMING TREES AND SHRUBS ON CITY PROPERTY:

1231. PERMIT FOR REMOVAL OF TREES: Any person desiring to cut down or remove any tree growing in or upon any public street, way, park or place within the City, or any tree on private property when more than one-half of the basal cross-sectional area of such tree is on City property shall file an application therefore with the City Clerk. Such application shall be accompanied by a fee of twenty dollars (\$20.00) for each tree to be cut down or removed which fee shall not be refundable. Each application shall include a plot plan showing the location of the tree or trees concerned and shall further include a statement of the reason for the request.

Upon receipt of such application, the City Clerk shall forward the application to the City Forester who shall indicate on said application:

- a. The health or condition of the tree or trees.
- b. Whether or not such removal is justified by reason of:
  1. Good forestry practice.
  2. The poor health or dangerous condition of the tree or trees.
  3. Construction or other improvement on private property. In exceptional circumstances in which it would cause substantial loss or inconvenience to delay removal until the Forestry Commission's next meeting, the City Forester may approve removal providing such approval unquestionably conforms to the policy and the practice of the Forestry Commission. The City Forester will report his action at the next meeting of the Forestry Commission. (257 C.S.)

and return the application to the City Clerk.

If, in the opinion of the City Forester, the tree or trees should be removed because of disease, infestation or clear and present danger to persons or property, he shall cause the tree or trees to be removed.

In all other cases, the City Clerk shall:

- c. Place the application on the Agenda of the Forestry Commission which shall act as provided for in Sections 270 through 273, inclusive.
- d. Give notice of the action of the Forestry Commission to the applicant.
- e. If approved, the deposit shall be placed in the Tree Planting Fund and the applicant notified of the action of the Commission.

Any permit granted hereunder is nontransferable and shall expire one (1) year from date of issuance. The City Forester may condition a permit on a replacement tree being planted at a place, of a species and of a size designated by the City Forester. The person requesting the permit may also be required to pay the cost of obtaining and planting the replacement tree. (75-10)

1231.01 FILING OF APPEALS: Any appeal from a decision of the Forestry Commission shall be taken by filing a Notice of Appeal in writing in the office of the City Clerk prior to the close of the fifth day of business following the day of action by said Commission. Any Notice of Appeal shall set forth the specific ground or grounds upon which the appeal is taken. The signature of at least one signer of said appeal shall be verified before a person authorized under the laws of the State of California to administer oaths.

1231.02 DUTIES OF CITY CLERK: Upon the filing of such appeal, the City Clerk shall place the appeal upon the agenda of the next regular meeting of the City Council, unless the Mayor authorizes placing the matter on the agenda of an earlier meeting.

1231.03 DETERMINATION BY CITY COUNCIL: At the time set for hearing the appeal, the City Council shall proceed to hear and determine the same. Said hearing may be continued, at the discretion of the Council, in order to obtain further facts or hear further witnesses. After initial hearing, the City Council may set a Public Hearing prior to making a determination. Any determination of the City Council shall be final and conclusive and not subject to further appeal.

1231.1 PERMIT FOR REMOVAL, IMPROVEMENT OF PRIVATE PROPERTY: In the event a permit for tree removal is granted, in order to enable the applicant to carry out some project of development or improvement of his property, such permit shall be effective only in connection with the actual accomplishment of said project.

1231.2 PERMIT FOR TRIMMING OF TREES OR THE REMOVAL OR TRIMMING OF SHRUBS: Any person desiring to trim, shape or remove wood or roots from any tree or to remove or trim any shrub, except genista, growing in or upon any public street, way, park or place within the City, or any person desiring to cut any wood, foliage or roots from any tree on private property when more than one-half of the basal cross-sectional area of such tree is on City Property, shall apply therefor to the City Forester. The City Forester may:

- a. Grant such permission and allow the work to be done by the applicant at his own expense, or,
- b. Approve such request and recommend the work be done by the City, if such removal or trimming would benefit the general public, or,
- c. Deny the request.

The applicant may appeal any decision of the City Forester to the Forestry Commission within ten (10) days of such decision.

1231.3 METHOD OF TRIMMING: All limb cuts made on trees covered by this Division shall be smooth and flush with the trunk or larger branch on which cuts are made. All limb cuts larger than one-half inch on oaks and broad-leaved trees and one inch on conifers must be treated with a preservative approved by the City Forester.

1231.4 EXCLUSIONS: The provisions of this Article shall not apply to the cutting or trimming of trees or shrubs:

- a. When necessary for the construction of streets or buildings on public property.
- b. When determined by the Chief of Police to be necessary for traffic safety.
- c. When covered by the provisions of Article 3 of this Division.
- d. When ordered by the City Council.

1231.5 RESPONSIBILITIES OF THE CITY FORESTER: The City Forester shall:

- a. Supervise all tree cutting or trimming for which a permit has been granted.
- b. Cause to be removed all dead trees or shrubs from public property.
- c. Cause to be removed or trimmed any trees or shrubs for which such removal or trimming is ordered by the Forestry Commission or the City Council or is required in connection with any public works project ordered by the City Council.

1231.6 REGULATION OF THE CUTTING BY THE CITY OF TREES PARTIALLY ON PRIVATE PROPERTY: When more than one-half of the basal cross-sectional area of a tree is on private property and the remainder on City property, the City shall not cut or trim wood, foliage or roots except when:

- a. In the opinion of the City Forester such cutting would not threaten the survival of the tree nor endanger public health and safety, nor endanger the health and safety of the property owner, and
- b. Permission has been granted by the property owner concerned.

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DIVISION 3 - TREES AND SHRUBS:ARTICLE 3 - CUTTING TREES ON PRIVATE PROPERTY (79-5)

1232. REGULATION OF THE CUTTING OF TREES ON CERTAIN PRIVATE PROPERTY: Without a permit, therefore, it shall be unlawful to cut down or otherwise destroy, or authorize the cutting down or destruction of any living tree of an average diameter of greater than two inches, or a circumference greater than six and one-fourth inches, measured at a point 4.5 feet above the ground level, which is growing on private property under the following conditions:

- a. When the tree is situated on a vacant lot.
- b. When the tree is situated on any lot on which existing building is to be remodeled to increase ground coverage, or to rebuild a demolished structure. If remodeling or rebuilding is undertaken within six months from the cutting down of a tree, while the property remains in the same ownership, it shall be presumed that the tree was removed for remodeling or rebuilding. (246 C.S.)

1232.01 APPLICATIONS FOR PERMIT: Applications for permission to cut or remove a tree or trees under this Article shall be submitted to the City Clerk on forms provided by the City Clerk. There shall be no fee for application or permit under this Article. The Forestry Commission may impose as a condition on which a permit is granted that a replacement tree be planted at a place, of a species and of a size designated by him on public or private property. The person requesting the permit may also be required to pay the cost of obtaining and planting the replacement tree. (75-10)

1232.02 RESPONSIBILITY OF BUILDING INSPECTOR: It shall be the responsibility of the Building Inspector to inform every applicant for a building permit of the restriction of this Article.

1232.03 ISSUANCE OF PERMIT: The City Clerk shall forward all applications to the City Forester who shall make recommendations concerning the application to the Forestry Commission. The Forestry Commission may grant or deny the permit. It shall be guided by the standards set forth in Article I of this Division.

1232.04 PENALTY: Removal of trees, without a permit, shall be a misdemeanor and shall be grounds for revocation or suspension of any permit granted for construction or remodeling of buildings or for the subdivision of land.

1232.05 APPEAL: Any appeal from a decision of the Forestry Commission shall be made by submitting a letter of appeal to the City Clerk for transmission to the City Council pursuant to the procedure set out in Section 1231.01 of this Code.

DIVISION 3 - TREES AND SHRUBS:ARTICLE 4 - PLANTING TREES ON PUBLIC PROPERTY

1235. GENERAL PROVISIONS: All trees planted in the public street or sidewalk area, and all tree planting spaces required by this Code, shall be located and planted under the supervision of the City Forester, who shall supervise such planting and locating. In the performance of such work, consideration shall be given to the following factors, provided that setbacks permit and considerations of safety do not interfere. These factors are determined to be of primary importance in maintaining the City Forest.

- a. Trees that must be removed shall be replaced by new planting, except in unusual circumstances.
- b. Wherever feasible, trees shall be planted near old and dying ones in anticipation of their removal.
- c. Unnatural regularity of spacing and arrangement shall be avoided; staggered or irregular locations or a simulated forest arrangement being preferred.
- d. Species selected may vary depending on location, however, the preference of native species is urged; the Monterey Pine is to be perpetuated as our dominant forest tree within the City.
- e. The coordinating of tree planting on public ways with landscaping on private property, so as to achieve the above purposes, is deemed desirable.

DIVISION 3 - TREES AND SHRUBS:ARTICLE 5 - DISEASED AND DANGEROUS PLANTS:

1236. TREES, SHRUBS AND OTHER PLANTS ON CITY PROPERTY: Any tree, shrub or other plant growing on City property, when infested by any insect or infected by any disease threatening the life of same, or which by reason of such infestation or infection endangers the life or growth or healthful existence of other trees, shrubs or other plants within the City not so infested or infected, or any trees determined by the City Forester to be a clear and present danger to persons or property, shall be removed as directed by him.

1236.01 TREES, SHRUBS, AND OTHER PLANTS ON PRIVATE PROPERTY: Any trees, shrubs and other plants growing on private property, when infested by any insect or infected by any disease threatening the life of same, or which by reason of such infestation or infection endangers the life or growth or healthful existence of other trees, shrubs or other plants within the City not so infested or infected, or any trees determined by the City Forester to be a clear and present danger to persons or property may be declared, by resolution of the City Council, to be a public nuisance and thereafter abated as provided for in this Article. (302 C.S.)

1236.02 NOTICE TO PROPERTY OWNER: Immediately upon determination by the City Forester that any tree, shrub or other plant is a public nuisance, he shall cause a copy of this Article to be sent by certified mail to the last address of record of the property owner concerned, together with a notice setting forth the details of the nuisance and the requirement of its abatement, advising the owner of the property that the nuisance shall be abated by the owner within thirty (30) days if the City is not to proceed with the further steps set forth herein. (302 C.S.)

1236.03 NOTICE TO CITY COUNCIL: In the event the nuisance is not abated by the property owner or his agent within the specified time, the City Forester shall forward to the City Clerk a request for resolution by the City Council indicating that adequate notice has been given the property owner concerned and that the nuisance still exists. (302 C.S.)

1236.04 RESOLUTION OF INTENT: The City Clerk shall place on the agenda of the next regular meeting of the City Council a resolution declaring said trees, shrubs or other plants to be a nuisance and setting a Hearing thereon. The Clerk shall cause a copy of said resolution to be mailed to the property owner at least ten (10) days prior to such Hearing. (302 C.S.)

1236.3 NOTICE: After the passage of such resolution, the City Forester shall cause to be conspicuously posted on the property upon which such public nuisance is alleged to exist, not less than three notices headed "Notice to Abate Public Nuisance", such heading to be in letters not less than one inch in height and substantially in the following form:

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## NOTICE TO ABATE PUBLIC NUISANCE

Notice is hereby given that on the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, the City Council of the City of Carmel-by-the-Sea passed a resolution declaring that certain (trees, shrubs or other plants) located on (description of property) are (infested with insects, infected with disease or a clear and present danger to persons or property), and that the same constitute a public nuisance which must be abated by the removal of the same, otherwise they will be removed and the nuisance abated by the City, in which case the cost of such removal shall be assessed upon the property from which such (trees, shrubs or other plants) are removed, and such cost will constitute a lien upon such property until paid. Reference is hereby made to said resolution for further particulars.

Any person objecting to the proposed removal, as aforesaid, is hereby notified to attend the meeting of said City Council to be held in the Council Chamber in City Hall at (time) on the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, when such objection will be heard and given due consideration.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_.

\_\_\_\_\_  
City Forester  
City of Carmel-by-the-Sea

Said notices shall be posted at least five (5) days prior to the time for hearing objections to the abatement of such public nuisance.

1236.4 HEARING: At the time stated in such notices, the City Council shall hear and consider all objections, if any, to the proposed removal, and may continue the hearing from time to time. Upon the conclusion of such hearing, said City Council shall by resolution allow or overrule any and all objections; whereupon said City Council shall be deemed to have acquired jurisdiction to proceed and perform the work or removal, and the decision of said City Council on the matter shall be final and conclusive.

1236.5 REMOVAL: After final action has been taken by the City Council, or in case no protests or objections have been received, said City Council shall, by resolution, order the City Forester to abate said nuisance by having any and all trees, shrubs or other plants infected as aforesaid, removed from the premises in question, and said City Forester, his deputies and assistants, are hereby expressly authorized to enter upon private property for such purpose. Any property owner shall have the right to have such trees, shrubs or other plants removed at his own expense, providing the same is done prior to the arrival of the City Forester or his assistant to remove the same.

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1236.6 COST OF REMOVAL: The City Forester shall keep an account of the cost of abating such nuisance upon each lot, piece or parcel or land, and shall submit an itemized statement thereof to the City Council at its next subsequent meeting thereafter, and shall forthwith mail a full and correct copy of such statement to the owner or owners of such premises, if known, to his or their last known place of residence. In the event that any such owner is unknown, said statement shall be posted on the bulletin board of City Hall for one week, giving notice when such statement will be submitted to said City Council for approval.

1236.7 ASSESSMENT: At the time for receiving and considering such statement, the City Council shall proceed to consider the same and the objections thereto, if any, and may raise, lower or modify the amount alleged to be due herein. The determination of the City Council thereon, as aforesaid, shall be final and conclusive, and the amounts of the cost of abating such nuisance upon the various lots or parcels of land mentioned in said statement, shall constitute special assessments against the same, respectively, upon confirmation of such statement, a full and correct copy thereof shall be delivered to the Assessor for said City, and it shall be the duty of said Assessor to add the amounts set forth in such statement and charged against any lot, piece or parcel of land, to the amount assessed against the same for municipal taxes and assessments, and thereafter said amounts shall be collected at the same time and in the same manner as ordinary City taxes are collected, and such special assessments shall be subject to the same penalties and the same procedure under foreclosure and sale in case of delinquency, as provided for ordinary municipal taxes.

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DIVISION 3 - TREES AND SHRUBS:ARTICLE 6 - MAINTENANCE OF TREES WHILE CONSTRUCTION IS IN PROGRESS AND AFTER CONSTRUCTION.

1237. SAFEGUARDING TREES DURING CONSTRUCTION: For the purpose of safeguarding trees during construction, the following conditions shall apply to all trees other than trees for which a removal permit has been issued. (75-10)
- a. Prior to the commencement of construction, all trees on the building site shall be inventoried by the owner or contractor as to size, species and location on the lot, and the inventory shall be submitted on a topographical map to the Building Inspector. (75-10)
  - b. Damage to any tree during construction shall be immediately reported by a person causing the damage, the responsible contractor or the owner to the City Forester, and the contractor and/or owner shall treat the tree for damage in the manner specified by the City Forester. (75-10)
  - c. Oil, gasoline, chemicals and other construction materials which might be harmful to certain trees shall not be stored around them. (75-10)
  - d. Drains shall be installed according to the City specifications so as to avoid harm to trees due to excess watering. (75-10)
  - e. Wires, signs, and other similar items shall not be attached to trees. (75-10)
  - f. Cutting and filling around the base of trees shall be done only after consultation with the City Forester, and then only to the extent authorized by him. (75-10)
  - g. No paint thinner, paint, plaster or other liquid or solid excess or waste construction materials or waste water shall be dumped on the ground or into any grate between the drip line and the base of the tree, or uphill from any tree where said substance might reach the roots through a leaching process. (75-10)
  - h. Barricades shall be constructed around the trunks of trees as directed by the City Forester so as to prevent injury to trees making them susceptible to disease causing organisms. (75-10)
  - i. Wherever cuts are made in the ground near the roots of trees, appropriate measures shall be taken to prevent exposed soil from drying out and causing damage to tree roots. (75-10)

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- j. Trimming cuts one (1) inch in diameter and over must be covered at the time the cuts are made with a tree seal pruning compound approved by the City Forester. (75-10)
- k. All ground areas within the drip line of existing trees must be roto tilled and aerated every two (2) months during construction and upon completion of construction to eliminate soil compaction resulting from compaction of soil during construction. (76-10)

1238. SAFEGUARDING TREES AFTER CONSTRUCTION: Trees required to be kept on the building site and trees required to be planted as a condition of construction shall be maintained after completion of construction according to accepted arboricultural practices for the purpose of maintaining and furthering the health of said trees. (75-10)

Nothing contained in these Sections 1237 and 1238 shall be deemed to replace or revoke any requirements for the safeguarding of trees found elsewhere in this Municipal Code or in the ordinances and procedures of the City. (75-10)

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PRACTICAL FORESTRY TECHNIQUES

SECTION VI  
PRACTICAL FORESTRY TECHNIQUES

PLANTING TREES

The tendency, more and more, is to plant larger trees in the landscape. But whether planting bare root seedlings, small canned stock, balled and burlaped trees or boxed container trees, the procedures are almost always the same.

Before planting any tree, obtain the necessary equipment:

1. Round point shovel
2. Can cutter
3. Mattock
4. Garden hose
5. Tree stakes (only if absolutely necessary)

After assembling the tools, the next steps are to choose the planting site and the desired tree species. Make certain your choice of species will grow well in the chosen planting site. Study the area for: amount of sunlight or shade; existing plants; wind direction; soil type (is it porous or compact); proximity to sidewalks, driveways or buildings; and any other variables which would affect the growth of the tree.

Once the tree species and planting site have been carefully selected, you can begin planting. Generally, the tree hole should be large enough to allow you to work on all sides of the root ball. The depth of the hole should not be any deeper than the overall depth measurement of the root ball, as the root ball should rest on firm soil (see figure 1).

Next, prepare for adequate drainage before placing the tree in the hole. This is accomplished by auguring a four to eight-inch diameter hole at least three to four-feet deep in each of the four corners of the tree hole. The actual depth of these vertical mulch holes will depend on the soil structures encountered while digging. If at all possible, these holes should be dug to a soil layer through which water will move readily (see figure 2). Backfill these vertical mulch drainage holes with a mixture of one/half excavated soil and one/half organic soil amendment. Do not pack or tamp the soil, or backfill with gravel (see figure 3).

After placing the tree in the hole, fill the hole half full with the backfill soil and mildly compact it using your own body weight. Next add fertilizer, such as bone meal and vitamin B 1, in recommended label dosages (see figure 4). After applying the fertilizer evenly around the root ball, wet the soil thoroughly and then continue to backfill.

Quite often the specifications require the use of imported soil. This is a questionable requirement. If the tree won't grow in the native soil, the wrong species has been selected for the site. Further, imported soil multiplies the problem associated with growth. When you acquire the tree, the roots are acclimated to the soil in the root ball. The imported backfill soil may encourage tremendous root growth, but when the roots encounter the "native" soil, the trouble starts. It is far better and much wiser to use the native excavated soil for the backfill. As in all planting operations, it is wise to have the soil analyzed and amended according to the needs of a specific species. The "interface" soil problems will be minimized by using the amended native soil for backfill.

After completing the backfilling and compacting the soil, properly secure the tree with tree stakes if necessary. If possible, do not tie the tree securely to the stake. Instead, place the stakes on the windward side of the tree. This placement will prevent the tree from bending too far in the wind and will allow the natural development of the tree's main stem (see figure 5).

The last operation is to again irrigate the tree. In order to insure adequate and proper distribution of water, it is advisable to construct some berms. Construct a six-inch high berm on the inside edge of the root ball and a six-inch high berm on the outside edge of the tree hole. This will allow individual watering of the root ball and the backfill area, the two major areas of concern (see figures 6 and 7). It is essential that sufficient moisture be maintained in each to assure optimum root growth. Use a soil probe to make this determination. The root ball area will normally require irrigation three to four times as often as the backfill area. Do not allow the root ball to dry out. If at all possible, do not allow sprinkler irrigation or surface drainage waters to fall on or drain into the tree hole. Water thoroughly once per week for the first six months and twice per month for one year after that. The use of the vertical mulch drain holes and the watering berms can be the determining factors whether or not the tree survives the shock of planting.

FIG. 1

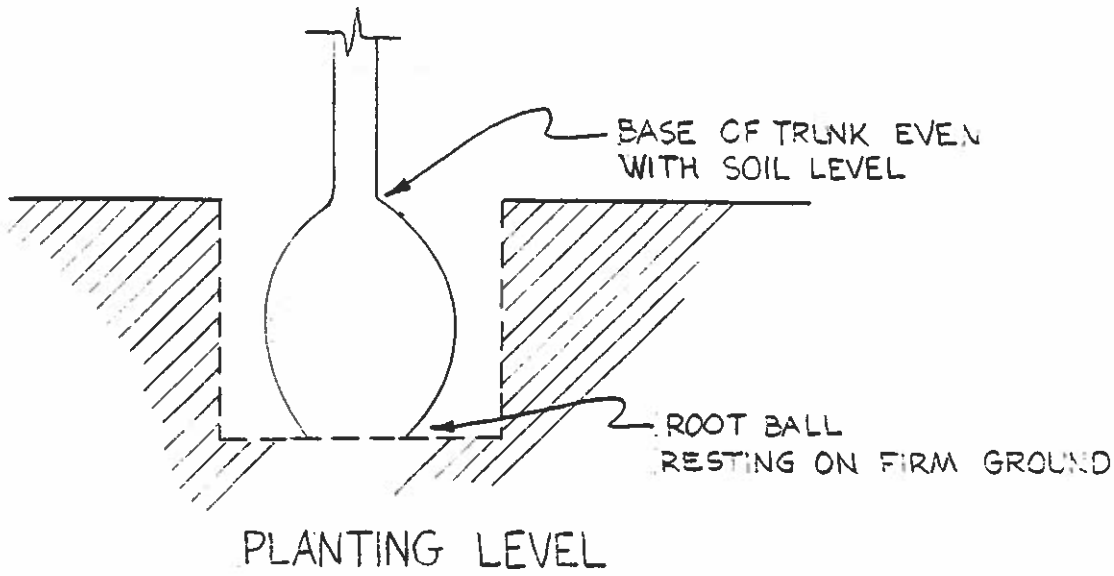


FIG. 2

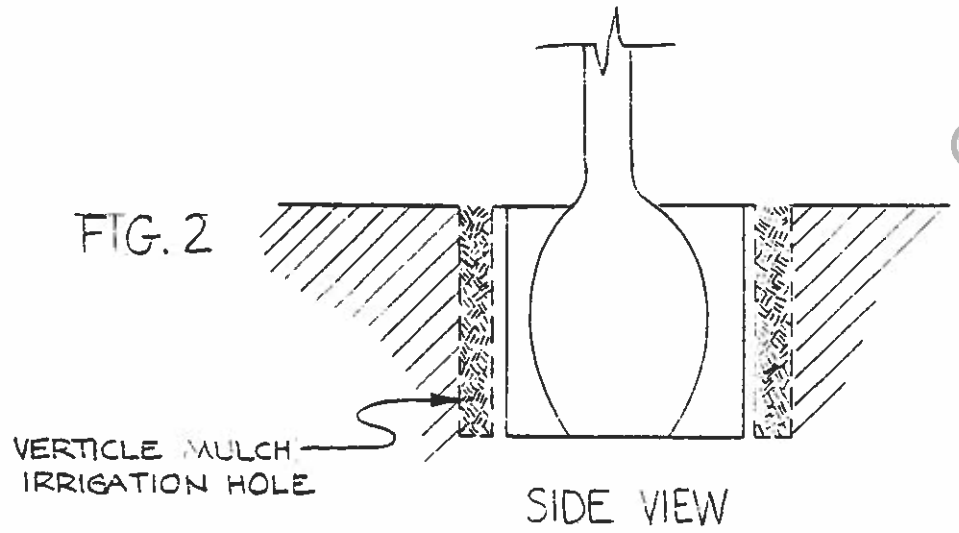


FIG. 3

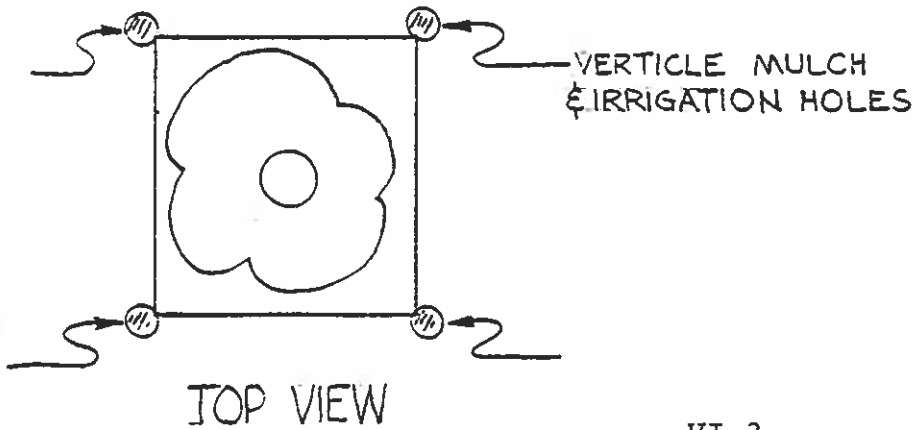
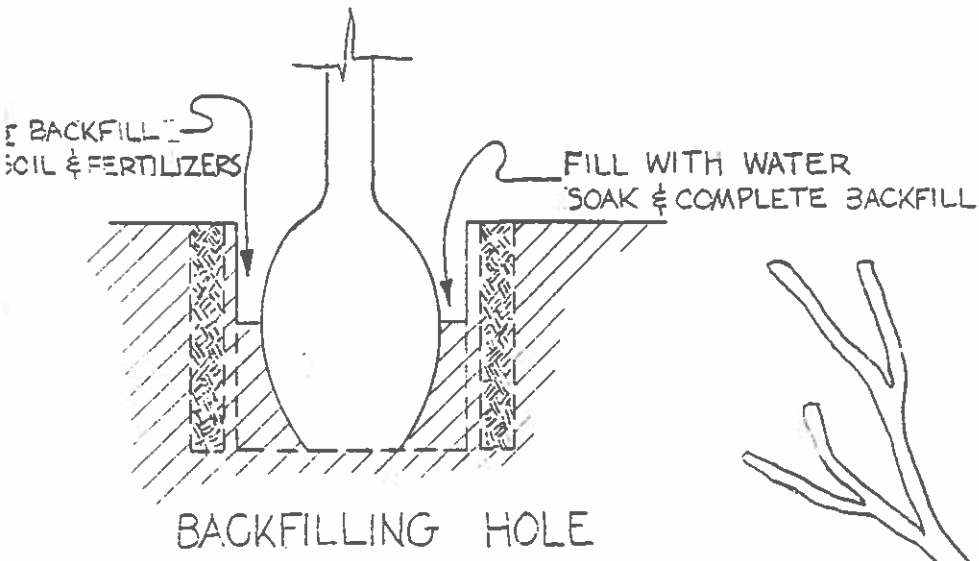


FIG. 4



WIND DIRECTION →

FIG. 5

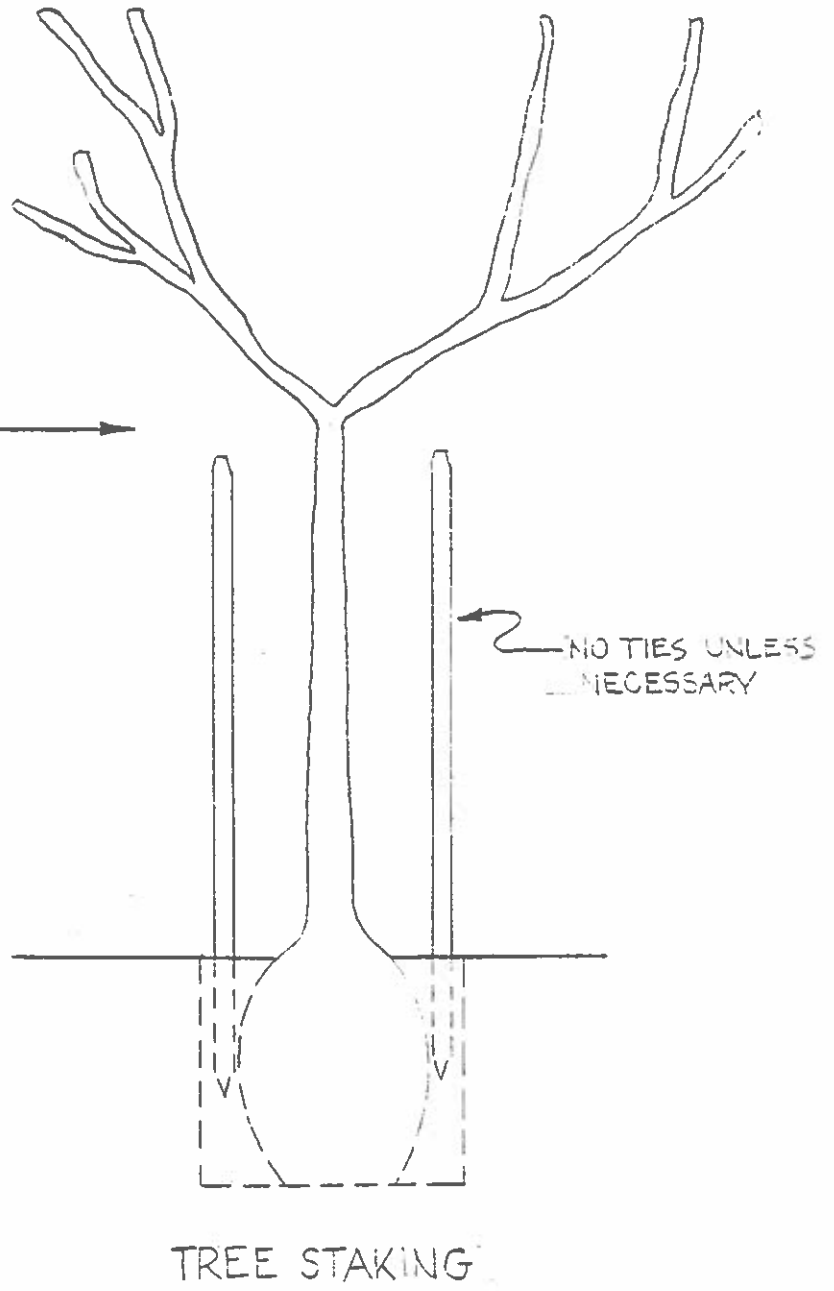
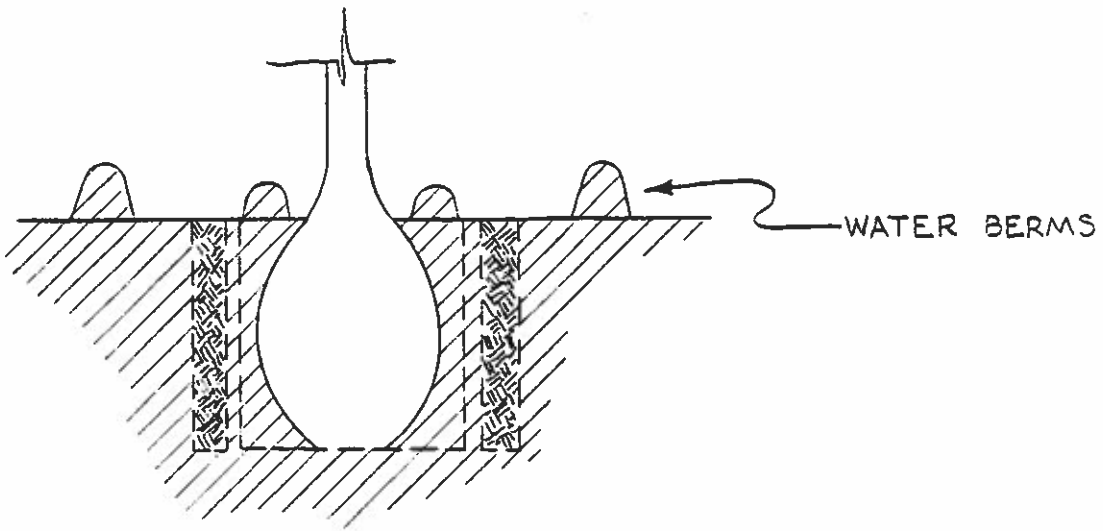


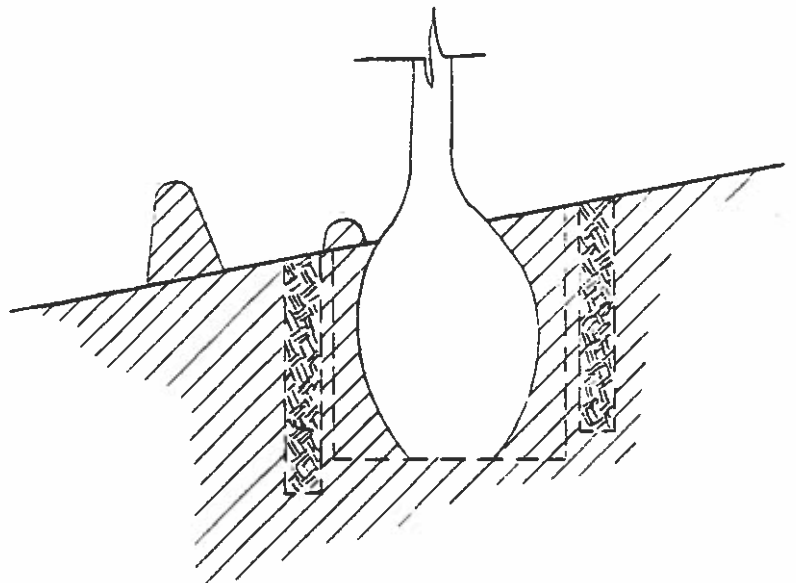


FIG. 6



BERMS FOR WATERING

FIG. 7



BERMS FOR SLOPING GROUND



## PLANTING BARE ROOT SEEDLINGS

The planting of large numbers of trees at one time often dictates that smaller bare root stock should be used instead of container grown stock. Bare root trees have no soil surrounding the roots, so the roots are kept moist to prevent drying out. Tools, container materials, and planting methods also differ slightly from conventional container tree stock.

### Tools and Supplies Needed

To carry trees and keep the roots moist it is necessary to use a container in which is placed wet vermiculite, peat moss, or sawdust.

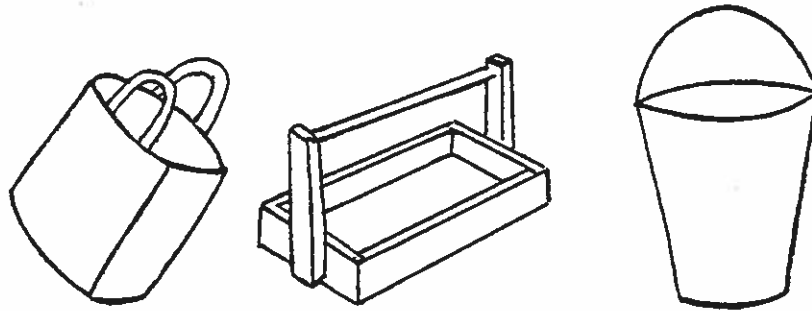
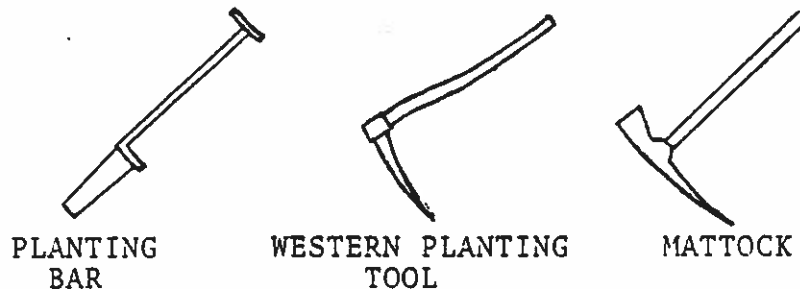


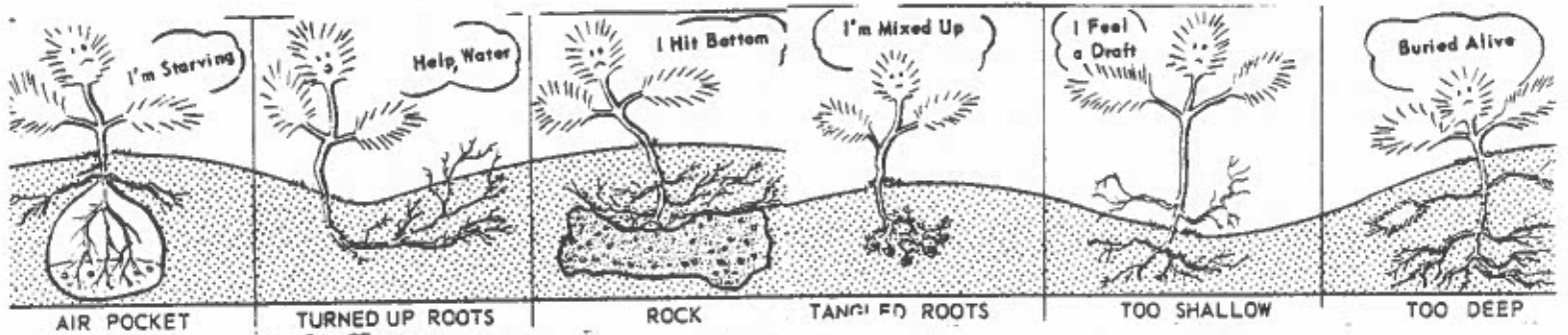
FIGURE 1. Carrying the Trees

Tools which may be used for planting bare root seedlings are the planting bar, western planting tool, mattock or conventional round point shovel. Where soils are readily workable, the western planting tool seems to be best. This tool is designed for rapid planting if properly used. For planting in hard soils, or very loose soils the mattock or round point shovel is preferred respectively.

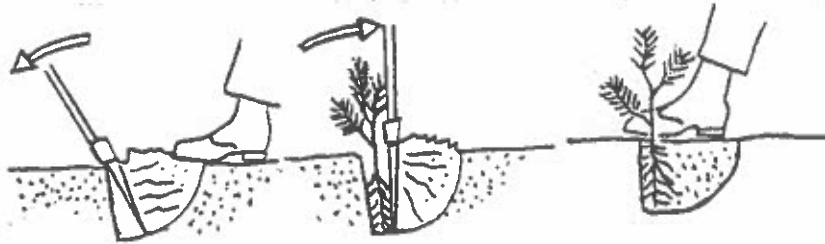


## How to Plant

Planting with extreme care is essential. Bare root seedlings, although healthy and vigorous, require careful placement in the ground. Bare root trees have no soil protection around their roots so planting errors as shown below are common. Sacrificing planting quality for speed can be a mistake.



To plant, the tool is inserted to the depth of the blade and the bottom of the hole is opened by a forward motion of the tool. This will break up the soil on the upper side of the blade. The tool blade is then replaced in the middle of the hole and pulled back to form an opening for tree placement. The bare root seedling is inserted at the proper grade level and the planting tool removed. The soil will fall in around the tree roots. The soil is then tamped down and more added around the tree if necessary.



Bare root seedlings should be planted to coincide with seasonal rains. If planting cannot be scheduled during seasonal rains, then supplemental manual watering once per week should be done to insure that the young tender roots do not dry out.

## DEEP NEEDLE WATERING/FERTILIZING

### DIRECT ROOT FEEDING

Roots develop and grow only in the presence of water. They are not capable of seeking out water. In soil which is not penetrated easily by water, or in areas of light rainfall, roots will exist only in the upper portion of the soil.

Roots take in water and other nutrients through tiny appendages along the outside of the root called root hairs. These root hairs are very sensitive and are easily damaged by exposure to air or to the force of water at high pressure.

Trees growing in areas of restricted water supply need additional irrigation or their growth will be extremely limited. They also need additional nutrients because of the limited area of root growth.

The best system for watering and fertilizing trees is to use a subsoil irrigator. This is a hollow needle, 18-inches in length, which allows for deep penetration of the soil. This device, combined with a pressurized water source, such as a water faucet or a portable John Bean Pump and Tank unit, is very effective. The advantage of using a pump and tank unit is that soil amendments can be mixed with the water before it is applied to the roots. A good fertilizer to use is 18-18-18, a slow-release water soluble fertilizer. Always follow the manufacturer's directions printed on the container when using this or any other fertilizer.

The steps to follow to deep needle water and fertilize a tree's roots with the direct root feeding method are:

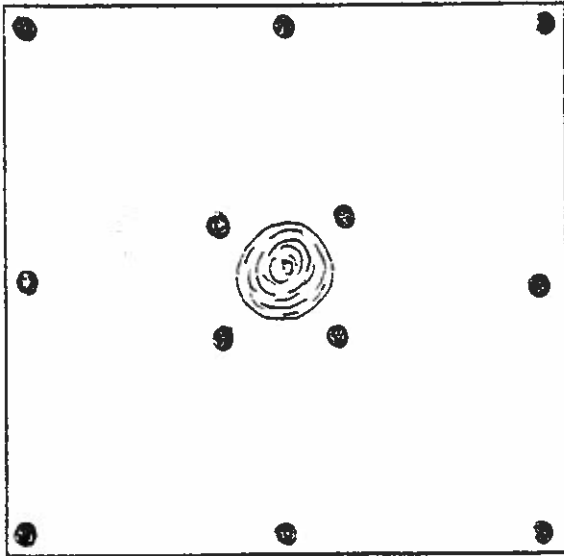
1. Be certain to use no more than 50 PSI (pressure per square inch) of water pressure or the root hairs can be damaged.
2. Place the needle in each corner of the tree square and run the water one minute per hole.
3. Continue your way around the tree making at least eight more penetrations with the irrigator and again run the water one minute per hole. Try to insert the needle at various angles to insure uniform saturation of the tree square and to reach as far under any sidewalk as possible (see figures 1 and 2).

4. Make certain each tree gets a minimum of 60 gallons of water. (Twelve minutes pumping at 50 pounds of pressure)
5. When the tree to be watered is not in a tree square/planter, the proper number and position of needle penetrations is determined as follows: Triple the trunk DBH (diameter at breast height). The resulting figure is the distance to move out from the trunk to start watering. Move the needle around the tree and apply water every 18 inches. After completing one circle around the trunk, move 18 inches further out from the first circle and insert the irrigator in the same manner. Continue this process until you reach the drip line of the tree (see figure 3).

Watering should follow normal rainfall conditions for an area. Our native trees on the Monterey Peninsula expect and need water during the winter months so they will be ready for their growing season. Trees in planters should be watered in the early winter months of November and December. Watering should then be continued as needed if the rainfall is light.

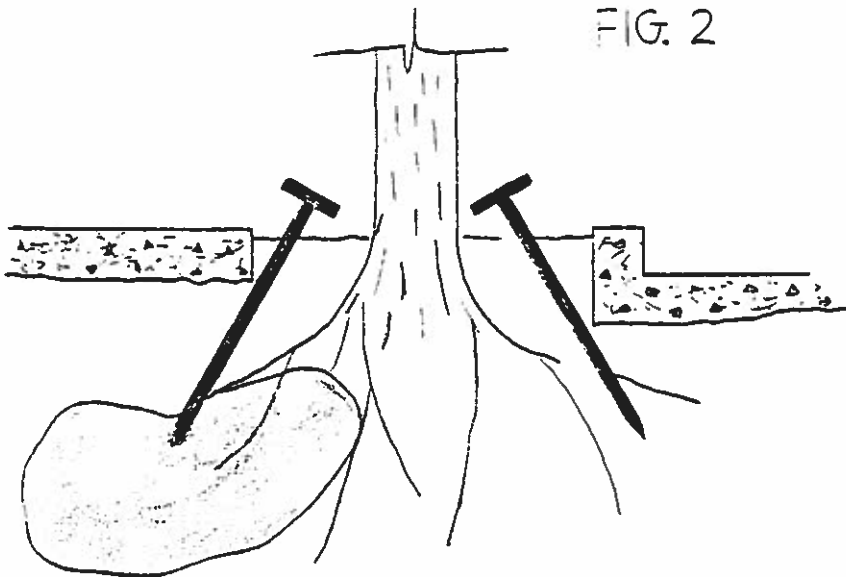
# WATERING TREES IN PLANTERS

FIG. 1



MINIMUM OF 12 PENETRATIONS PER PLANTER  
TYPICAL 48" x 48" TREE SQUARE  
PENETRATIONS AT CORNERS OF TREE SQUARE  
ARE STRAIGHT DOWN, ADDITIONAL HOLES  
ANGLE INTO ROOT BALL AND UNDER SIDEWALK

FIG. 2



WATER PENETRATION UNDER SIDEWALK  
AND STREET IS VERY IMPORTANT  
WATER MUST COME IN CONTACT  
WITH ROOT HAIRS.

# WATERING TREES NOT IN PLANTERS

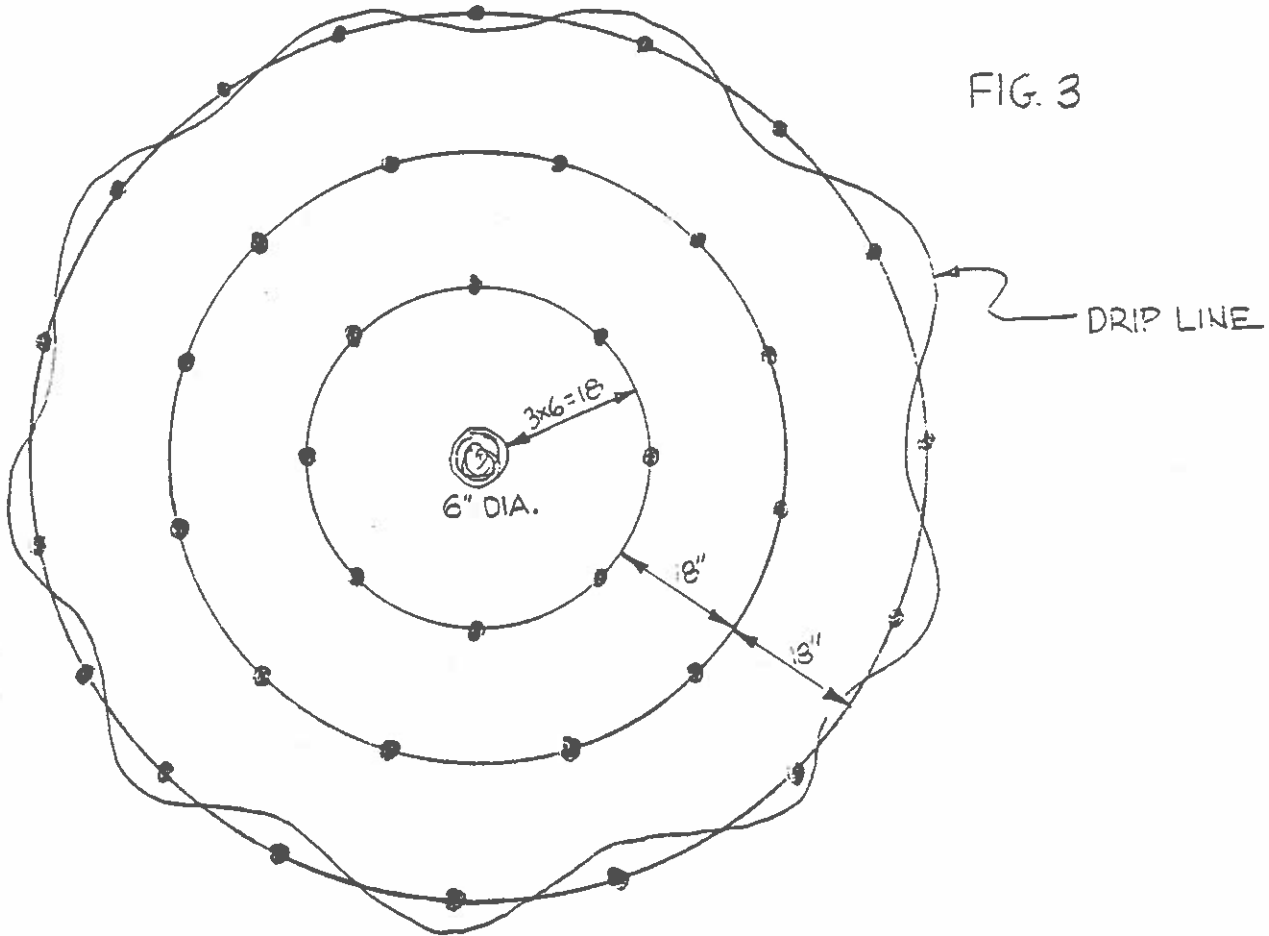


FIG. 3

EXAMPLE: A SIX IN. DIAMETER TREE ; MULTIPLY THE DIAMETER OF THE TREE TRUNK BY THREE ,  $3 \times 6 = 18$ ". THE FIRST OF CONCENTRIC CIRCLES AROUND THE TREE STARTS 18" FROM THE TRUNK.



## WATER STRESS-DROUGHT

Between 1975 and 1977 California experienced it's worst drought in thirty-five years. Many things were learned about water stress and how to prevent a high mortality rate among trees and plants of all types. As was anticipated, plants with shallow root systems experienced severe stress and a much higher death rate. Established native trees and shrubs were less affected than non-natives. All plants; natives, native types, and non-natives were able to survive with a drastic reduction in water availability.

### Preventative Measures

To optimize water use several important steps were taken to supplement plant moisture. Competition between plants was reduced by weeding out those plants that were easily replaced and were fast growing. By eliminating competition, more water was present for plant absorption. Trees and shrubs were stimulated by injecting water directly into the root zone at a depth of 18" to 24" on a twenty day interval schedule. By subsurface watering, the roots were irrigated without any loss through evaporation. Water root contact was immediate.

By far the most effective program was that of mulching. All areas that are planted or maintained were mulched with wood chip composts from our own trimming by products. Brush and limbs that are trimmed from trees are run through our wood chipper and converted into wood chip residue. An application of approximately four inches of chip compost was spread uniformly over the ground of landscaped areas. After the compost was applied, it was thoroughly saturated. Subsequent irrigations developed a moisture reservoir which provided water to plants during the drought. There were several side benefits of the composting process. Weed problems were eliminated. Competition between plants and weeds was non existant. As the drought ended, composted areas were tilled and fertilized adding a thick layer of humus and decayed chip matter to the upper soil strata. Future water absorption has improved and plants are generally more vigorous.

## CABLING AND BRACING

### Cabling

Cabling is a method of supporting large limbs or trees by attaching cables either within one tree or to other sturdier trees (see figures 5 and 7). Guys, ground anchor supports, are installed to prevent trees from uprooting (see figure 6).

Cabling is accomplished by attaching seven-wire strand cable to the tree by means of a lag (wood thread) eye or "J" lag screws, or by boring through the tree and inserting an eyebolt with a washer and nut at the opposite end. Common sense dictates that the size of the cable must be related to the strength or holding power of the "J" lag or eyebolt (see figure 8).

The most common size cable used is 3/8-inch diameter which, allowing for the holding power of a 5/8-inch lag in wood, has a capacity of about 4,200 pounds. The cable itself has a breaking strain of about 5,200 pounds (see figure 8).

One seven-strand 3/16-inch cable should be ample for limbs of moderate size. This cable is capable of supporting in excess of 3,600 pounds. The larger cable and bolts, 5/8-inch or more, should be used for connecting big branches and/or trunks which require more cable strength.

When cabling potentially weak limbs, place the eye bolts or "J" lags at a position on the limb or trunk that affords the most support. Placing the bolt too close to the branch junction, or too far out on the limb end, will not give the necessary support. Instead, position the bolt so that the weight of the branch is evenly distributed on either side of the bolt. The bolt location on the branch will determine the amount of sway during windy periods (see figure 1). The same theory for positioning can be used for tree trunks requiring support.

### Bracing

Bracing is a method of supporting and/or strengthening weak or fractured crotches of limbs or trunks (see figure 3). Cavities which have been cleaned and repaired may also warrant bracing (see figure 4).

The materials required for bracing are:

1. X amount of feet of 3/4-inch threaded bolt.  
(Amount dependent upon diameter of limb)

2. Drill and bit. (Bit should be 1/16-inch smaller than the bolt)
3. Two two-inch square plates or washers.
4. Two nuts - one for either end of the bolt.
5. Tree seal compound to seal over bolt system after the project is completed to avoid decay to wood or damage to thread rod.

To repair a weak junction, it is necessary to determine the size of the affected area and then use the proper number of bolts. Never use more than necessary to give effective support as too many bolts weaken the wood further. For instance, a tree of six to eight-inches in diameter requires only one bolt for strength. To repair a fracture, use one bolt for every two feet of fracture or every six to eight-inches of diameter.

Bore the holes for the bolt insert 1/16-inch smaller than the bolt size. Insert the bolt and attach the steel plate or washers. Fasten the plate securely with the nuts and seal over all the exposed metal. Finally, trace, clean and seal the repaired fracture.

Bracing, when using lag rod (wood-threaded rod) or bolts with nuts, is an extension of cabling and is often used with it. Bracing has the advantage that considerable "squeeze" can be applied by tightening the nuts (see figure 2).

Two types of materials are used in lag rod or bolt bracing. The simplest are long threaded bolts and nuts with washers on each end. The disadvantage of this type of material is that the holes for the bolts must be at least 1/32-inch larger than the diameter of the bolt. As a result, it is impossible to thoroughly paint the sides of the hole and decay can result due to fungus invasion. However, such bolts are cheaper and can be readily cut and threaded to length at the site.

Lag rod, the second type, comes in ten-foot lengths, is 3/8 to 3/4-inch in diameter, and is more expensive. It has the advantage that it holds in the wood and requires no washers or nuts except where the walls are too thin for holding or where some "squeeze" is required. Should "squeeze" be required, one of the two aligned holes must be the same diameter as the lag rod and a washer and lag-threaded nut are used. The nut and washer should be below the cambium layer (see figure 3).

As a problem solving method, cabling or bracing should not be tried until all other alternative methods have been considered and eliminated as unfeasible. Pruning, or heading-back, to laterals should be considered before cabling. However, pruning is

usually rejected as the reduction of the extra weight is not sufficient to eliminate the hazard. Further, pruning to reduce the sail effect of the wind may make the tree unattractive.

In other words, if the tree's problem can be solved by pruning, then do so. If not, the tree must be cabled or both cabled and pruned in combination.

# LIMB CABLING

SIZE OF CABLE TO SIZE OF LAG

3/16" CABLE      1/2" LAG

3/8" CABLE      5/8" LAG

1/2" CABLE      3/4" LAG

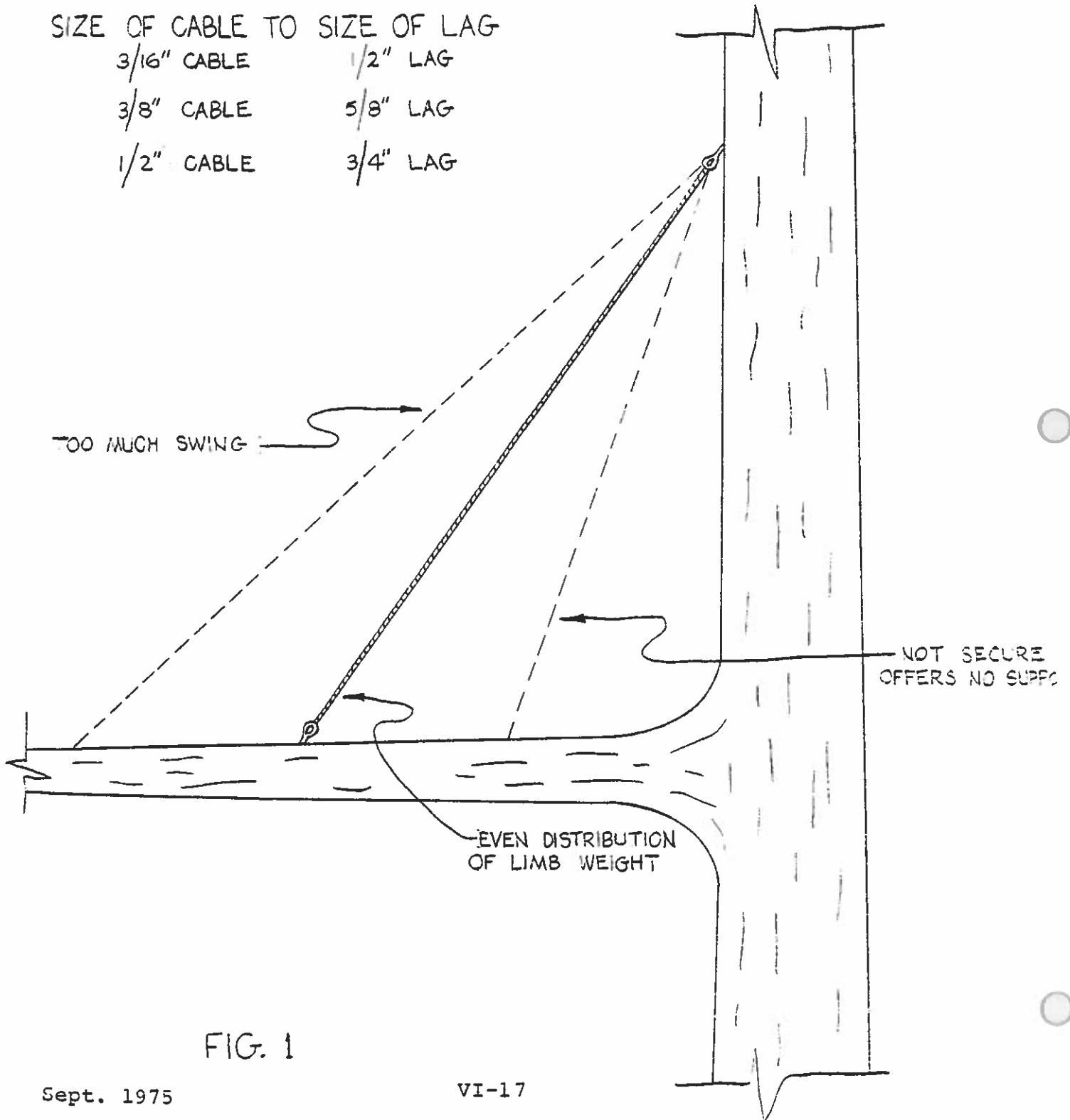


FIG. 1

# BRACING FRACTURES & CAVITIES

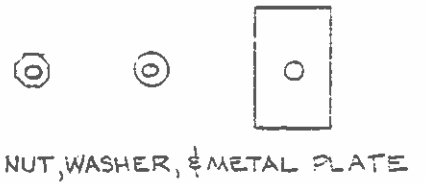
FIG. 2



BRACE & AUGER BIT



THREADED ROD

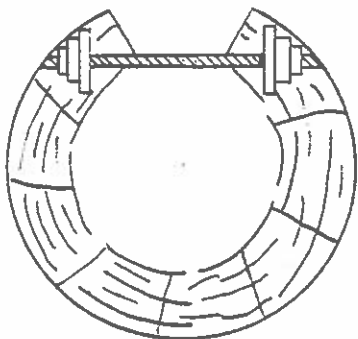
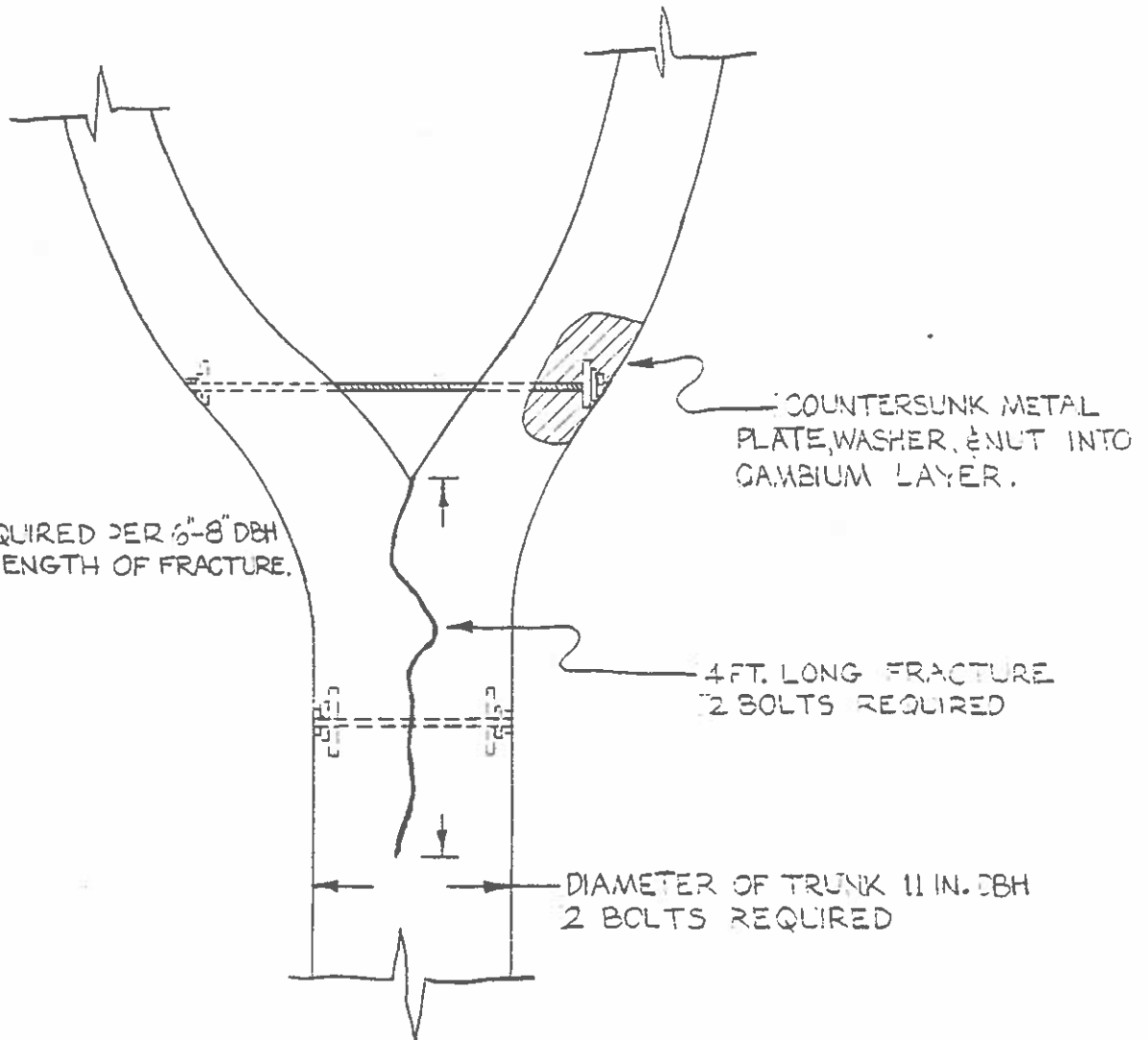


NUT, WASHER, & METAL PLATE

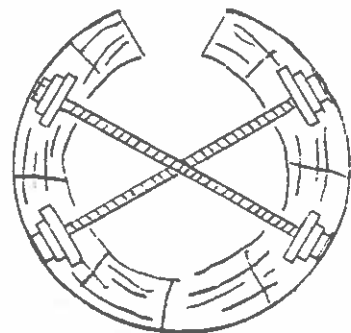
TOOLS FOR BRACING

FIG. 3

1 BOLT REQUIRED PER 6"-8" DBH & PER 2FT. LENGTH OF FRACTURE.



LIP BOLT

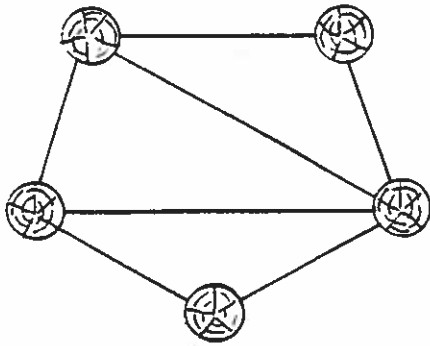


CROSS BOLTS

FIG. 4

# CABLING SYSTEMS

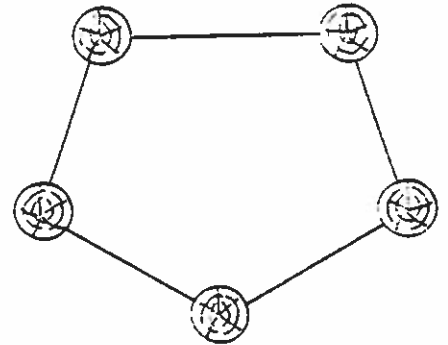
FIG. 5



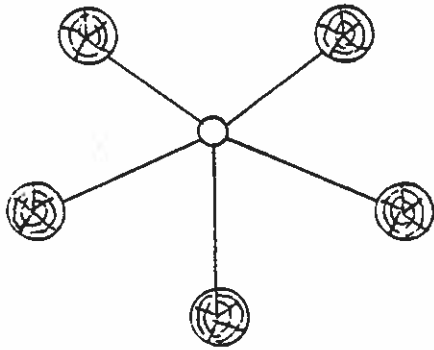
TRIANGULAR



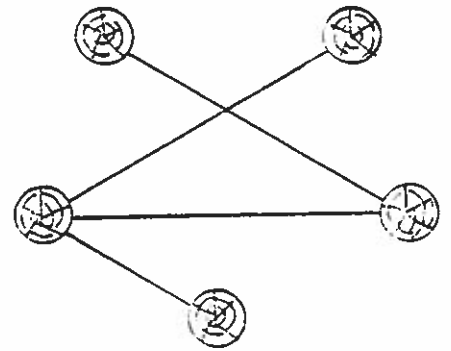
DIRECT



BOX OR ROTARY

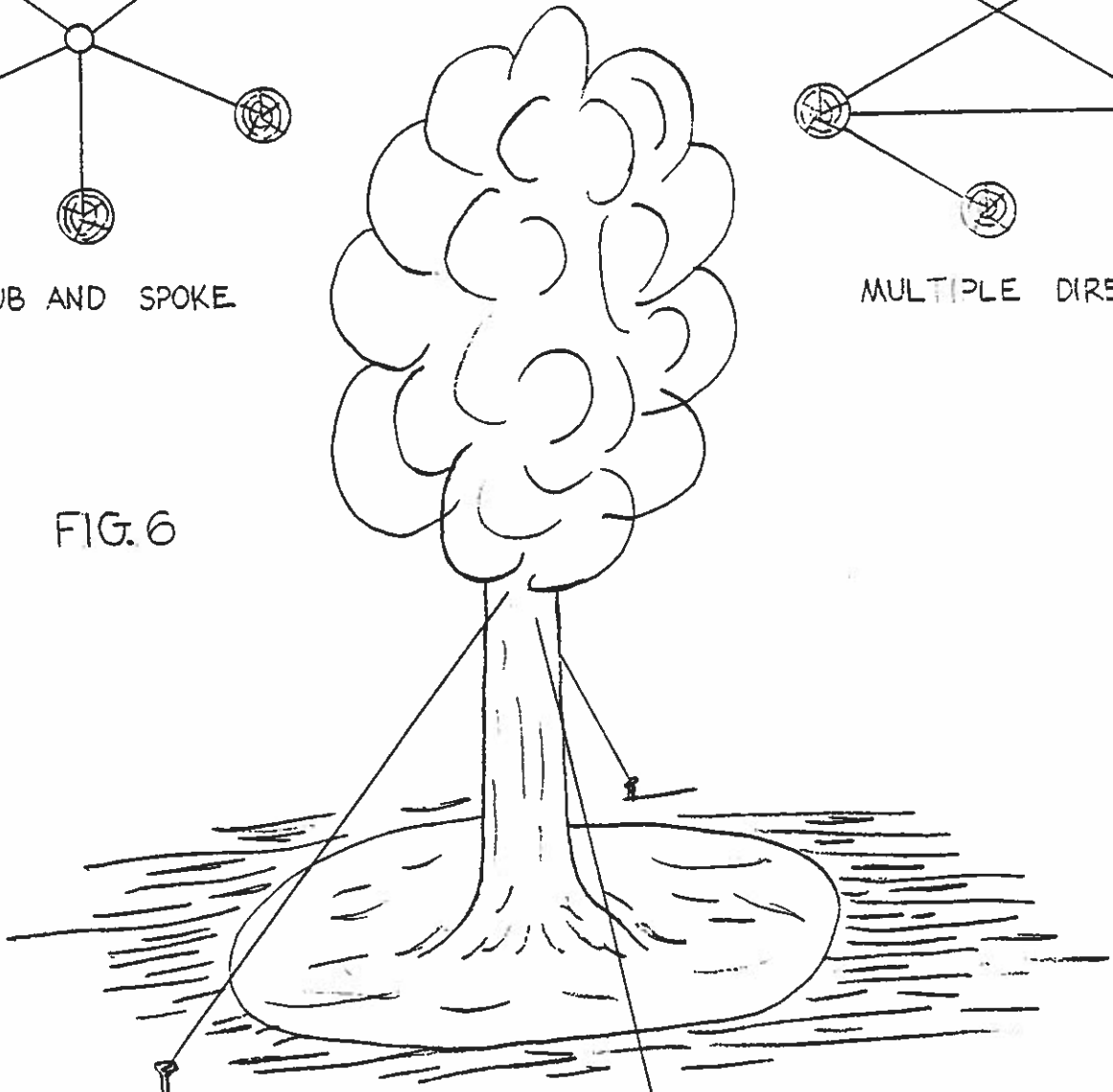


HUB AND SPOKE



MULTIPLE DIRECT

FIG. 6



GUYING

FIG. 7

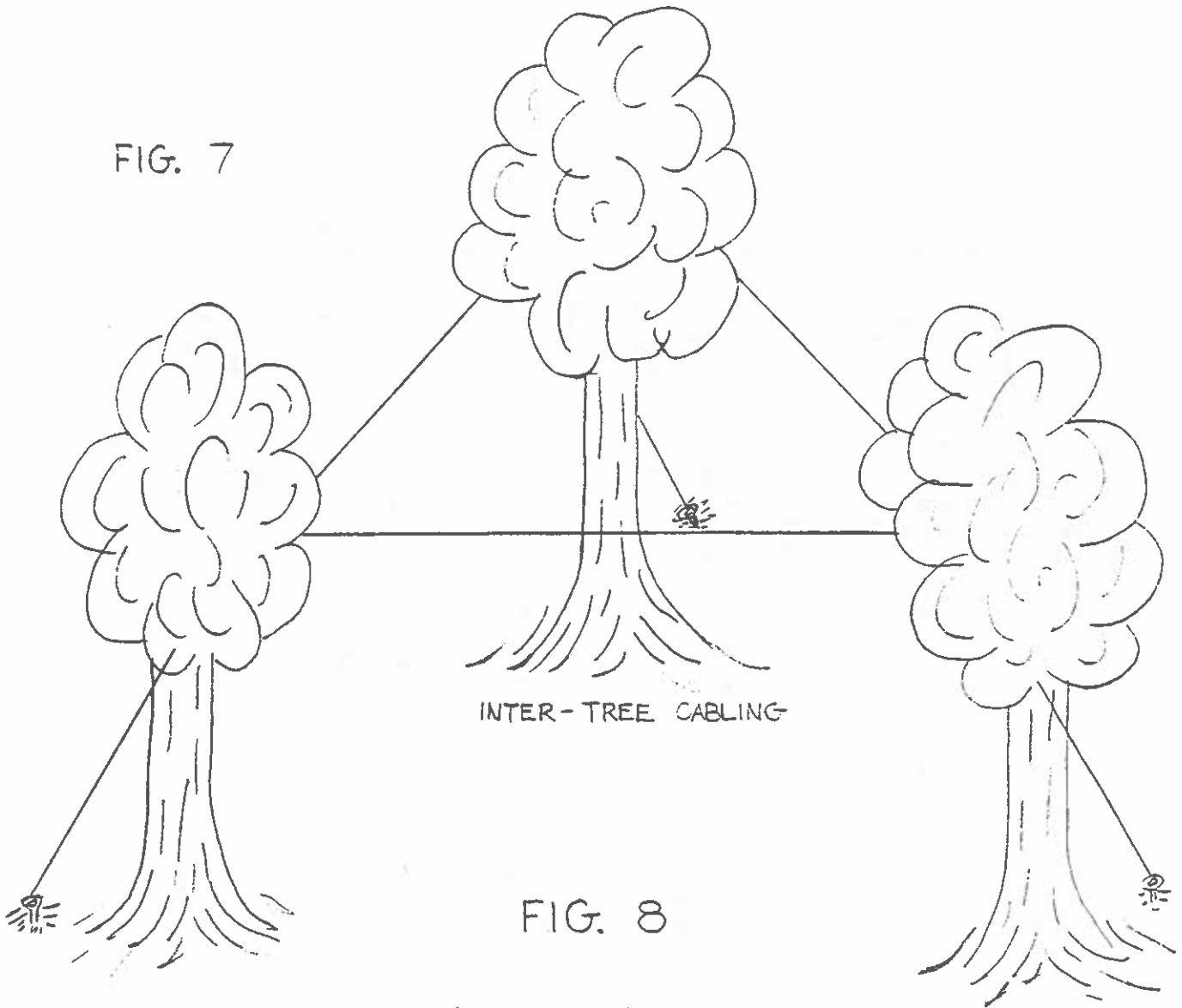


FIG. 8

TOOLS FOR CABLING



LAG HOOK



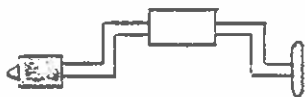
DROP-FORGED EYEBOLT



BENT EYEBOLT



7 STRAND WIRE CABLE  
3/16", 3/8", 1/2"



BRACE & AUGER BIT  
VI-20





## CAVITY REPAIR AND SUPERFICIAL WOUND TREATMENT

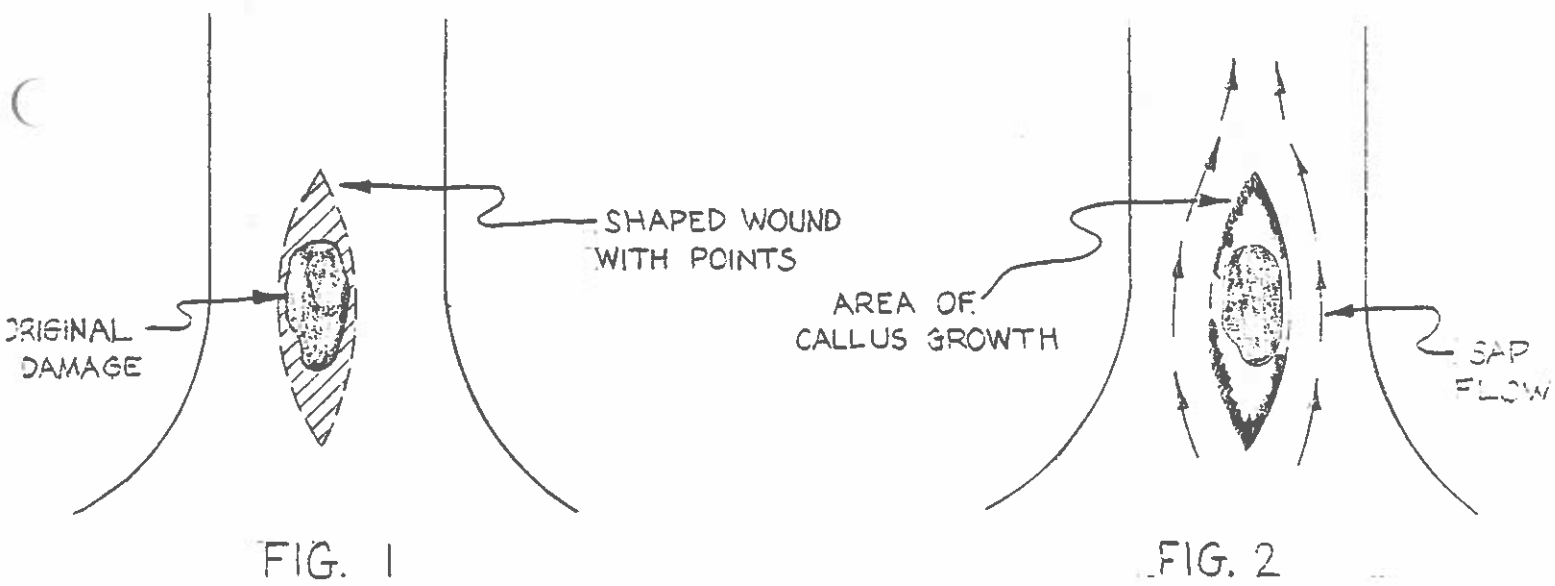
In the strict sense, cavity repair involves the care of hollow or rotted trees infected with wood rotting fungi, and the excavation and treatment of cavities. It can include either filling or open cavity work.

Wound treatment involves the care and cleansing of surface damage to the trunk or branches of a tree to prevent bleeding of sap or future infection and decay. Both repair techniques have parallel standards which should be followed to halt further decay and promote rapid regeneration.

The treatment for either procedure is:

1. The wound or cavity is traced back to solid bark with a sharp knife or chisel, and a wooden mallet or carpenter's hammer.
2. The wound is traced to promote proper callus growth, by pointing the top and bottom and shaping the entire damaged area into the form of a pointed oval. Callus growth takes place on the sides parallel to the sap flow and slowly grows inwards eventually closing the wound (see figures 1 and 2).
3. Oval shaping will allow for rapid runoff of moisture and will prevent water from collecting on the wound.
4. When shaping, avoid removing the white tissue if it is undamaged. This is in the inner bark and sapwood.
5. After the desired shape is attained, remove all the bark fragments and dirt.
6. Seal the wound edges and the entire injury area with a tree seal compound to avoid drying. If sufficient cambium is retained, the seal will act as a bark covering until a healthy callus is formed.

CAVITY REPAIR AND WOUND TREATMENT



## STRUCTURAL CAVITY REPAIR

Open and closed cavity repair are two basic methods which are designed to arrest the advance of decay in the main stem of a tree. Each method is intended for specific situations where trunk injuries have caused decay that may lead to a serious reduction in support of the entire tree. A careful examination of the tree's interior wood fiber must be made before deciding which method to apply. The percent of healthy supporting wood decides which cavity treatment to use. If more than one-third of the wood is affected, a closed cavity system is recommended.

### Open Cavity Repair

Open cavities are those that have had all the decayed wood fiber removed exposing healthy solid wood tissue, and most of the structural supporting wood remains intact and continues to safely support the injured tree. No artificial filler material, such as cement, is required to supplement the tree's supporting system. A mallet with a hard rubber head and two inch wood chisel are the recommended tools. Following removal of all decayed wood, the interior sides of the cavity are smoothed to eliminate rough edges or crevices that may promote new points of decay. Once the interior of the cavity has been properly prepared, the exterior edges of the cavity are shaped into an ellipse to promote rapid callus growth and proper drainage of moisture. (See Figure #1).

A mixture of 2 cups of clorox to 1 gallon water should be used to swab the cavity thoroughly to eliminate any foreign material. This also helps sterilize the wood. After allowing the cavity to dry a recommended tree seal should cover the entire cavity surface.

The advantages of the open cavity treatment are that air circulation will keep the repaired cavity dry and future inspections are easily made. (See Figure #2).

### Closed Cavity Repair

The closed cavity method goes several steps further than the open cavity method. The same initial procedures for removing wood decay are applied. After cleaning, smoothing, sterilizing, and sealing the interior walls of the wound, #10 screen mesh is attached to the interior wood with tacks or a staple gun. The screen mesh will act as a bonding material for connection of the cement filler to the interior wood. It is extremely important that the screen be stout enough to provide a solid bond. When the mesh is installed, place 1 x 6 precut boards over  $\frac{1}{2}$  the outside face of the wound.

The forms will wall off the opening so that cement can be poured into the cavity. (See Figures #3 and #4). Do not fill the entire cavity at once. Form the opening in stages so that the cement filler can be vibrated into all voids in the cavity. This can be done by filling a small portion of the cavity and then using a dowel rod to vibrate the cement in a ram-rod motion. Vibrating the cement produces a continuous mass of filler. Any voids that remain after the cement filler has hardened will only weaken the structure and promote future decay.

After completely filling the cavity, place the last forming board over the face of the cavity opening and allow the cement filler to cure for 3 days. (See Figure #5). Remove the board forms after the cement has cured. Inspect the cement surface for any voids or gaps. If no voids exist, allow the surface of the cement to cure for two days.

When the cement surface is completely dry, file and sand the cavity face so that there are no rough edges. Apply a recommended tree sealer to the face of the cement filler and the solid wood of the tree cavity edges to develop a complete bond between cement and wood. (See Figure #6). If so desired, paint the entire surface to match the bark color of the particular tree species.

Future inspections should be made to insure that the filler is continuing to bond to the interior walls of the cavity. If properly constructed, the cavity filler should last as long as the tree.

OPEN CAVITY REPAIR

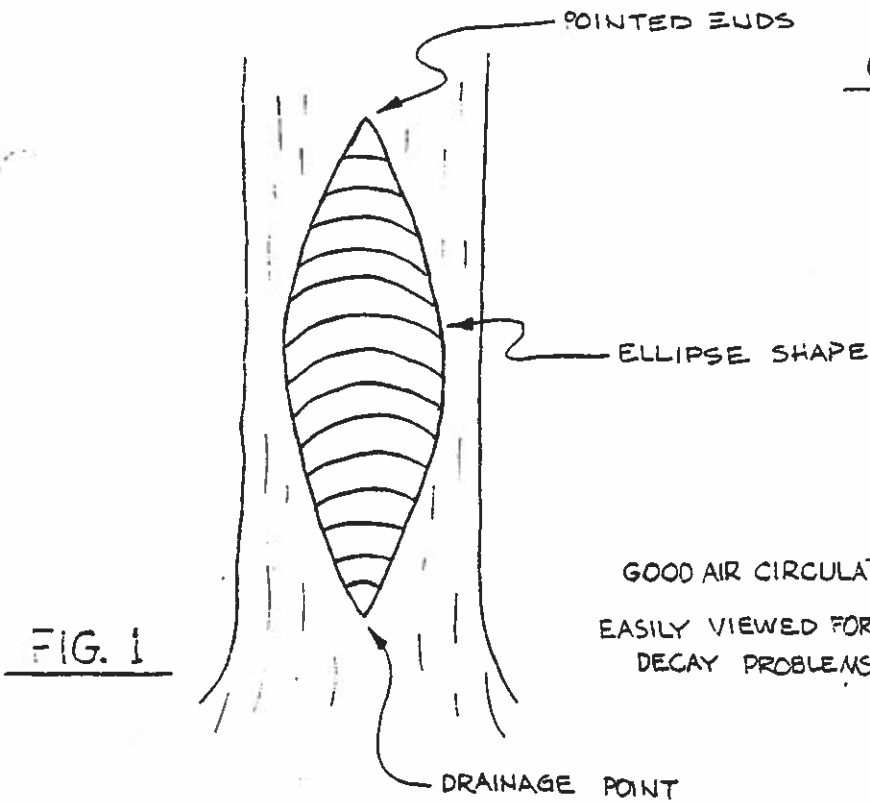


FIG. 1

CLOSED CAVITY REPAIR

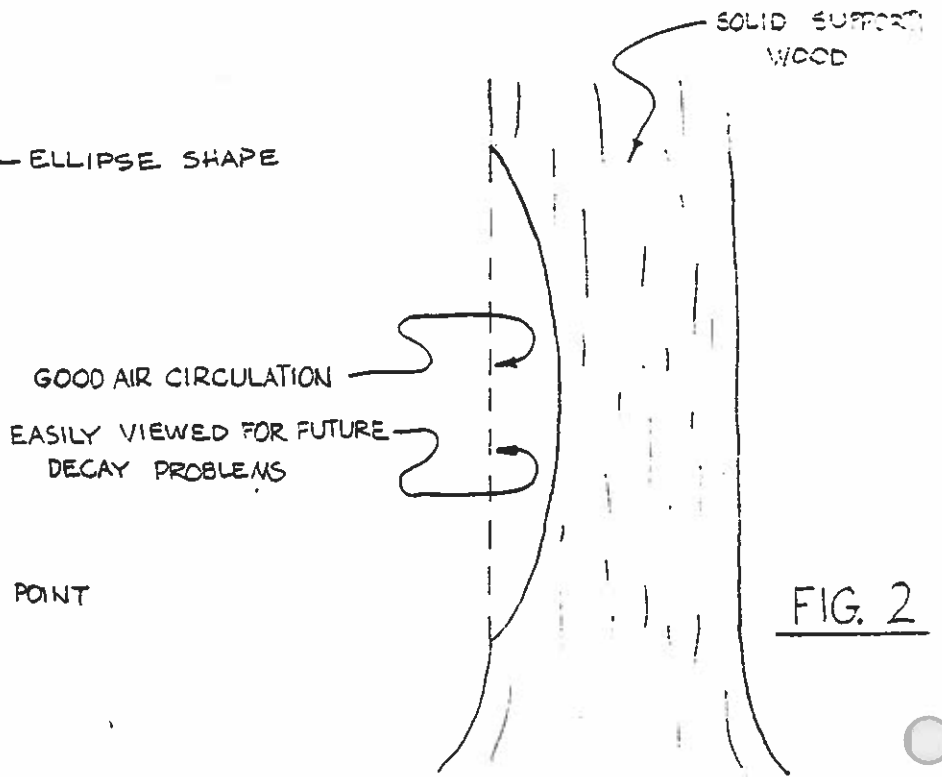


FIG. 2

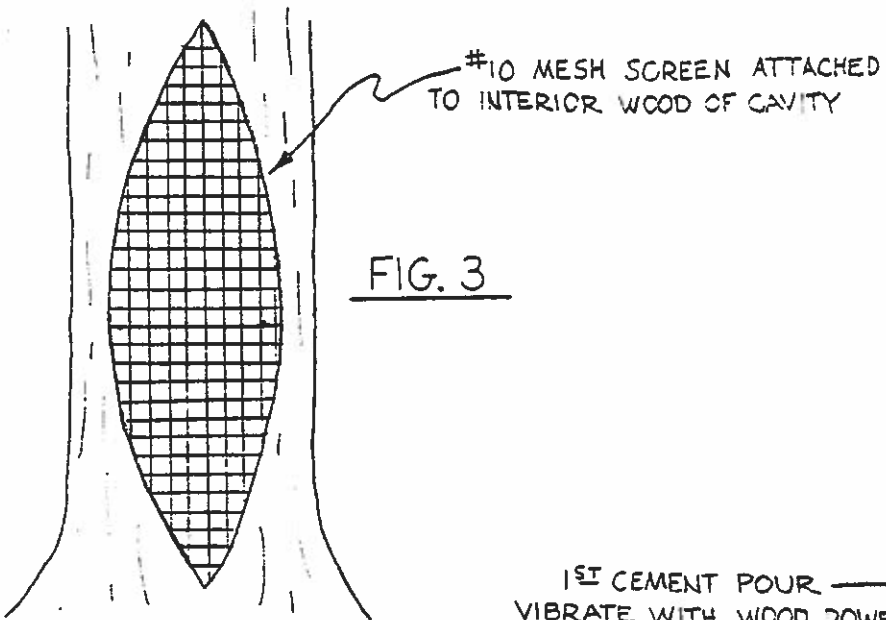


FIG. 3

1 1/2" CEMENT POUR  
VIBRATE WITH WOOD DOWEL

1x6 WOOD FORMS  
HELD TO FACE OF CAVITY  
BY ROPES OR STRAPS

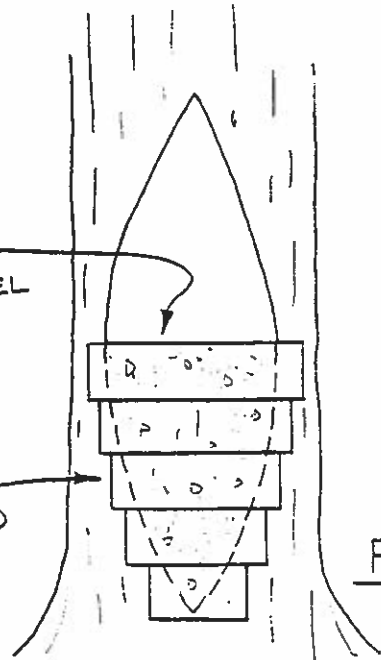


FIG. 4

# CLOSED CAVITY REPAIR

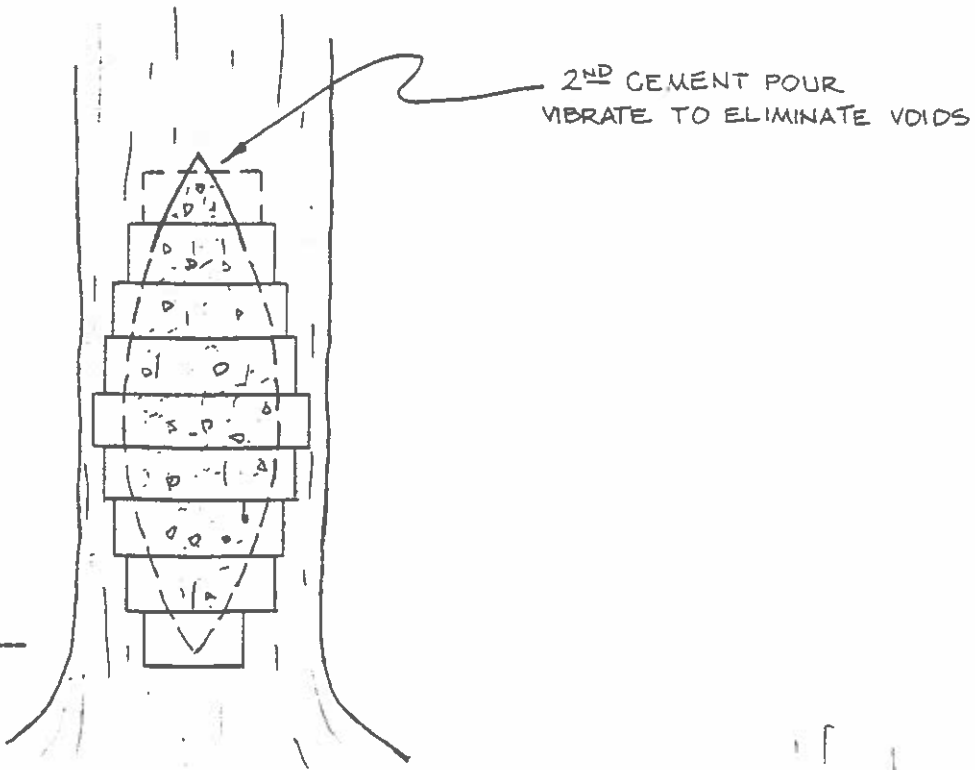


FIG. 5

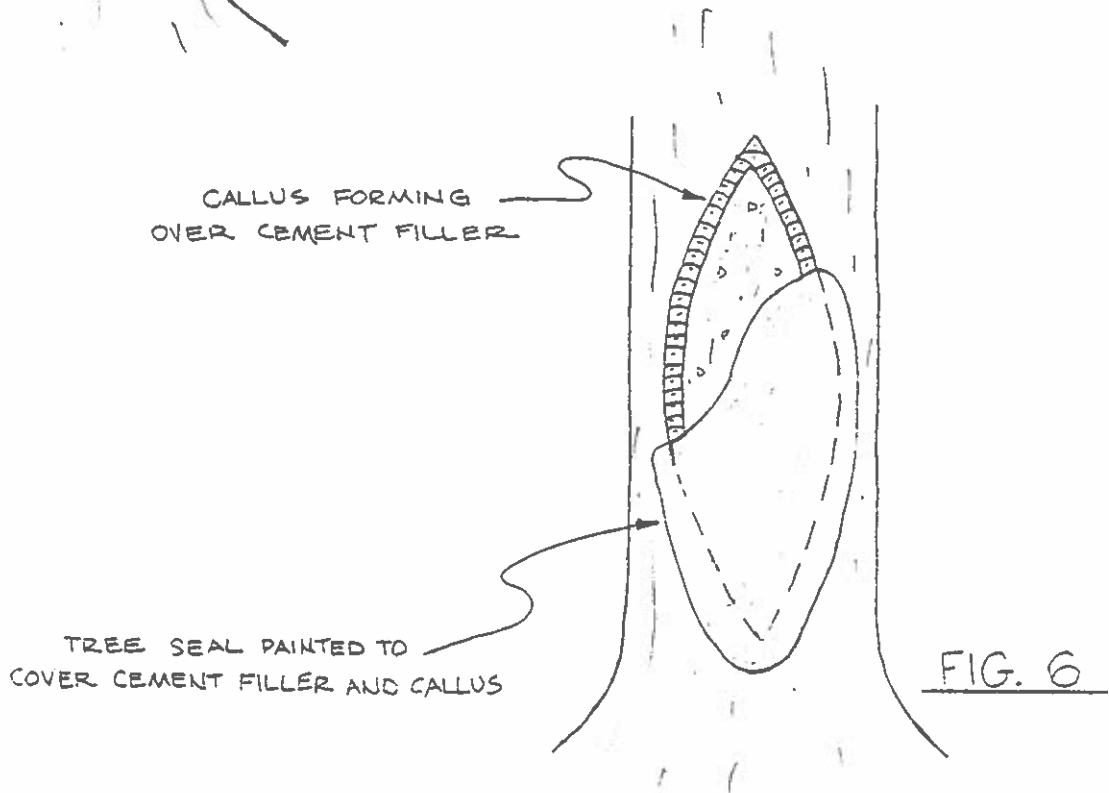


FIG. 6

SECTION VI  
PRACTICAL FORESTRY TECHNIQUES

SAFETY WHEN SPRAYING

Always remember that pesticides are poisons and can be harmful -- or even fatal -- if handled carelessly or misused.

Safe use of pesticides is everyone's responsibility. As the user, however, you have the major responsibility. This begins the day you select and buy a pesticide and continues until the empty container has been disposed of properly. Your County Extension Agent can help you choose the proper pesticide for the pest you wish to control, and also help you decide the proper time to use it.

Before using any pesticide, be sure and read the label carefully. The label gives you some idea of the hazards involved. Those pesticides that have DANGER-POISON on the front are very poisonous if you get them on your skin or breathe or eat them, and could kill you. Pesticides that have CAUTION on the label could harm you if the material is eaten or grossly misused. Labels that have WARNING are poisons that are in between the other two and can be quite hazardous. Follow the instructions for mixing, handling, and applying. Be sure -- don't guess.

The following safety guides will help:

GENERAL PRECAUTIONS

1. Always read and follow the label instructions before using a pesticide.
2. Use pesticides only for the purpose given on the label.
3. Keep pesticides in the original labeled container and store in a locked, well-ventilated building. (Don't Poison Your Children!)
4. Keep pesticide application equipment in good repair and adjust carefully to help insure proper dosage.
5. Mix pesticides carefully, keep off your skin and avoid breathing dust or fumes.
6. If you get pesticides on your skin or clothing, immediately remove the clothing and take an all-over bath (wash your head) using plenty of soap and water.

7. During application, stay out of the spray drift. Don't apply when wind is high. Keep people and livestock away from spray area.
8. Have someone keep an eye on you when you apply dangerous pesticides.
9. When you finish the job, wash immediately with soap and water. DO NOT smoke, eat, or drink without washing first.
10. Do not immediately re-enter treated fields, or permit other people to do so without protective equipment. Also, keep livestock out.
11. Never allow children to play around treated fields or pesticide mixing, storage, and disposal areas.

#### TRANSPORT

Transporting pesticides can result in broken containers and spills unless care is taken.

1. When transporting pesticides to your farm don't carry them near your groceries. You could poison your food.
2. Don't carry your pesticides with feed or mash for livestock. You could get them mixed up and kill the livestock.
3. Don't allow children to ride near poisons. A spill could result in injury or death.
4. Place pesticide containers so they do not shift, roll around or bounce while they are being hauled.
5. If any pesticide is spilled, clean it up immediately, being careful to not get any on your skin or clothing.
6. Do not carry poisons inside your truck cab or car. Pesticide poisons spilled on seat covers are very hard to remove.

#### STORAGE

Improper storage increases the possibility of injury to children and livestock. Safe procedures will help reduce hazards.

1. Store all pesticides in a well-ventilated, locked building. Packages that are likely to be damaged by dampness should be kept off the floor.



2. Poisons should be kept in tightly closed, original containers. The label gives information needed in case of accidents. Deaths have resulted from children drinking pesticides stored in coke or milk bottles.
3. Do not store clothing, respirators, lunches, cigarettes, or drinks with pesticides. They may pick up poisonous fumes or dusts or soak up spilled material.
4. Keep soap and plenty of water handy. Seconds count when washing pesticides from your skin.

#### PERSONAL PROTECTIVE EQUIPMENT

Protective clothing and safety equipment will help to keep you from being poisoned. The type of protective clothing and equipment needed depends on the job being done and the type of pesticide being used. Many pesticides are more apt to enter the body through the skin than any other way.

Proper protective clothing during application:

1. Clean clothing -- long sleeves, full skin coverage, closed at neck, wrists, and pant legs outside boots.
2. Waterproof gloves with long, tight-fitting wrists.
3. Wide-brimmed hat.
4. Waterproof boots (no canvas or leather shoes).
5. Approved respirator when required.

Proper protective clothing during mixing:

1. Clean clothing -- long sleeves, full skin coverage, closed at neck and wrists, and pants legs outside boots.
2. Waterproof gloves with long, tight-fitting wrists.
3. Wide-brimmed hat.
4. Waterproof boots.
5. Approved respirator with the right cartridge, when mixing dust or wettable powder (WP).
6. Safety goggles.
7. Rubber or plastic apron.

Safety points to remember:

1. Always wash clothing after each day's use. The body can absorb pesticide poisons from contaminated clothing if reworn before washing.
2. Always wash boots and gloves after each use.
3. Change filters in cartridge-type respirators after eight hours use or sooner if breathing becomes difficult or if pesticide odor can be detected when mask is properly worn.
4. It's your choice -- sickness or death -- if not protective measures are taken.

#### SAFE MIXING PROCEDURES

The greatest danger to you is when you mix the pesticide in the spray solution. You must be very careful not to inhale the pesticide, get it on your skin, or in your eyes.

1. Protect your skin:
  - a. Wear a long-sleeve shirt and long pants.
  - b. Button shirt at neck and wrists.
  - c. Wear a wide-brimmed hat.
  - d. Wear waterproof boots.
  - e. Wear waterproof gloves that fit around wrists.
  - f. Wear safety goggles to protect your eyes.
  - g. Wear a plastic or rubber apron.
2. To keep from inhaling the dust when mixing dust or wettable powder (WP) wear an approved respirator.
3. To mix, put water in the spray tank until it is about half full.
4. Measure the amount of pesticide needed and slowly pour it into the spray tank. Be very careful - DO NOT spill or splash. NOTE: Put the measuring cup in a larger container so that if it runs over, the formulation will not spill on the ground.
5. Always stand with your head well above the fill hole of the spray tank when mixing to keep from splashing it on your face and eyes. Keep the wind from blowing any of the material on you.

6. Rinse the measuring cup three times with about one-half cup of water and pour into spray tank.
7. If you use the whole can of pesticide, rinse the empty can three times with about one-half can of water and carefully pour into the spray tank.
8. Carefully fill the spray tank with the amount of water you need. DO NOT run it over.
9. Put all pesticide cans and bags back in the storage building and lock it.
10. Always have someone with you. In case of accident, they can assist you.
11. If you spill some of the pesticide:
  - a. Remove contaminated clothing.
  - b. Wash yourself with soap and water.
  - c. Clean up material spilled on the ground or equipment.

#### APPLICATION PROCEDURES

You are the only one who can keep yourself safe when you are applying pesticides. Work safely. Know the dangers of the pesticides you are using and how to keep yourself from being poisoned. Keep these points in mind:

1. Don't apply pesticides more often than they are needed. Look at the plants to see if there are enough insects to make it worth your time and money to apply. Wait until pesticides are needed. Your County Extension Agent can advise you on timing of applications.
2. Read all labels for every pesticide you use. Don't rely on your memory.
3. Wear clean clothing every day.
4. Do not carry food, cigarettes, or smoking equipment in your pockets when you are applying pesticides.
5. Never smoke, eat or drink while applying pesticides.
6. Change your work clothing after leaving the field. Bathe and change clothing before doing other chores. (Don't forget to wash your head and hair.)

7. Wash your skin immediately with soap and water if you spill pesticides on your skin or clothing.
8. If you splash material in your eyes, flush them with plenty of clear water.
9. Keep trouser legs outside of your boots.
10. When you apply highly-toxic pesticides, have someone keep an eye on you.
11. Keep out of the spray drift.
12. Never apply spray when wind exceeds 5MPH.
13. Carry a can of water, soap, and paper towels in a protected box on the spray rig.

#### GOOD HOUSEKEEPING

Keep the storage building clean and in good order -- good housekeeping -- a place for everything and everything in its place. These points can improve your operations:

1. Make certain that plenty of soap and water are available so that you or any worker can immediately wash off spilled pesticide.
2. Watch for leaky containers, damp spots on the floor, and loose caps or bungs. Correct any of these dangerous conditions immediately.
3. Have supplies such as common household detergents, lime, and sawdust handy for cleaning up spills.
4. Dispose of empty pesticide containers. Don't keep them lying around.
5. Keep protective clothing and safety equipment such as waterproof gloves, boots, jackets, trousers, aprons, hats, goggles, and respirators handy to use during cleanup and emergency situations involving pesticides.

#### PESTICIDE DISPOSAL

Safety disposal of waste pesticides and empty containers is a big part of your job. Follow these rules to minimize disposal problems:

1. Buy only the amount of pesticide you need for the season.

2. Mix only as much pesticide as you need for a particular job. If you mix too much, it is better to go ahead and apply all of it to the crop you are spraying. Do not dump it on the ground.
3. Rinse the empty container three times with about one-half the container of water and pour the rinse into your spray tank.
4. After rinsing, containers can be punctured, crushed, or broken and buried 18 inches deep in a well-drained location away from streams and water supply. Ask your County Extension Agent what to do with waste pesticide.
5. Store appropriate excess pesticides until the following year in your locked storage building.

### PESTICIDE POISONING SYMPTOMS

The symptoms of pesticide poisoning may resemble fatigue or other common condition or illness. However, you can protect yourself by knowing and being alert to the early warning signs of poisoning.

Look for these symptoms of sickness -- if you feel sick, go to your doctor: headaches, dizzy spells, nervousness, sudden weakness, sick stomach, cramps, vomiting, diarrhea, heavy sweating, watery eyes, salivating, skin rash, breathing difficulty, fits, coma.

Ways you can be poisoned -- how to prevent it:

Toxic chemicals may enter the body in three ways. They are listed below along with preventive measures and what to do about it.

1. Through the skin: use protective equipment to keep chemicals off the skin. If you get some on you, immediately wash all contaminated skin areas thoroughly with soap and water. Also change clothing. If you get some in your eyes, rinse thoroughly with clear water.
2. Swallowing: wash hands and face thoroughly before eating, drinking, and smoking. If poisons are splashed into mouth, rinse out with plenty of water and go to the doctor immediately. If poison is swallowed, give one tablespoon ( $\frac{1}{2}$  ounce) of syrup of ipecac. Do not wait for vomiting. Immediately go to physician. If you do not have syrup of ipecac, use one tablespoon of salt in a half glass of water. Go immediately to a physician. Do not wait for vomiting. Do not give any more salt water.

3. Breathing: use approved protective equipment. Wash respirators with soap and water after each use and change filter cartridges and canisters every day or more often if you can smell the pesticide.

#### SUMMARY

1. The major responsibility for safe pesticide usage rests with the user. That responsibility for safe pesticide usage begins when you select and buy a pesticide and ends when the empty container is disposed of properly.

2. Specific or exact information on pesticide usage can be obtained from your County Extension Agent, dealer, or chemical salesman. Such individuals should always be contacted when you have questions on the use of pesticides.

3. Reading the label each time you use a pesticide is a must because it tells you the safety measure to follow. Although brand names may stay the same, the product may contain different chemicals.

4. Careless transportation of pesticides can result in poisoning your food and feed. Keep pesticide containers from moving about when hauling. Pesticides should not be carried insideinside the trunk cab or car.

5. Mixing the pesticide formulation into the spray solution is the most dangerous part of your handling. Mixing must be done carefully so that you do not splash material on your skin or equipment. Pesticide material must be removed immediately from you, your equipment, and the area if it is spilled.

6. Keep your skin covered when applying pesticides. Having someone keep an eye on you is a good idea when applying pesticides.

7. Protective clothing and equipment needed depends on the job you are doing. It is dangerous to wear clothing that has not been washed since you last used pesticides. Gloves and boots must be washed with soap and water after each pesticide application.

8. The storage area must be kept locked. Children should be out of places where pesticides are stored. Good housekeeping is essential for pesticide safety.

9. Empty pesticide containers can be disposed of safely after rinsing and draining them three times with the right amount of water. Empty pesticide containers should never be used for storage of feed or food, raft or pier floats, or watering troughs. It is cheaper and safer to buy only enough pesticide for one season.

10. Poisoning symptoms resemble other illnesses. You may save your own life by knowing how you feel when poisoned and knowing what to do about it. Immediate action on your part, based on prior knowledge, can be extremely helpful in the event of a poisoning. The original container has safety information needed in case of accidents.

11. Spills cause emergencies that can be brought back into control through sound practices. In emergencies, planning ahead can help reduce hazards and may also save time. Supplies should be on hand for cleaning up. Protective clothing and safety equipment should always be used on clean-up jobs.

## HOW TO SPRAY TREES OF SMALL AND MODERATE SIZE

Spray trees from the inside out! By this we mean, apply spray to the interior foilage before spraying the entire outside canopy. Spraying the interior will soak those leaves which may not be drenched by spraying the outside canopy alone. Many insects and the eggs they lay are attached to the underside of leaves. Unless the spray kills by ingestion, the pesticide being applied may not kill the insect. Contact pesticides require the chemical to touch the insect's body. Therefore, spraying the underside of leaves and interior of trees will insure a good distribution of the pesticide.

After completing the interior spraying, spray the foilage from beyond the tree's drip line. Sprays should not be applied in a steady high pressure stream. Such an application will only knock insect pests off the tree. High pressure application (over 150 lbs.) can result in excessive drift beyond the application area. Avoiding drift is extremely important. Trees, shrubs, and other plants (i.e. all types of ferns) may be injured or killed by the chemical being applied. Small animals, birds, fish, and even beneficial insects may be injured or killed due to careless application or drift of chemical sprays. Always mix sprays exactly as directed and never spray when wind velocities exceed five mph. Less pressure, or a mist application under ideal conditions, will produce superior insect control and a substantial savings of pesticide material.

The tree has been thoroughly sprayed when all branches are wet and freely dripping. After completion of your spray application, check the immediate area for signs of excessive drift. If shrubs or trees other than the target plant have been soaked, carefully wash them clean of all chemicals by using clean water. This procedure will prevent burning of plant leaves. The same application techniques can be used for all shrubs and trees. Only use pesticides applicable to the species of plant being sprayed and the insect you plan to eradicate. Always follow directions carefully and to the letter.



## MONTEREY PINE BARK BEETLE CONTROL

Control of the Monterey Pine Bark Beetle is fairly simple. This particular beetle causes wide destruction and is a major contributor to the rapid death of healthy Monterey Pines in this area. The beetle measures 1/3" in length and is red to reddish brown in color. Contrary to popular belief, the Monterey Pine Bark Beetle cannot be controlled by a simple spray application to the trunk. Physically removing the insect pest is essential before control can be assured. Following removal of the insect pest, spraying the trunk of the infested tree will provide protection from additional infestations.

### WHERE THE BEETLE ATTACKS

Bark Beetles attack the Monterey Pine at the base of the trunk and to a height of approximately six feet. Any surface roots that are exposed are susceptible to attack as well. On rare occasions, the Bark Beetle has been known to infest the tree at heights greater than six feet.

### INDICATIONS OF BEETLE INFESTATION

Positive examination of a Monterey Pine for signs of infestation will reveal whitish or reddish pitch granules lodged in the crevices of the bark or on the ground at the base of the tree. If you find granules, examine the bark surface at or near the granular deposit, or directly above a deposit to locate the insects' entrance hole. The entrance hole will either be surrounded by reddish pitch forming a small cone, or the hole will be completely covered with a mass of gummy residue. Such tell-tale signs indicate that Bark Beetles are active.

### HOW DAMAGE IS CAUSED

The insect pest tunnels through the tree's thick bark plates, into the cambium and sometimes into the sapwood. As the beetle bores, liquid sap is transformed into crystals or sap gum and ejected from the tunnel. These are the crystal residue deposits seen in the bark crevices or on the ground. There is no particular direction or pattern to the tunneling operation; the beetle simply tunnels. Usually the tunnel is between six and ten inches in length. At the end of the tunnel is the nuptial chamber where the female deposits most of her eggs. Eggs are also attached to the walls of the tunnel. Following hatching, the larvae feeds on the tree's cambium layer forming numerous galleries in the process. The insect's cycle can repeat itself every 180 days within the same tree if left unchecked. Thus, several generations can be present.

Uncontrolled, the insect pest can cause a rapid dieback of a healthy host tree. Eventually, death will result due to the girdling of the tree's life supporting cambium layer. A concentrated attack can cause death within several months.

#### HOW TO ERRADICATE THE INSECT FROM THE HOST TREE

Find the entrance hole or holes of the insects, mark them for repair, and gather the following tools:

1. Wooden mallet or hammer
2.  $\frac{1}{2}$ " chisel and a 1" chisel
3. Small wisk broom
4. Tree seal compound and paint brush for application.

Starting at the entrance hole, begin chipping away small pieces of the bark around the entrance hole. Avoid removing too much bark at any one time. Do not lose site of the tunnel. Trace the bark as you follow the beetle's tunnel, making certain that all damaged cambium is exposed. The tunnel will be your guide as you continue tracing. Remove 1-1 $\frac{1}{2}$  inches of healthy bark and cambium from either side of the infested tunnel. Gradual and cautious removal of bark and cambium will serve two purposes:

1. Damage to healthy bark and cambium will be minimized.
2. The insect causing the destruction can be captured-- this will eliminate any guess work and assure destruction of the insect.

The most important part of tracing is to find the insect or insects (there have been as many as six mature beetles in one gallery). When you have reached the nuptial chamber, trace beyond it (1-1 $\frac{1}{2}$  inches) to make certain that other tunnels do not extend beyond the chamber.

Once you are certain that all the beetles have been removed, trim the damaged areas by smoothing the edges of the chiseled area. Making the edges even and smooth will reduce future possibilities of decay and stimulate rapid callus growth. Shape the entire wound into an oval with pointed ends. The oval shape and the pointed ends will also stimulate rapid callus growth and will allow easy runoff of surface water. The oval shape cannot always be maintained because of the erratic direction that Bark Beetles often take when tunneling. In this situation, shape the wound as well as you can, and form points wherever the edge of the wound changes direction.

After the wound is shaped and the edges have been made smooth, clean the exposed wood of all dirt and foreign debris with a small wisk broom. Follow this procedure with the application of a tree seal compound. Spread the seal so that all of the wound is covered with 1/8" to 1/2" of material. Overlap the seal so that the edges of the undamaged bark and cambium are sealed as well.

After applying the seal compound to all repaired areas, spray the exposed roots and the trunk from ground level to a height of six feet. Linden 200 or Chloridane insecticides are commonly recommended. Examine the tree every so often to make certain that there are no further infestations.

## CONTROL OF MONTEREY PINE ENGRAVER BEETLE

### IPS paraconfusus

The Monterey Pine engraver beetle is not considered to be a primary killer of mature Monterey Pines in this area. Ips paraconfusus usually infests dead and dying limbs of mature trees, small seedlings and very young trees and where certain conditions of stress are prevalent, i.e. where shallow rooted pines are under stress because of insufficient soil moisture, where encroachment from building development has damaged the root system or has compacted the soil, or when Red Turpentine Bark Beetles are actively attacking the basal area of a tree's trunk. Under these adverse conditions, Ips paraconfusus beetles have killed mature Monterey Pines.

#### Recognizing the Symptoms

Characteristic infestation is recognized by a severe and very rapid dieback of the upper canopy foliage. During the first weeks of infestation, needles begin to droop, and exhibit a change in color from deep green to a pale yellow-green. As the infestation progresses, bark may begin peeling from the smaller limbs in the upper canopy. Lower limbs will remain healthy and undamaged. Infested branches will quickly turn red after several weeks as the insects continue to mine and move downwards through branches of the tree. If the infestation is not arrested, the insects will continue their downward movement until the entire tree is killed. Successful control of this insect pest requires sanitary and complete removal of all dead, dying, and infested living branches. (See Figures #1 and #2). If more than two-thirds of the canopy has been killed, complete removal is usually recommended.

# CONTROL OF IPS

DROOPING NEEDLES  
PALE GREEN COLOR INDICATES  
BEETLES ARE ACTIVE

NORMAL NEEDLE  
CLUSTER

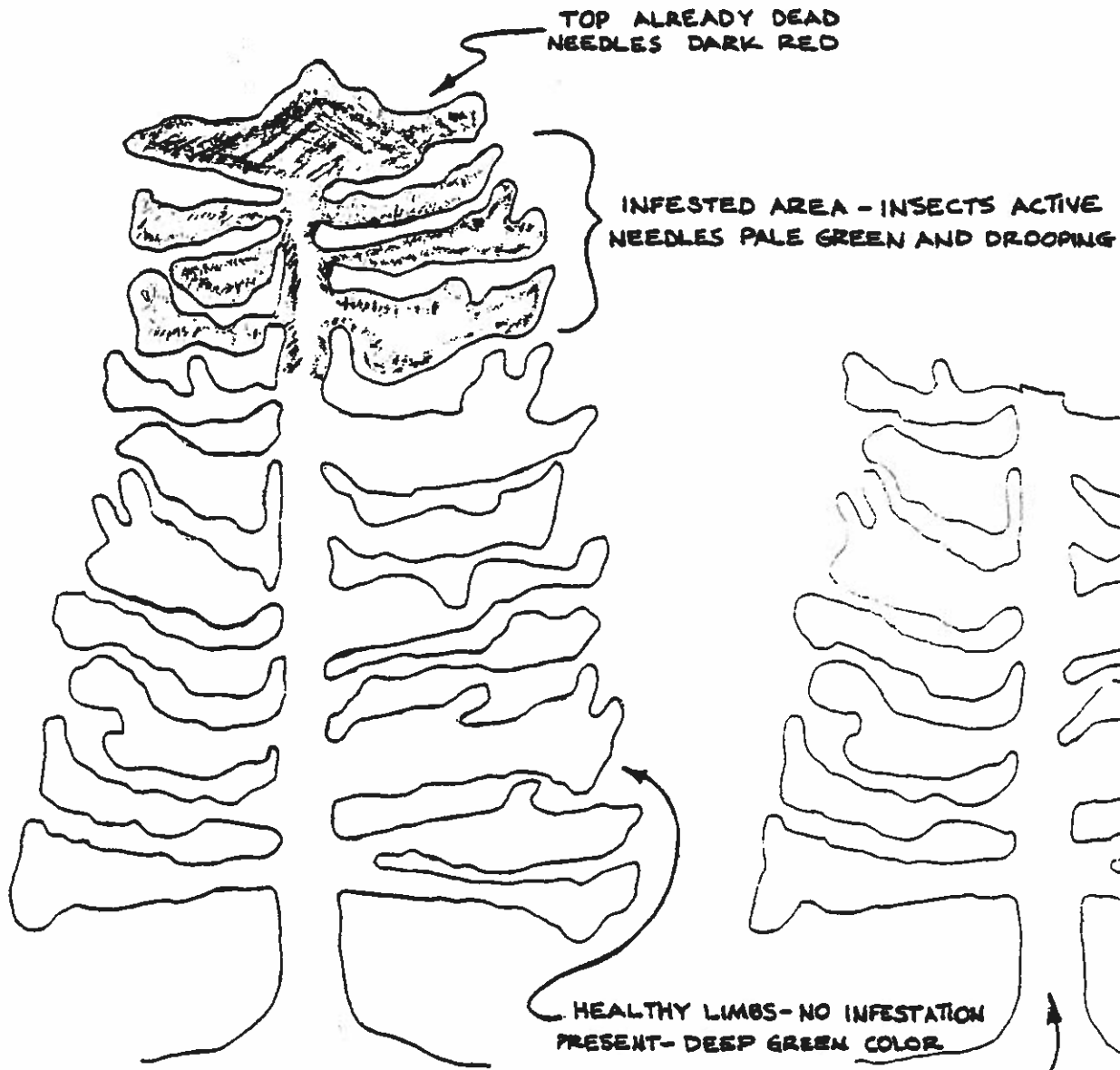


FIG. 1

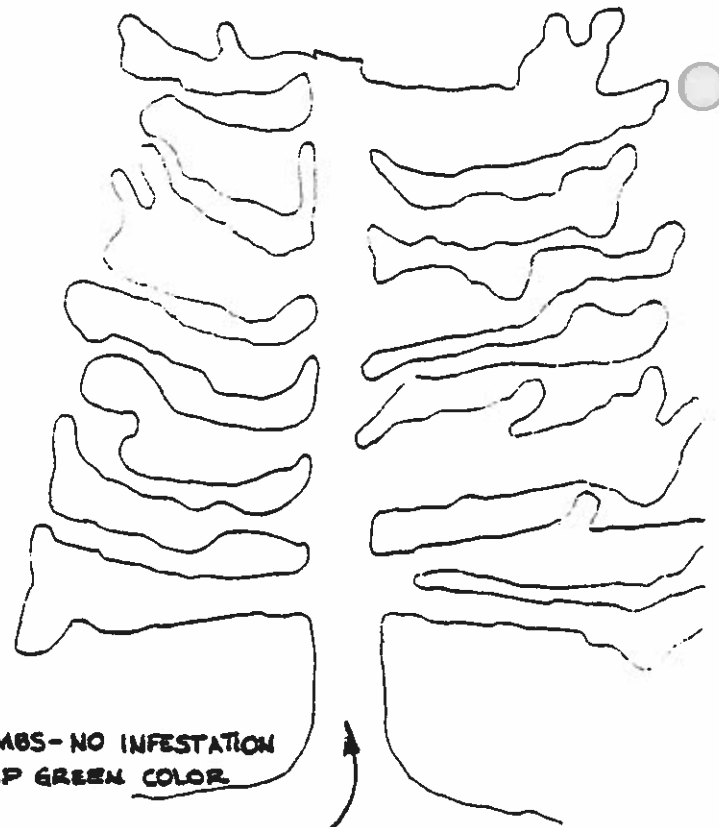


FIG. 2

## TREE TRIMMING METHOD

### Types of Trimming

The word trimming suggests the removal of parts of a tree as contrasted to its entire removal. One system of classifying types of trimming is as follows:

1. Safety trim - removal of those dead or fractured branches or stems that would cause harm to persons, property or valuable plants if they fell.
2. Dead wood trim - same as above and remove most other dead twigs and branches for aesthetic purposes.
3. Detail dead wood trim - same as above and remove all dead twigs.
4. Standard trim - same as above and remove some green twigs and branches for natural but open appearance. This type of trim generally improves the tree's aesthetics, stimulates new growth, reduces shade below and prevents wind damage by letting the wind blow through.
5. Rough standard trim - same as above but less time spent on detail. Same attention given to proper cutting technique and treatment of cuts, and same density achieved as in Item 4, but small dead and green twigs not removed. Appearance should be quite similar to standard trim.
6. Thick standard trim - same as Item 4 but more dense.
7. Thin standard trim - same as Item 4 but more thin.
8. Shaping - removing outer parts of branches to give tree a lower, or narrower, or rounded, or conical shape, etc.
9. Shaping for weight - removing outer parts of branches to prevent breakage.
10. Topping - removing highest parts of a tree only.
11. Pollarding - cutting all green from a tree and shortening branches to stubs for re-sprouting. Usually done only to species like plane and willow.
12. Modified pollarding - same as above but leaving a little green on the end of each stub for better appearance. Usually done to species like elm and certain acacias.
13. Hedge trim - shaping a row of trees to exact square or rounded form to make a wind or visibility screen between properties or parts of a property.

## Tree Tolerance

It is essential to know a tree's tolerance before trimming. For example: Monterey pine should not have more than 1/3 of the green removed from any one twig, branch or tree in any one year. Monterey cypress will tolerate the removal of 3/4 of the green. Coast live oak will tolerate drastic trimming except during the months of May and June. During those months trimming tends to stimulate a witch's broom growth on the ends of the branches that develops mildew, then dies. If all of the green is cut from a branch of certain species, such as Australian tea, certain acacias, and most conifers, the branch will not re-sprout. This can be disastrous when trimming hedges. It is best to trim most deciduous species in the winter months. Acacias are usually trimmed after they bloom in the spring for aesthetic reasons.

Since trimming stimulates growth, it is best not to remove green foliage at the same time of year that a tree is fertilized or over-stimulation may result.

## Trimming Technique

When a branch is removed from a tree it should be cut close to the trunk or intersection so that it will heal. It must not be allowed to tear down below the cut, so a two-cut or three-cut system is often necessary. The final cut should be a single one so that a smooth surface is left for painting.

The cut must be treated as soon as possible with an approved sealing compound, preferably one that provides a thick, flexible coating to match the bark color. A fungicide and insecticide may be added to the material.

Whenever trees are trimmed or removed, or even climbed with climbing irons, it is essential that all Monterey pines within a radius of 50 feet be sprayed at the base with a .2% lindane mixture to prevent attack by the turpentine beetle.

## TREE REMOVAL METHOD

Only rarely in urban forestry can an entire tree be felled at once. Usually, the climber installs a rope for himself in the highest and most central part of the tree and another nearby for lowering the individual branches. He then starts removing the lowest branches and working upwards. When a bare spar remains, sections can usually be thrown into a prepared space below. A useful rule of thumb is that one-quarter of the remaining spar will turn 270° and land flat on the ground without bouncing. More than one-half of the spar will land safely, except that the butt may hit a short distance behind the base of the spar.

When making cuts through the spar, at any level, it is advisable to follow these steps:

1. Cut 1/3 of the way into the trunk on the side toward which the piece above is to fall. Cut down at 45° to make a notch. This is the undercut. It must be shaped exactly and accurately aimed.
2. The back cut is then made on the opposite side of the tree at the same level as the bottom of the undercut. It must not ever reach the undercut.
3. If the spar leans to the left, more hinge wood should remain on the right side when the fall begins. This does not influence the direction of fall but keeps it from breaking toward the lean. The only time the back cut should be a couple of inches above the back cut is when the tree is being felled uphill.
4. When the back cut is complete the tree is pulled over with a rope previously tied at the top. The direction of pull does not influence the direction of fall.

Where there is not enough space to drop parts of the spar, these parts must be lowered by blocks, tie-ropes and adequate lines. This technique should be discussed first with someone who is familiar with it.

State law requires that trimming or removal be done so that no parts of the trees or workers come within 10 feet of power lines carrying more than 770 volts unless the workers have met special training standards and equipment is properly designed.

Ropes, climbing and safety equipment must meet strict state standards for both trimming and removal. These standards must be checked at regular intervals.



## PRUNING TECHNIQUES

### Need for Pruning

Many trees, during the course of their life span, require periodic pruning to regulate and control growth, to aid in the development of form or shape, or to eliminate the accumulation of unsightly dead twigs and branches. The development of form through pruning is usually made while the tree is immature. The pruning of mature trees is done to either eliminate dead twigs and branches, improve aesthetics, or improve shape and form of large branches that may hinder overall development. With proper pruning practices, the qualities of any tree can be fully realized.

### Pruning for Physical Reasons

Leaves on the interior and lower portions of plants need air and light to function. Therefore, a common reason for pruning is to thin out dense growth to let in air and sun light. Pruning to thin out crowded conditions sometimes pays dividends also in providing more space, light, moisture, and air to adjacent plants. It can also lessen damage by subsequent winds and storms. In a harsh winter area, it is advisable to thin to reduce the danger of breakage due to high winds. Where brush and forest fires are a danger, good garden housekeeping can reduce fire risk. Dead wood and withered leaves should be trimmed off shrubs, vines, and trees as part of the overall trimming operation. (See Figure #1).

### Pruning to Correct or Repair Damage

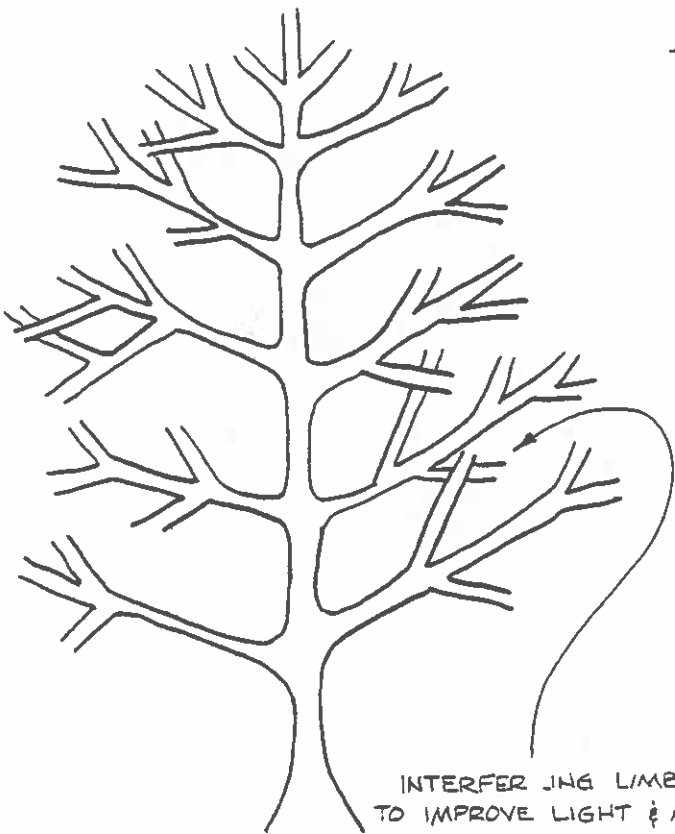
If a storm breaks a limb, the stub should be cut back to another branch or to the trunk. Branches that die from unknown causes should be removed as soon as discovered. Such a branch may be diseased and the removal can prevent the infection from spreading to healthy wood. Such cuts should be made back into live wood, and the shears dipped in a disinfectant between cuts. (See Figure #2).

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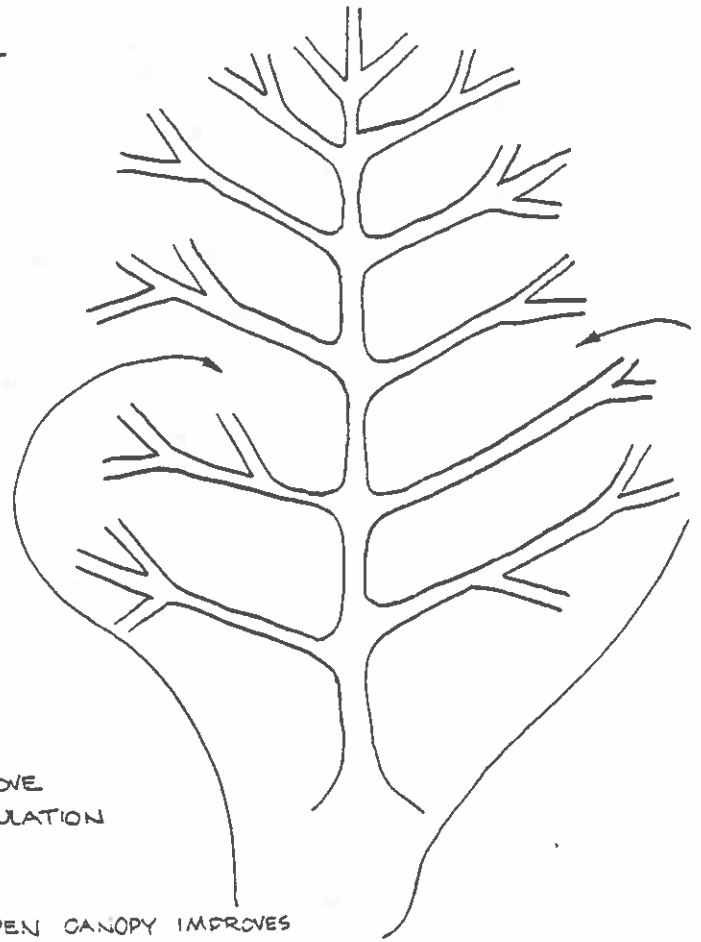
Lee Klein, 1975, Menlo Park, California, Sunset Pruning Handbook, Lange Magazine and Book Company.  
George E. Brown, 1972, London, England, Pruning of Trees, Shrubs and Conifers, Faber and Faber Ltd.

# PRUNING FOR PHYSICAL REASONS

FIG. 1

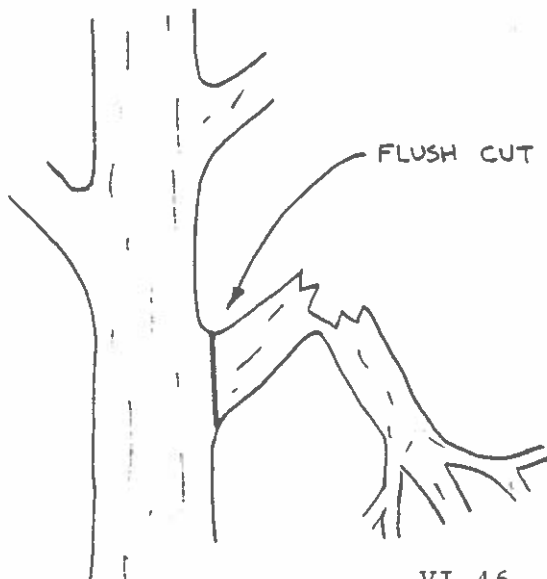


INTERFERING LIMBS - REMOVE  
TO IMPROVE LIGHT & AIR CIRCULATION



OPEN CANOPY IMPROVES  
AESTHETIC LINES OF MAIN LIMBS  
AND REDUCES INSECTS OR DISEASE PROBLEMS

## DAMAGE REPAIR



FLUSH CUT TO MAIN TRUNK

FIG. 2

### Pruning to Direct or Control Growth

When the end bud is pinched off a branch or a cut is made through a stem or branch, growth is stopped or inhibited in one direction and encouraged in another. The removal of side branches, speeds up growth of the central leader (main trunk); removal of the tips of the leader and the main branches speeds up growth of lesser side (lateral) branches. The cuts cause food to be diverted from one part of the plant to another thereby allowing shaping and training.

By simply using the thumb and forefinger (or a pair of pruning shears) to nip off soft buds, growth is stopped in one region and forced to another part of the plant.

Effective use of this knowledge will not only shape the plant in the form wanted, it will also keep the size wanted; low, flat against a wall, compact, whatever the objective. Using this knowledge of growth diversion to control or modify growth of plants is one of the most satisfying aspects of pruning. (See Figure #3).

### Pruning for a Pleasing Artificial Form

This includes pruning to reveal the attractive branches of normally leafy plants, hedge shearing, topiary pruning, or espaliering.

### Pruning to Compensate for Transplanting

A living healthy plant has its root mass and its leaf mass in a state of equilibrium. There are just enough leaves to manufacture food, and just enough roots to take in water and minerals. The two parts supply each other and depend on each other.

When a plant is transplanted many roots are severed. The plant then has trouble getting enough water to supply the leaves. As a result, it wilts, and can die unless something happens within the plant or its environment to reduce the moisture loss. The top of a plant can be removed so that the leaf area is reduced to compensate for the loss of roots. (See Figure #4).

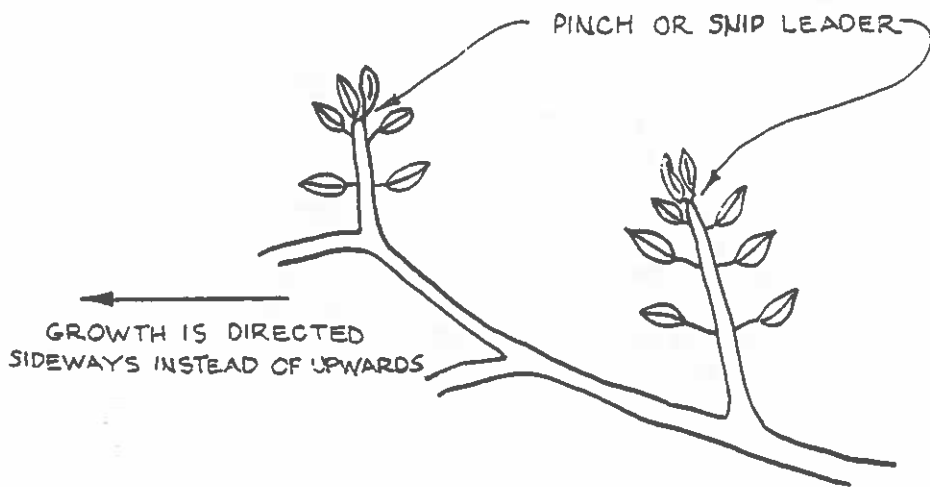
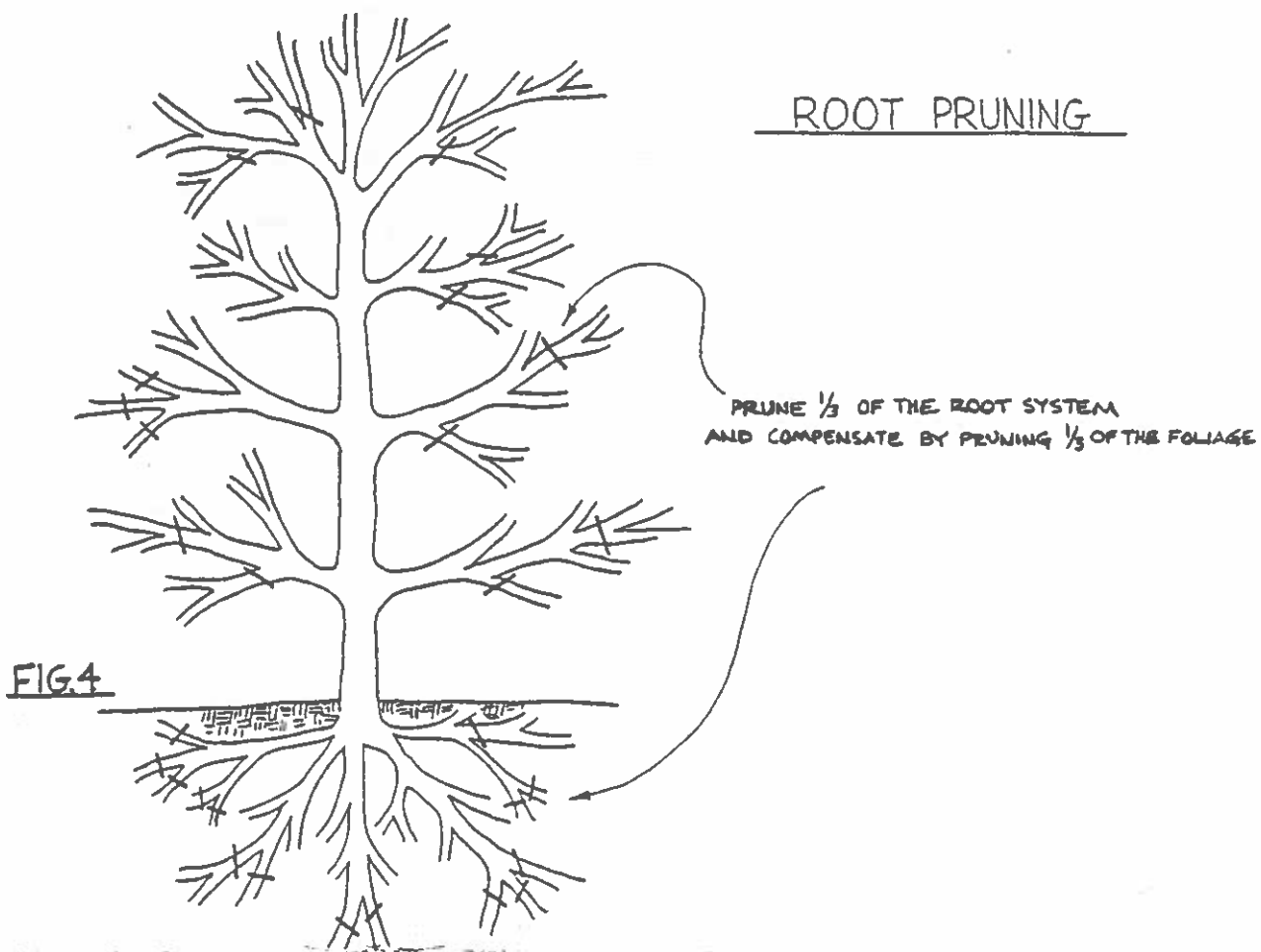


FIG. 3



## Pruning Because of Someone's Bad Judgement

Some pruning takes place because at some time previous the planter selected and placed a plant without adequately allowing for its ultimate size, its rate of growth, or what it would look like when mature.

It may be desirable to experiment with pinching and pruning to get interesting forms from a misplaced plant. To minimize pruning problems, however, plants should be selected and placed with objectives (3, 5, 15 years from now) in mind. Many plants placed appropriately and properly trained while young never need any pruning at all, beyond the removal of damaged or dead wood.

## Pruning Large Limbs

The proper method for removal of large limbs is to use the three cut method. First, an undercut one-third of the diameter of the branch is made. The second cut is made above the first and one inch outside of the first cut. After the major portion of the limb has been removed, the final cut is made one inch from the branch junction. The three cut method will prevent the bark from tearing on the main stem due to too much weight. (See Figure #5). If a single cut is made without reducing the weight of the limb, the limb's weight tears the limb away from the trunk and causes a large tear at the branch junction. (See Figure #6).

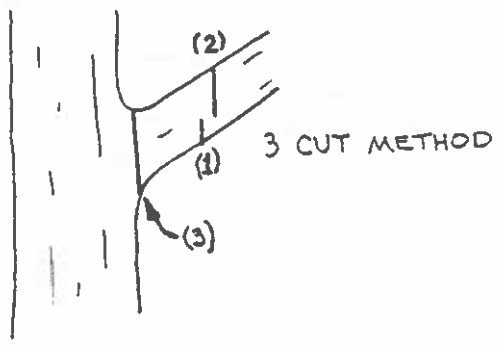
## Stubs

Stubs are unsightly and cause future decay of the main stem. Cutting limbs flush with the junction of a branch or trunk provides a smooth surface with little or no possibility of future decay. (See Figure #7).

## Tipping and Shaping

Tipping and shaping develop's a healthy full shaped tree and is usually done during a trees immaturity. Pruning trees at this stage of development will usually guarantee elimination of unsightly growth habits. Shaping and selective removal of unsound limbs or double branches will prevent a hazard as the tree matures. Tipping is easily done by pinching the terminal leader. This procedure will restrict growth for one year and will produce dense foliage. (See Figure #8).

FIG. 5



IMPROPER METHOD

FIG. 6

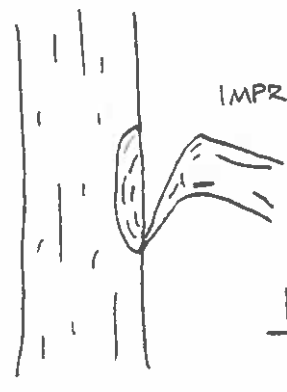
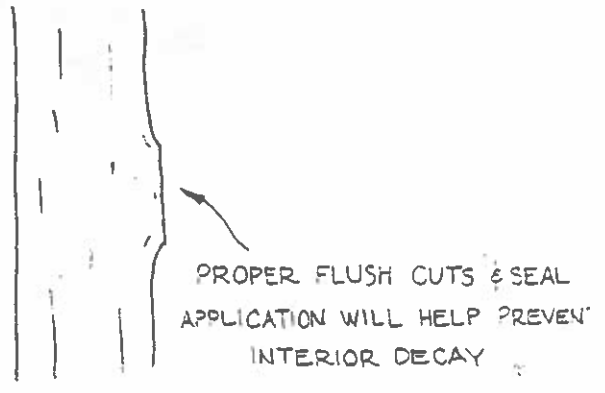
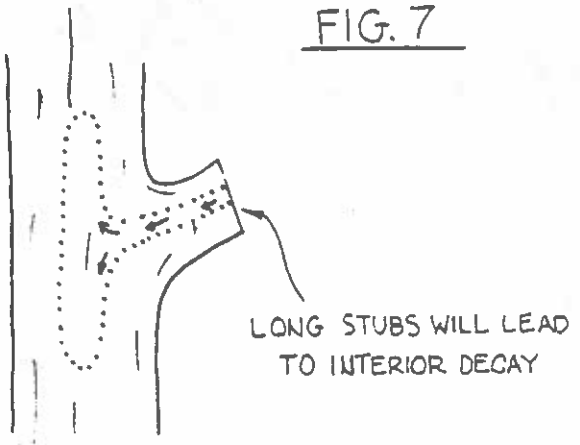


FIG. 7



TIPPING AND SHAPING

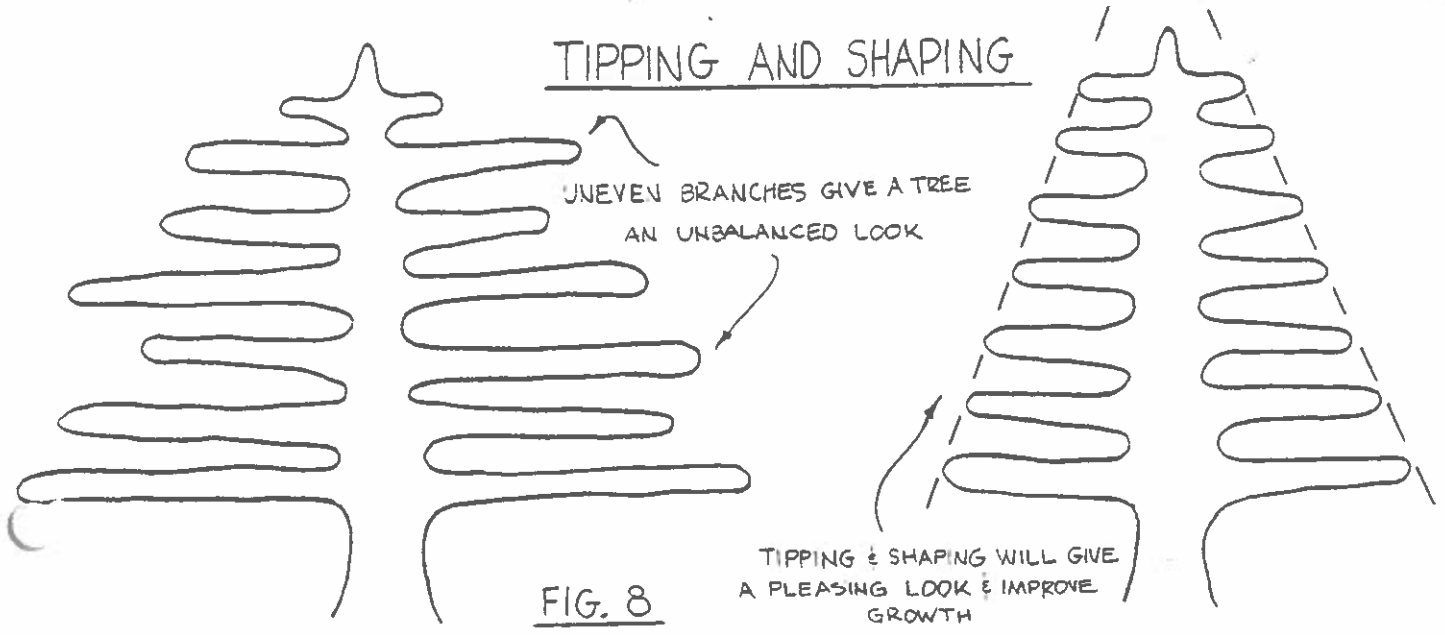
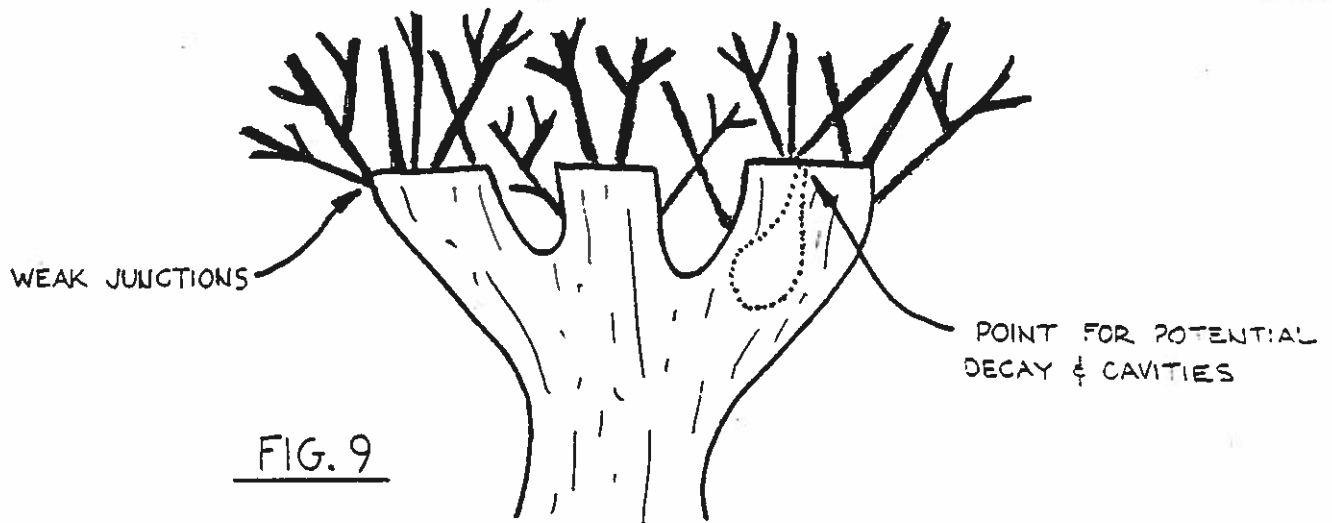


FIG. 8

## Pollarding

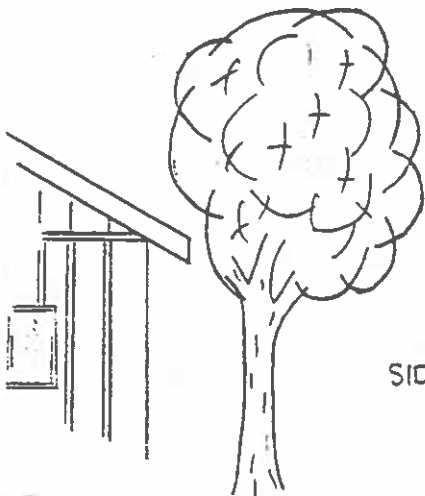
Pollarding is the cutting back of all the main branches of a tree to reduce its size. This is generally a poor practice, in that a tree will lose its natural shape at least for several years, and it is only a short term corrective measure. The new sucker shoots that grow after initial trimming have poor junction development. In future years these junctions can be a source of potential danger.

Because many sucker shoots are produced very rapidly on a pollarded tree, special care should be taken to inspect the tree. Sucker shoots should be thinned by selecting the strongest and healthiest of the shoots and eliminating those that are weak or poorly developed. Pollarding can cause rot or cavities to develop where large limbs have been cut. If this is the case, serious consideration should be made for removal. (See Figure #9).



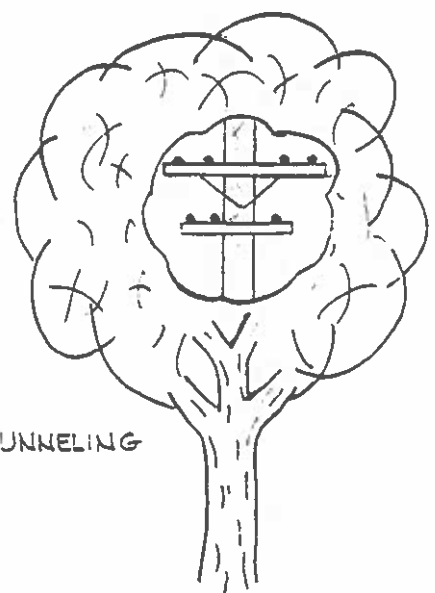
## Trimming for Clearance Purposes

This type of pruning is done when trees or large shrubs are in conflict with structures or power lines. Several types of shaping are; side pruning, tunnelling and roundovers. (See Figures #10 to #12). Each style will produce an adverse affect when considering the natural shape of most tree species; particularly with trees that have a central leader such as conifers. In each case, limbs should be removed to a lateral junction or flush with the trunk.



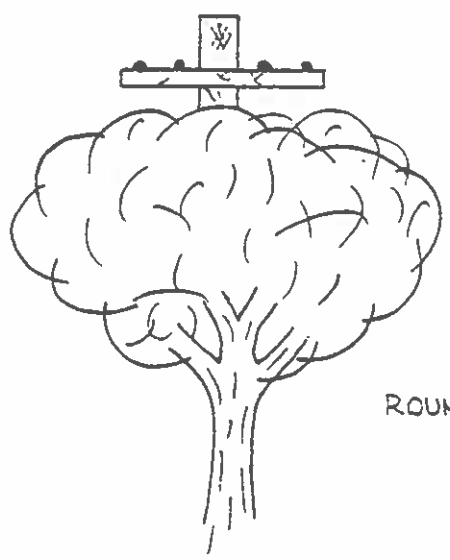
SIDE TRIM

FIG. 10



TUNNELING

FIG. 11



ROUND OVER

FIG. 12



direct root feeding techniques. (See Section VI-6 of Carmel's Forest Management Guide) Follow the procedures for subsurface watering using a commercial fertilizer with no more than 10% Nitrogen. A 10-10-5 slow release mixture would be advisable at a rate of 10 lbs. per 500 gallons of water. Fertilize only once, and follow with several irrigations at monthly intervals for a six month period.

#### GRADE FILLS

Fills, especially compacted fills, cause a tremendous amount of stress to existing trees. Increases in grade elevations of a few inches usually are not a problem. A change of grade is critical when soils are heavy and in excess of six inches in depth.

Air circulation usually ceases or is substantially reduced through compaction operations. Compaction usually results in a lack of water availability to the tree due to little or no soil porosity. When soil compaction exists, trees suffer from a substantial loss of water and nutrients; thus the tree may starve.

Because soil grades are not examined carefully during initial surveys, modifications of grade elevations may result in significant alterations in drainage. Where a tree was once used to moderate soil moisture, soil may become saturated, or reach what is called field capacity. If this occurs for extended periods, the tree's roots and trunk suffer. The end result will probably be severe rotting of the roots or trunk and eventual death of the tree. How then should we try to treat a tree if we are not certain what the original grades were? Study the surrounding land contours that have been untouched by grading operations. Careful examination of soil levels should give you a close approximation of original soil levels and drainage slopes. If previous drainage or slope elevations can be re-established then regrading should be done. In many situations original grades cannot be met. To avoid serious tree degeneration, remove all fill soils around the circumference of the trunk, plus six to eight inches depth of the original soil. The dimensions of this excavation should be twice the circumference of the tree trunk. Once the excavation has been completed, several drain channels at six foot intervals should be dug from the trunk outwards towards the tree's drip line. These channels are then filled with one inch drain rock or perforated tiles to promote good drainage away from the tree's root system and trunk. (See diagram.) When the channels are filled with rock, soil is spread over the surface to cover the entire drainage system. A planter box should then be constructed around the well of the tree trunk to prevent any soil from refilling the tree well.

When the drainage system has been completed, the tree should be deadwood trimmed and shaped to the desired specifications. Watering should be done only when needed. Fertilize just prior to new bud development with a 10-10-5 slow release fertilizer by means of direct root feeding procedures.

## PROTECTION OF TREES - GRADE CHANGE

All trees respond negatively to drastic changes in their immediate environment. The most dramatic and significant cause of tree decline and mortality is a change in the soil level. Alterations in grade elevations such as grade cuts or grade fills, will usually result in a significant change in a tree's overall health. The most dramatic, and often the most difficult to contend with, are grade cuts. Grade changes which result in additional fill material around an existing tree are easier to contend with but still require careful corrective measures. The latter rarely cause structural damage to roots or trunk.

### GRADE CUTS

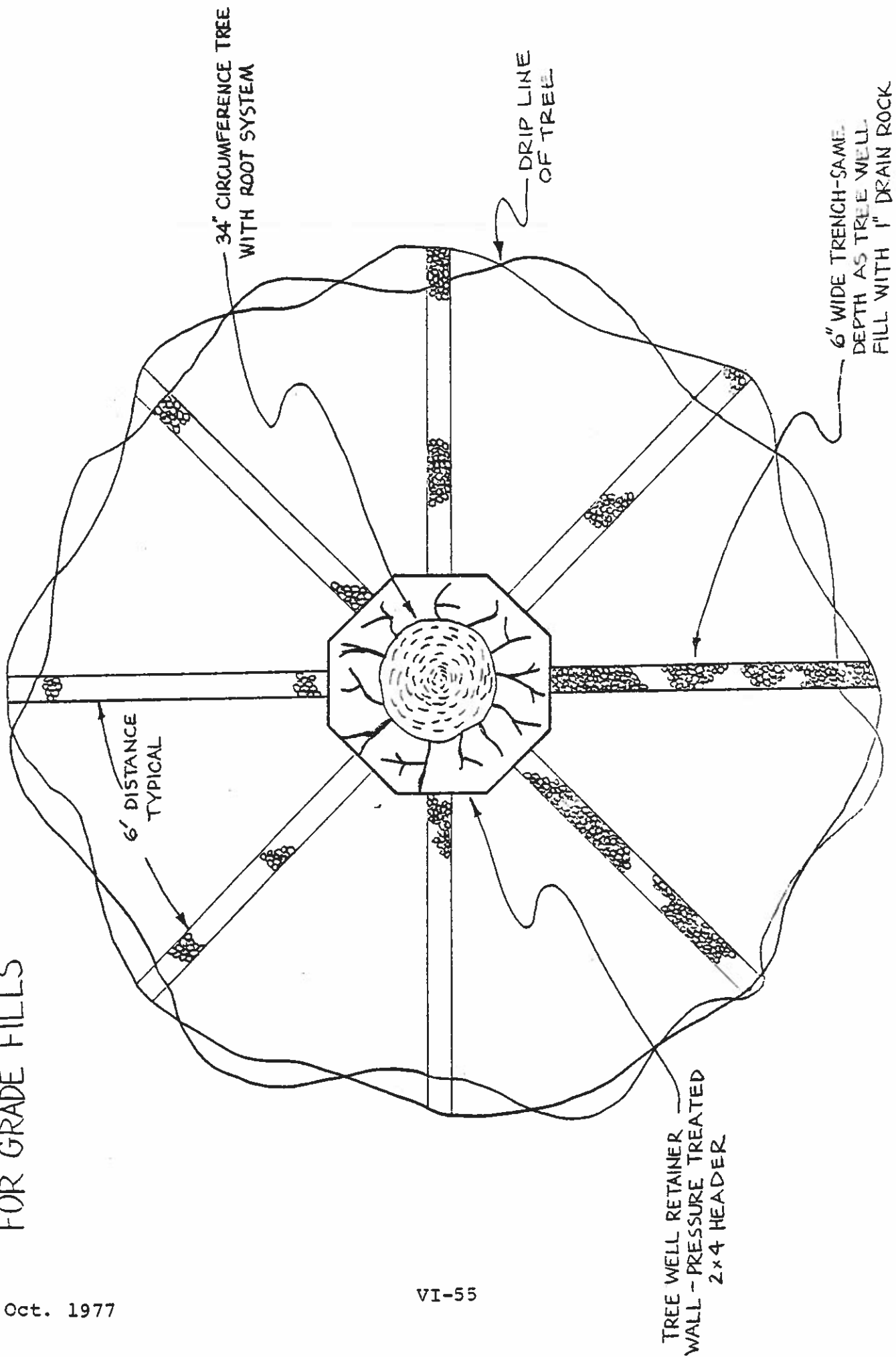
Reduction in grade elevations around existing trees is the most immediate and detrimental of all local environmental changes to a tree. Root damage, tearing, bruising, severing, and even dislocation of an entire root zone by heavy equipment is typical of grade cut operations. To prevent extensive root damage, precautionary measures should be taken to avoid severe root damage. Prior to any grade cuts, examine the ground around the existing tree to see whether surface roots are apparent. If the roots are not exposed on the soil surface, hand trenching at the point of grade cut will determine whether roots of significant size exist. Roots of 2 inches or larger should be considered major or significant roots. After trenching to the required depth, any roots then exposed should be cut with a saw and sealed with a recommended tree seal compound. Pruning roots in this manner will avoid any root damage by heavy equipment. Following removal of the soil in the grade cut area, exposed roots should again be inspected for stability, smoothness of pruning cuts and sealing. Any additional root damage should then be repaired in the same manner.

Grade cuts expose soil horizons to sunlight and air which hasten the drying out processes. For this reason, an absorbent tarp or heavy cloth fabric should be placed over the new grade cut and secured with stakes. Two to four inches of compost or wood chip mulch should then be spread over the tarp to prevent soil moisture loss. Wetting the fabric thoroughly twice per week to insure constant moisture levels is recommended until backfilling takes place. When backfilling is completed, saturate the soil.

After these steps have been taken, pruning of the tree is essential. Compute the approximate percentage and size of roots that were pruned. The same percentage of green foliage should be trimmed from the tree as was pruned from the root zone. If one side of the tree's root zone has been cut, then pruning of live limbs should be equal in that area of the tree's canopy. Deadwood trimming of the entire tree is recommended prior to removal of any live limbs. This general deadwood pruning will expose the shape and appearance of the tree, so that live limbs can be removed with little chance of destroying the shape or appearance of the tree. Seal all pruning cuts with a recommended tree seal compound.

Continue irrigation every two weeks until the next growing season. At the onset of new bud development, fertilize the tree by subsurface

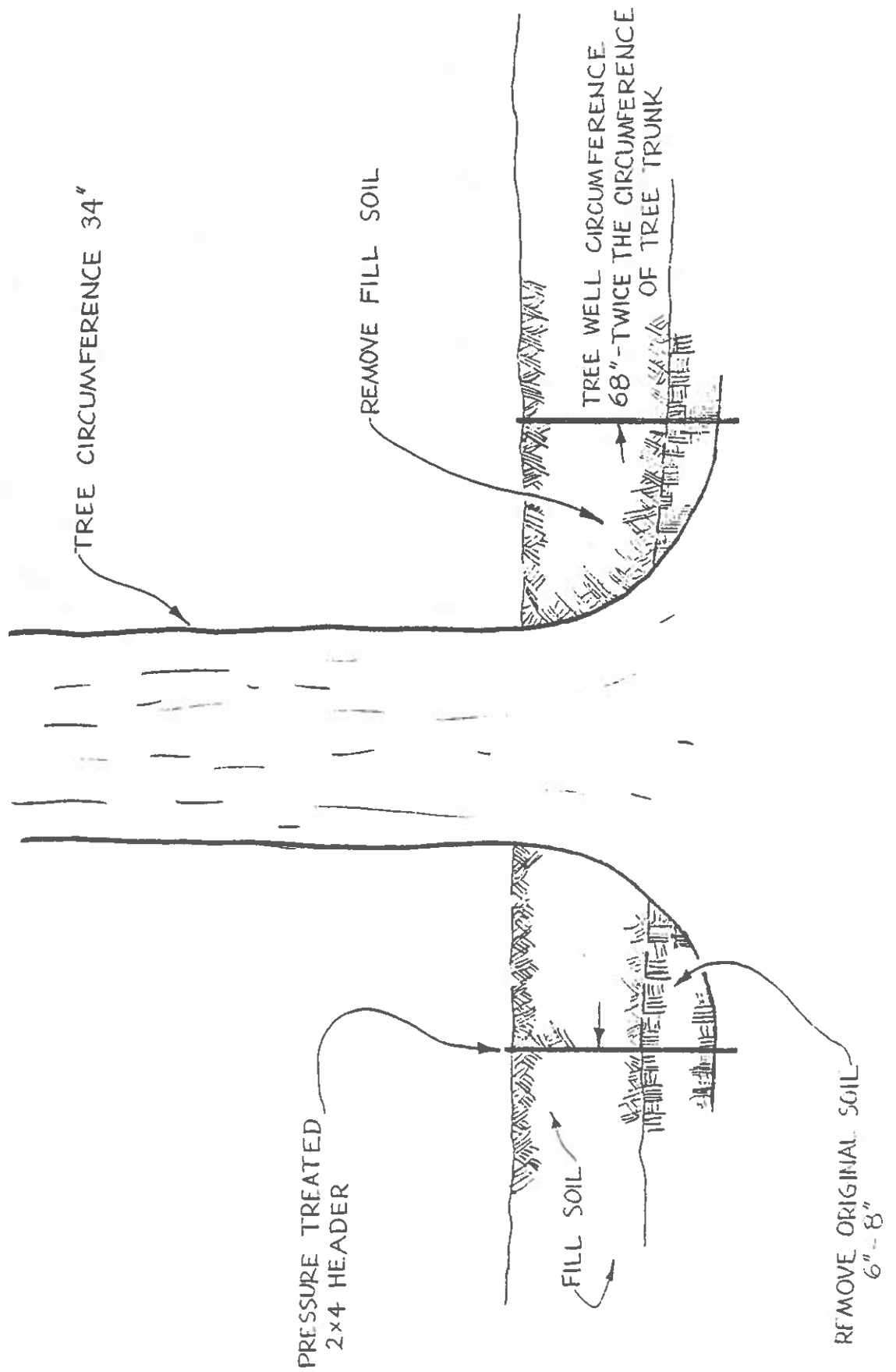
# LAIN CHANNELS FOR GRADE FILLS



Oct. 1977

VI-55

# TREE WELL CONSTRUCTION FOR GRADE FILLS



## ROOT PRUNING AND GIRDLING ROOTS

### Effects of Root Pruning

The removal of roots or damage of a tree's root system effects the overall growth of a tree in direct proportion to the amount of damage that is incurred. In situations where trees are being planted from container stock, minor root pruning is necessary to correct problems of pot-bound roots. When roots are cut, regeneration of new fibrous roots occurs quickly. Minor pruning and thinning of the foliage is recommended as compensation for temporary root loss.

Where trees are being transplanted from woodland areas, root pruning and thinning of the foliage should be performed in carefully timed stages over a two year period. (See Figures #1 and #2). This procedure will minimize shock prior to transplanting. Root size should be carefully examined before pruning. Too many large roots cut at the same time may result in loss of vigor, loss of anchorage in the soil, or possible death of the tree. Never sever more than one-third of the large supporting roots during any root pruning operation. Make smooth, clean cuts on large roots and apply a recommended wound dressing to prevent decay of the remaining portion of the root. Prune equal foliage from the tree to compensate for root loss. Allow the tree sufficient time (1 year) to develop new fibrous roots and then proceed with the second root pruning and thinning operation. Timely pruning, during the growing season, will develop healthy fibrous roots and full compacted foliage.

### Damaged Roots

Roots that are torn or bruised should be cut back to sound undamaged wood and a recommended wound dressing applied. Trimming roots back to lateral root junctions will promote new growth of the smaller lateral roots resulting in a dense root system. Cuts should be made flush with the junction of smaller lateral roots so that stubs or snags are not left that may cause decay. (See Figure #3).

### Girdling Roots

Girdling roots form a partial circle around the trunk base and restrict the growth of main supporting roots as well as weaken the main stem of the tree. As the girdling root and the trunk continue to grow, both the root and trunk may weaken. The best measure to take is to sever the girdling

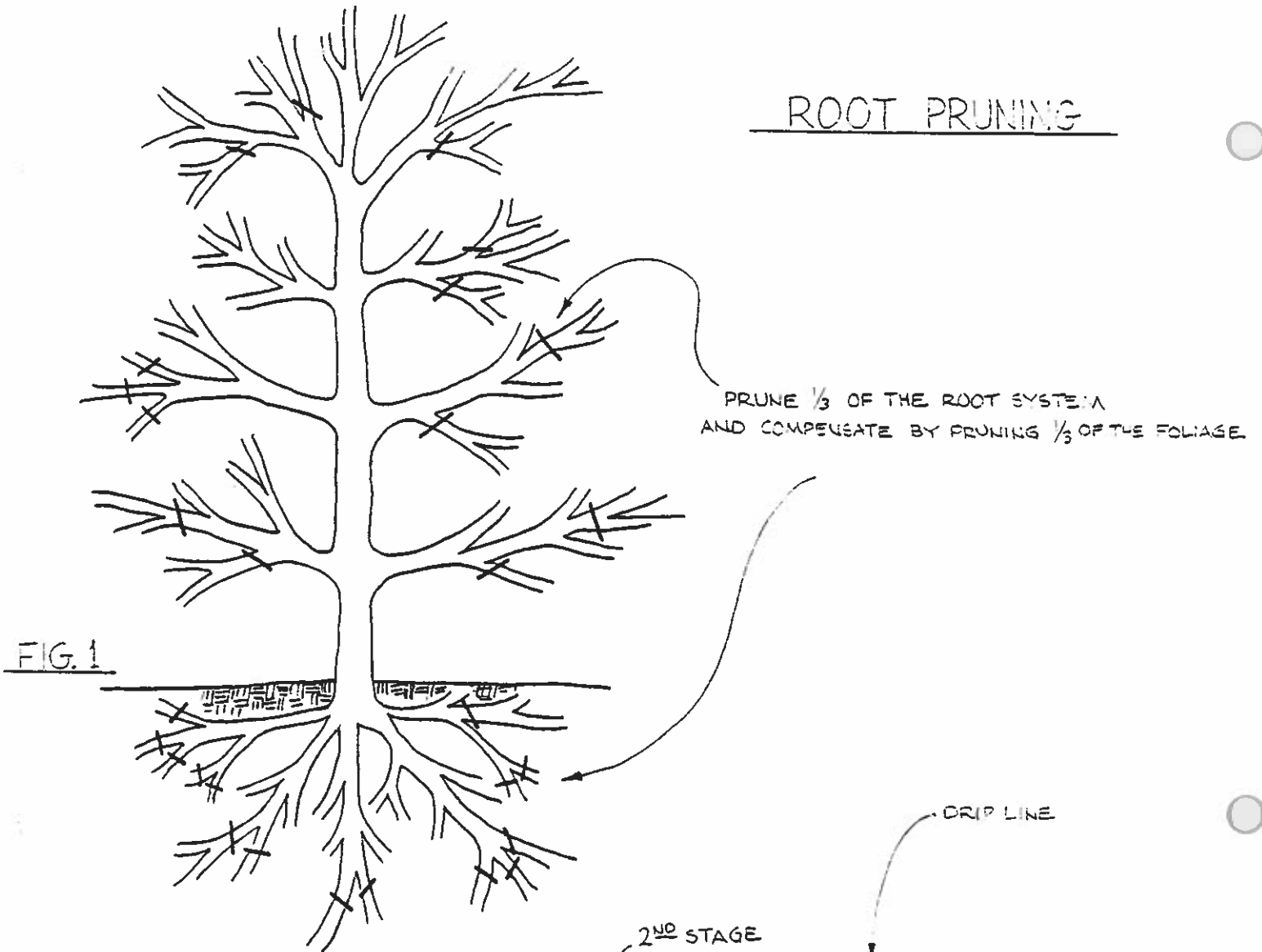
root when it is small and the tree still young. If the root has fully developed in size, severing the root with a saw is recommended. The resulting wound should be properly sealed with a recommended dressing to prevent disease or decay. (See Figure #4).

Tree roots are the main life support system of a tree. Poor maintenance techniques cause a higher mortality rate than any other type of tree maintenance.

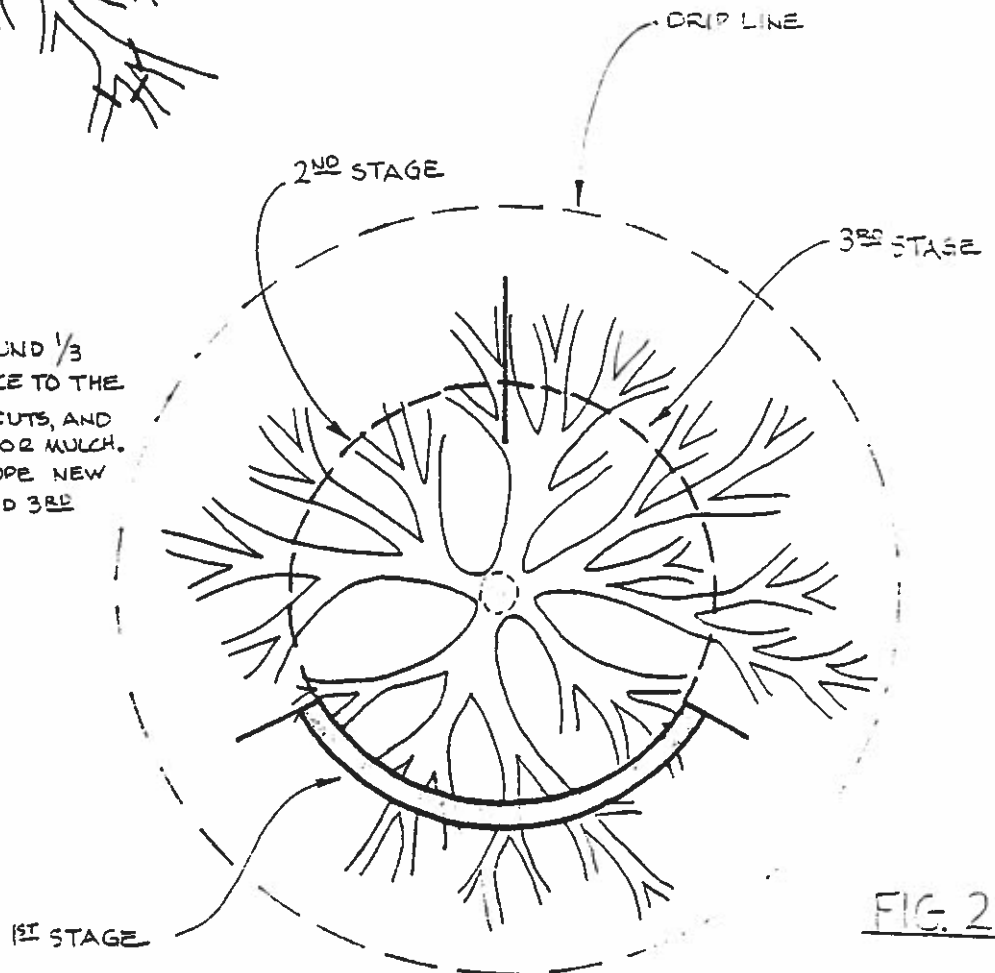
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George E. Brown, 1972, London England, Pruning of Trees, Shurbs and Conifers, Faber and Faber Ltd.

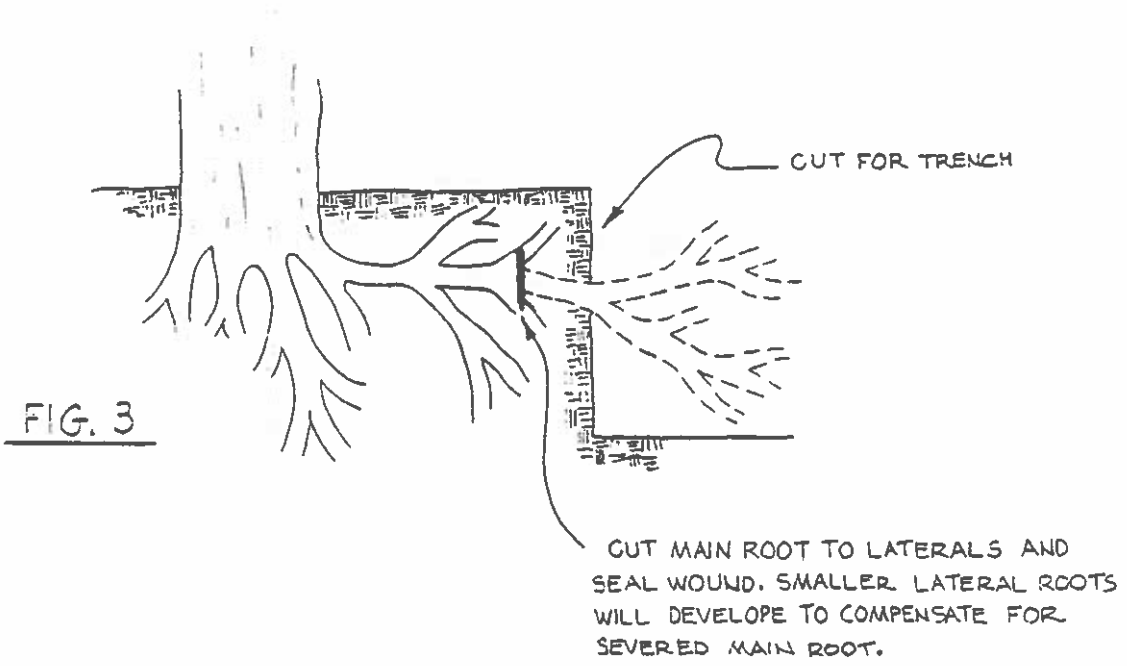
# ROOT PRUNING



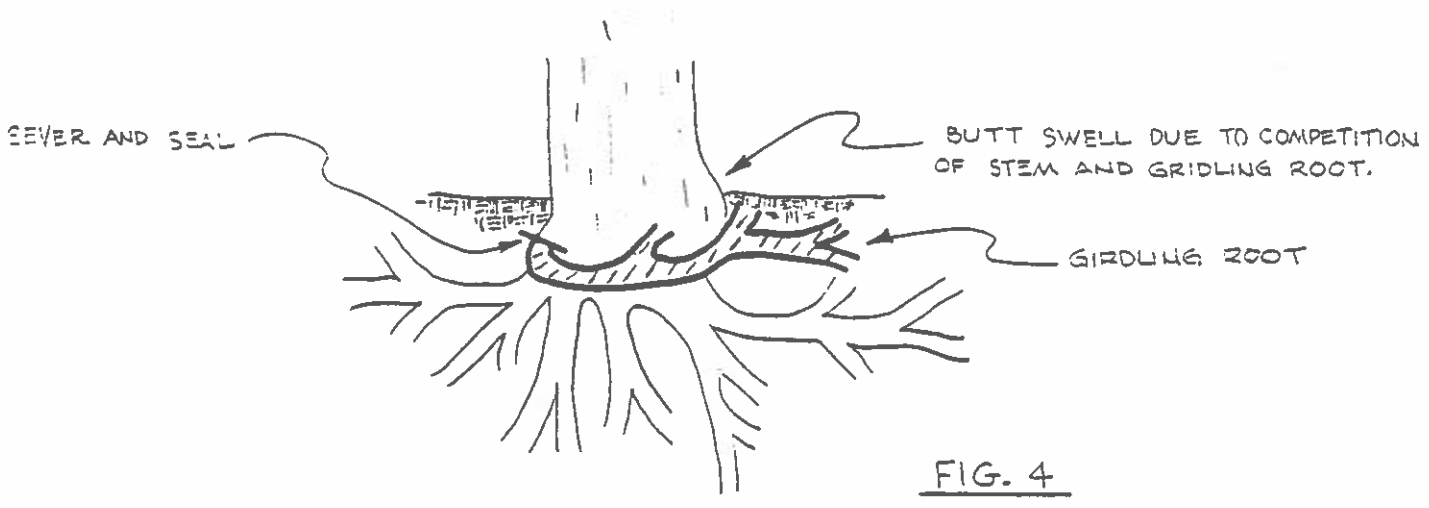
DIG TRENCH  $\frac{1}{2}$  FT. DEEP AROUND  $\frac{1}{3}$  OF THE TREE AT  $\frac{1}{2}$  THE DISTANCE TO THE DRIP LINE. SEVER ROOTS, SEAL CUTS, AND BACKFILL TRENCH WITH COMPOST OR MULCH. WATER AND FERTILIZE TO DEVELOPE NEW FIBEROUS ROOTS, FOLLOW 2<sup>ND</sup> AND 3<sup>RD</sup> STAGES AT 1 YEAR INTERVALS.



# ROOT PRUNING



# ROOT PRUNING GIRDLING ROOTS





## ROPES, KNOTS AND SPLICES

### Introduction

Rope is used extensively in many phases of tree work, and is one of the most crucial pieces of equipment used in the trade. It is important that all arborists become familiar with the makeup of rope in order to clearly understand the uses to which rope can be put. It is also necessary for the worker to realize the importance of proper care and handling of rope.

Manila fibre is a product of nature coming mainly from the abaca or wild banana plant grown in the Philippines. Its quality and strength therefore will vary depending upon climatic conditions, fertility of the soil, cultivation and curing.

No. 1 Manila rope is light yellow in color, hard and pliant, has a silvery lustre and a smooth waxy surface.

Synthetic ropes (nylon, dacron, and polypropylene) are now being used in tree work and have been found superior in strength. They are less effected by weather and don't have the problems of manila (splinters, drying out, etc.).

### Use of Rope

Rope is used on many operations performed by the tree surgeon. Various sizes are in use depending on the particular job to be done.

It is important that arborists be familiar with these uses and that the right rope is used for the right job. Principal uses include:

1. Safety Rope. To be used by each arborist when working in trees. Manila rope has been replaced by synthetic for this purpose.
2. As a handline for raising and lowering tools.
3. To be used as a guy, or when rigging in pruning operations or for tree removals.
4. As a block and tackle and for snatch blocks.
5. For slings and lashings.

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Richard G. Alvarez, 1976 Ontario Hydro Electric, Southern California Edison, Ropes Knots and Splices, Western Chapter International Shade Conference, Inc., International Society of Arboriculture

6. For rigging power saws into trees.
7. As pole pruner rope.
8. To be used when necessary for roping off restricted areas during line clearing operations.

### Inspecting Rope

All new rope should be carefully examined before being put into use.

#### External Conditions

1. Abrasions (broken fibres).
2. Cuts.
3. Unnaturally soft (badly worn rope becomes extremely unsafe and loses its resilience).
4. Decayed or burnt by heat or chemicals.
5. Any unnatural color or change in the lustre or physical characteristics of the rope.
6. Variation in size or roundness of strands.

#### Internal Conditions

Detected by twisting open the strands at several places making sure rope is opened at critical points of wear.

1. Broken Fibres.
2. Fine powder (which determines the presence of grit or other small foreign particles).
3. Mildew or mold.
4. Any change in color, lustre or physical characteristics of fibres.
5. Displacement of yarns or strands.

### Care of Rope

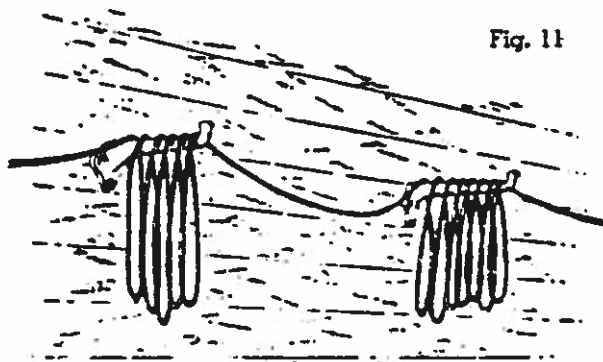
The useful life of any arborist rope depends to a large extent upon the care it gets in field use. Proper care begins with the opening of the new coil of rope and continues through each operation where a rope is involved until it is finally discarded altogether or relegated to a use where working strength is not a prime consideration.

### Storing of New Coil of Rope

A new coil of rope should never be stored on the floor, in a box, cupboard or closet where air circulation is restricted.

The coil should be stored at least six inches off the floor on a wood grating platform. The coil should not be stored near boilers, radiators, steam pipes or other sources of intense heat. A temperature of 50 to 70 degrees and humidity of 40 to 60 percent is ideal for rope storage.

New rope, when taken from the coil and stored, should be hung in loose coils on large diameter wooden pegs. If wooden pegs are not available a discarded 3 gallon pail nailed to the wall would make a good bracket.



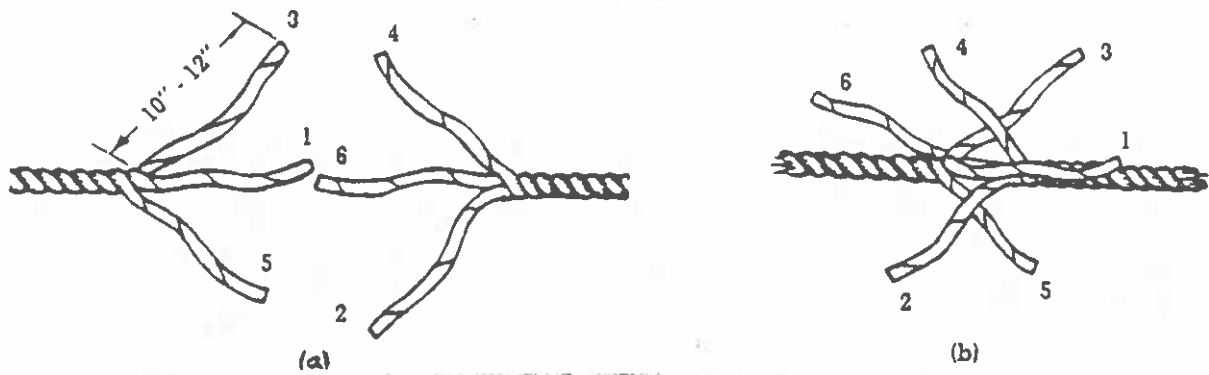
### Making the Short Splice

The Short Splice is used to unite two ends of a rope for a sling which may be used for hoisting purposes.

The Short Splice is a laced splice and when properly made is in excess of 90% of the strength of the rope itself. Because it is rather bulky, a short splice is never used where the splice is to run over a pulley or sheave. A long splice is used in such cases.

#### Procedure:

1. Unlay the three strands at each end of the rope to be spliced to length of 12 inches for rope up to  $\frac{1}{2}$  inch diameter. Fig. 3(a). For rope up to 1 inch unlay approximately 18 inches.
2. The butt ends are interlocked tightly together by laying the strands of one end of the rope alternatively between the strands of the other end as in Fig. 3 (b).



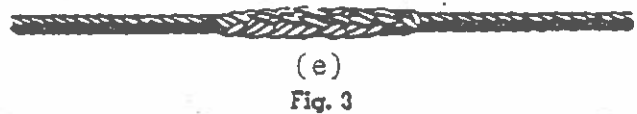
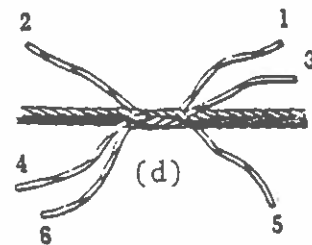
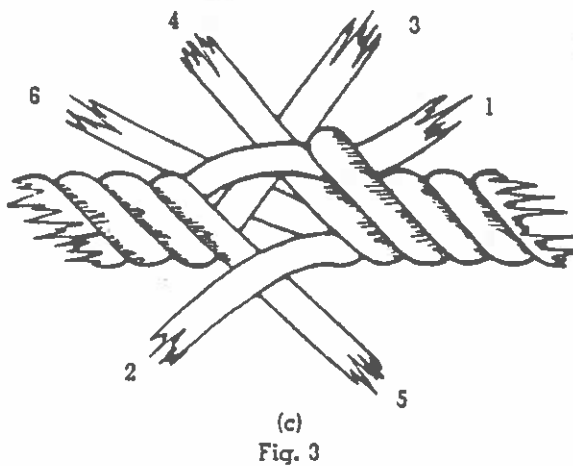
Thus:

Strand 1 is between 2 and 4

Strand 3 is between 4 and 6

Strand 5 is between 2 and 6

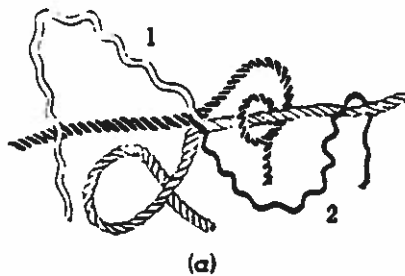
3. Start tucking each strand over the nearest and under the next strand against the lay of the rope, Fig. 3(c) until you have made three complete tucks so that the splice will be tight.
4. After three tucks have been completed, taper the splice as when making the Crown Splice. Cut off the loose ends. Make sure the standing part of the rope is not damaged when cutting the surplus ends, Fig. 3(d).
5. Roll the splice on the floor with the foot to smooth out. Fig. 3(e) shows completed splice.



## Making the Long Splice

The Long Splice is used to unite the two ends of a rope which will pass through a pulley or over a sheave as easily as the rope itself. The Long Splice is a spiral winding process and is in excess of 90% of the strength of the rope. The long splice is made so that each pair of strands is joined in a separate place in the rope instead of all at one place. In three strand rope the greatest number of strands at any one place in the splice is four instead of six, as in the short splice.

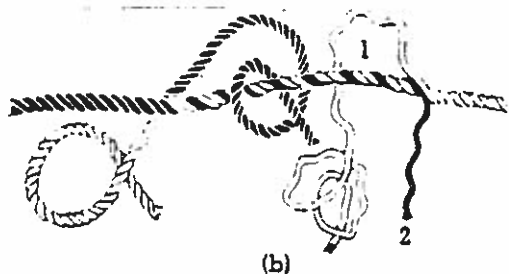
### Procedure:



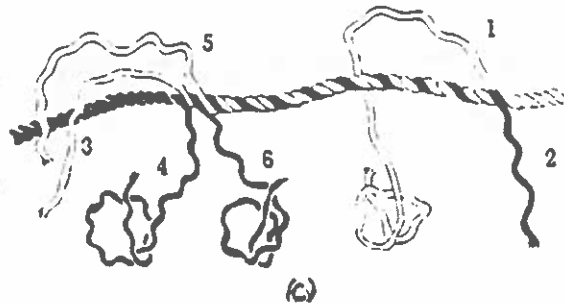
1. Unlay one strand of each rope for distance from the end as follows:

18 inches for  $\frac{3}{8}$  inch rope  
24 inches for  $\frac{1}{2}$  inch rope  
30 inches for  $\frac{3}{4}$  inch rope  
36 inches for 1 inch rope

2. Place the ropes together as shown in Figure 4(c), making sure that strands (1) and (2) are side by side. See that the strands of the rope do not separate. Unlay strand (1) from its rope and follow it with strand (2). Keep (2) snug and pull it firmly into place of (1). Continue this until about 6 to 9 inches of strand (2) remain. (See Figure 4 (b)).



3. Untwist strands (3), (4), (5), and (6) and lock them as shown in Figure 4(c), strand (3) between (4) and (6) and strand (6) between (3) and (5).
4. Strand (4) is now unlaied toward the left and strand (3) is laid in its place. Strand (3) replaces strand (4) to the left just as (2) replaces (1) to the right. Be sure that (4) is unlaied and not (6). The replacement of (4) by (3) continues until (3) is about 6 to 9 inches in length.



5. At this point the breaks in the strands are separated as shown in Figure 4(d). Arrange each pair so that the strand from the left is in front of the strand from the right, that is, arrange the strands so that they cannot untwist from the rope without first uncrossing. The break between (5) and (6) is in the middle of the splice; (1) and (2) is the right and (3) and (4) at the left.
6. Tuck in the ends of the strands at each break. To do this the long strands must be cut so that they are the same length as the shorter ones. To begin tucking, tie each pair of strands together with an overhand knot and pull the knot down snugly into the rope as shown in Figure 4(e). Each strand is then tucked in twice. These steps are shown in Figure 4(g). If each strand is untwisted a little, a smoother job will result. A loose strand will flatten out and conform to the oblong opening between the strands. By doing this the diameter of the splice is reduced. A tight strand will not readily conform to the opening and will result in a larger splice.

The splice should then be tapered by cutting away about half of the fibres in the strand and making two more tucks. This operation is required to the ends of all strands and the splice is then completed as shown in Figure 4(h).

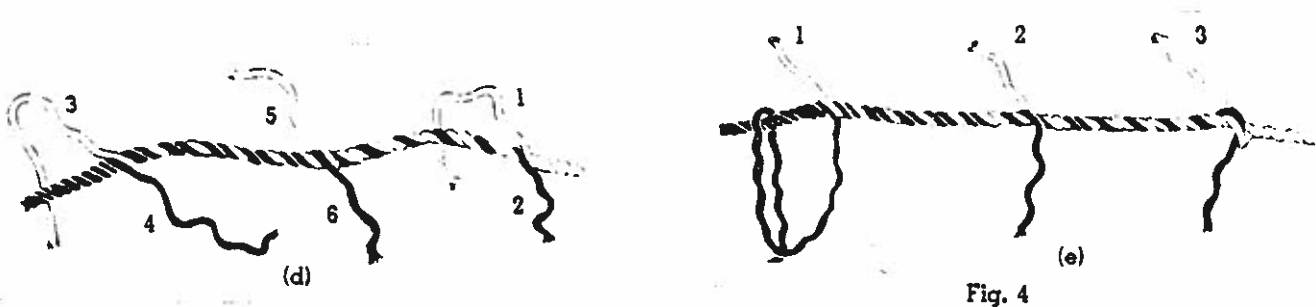
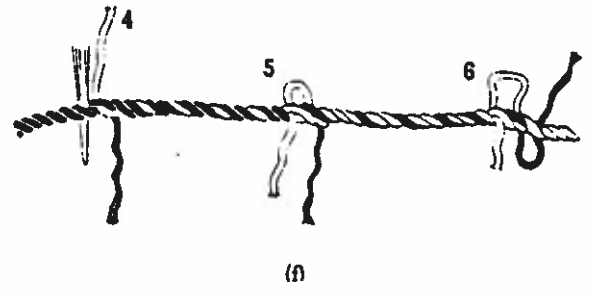
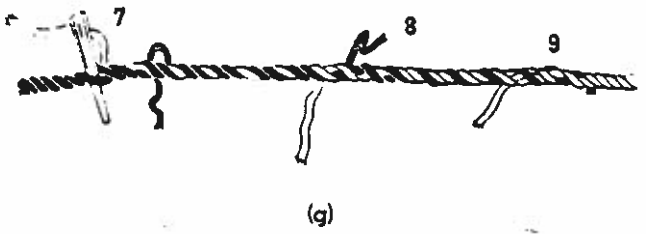


Fig. 4



(f)



(g)



(h)  
Fig. 4

After the tucks have been completed, cut off the remaining ends of the strands leaving about  $\frac{1}{2}$  inch to work into the rope. The splice can be finished off by pounding down each part with a round stick and rolling it on the floor with the foot. This makes the splice more compact and pliant.

## KNOTS

### Single Bowline

#### Uses:

The bowline is used in making hitches of all types and is formed in various ways depending upon the conditions under which the work is done. It is the tie of universal use and is the best known method of forming a bight that will not slip under tension and may be easily untied.

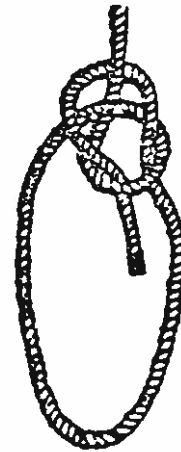
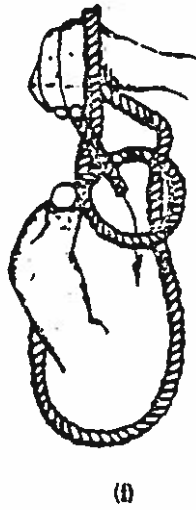
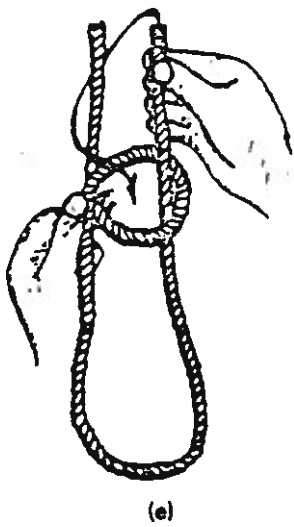
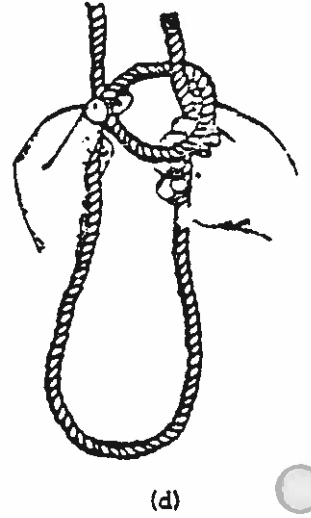
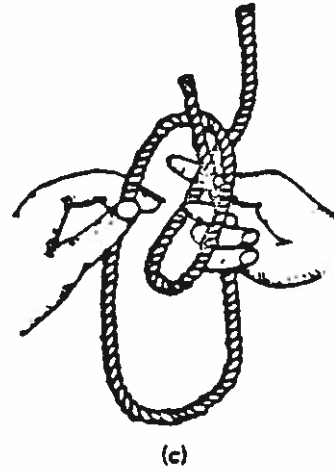
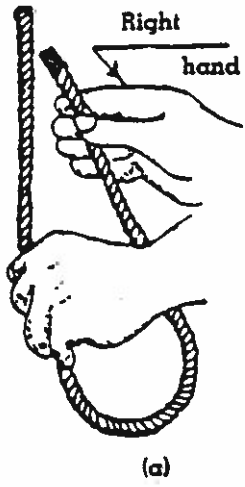
The single bowline at the end of a rope, not attached to an object, is intended for use in attaching rope to hooks or blocks and uniting ends of rope of different sizes.

#### Operations:

The operations required to make a single bowline at the end of a rope are shown in Figure 2(a) to Figure 2(g).

1. Form an overhand loop in the rope leaving enough end to obtain the size of bight required. Hold this loop in the left hand with the loop inward.
2. Take the end of the rope in the right hand and pass it through the loop.
3. Pass the end of the rope under the standing part away from the bight.
4. Now pass the end back down through the loop.
5. Draw all parts down tight.  
(See Figure 2(a thru g) on next page)





(g)  
Fig. 2

## Running Bowline

### Uses:

The running bowline is intended for use in attaching a rope to the end of a limb that is too small to climb out on for raising or lowering purposes. A ball is first formed in the end of the rope and passed over the limb, then pulled back with the aid of a pole pruner to where the worker can tie the running bowline. The running bowline is then made and when the fall line is pulled, the running bowline slides up against the limb where it is held taut.

### Operations:

The Operations required to make a running bowline are shown in Figure 5.

1. Pass end of rope around limb and draw it back.
2. With the end of the rope take an overhand turn around the standing part. See Figure 5(a).
3. Now tie a bowline in the rope back from the end. See Figure 5(b).
4. Draw all parts down tight, Figure 5(c).

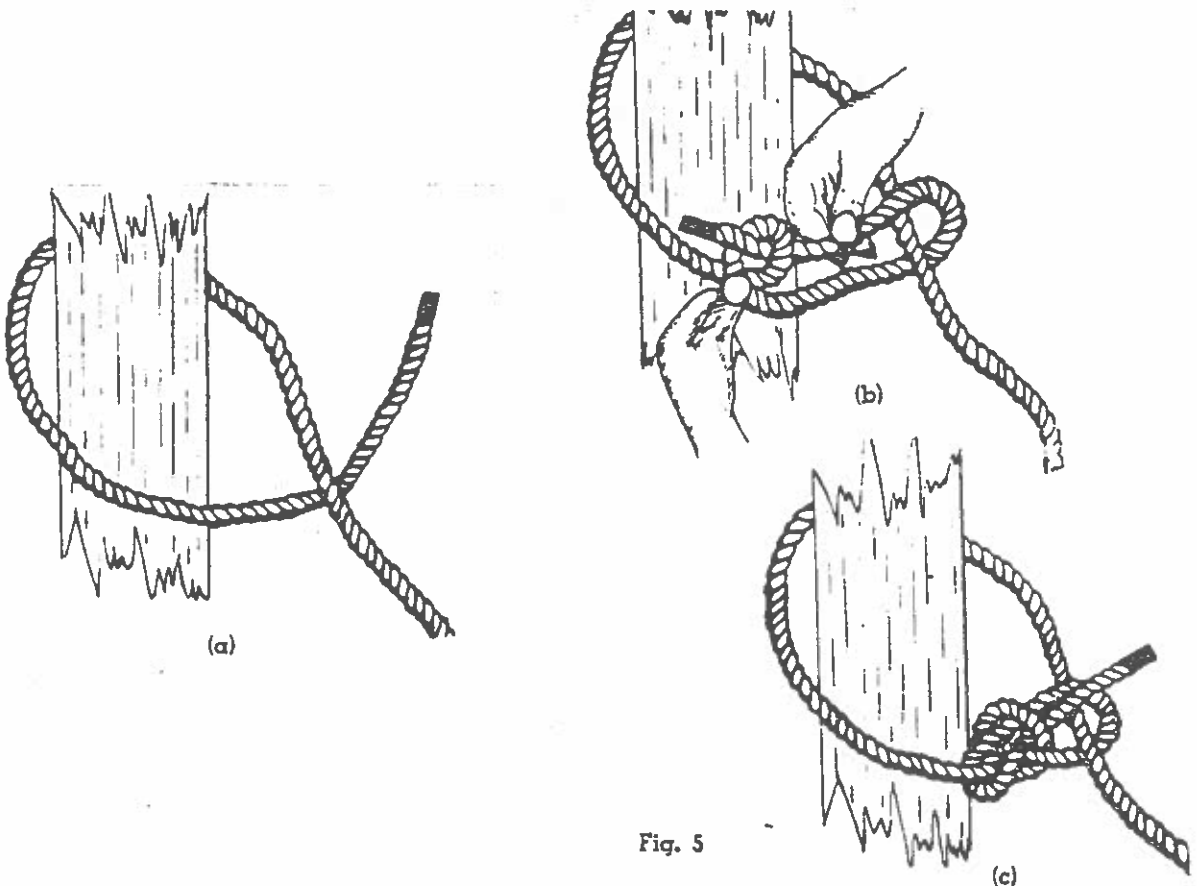


Fig. 5

## HITCHES

### Clove Hitch

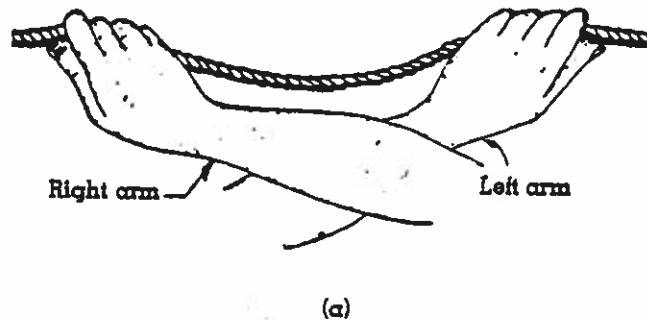
#### Uses

The clove hitch has many uses - attaching material for raising and tying limbs without crotches.

#### Operations

The operations required to make the clove hitch by this method are shown in Figure 11.

1. Cross the arms in front of body, with the left arm outside the right, and pick up the rope, Figure 11 (a).



2. Without twisting the wrists, uncross the arms until the loops are in the position shown in Figure 11(b).

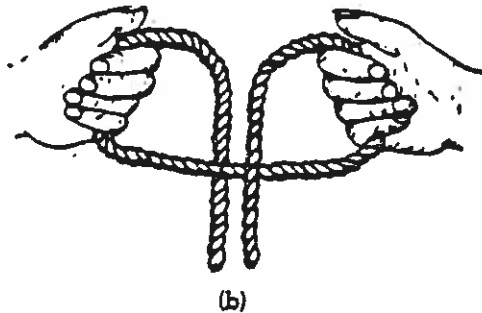
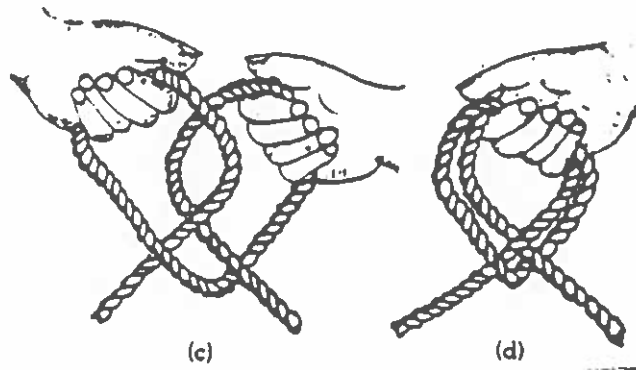


Fig. 11

3. Now place the loop (in the right hand) outside the loop (in the left hand) Figure 11(c), until the knuckles on the left hand fit into the palm of the right hand.
4. Slip the loop from the left hand into the right. Figure 11(d), and the hitch is ready to place over the object.



## Timber Hitch

### Uses:

The timber hitch is intended for use in skidding or rolling logs and is never to be used for guying trees or lowering limbs.

### Operations:

The operations required to make a timber hitch consist of:

1. Passing the rope around the limb or timber taking a half hitch around the standing part of rope, Figure 15(a).
2. Then pass the free end once or twice more between the rope and the limb or timber, similar to Figure 15(b).
3. Pull all parts down tight.

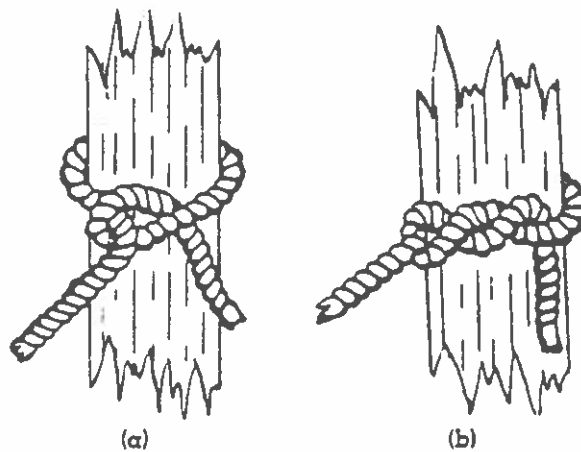


Fig. 15

## Taut Line Hitch

### Uses:

The taut line hitch is used for arborist workers, as a tie in to their safety ropes, Figure 16(a).

### Operations:

The operations required to make a taut line hitch are as follows:

1. With the end of the taut line piece take two underhand turns around the fall line, Figure 16(b). The second turn being below the first.
2. Holding the two first turns with the most convenient hand, Figure 16(c), bring the end of the rope up over the turns and beginning from the outside make two underhand turns around the fall line, the second turn being the lowest.

The completed taut rope hitch is shown in Figure 16(e).

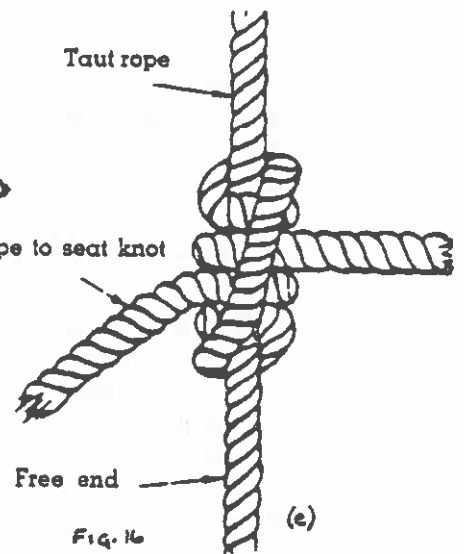
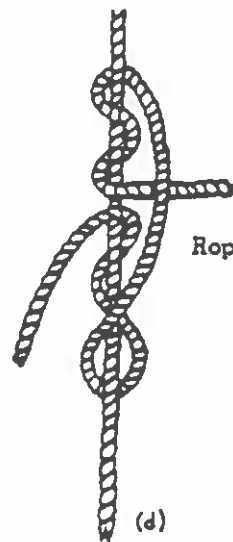
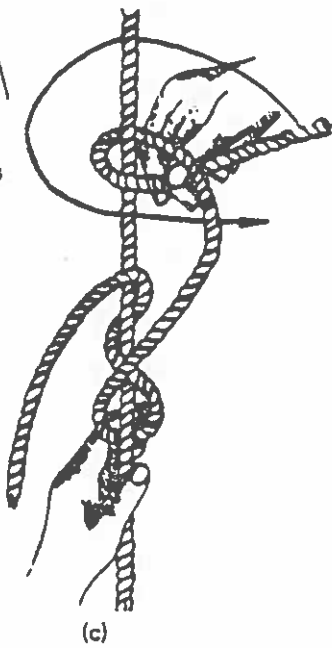
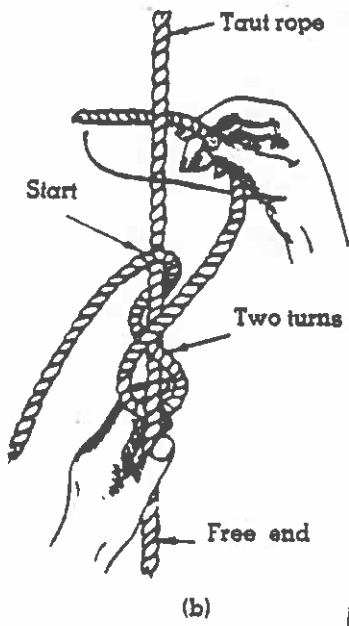
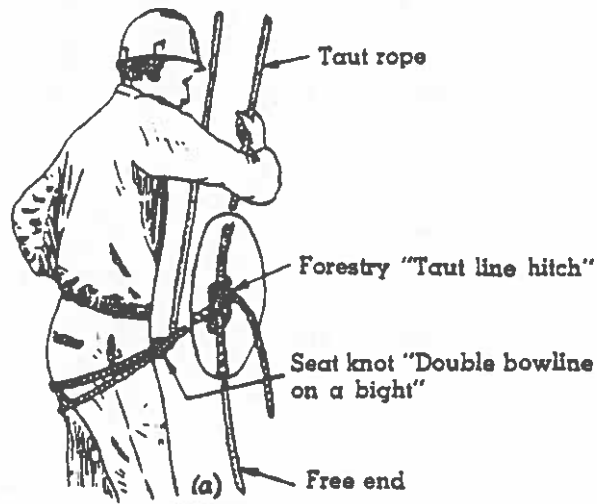


Fig. 16

Fig. 16

## CHAIN SAW MAINTENANCE

Properly operating chain saws are essential for the mission of the Forestry Department. A continuing maintenance program will greatly increase the life and dependability of the saws. Maintenance is divided into three groups. That which should be performed on a daily basis, weekly and annually.

### DAILY MAINTENANCE

Air Filter: Remove dirt around the air filter cover to prevent dirt from falling into the airbox. Blow the dirt and dust from the filter with a high pressure hose.

Chain Tension: The chain should be adjusted as often as necessary throughout the day to keep the chain snug on the bar, but loose enough to be pulled around the bar by hand.

Chain Sharpening: If the chain does require sharpening, use a file of the proper size and a file guide for the correct filing angle. (Refer to the owner's manual for these specifications). Hold the file at the correct top filing angle, apply pressure against the face of the tooth and push the file towards the outside of the tooth. Release pressure on the cutting edge on the return stroke. Repeat the sharpening stroke until the tooth is sharp. Sharpen all the teeth on one side of chain before sharpening teeth on the other side. Use the same number of strokes on each tooth to help keep all teeth the same length.

Inspection and Cleaning: Wipe the saw clean and remove any debris around the sawdust guard. Inspect all screws, nuts, and bolts to make sure they are tight.

### WEEKLY MAINTENANCE

Spark Plug: For efficient operation of the saw, the spark plug must be kept clean and properly gapped. Use only a spark plug wrench to remove the plug. Clean electrodes with an emery cloth or fine sandpaper. Blow all dust away. Do not use a grit type cleaning machine. Adjust the electrode gap to the manufacturer's specification.

Cooling Fins: Cooling fins are easily cleaned after removing the fan housing and spark arrestor. Scrape all dirt, grease, wood chips, etc. from the cooling fins on the cylinder head. Use a thin scraper or a stiff brush. Clean the vanes on the flywheel and other parts of the engine that become visible when the fan housing was removed.

Muffler or Spark Arrestor and Exhaust Port: Remove the muffler cover and spark arrestor screen if utilized. Clean away all carbon deposits with a scraper blade, wirebrush,

or by washing with a good solvent. While the muffler is removed from the saw, examine the exhaust port for evidence of carbon around the port. Clean the port as follows: Pull the starter rope slowly until the piston covers the port completely. Use a wooden scraper and clean in and around the port. Do not use any metal or sharp-edged tool that might scrape the piston or rings. After cleaning, turn the saw exhaust side down and blow loose particles away with compressed air.

Chain and Bar: The chain is cleaned in solvent and then sharpened. The bar must also be cleaned by inserting a putty knife in the chain slot and removing all pitch and saw dust. The bar is then cleaned with solvent and replaced so that the top of the bar is in a reverse position by turning it over.

Fuel Filter and Oil Screen: If the saw is equipped with a fuel filter, it should be removed and cleaned in solvent. The oil screen is cleaned by emptying the oil reservoir and then emptying it again.

Lowering Depth Guage: Place the depth guage tool over two cutter teeth with the depth guage on the first cutter projecting through the desired clearance of the depth guage tool. Remove the projecting part of depth guage with a flat file. After lowering all depth guages, round off their leading edges. Maintain the same profile as on the original depth guage. Always place the depth guage to be filed at the same place on bar when lowering the depth guages.

#### ANNUAL OR AS NEEDED MAINTENANCES

Sproket: Each time a new chain is used, a new sproket must be installed.

Breaker Points: Should be cleaned and adjusted to the manufacturer's specifications.

Carburetor Diaphragm: Replace once each year.

Crank Shaft Seals: Replace once each year.

Head Gasket: Replace once each year.



## CHAIN SAW OPERATION

Whether on the ground or in a tree the following chain saw operating procedures apply. However, since working in a tree is more hazardous, extra care must be taken.

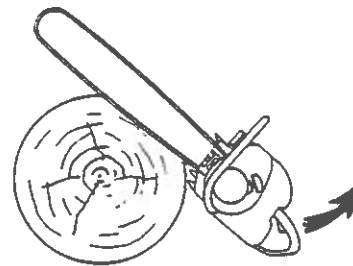
### Safety Precautions:

1. Be cautious. Always wear a hard hat when using a chain saw. Wear trim fitting clothing. Always work in pairs so that help will be available when needed.
2. Handle fuel safely. Use approved fuel containers. When refueling, find or clear a bare spot of ground before pouring. Move at least ten (10) feet away from the refueling spot; wipe the saw down before starting the engine.
3. Always keep both hands firmly on the saw; one on the handle bar, the other on the pistol grip. Stand with both feet firmly braced or if you are working in a tree, your spurs should be firmly implanted. Even if the saw kicks back unexpectedly because the blade (a) hits a branch or other obstruction, (b) gets caught in a cut, or (c) is inserted incorrectly into a previous cut, you will not be endangered.
4. Always stop engine between cuts. Never carry a running saw from tree to tree and always carry the saw with the blade to the rear so the chain will not become snagged in the underbrush or present a hazard if you fall.
5. Keep clear of the work. Always stand on the uphill side when bucking a log. When limbing or pruning, do not stand directly under the work.
6. When working in a tree, always check the location of your flipline and/or climbing rope before making a cut.
7. Keep all equipment in good operating condition. Poor equipment makes the work more tiresome and invites accidents.

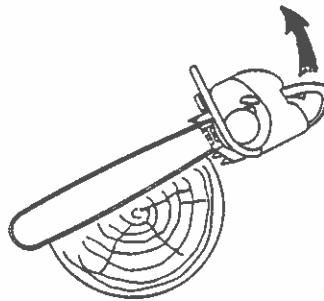
### Cutting Technique:

Cutting can be done at any part of the guide bar. Using the bottom edge however, results in less wear than using the top or nose of the bar to cut whether limbing or bucking. Pivot action is the best method of cutting and is described below:

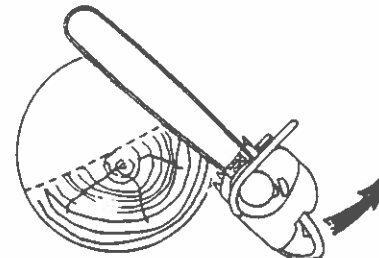
PLACE THE SAW BUMPER AGAINST THE WOOD. OPEN ENGINE THROTTLE. WHEN CHAIN REACHES FULL SPEED, PIVOT SAW BY PULLING ON PISTOL GRIP UNTIL THE CHAIN ENGAGES WOOD.



KEEP PULLING ON PISTOL GRIP TO PIVOT GUIDE BAR THROUGH THE WOOD. IF SAW JAMS IN CUT, RELEASE THROTTLE, PULL SAW FREE, AND REENGAGE IN CUT.



STOP PIVOTING BEFORE TIP OF BAR HITS GROUND—OR WHEN YOU CAN NO LONGER FULL ON GRIP AND CUT WOOD. KEEP CHAIN RUNNING IN CUT, BUT PUSH DOWN ENGINE END TO REACH NEW PIVOT POINT. CONTINUE TO CUT USING PIVOT ACTION.





VII  
APPENDIX



ANNUAL FORESTRY PROGRAM PLANNING

- Jan. Central Business District deep root fertilizing program  
Planting Program  
Safety Trim Pines  
Monitor over-wintering Oak moth population  
Monitor Tussock Moth population/pines  
Spray herbicide for weed control/parks, municipal building grounds,  
mini-parks  
Plant wild flower seed
- Feb. Central Business District deep root fertilizing program  
Monitor over wintering oak moth population  
Monitor Tussock Moth populations/pines  
Fertilize beach slopes - ice plant  
Foliar feed Central Business District trees  
Safety trim pines  
Detail trimming and shaping young pines  
Planting Program
- Mar. Monitor Cypress Bark Moth, Cypress Tip Moth at Carmel Beach  
Monitor Anthracnose; Sycamore  
Monitor Tussock Moths  
Monitor mites/Monterey Pines  
Safety trim pines  
Detail trimming and shaping young pines  
Trim ivy Flanders Estate  
Spray growth inhibitor on Willows in Mission Trail Park  
Spray roadside grasses with growth inhibitor
- Apr. Monitor Cypress Bark Moth, Cypress Tip Moth at Carmel Beach  
Monitor Aphids  
Monitor Leaf Hoppers/Oaks  
Monitor Gypsy Moth  
Safety trim pines  
Spray herbicide for weed control/parks, municipal building grounds  
and mini-parks  
Spray roadside grasses with growth inhibitor
- May Monitor bark beetles, pine tip moth, irregular pine scale/pines  
Monitor Gypsy Moth  
Monitor aphids  
Monitor Pit Scale/Oaks  
Spray herbicide to control poison oak, genista  
Water trees planted during winter season  
Spray growth inhibitor on Willows in Mission Trail Park  
Spray roadside grasses with growth inhibitor
- June Monitor bark beetles, irregular pine scale/ pine trees  
Monitor Gypsy Moth  
Spray herbicide/poison oak and genista  
Spray herbicide in drainage channels in Mission Trail Park  
Trim Willows for trail clearance in Mission Trail Park  
Fire suppression program  
Ivy removal program - all City trees  
Water trees planted during winter season  
Tree Survey  
Monitor Pit Scale  
Spray roadside grasses with growth inhibitor

- July Monitor Oak Moth  
 Monitor bark beetles  
 Fire suppression program  
 Brush removal program - City streets, Forest Hill Park, Mission Trail Park  
 Remove and thin acacia thickets - Carmel Beach (2 year cycle)  
 Ivy removal program - all City trees  
 Maintenance and irrigation, Arboretum  
 Tree Survey
- Aug. Monitor oak moth  
 Monitor bark beetles  
 Rototill and site preparation for winter wild flower seed planting  
 Trim ivy-Flanders Estate  
 Trim oaks  
 Maintenance and irrigation - Arboretum  
 Water trees planted during winter season  
 Tree survey
- Sept. Monitor bark beetles  
 Monitor oak moth  
 Safety inspect all trees with cables or bracing systems prior to winter season  
 Water trees planted during winter season  
 Trim oaks  
 Maintenance and irrigation, Arboretum
- Oct. Monitor bark beetles  
 Spray herbicide to control poison oak and genista  
 Water trees planted during winter season  
 Trim oaks  
 Maintenance and irrigation - Arboretum
- Nov. Monitor bark beetles  
 Trim central business district trees for sidewalk and traffic clearance  
 Spray weeds roadsides and drainage channels  
 Trim ivy - Flanders Mansion  
 Maintenance and irrigation - Flanders Mansion  
 Order trees for Tree Day
- Dec. Prune Sycamore / Anthracnose  
 Start planting program  
 Safety trim pines  
 Begin detail trimming and shaping young pines  
 Plant wild flower seed  
 Annual Tree Give-away Day

MISCELLANEOUS

Monthly Inspection and Special Projects:

Monthly trail maintenance and repair Mission Trail Park and  
Forest Hill Park

Monthly safety inspections of Playground apparatus - Forest Hill Park

Monthly safety inspection of Par Course Stations and trails -  
Forest Hill Park

July 4th Weekend

Sand Castle Event

Installation of Christmas lights (December 1)



INSECTS AND DISEASES OF CARMEL'S TREES\*

By Gregory D'Ambrosio  
City Forester

MONTEREY PINE INSECTS

Red Turpentine Bark Beetle	<u>Dendroctonus valens (Lecante)</u>
Monterey Pine Engraver Beetle	<u>Ips radiata</u>
Monterey Pine Twig Beetle	<u>Pityophthorus carmeli</u>
Monterey Pine Midge	<u>Thecodipbsis pini radiata</u>
Sequoia Pitch Moth	<u>Vespa mima sequoiae</u>
Spittle Bug	<u>Aphrophara permutata</u>
Spider Mite	<u>Oligonychus subnudus</u> or <u>Oligonychus milleri</u>
Irregular Pine Scale	<u>Toumeyella pinicola</u>
Pine Needle Scale	<u>Phenacaspis pinifoliae (Fitch)</u>
Black Pine Needle Scale	<u>Nuculaspis californica (Coleman)</u>
Pine Tip Moth	<u>Rhyacionia pasadenana</u>
Pine Needle Weevil	<u>Seythropus californicus (Horn)</u>
Tussock Moth	<u>Hemerocampa vetusta (Boisd.)</u>

CYPRESS INSECTS

Cypress Tip Moth	<u>Argyresthia franciscella</u> or <u>Recurvaria stanford iakeif</u>
Cypress Bark Beetle	<u>Phloeosinus cupressi (Hopk)</u> or <u>Phloeosinus cristatus (Lec.)</u>
Cypress Bark Moth	<u>Laspeyresia cupressana (Kearf)</u>

OAK INSECTS

Oak Moth	<u>Phryganidia californica</u>
Oak Twig Girdler	<u>Agrilus angelicus</u>

\* Excerpts from various texts plus experience in treatment of Carmel trees form the basis of these descriptions.

Gregory D'Ambrosio, City Forester

Pit Scale  
Tree Hopper  
Gypsy Moth

Asterolecaniidae  
Platycotis vittata  
Porthetria dispar

CYPRESS DISEASE

Canker

Seiridium cardinale

OAK DISEASES

Oak Root Fungus or  
Shoestring Root Rot

Armillaria mellea

Crown Rot

Powdery Mildew or Witches Broom

Sphaerotheca lanestrus

Slime Flux

Various bacteria and fungi on sap  
exuded from injuries

Heart Rot

Fomes annosus

Anthracnose (oak)

Gnomonia guercina (Kleb)

Anthracnose (sycamore)

Gnomonia platani (Kleb)

PINE DISEASES

Gall Rust

Peridermium cerebroides or  
Peridermium harknessii

Dwarfmistletoe

Arceuthobium campylopodium f. typicum

Decays and Stains

## MONTEREY PINE - INSECT PESTS

RED TURPENTINE BARK BEETLES - *Dendroctonus valens*: Lecante. The red turpentine beetle is the most destructive insect pest of Monterey pine in this area. The beetle is approximately 1/3 inch in length and is dark reddish brown. Attacks are usually restricted to the lower bole and/or exposed surface roots of mature pine trees. Reddish pitch tubes or entrance holes and red or whitish pink frass indicate this insect's presence. Frass is commonly found lodged in the thick bark plates or in piles at the base of the infested tree. Severe infestations can be recognized from great distances due to the striking change in the normally green foliage. The crowns of dying trees have a characteristic yellow green or orange tint. Trees in this state should be removed or they may act as vectors. Immediate mechanical removal of this insect, and spraying infested trees with lindane is the only proven control. Most trees infested with Bark Beetles can be saved with some diligence and knowledge of proper preventive techniques.

Recognizing the signs of the presence of Bark Beetles in a Pine tree is the most important step toward saving the tree. Look between the bark plates on the trunk at the base of the tree and up to a height of approximately six to eight feet. If beetles are present, you will see a small cone-shaped entrance hole incased in a brownish-orange mass of pitch. The entire cone is about 1/4-inch in diameter. Directly below the entrance will be a collection of sawdust-like material, pink or white in color. This material is the frass or tailings chewed by the insect. It is actually wood residue extracted by the beetle's tunneling operations.

To prevent this insect from doing further damage, you must trace the path or canal until you find the beetle. The tools necessary for the tracing operation are a hammer and chisel.

To begin, chip away the bark and carefully follow the canal which is just below the bark layer. Take care not to cut any deeper than the white cambium just behind the bark. Follow the canal, it may meander, but do not lose track of where the insect is tunneling. As you trace, check to see that you have not accidentally cut more of the bark than necessary. Your objective is to find the insect. If you don't find the beetle, you may not have corrected the problem.

There are usually two beetles per tunnel. Carefully check the area traced to assure yourself there is no more infestation. After completing the tracing, clean the wound by shaping it into an oval with pointed ends. This shape is best for the healing process and stimulates proper callus development. This oval shape also prevents moisture from settling in the wound and allows for rapid runoff and faster drying of the area. After shaping, paint the entire wound area with a thick tree seal compound. This will slow down or prevent the process of wood decay. Immediately following these steps, spray

the trunk with a mixture of Lindane, water and a small amount of oil. The insecticide label will tell you what mixture is to be used.

Check the tree several times in the weeks to follow to assure there is not a reoccurrence of the same problem. Doing the job yourself will save you considerable money.

MONTEREY PINE ENGRAVER BEETLE - Ips radiata. The Ips beetle is approximately 1/16 to 1/8 inch long and deep brown in color. This beetle primarily infests dead or dying limbs of mature trees, small seedlings or very young trees. Ips are also known to attack and kill mature trees that are experiencing moisture stress or other problems. The Ips beetle has not been a killer in this area but has been listed as a primary killer of healthy Monterey Pines planted out of their natural range.

Characteristic infestation is shown by a severe and very rapid dieback of the upper crown foliage. As the infestation advances, treetops quickly turn red, and the attack moves downward until the entire tree is dead. To arrest the advance of infestation, a sanitary and complete removal of all dead, dying and infested living branches is essential. If more than 2/3 of the canopy has been killed, complete removal is usually recommended.

MONTEREY PINE TWIG BEETLE - Pityophthorus carmeli. Monterey Pine twig beetles are black and 1/8 to 1/4 inch in length. They attack the smallest branches, boring and feeding in the same manner as Ips and bark beetles. Damage is restricted to the very small branches which turn yellow and deep burnt orange. Very rarely do these insect pests cause any measurable damage. Preventive measures include trimming and removing all dead wood and twigs that provide a breeding habitat. Dead or dying branches infested with this insect should be removed whenever possible to eliminate further damage.

MONTEREY PINE MIDGE - Thecodipbsis pini-radiata. The pine midge is an extremely small fly that deposits eggs on the terminal buds of pines during the late winter months. The insect larvae bore into the base of new needles forming on the branches causing the base of the new needle to swell. The infested needles are characteristically short - rarely over 1½ inches in length and very thick and swollen at the needle base. They are usually a greenish-yellow instead of a typically deep green. Only the current season's needles are attacked, but in combination with needle fall of old needles, trees affected can become sparse. The larvae, upon maturing, leave the host and reportedly fall to the ground until the following season's egg laying process begins. Spraying with Sevin insecticide during the larva stage is recommended.

SEQUOIA PITCH MOTH - Vespa mima sequoiae The eggs of the pitch moth are laid in wounds or on the bark of branches or trunks. The larva tunnel into the inner bark or phloem where it excavates a cavity and feeds on pine resin. Large masses of pitch build up around the cavity or infested area. The development of the larvae requires two years, after which time the insect emerges. Damage is not significant unless there are mass attacks. Mechanical removal of this insect pest is the best preventive measure, but is generally not very economical.

SPITTLE BUG - Aphrophara permutata. Spittle bugs are approximately 1/8 to 1/4 inch in length, gray to light brown, and resemble a large leaf hopper with their characteristic blunt head and wedge-shaped body. The insect overwinters on pine branches. When eggs hatch in the spring the nymphs insert their mouthpart into the plant tissue and begin feeding. As the insect feeds, fluid is secreted which develops into the characteristic froth or spittle mass that clearly designates this insect's presence. Spittle bugs appear to cause no significant damage unless extremely large populations are present on a single host tree. Usually there is only one generation per year which occurs in the spring months. Spraying with Malathion or Sevin is the recommended control on trees that are severely infested.

SPIDER MITES - Oligonychus subnudus or Oligonychus milleri. Spider mites attack conifers as readily as they do the broadleaved plants. Many conifer-feeding mites build up to damaging numbers in the spring and early summer and sometimes again in the fall. Hot dry summer weather often causes a slowdown in their activities.

As they feed, spider mites destroy the chlorophyll-bearing cells at the surface of the conifer's needle. This results in a flecking, stippling, or bleaching of the affected foliage; some of the leaves often turn brown and later drop as a result of the mite injury. These symptoms may be confused with certain kinds of air pollution injury. Webbing may or may not be found, depending on the mite species involved.

To determine whether a plant is infested with spider mites, hold a sheet of white paper beneath some foliage and shake the foliage sharply. If the tree is infested, mites will soon begin to crawl around on the paper. Although very small, the crawling mite can be easily seen against the white background. The presence of a few mites is of no concern. However, if dozens are seen running about on the paper, some measures should be taken to reduce the mite population before serious damage occurs to the plant.

Large and destructive mite populations sometimes result from improper usage of insecticides on conifers. Some pesticides kill the natural enemies of the spider mites without eliminating the mites themselves. The insecticides BHC, carbaryl (sevin) and lindane should not be used on conifers unless a specific mite-controlling chemical, known as an acaricide, is added to the spray tank and applied simultaneously.

In the western states several other species of Oligonychus are destructive to conifers. O. subnudus (McGregor) is a serious pest of young Monterey pine, Pinus radiata, and especially to those grown for Christmas trees. Populations of O. subnudus tend to be highest in the spring.

Another species, O. milleri (McGregor) makes its appearance in the summer and fall on the same trees. Neither O. subnudus nor O. milleri form webs.

June 1976

## IRREGULAR PINE SCALE AND MONTEREY PINE SCALE

The irregular pine scale, TOUMEYELLA pinicola(Ferris) is one of the most common and probably the most destructive scale insects attacking pine in California. It infests Monterey pine, more than any other species.

Scale insects reduce the vigor of trees by sucking plant juices; severely infested trees suffer retarded growth. The old needles turn yellow and die. Young trees may die if exceptionally heavy scale infestations are left uncontrolled for a period of years.

As the scales feed they produce vast quantities of sticky honeydew, which collects on the needles, branches and trunk. Sooty mold fungi colonize the honeydew and blacken the tree.

The insect overwinters on the twigs of the pine tree. All the scale insects present during the winter are females. They are approximately 1/4 inch in diameter, and more or less circular in outline when viewed from above. Immature male scales may occur in large numbers on the needles.

The irregular pine scale may occasionally be found on the same tree with the Monterey pine scale, physokermes insignicola (Craw.), although the latter species is not a common one. The mature remale insects are about the same size as the irregular pine scale, but they are dark, shiny, and bead-like in appearance. Males are found on the needles.

In southern California, the young crawlers of irregular pine scale begin to emerge from beneath the body of the adult females as early as mid-February. In the Carmel area, crawler emergence begins in late April. During its life each adult female produces up to 2000 young. These crawlers are orange-yellow, oval, and distinctly flattened. They are easily visible as they crawl over, and settle on, the shoots and needles.

After settling, the young scales enlarge as they suck juices from the tree. In late summer tiny winged adult males emerge, mate with the still immature females, and then die. The females remain fixed on the shoots and continue to enlarge until spring, when they produce crawlers. Only one generation of the insect occurs each year.

Effective control can be realized by spraying with applications of either Sevin or Malathion. Proper timing is important. The first application should be made when new crawlers are seen in large numbers. This stage normally occurs in May or early June. A second application is required 2 or 3 weeks later. The addition of a miticide such as Kelthane will prevent any mite buildup.

## PINE NEEDLE SCALE

The pine needle scale, Phenacaspis pinifoliae (Fitch), is one of the most serious pests of Monterey pines. It was once referred to as the "white malady" because of the manner in which heavy infestations whitened the foliage. Ponderosa pine, Douglas fir, and cedar are also hosts of the insect pest.

Ornamental nurseries, Christmas tree plantations, ornamental plantings, and trees planted along dusty roads are more likely to be attacked than forest trees. Light attacks generally go unnoticed and cause little damage. As the populations increase, the needles become covered with the white scale insects, which suck juices from the needles, causing them to turn yellowish and then brown. Whole branches may be killed. Continued infestations can transform beautiful ornamentals into sickly looking trees with sparse, off-colored foliage. Heavy infestations can lead to the death of the tree.

Pines should be inspected at least twice a year for evidence of infestation. The adult scales are easily recognized even when only a few are present. The insects overwinter as reddish eggs beneath the female scale cover. Each female lays up to a hundred eggs. The eggs hatch in May or June. The reddish nymphs crawl from beneath the scale covering and migrate to a new site on the same host, or they may be blown by the wind to more distant hosts. One or two generations occur annually, depending upon geographic location. Where two generations occur, the second lot of crawlers begins to appear in late July. Whereas the female scales are wingless, the male scale has wings and is capable of flight.

The black pineleaf scale, Nuculaspis californica, often attacks the same tree as the pine needle scale. The dark, more circular scale covering easily distinguishes the black pineleaf scale.

Applications of Malathion or Sevin during the crawler period is the recommended treatment. A second application of insecticide should follow within 2 or 3 weeks.

### PINE TIP MOTH - Rhyacionia pasadenama.

The damage inflicted on hosts by all such species is similar; the tips of terminals and laterals are killed as a result of larval boring, initially into the base of the needles or buds, and then into the twig itself. At times trees that are heavily infested by these insects appear reddish in color as a result of the many dead branches. Small trees may be killed. Repeated infestations leave the trees distorted and unsightly. Light infestations may, however, actually improve the form of some ornamental pines, giving them a bushier appearance.

A single generation of the pine tip moth occurs annually. The adult pine tip moth lays small flattened eggs on new shoots near the base of the needles or bud scales. When the eggs hatch,

the larvae bore into the bases of the needles. As the larvae mature they begin to tunnel into the shoot tip. Some species overwinter as pupae within the shoot; others drop to the ground and spend the winter there.

All species are attacked by a number of parasites which at times, seem to keep the moth populations in check. Dry weather and poor soil conditions are thought to encourage damage by tip moths. Application of Malathion or Sevin during the larva stages is the recommended control.

PINE NEEDLE WEEVILS - Seythropus californicus: (Horn.) A number of the genus Seythropus feed on the needles of pines in western states. Their damage is distinctive in that the needles are notched intermittently along their length. Usually the needle dies beyond the point of damage. Under severe conditions the tree may assume a generally browned appearance.

The best known of these weevils is S. californicus (Horn) which attacks Monterey and Bishop pines and occurs along the Pacific Coast. In coastal central California the adults appear in late winter and begin feeding on needles produced the previous year. By May or June the adults have completed their activities and are not seen until the following year. Eggs are laid on year-old growth in an egg chamber. To construct it, the female draws together three adjacent needles and cements them together along their length. Upon hatching, the young larvae drop to the ground where they begin tunneling. They sustain themselves throughout this stage on the rootlets of pine. Pupation also occurs in the soil. The life cycle is believed to require two years.

Weevils attack only foliage that is two years old or older. It always leaves part of the needle uneaten. The damage done by weevils can thus be distinguished from that caused by other insect pests such as sawflies. Applications of Sevin or Malathion will control this insect.

#### TUSSOCK MOTH - Hemerocampa vetusta (Boisd.)

The California Tussock Moth lays its eggs in late summer in felt like masses. Eggs overwinter and hatch early in the spring. Young larva are nearly black in color; as they mature, the larva become attractively colored with spots of bright red and yellow. The mature larva has four round brush-like tufts of hair on its back, and horn-like tufts of black hair both posteriorly and anteriorly.

This insect feeds on Willow, Manzanita, Oak, Pyracantha, California Holly, Coffeeberry, Hawthorn and Pine, all of which are extremely important tree and shrub species of Carmel. The young larva skeletonize the leaves; mature larvae devour the entire leaf.

To control this pest, spray applications of Bacillus thuringiensis or Sevin during the young larva stage to obtain optimum control.



## CYPRESS INSECT PESTS

### CYPRESS TIP MOTH - *Argyresthia franciscella* or *Recurvaria stanfordi* Keif.

The larvae that attack the Monterey Cypress are active during April, May and the early part of June. Eggs are laid on the Cypress branch tips. Upon hatching, the larvae tunnel into the succulent tissue and feed by mining the green branch ends. The pupal stage is spent in the hollowed-out dead point. The adult then emerges several weeks later, mates, and lays eggs on the branches. One cycle occurs per year. Characteristic of this insect's presence is the brown branch ends in spotty sections or mass browning. The larva is 1/4 inch in length and has a transparent yellow coloring. The adult moth is gray in color with three distinct dark bands on the folded wings. Spraying with the insecticide Sevin during the larva emergence period is the recommended control.

### CYPRESS BARK BEETLE - *Phloeosinus cupressi*: (Hopk) - *Phloeosinus cristatus* (Lec.)

These particular insects cause damage which is similar to that caused by Pine bark beetles. Attacks are generally restricted to the late spring and early summer months. Newly emerging Cypress bark beetles feed on the twigs of Cypress as well as the bole. Branches and twigs are attacked well back of the branch tips. These beetles bore and feed on the wood directly under the bark layer causing deep tunnels and galleries which fan out around the entire circumference of the branches or boles. Minor attacks on twigs and branches do not necessarily indicate decline or eventual mortality of the tree infected, although a severe infestation can cause rapid decline and death. A reddish type of foliage and reddish brown sawdust on the bark plates is an indication that the Cypress is infested and declining. These insects are also the enemies of the Coast Redwood, Junipers, and some types of cedars. The Cypress Bark Beetle and its larva are nearly identical to that of the Pine Bark Beetle. The coloring of this beetle is generally a dark brown or black versus the brown or reddish tinge of the Pine Bark Beetle.

If infestations are severe, sanitary pruning and disposal of infected wood is recommended. Injecting insecticide directly into the trees transport system may help control the spread of this pest. Insecticide injection must be timed to the beetle's life cycle.

CYPRESS BARK MOTH - *Laspeyresia cupressana* (Kearf). Cypress bark moths have two distinct generations during each year: late spring - early summer; and late fall - early winter. The adult moth lays eggs and the larvae upon hatching, bore into the bark and feed just below the bark layer. Cones are also attacked. Extensive damage is not common - the larvae usually restrict attacks to the immediate area of hatching. Reddish frass on bark plates and cones indicates these insects are present and active. Attacks can be directly related to the disease *Seiridium cardinale*. The moths are 1/2 inch in length, and are grayish in color with white spotted wings; the larvae are 1/4 inch in length and white with a brown head. When both the Cypress bark moth and *Seiridium cardinale* are present, Monterey Cypress can be severely damaged or killed. This insect is suspected as the major transmitter of the Cypress disease *Seiridium cardinale*. Spraying Sevin during the hatching period is the recommended control of this insect pest.

## OAK INSECT PESTS

OAK TWIG GIRDLER - Agrilus angelicus. This insect infests twigs and girdles the stems of several kinds of oaks, especially if the twigs are less than 1/2 inch in diameter. The oak twig girdler attacks the coast live oak, interior live oak, and other oak species. After the twig is girdled, patches of dead leaves appear because the supply of moisture and plant food has been cut off. The burrows of the girdlers are generally spiral-like and filled with brown, powdery frass. The larva of the beetle can be found at the end of the burrow toward the living portion of the twig. The small white larva may work into the heartwood in March or April in preparation for pupation and transformation into the adult beetle.

The mature larva is about 3/4 of an inch long, legless, and white. The adult beetles are about 1/4 inch long, slender, and brownish-bronze in color. The life cycle covers two years, the adults emerging during May and June or even July. The adults feed on leaves, then mate and lay their eggs. The eggs hatch in two or three weeks, and the young bore through the bottom of the eggshell into the twig. This means that there is only about one month during which the insect is outside the twig and can be reached with a contact spray.

Keep oaks in a vigorous condition by proper watering, fertilizing, and pruning. Apply two pounds of 50% carbaryl wettable, or 1 1/4 pounds of 60% carbaryl sprayable per 100 gallons of water at the beginning of the period when the beetles emerge (July in cool coastal areas). The spray should be on the twigs when the adults appear. To time the spray properly, remove some of the infested twigs and keep them in a screened container until the adults emerge.

OAK MOTH - Phryganidia californica. Several kinds of pests attack oak trees. The more important ones are the oak moth, the tent caterpillar, the leaf roller, the ribbed case maker, the twig girdler, various aphids, scale insects and borers.

Oak moth is found along the coast from San Diego to well north of San Francisco, but damage is usually most severe in the region adjacent to the mid-central California Coast.

The adult oak moth lays somewhat flattened, globular eggs in masses on the leaves, limbs, and trunks of trees. The eggs are white when first laid but darken as the hatching period approaches. The larvae cast their skins about five times while maturing; when full grown, they are about 1 1/4 inches in length. They have a brown or reddish head and an olive-green body with black and yellow stripes running lengthwise on their backs and sides.

The caterpillars pupate on leaves, limbs, and trunks of trees, or on any nearby shrubs. The pupae are shiny, smooth, and whitish or yellowish with black markings. Where infestations are heavy, they can be easily found.

The adult moth is pale brown, and about one inch in length. There are two generations a year, and there may be three in southern California.

The overwintering caterpillars spend the winter as tiny larvae in the eggs or on the leaves of evergreen oaks. They complete their development in May or June. The moths then emerge, mate, and lay eggs which develop into the summer brood. Moths from this brood appear in October and November and lay eggs that become the overwintering caterpillars. If infestation is severe, either of the two broods can seriously damage oaks -- on occasion, they defoliate trees over a wide area.

The oak moth is subject to attack by many natural enemies, including parasites, predators, and a wilt disease. These natural factors are important in limiting the damage done by the oak moth larvae. If these fail, protect trees with either a spray of carbaryl Sevin or of Bacillus Thuringiensis.

PIT SCALE - Asterolecaniidae. Several species of pit scales (Asterolecaniidae) attack many of the common deciduous and evergreen oaks grown in California. Damage is greatest in coastal central California.

Pit scales suck juices from the twigs and cause twig dieback, which first becomes apparent in mid and late summer. Affected trees retain the dead leaves on the killed twigs throughout the winter, which gives the tree an unsightly appearance. A severe infestation delays leafing out of deciduous oaks as much as 3 weeks in the spring. Young trees may be killed by pit scales when heavy attacks occur year after year.

The pitting effect is most noticeable on the bark of the younger twigs. The pits are doughnut shaped, and the scale is found in the central depression. The scale is a brown or dull green, flattened, circular, immobile insect about the size of the head of a pin. Where large numbers occur, the pits may coalesce, giving the twig surface a roughened, dimpled appearance.

The adult scales, all of which are females, produce living young from April to October. Maximum numbers of young, however, are produced in May and June. The immature scales, known as crawlers, move about for several days before settling on a twig, where they remain for the rest of their lives. The crawlers are extremely small and difficult to see without a magnifying glass. They are mature by late fall, and the cycle begins again the following spring.

Chemical sprays are the only known means of controlling pit scales. Spraying for pit scales requires high-pressure, high-volume equipment. However, on very small trees a hand-type compression sprayer may be used. Recent experiments show that a single application of any one of four different insecticides will afford excellent control.

- Sevin -- Apply 2 pounds of 50% wettable powder per 100 gallons of water.
- Malathion -- Apply 4 pounds of 25% wettable powder per 100 gallons of water.
- Diazinon -- Apply 1½ pounds of 50% wettable powder per 100 gallons of water.

TREE HOPPERS - Platycotis vittata. Tree Hoppers are strange-looking insects with many unusual shapes and forms. This particular variety is distributed over much of the United States but occurs most commonly along coastal areas.

Tree Hoppers overwinter as eggs and have a single annual generation which hatches in early spring. Eggs are laid in the bark of twigs. Both the nymph and the adult stages feed on twigs. They feed by inserting their sharp, needle-like mouth parts into plant tissues and sucking out cell fluids. Injury to the plant host is caused by the female of the species which cuts slits in the young bark tissue of twigs in preparation for egg-laying. Eggs are then deposited in the slits and remain until the hatch occurs in early spring.

As these insects mature, they can be seen on branches of oak trees throughout the Carmel area. When found in large numbers they are usually congregating in large compact colonies thus causing damage to new branch growth.

Application of Sevin or Orthene is commonly used to control this insect.

GYPSY MOTH - Porthetria dispar. The adult female gypsy moth is large, nearly white in color and has wavy blackish bands across its forewings. The male is dark brown. The female moths deposit dark brown, hairy egg masses of 100 - 600 eggs or more on branches, buildings, or any other suitable place.

The larvae generally hatch from early April to late May. Following hatching, the small larva spins a silk thread, suspends itself from a leaf, and becomes airborne during breezy days. The larva at this stage is hairy and dark in color.

As the larva grows and matures its feeding habits change. A nocturnal insect, it feeds on a large number of hosts. Oaks seem to be the preferred species but all species of trees in the Carmel area are susceptible to attack. The caterpillar can obtain a length of 1½ to 2 inches. When fully grown, it is identified by a distinct series of four pairs of blue dots followed by six pairs of red dots set in straight rows on its back.

The larvae stage lasts about seven weeks. Moths begin to emerge the middle of July, males appearing several days earlier than females.

To control this insect pest spray Bacillus thuringiensis or Sevin during the first few weeks of the larvae stage to obtain optimum control.

## CYPRESS DISEASES

Seiridium cardinale. Cypresses in the Carmel area are relatively free of disease organisms common to other regions where this species is planted. Seiridium cardinale has been known to attack young Cypress causing gradual dieback. It can provide an infestation point for Cypress bark moth.

A lesion is produced which spreads by progressive killing of bark tissues until the attacked part is girdled. Swellings in the crotches of lateral twigs and branches indicate points of infection. There is evidence that infestations may start in absence of a wound as well as through a wound. The bark swellings may be slight but usually turn brownish and exude resin in droplets from the surface.

As the lesion extends, the killed bark dries out to form a depression. The canker extends faster vertically on the trunk than around it. A heavy resin flow on the edges of the canker is a useful indicator of this disease on normally vigorous trees. Resin flow is usually less or even lacking on old, slow-growing trees and on trees growing in areas of low humidity. Older trees commonly wall off the infection, but this is rare in young Monterey Cypresses.

Generally the most noticeable symptoms are the fading and death of individual twigs, branches, or tops of trees. Dying of the affected part occurs most frequently in the spring but may occur at anytime of the year. Trees of any size, age, or condition of growth may be attacked. Infections may be found on the smallest twigs or the largest limbs. On young, fast-growing trees with crowns near to the ground, stem infections are more common. Branch cankers predominate on older, slow-growing trees.

Tree infections usually increase slowly unless surrounded by diseased trees. The length of time required to kill varies. A stem canker on a two-to-three year old tree may cause its death in one year. For large trees, the time required may be from five to twelve years, largely depending on temperatures in the area.

An infection may grow twice as fast in warm interior valleys compared with the cool coast. The fungus is spread almost entirely by minute dark spores. They are produced in small, black pustules on the surface of infected bark and are long lived.

Wind and rain appear to be the chief means of spreading the conidia of S. cardinale from one branch or tree to another. Spores from the sexual stage that form on dead branches are wind disseminated. The Cypress Bark Moth has been suspected as being a major cause of the spread of this disease.

The disease process has been slowed by mechanically cleaning and disinfecting the canker infections. Use of a chisel to remove the infection and rinsing the area with clorox has been beneficial. Allowing the wound to dry and sealing it at a later date is a good practice.

## OAKS

OAK ROOT FUNGUS OR SHOESTRING ROOT ROT - *Armillaria mellea*. This disease, a mushroom producing fungus, seldom causes severe injury or damage in natural stands of oak unaffected by development. When soil conditons are altered or completely changed, the disease spreads and becomes an important cause of oak dieback and death. Overwatering is the usual cause. Oak trees do not respond well to summer watering and prefer dry soil during the summer months. An increase in soil moisture and/or the presence of other disease organisms can cause development of oak root fungus. When the disease begins to spread, decline of the oak is extremely rapid.

Signs of this disease are white or cream-colored, fan-shaped fungus growths which occur between the bark and wood of roots and portions of the trunk just below soil level. There is a characteristic mushroom odor to infected tissue. Black root hair strands on the surface of infected roots indicate the presence of this disease. During advanced stages, mushrooms can be seen growing around the tree's base. The wood becomes pulpy, very moist, and gray or white in color.

Halting the advance of this disease requires removal of all infected tissue, exposing the healthy tissue to the air for drying purposes and discontinuing any artificial watering. There are no known chemical compounds that can eradicate this disease.

CROWN ROT. Crown rot is the most common of all diseases affecting oaks in this area and the major cause of dieback. Excessive soil moisture around the trunk base during the summer months is probably the cause. These conditions result in favorable development of water molds which cause this disease.

Infected trees decline over many years. As the disease advances, the foliage becomes sparse and whole branches begin to die. Eventually the entire tree is defoliated and dies. Control in the advanced stages is extremely difficult. If discovered early, several measures can be taken to slow the disease spreading process. Stop all watering between the trunk and drip line. Do not raise the soil level or grade around any infected tree. Remove soil from the area of the trunk base and allow the main roots and trunk to dry out. During winter months add fertilizer to the soil to promote tissue and foliage regeneration.

POWDERY MILDEW OR WITCHES BROOM - *Sphaerotheca lanestris*. Leaves infected with powdery mildew are covered with a white powdery growth. When tender new shoots are infected, they become shortened, excessively branched with small distorted leaves. Sometimes additional buds are stimulated to grow, resulting in growth covered with the powdery mildew fungus, often referred to as witches broom.

Succulent growth beyond the spring flush of growth is most susceptible; therefore, avoid excessive pruning, fertilization, and irrigation.

Remove the brooms where practical during the winter months to reduce the spread of the fungus. Always sterilize your cutting tool after each cut is made. Use clorox as a disinfectant. If the disease has been severe, several fungicidal sprays may be helpful if applied in the spring at the time of the normal flush of growth, and at 10 to 14 day intervals until rapid growth has ceased. Cycloheximide (Actidion PM) has been used successfully.

Another powdery mildew does not cause witches broom but develops as light brown or white, felt-like patches on the infected leaves. Cycloheximide may give control.

SLIME FLUX - Various bacteria and fungi on sap exuded from injuries. This disease occurs where wounds, pruning cuts, or separation between wood and bark fail to heal properly. Wounds such as these continue to bleed for extended periods. Fermentation of the sap is caused by bacteria, yeasts, and other fungi developing in the sap which collects in the unhealed wounds. The infection causes sap to flow until mechanical measures are taken. The sap has a disagreeable musky-like odor which is characteristic of this disease. Slime Flux is common to many broad leaf trees in the moist and foggy coastal zone.

There is no known chemical control for this disease. Mechanical treatment provides the best results and will usually eliminate the disease after the first treatment. Removing all the bark around the infected area that has been in contact with the fermented sap is the initial step towards a cure. A safe precaution would be to remove some healthy bark beyond the infected area. Follow this procedure with a thorough scraping of the infected area to remove any excess sap. Scrub the wound with a pure solution of clorox to sterilize. Before applying a tree seal compound, allow the wound to dry for a period of one to three weeks. If there is no indication of additional sap flow, seal the wound to protect the tree from further decay.

HEART ROT - Fomes annosus. The inactive heartwood of oaks and many other trees may be attacked by several wood-rotting fungi. The primary effect on the tree is to weaken the mechanical structure. Once the heartwood has become infected, there is no cure. To prevent heart rot, treat pruning and other wounds with a copper-containing fungicide, such as bordeaux mixture, and cover the wound with a wound-sealing compound.

ANTHRACNOSE - Gnomonia quercina (Kleb). This disease affects the California black oak (Q. kelloggii), white oak, and occasionally live oak. The fungus that causes the disease is related to the commonly occurring fungus that causes sycamore anthracnose Gnomonia platani (Kleb). The disease occurs in the spring when there is abundant rainfall and affects leaves and tender shoots as they emerge. On older leaves, the infections follow the midrib and veins of leaves, producing irregular brown blotches.

Benlate fungicide has been recommended as a control. Spraying should be applied during periods of new growth at 14 day intervals. Three applications are commonly recommended. Trimming to reduce canopy density and improve sun and air circulation is probably the most effective control of this disease. After pruning is completed, sanitary disposal of all cuttings is important. Burning or burying the infected material is also recommended.

#### PINE DISEASES

GALL RUST - Peridermium cerebroides. The western gall rust in its coastal form occurs at damaging levels in individual trees as well as stands of Monterey Pine in the Carmel area. Peridermium cerebroides has not yet been described validly as a species. Experience shows clearly that the gall rusts may be vigorous and damaging under a wide range of climatic conditions.

Both Peridermium harknessii and P. cerebroides stimulate the formation of witches broom and both retard the growth of the infected stem; where infection of the main stem occurs this can cause death of a small tree. Infection is invariably confined to the gall and its immediate surroundings. The galls tend to become spherical and seldom show exfoliation of bark during or after sporulation. By contrast the bark that overlays P. harknessii galls tend to break and scale off, showing underlying smooth, naked wood, well in advance of branch killing. The exfoliation of bark results in the formation of a collar of dead bark on P. harknessii galls that stands out most clearly at the end of the swelling. This collar seldom if ever is seen on the P. cerebroides galls on Monterey Pine.

Peak production of spores takes place in February and March. There are no known controls of this disease other than removal of infected branches or trees.

DWARFMISTLETOE - Arceuthobium campylopodium f. typicum, the western dwarfmistletoe, is a parasitic seed-bearing plant that attacks and damages Monterey Pines. This parasite, native to Monterey Pine stands in California, finds a highly susceptible host in P. radiata. In the Carmel area dwarfmistletoe and the gall rust are the most prevalent and destructive pathogens of Monterey Pine.

There are no special features of the western dwarfmistletoe on Monterey Pine to distinguish it from the dwarfmistletoe found on other hard pines. Dwarfmistletoe shoots are a characteristic olive green shade with large dense clusters of shoots characteristic of old infections. Seeds are born at the tips of each branchlet.

Trees weakened by dwarfmistletoe is usually not prevalent on very young saplings. Larger trees in the 4 to 12 inch diameter class are more susceptible. All sizes of trees can be damaged, deformed, or, in multiple heavy infections, even killed by this parasite. The disease often causes swellings on twigs and branches. Older infections on the main stem may cause little or no swelling. On the trunk, dwarfmistletoe breaks out between cracks in the bark.



Decayed and sunken faces of older branches or the trunk of Monterey Pine may be associated with gall rust, dwarfmistletoe, or mechanical or animal damage. In many locations within the Carmel area, dwarfmistletoe and gall rust may occur in multiple infections on the same tree. Both diseases apparently find an ideal environment for spread and intensification in coastal areas of central California.

Control of dwarfmistletoe in Monterey Pine is through removal of infected branches or trees. Other than trimming or removal of infected trees or removal of the mistletoe itself, there are no known chemical cures.

#### DECAYS AND STAINS

Native and exotic Monterey Pines are attacked by a broad spectrum of organisms causing decay of heartwood and sapwood, staining of sapwood, and deterioration of wood. Rot fungi causing significant losses of Monterey Pine timber in Carmel, Fomes pine, Polyporus schweinitzii, Armillaria melea and Polyporus tomentosa are especially noteworthy. F. pini and P. schweinitzii both occur in the Carmel area, but occurrence is spotty within these areas. Heart rot losses in Monterey Pine are generally low, probably on the order of 2 or 3 per cent of the total. Polyporus anceps has been found on native Monterey Pine but it is not common. The most prevalent saprophyte found on dead trees or down logs and slash is Polyporus abietinus. Under favorable conditions blue stain and other sapstain fungi will develop in windblown or felled trees in the woods and in log decks.

NOTE: Other references to insect pests and diseases may be found in the City Forester's files and library.

## TREES NATIVE TO THE PENINSULA AREA

The list of trees that has been prepared is composed of those that grow on or near the Monterey Peninsula. These trees are considered adaptable to the climate and soil conditions that exist, and are trees that have shown excellent growth qualities and the ability to withstand minimal maintenance when grown on home grounds.

<u>Name</u>	<u>Growth Characteristics</u>
Monterey Pine <u>Pinus radiata</u>	Extremely fast growth to 80-100 feet. Fairly drought resistant; susceptible to smog damage; dense foliage.
Bishop Pine <u>Pinus muricata</u>	Rapid growth to 40-50 feet; dense foliage; salt resistant.
Monterey Cypress <u>Cupressus macrocarpa</u>	Moderate to rapid growth; pyramidal growth in youth; spreading flat crown in maturity when grown near coast.
Coast Live Oak <u>Quercus agrifolia</u>	Round crown with wide spreading irregular branches; 20-70 feet; massive tree; drought resistant; fast growth when growing in ideal soil conditions. Drops leaves throughout the year.
Valley White Oak <u>Quercus lobata</u>	Deciduous tree; wide spreading; growth to 70 feet, massive tree; drought resistant; fast growth when growing in ideal soil conditions.
Coast Redwood <u>Sequoia sempervirens</u>	Fast growing; almost insect free; dense green foliage; good to plant near lawns, but may choke out lawn when in middle age.
Madrone <u>Arbutus menziesii</u>	20-40 feet; slow grower; particular about soils; no alkalinity; fast well drained soil; drooping leaves and fruit. Beautiful red bark; very temperamental.
California Sycamore <u>Platanus racemosa</u>	Fast growing; 80 feet; multiple trunks; gray to white bark; good for low river areas; very picturesque with twisted, gnarled branches.
Douglas Fir <u>Pseudotsuga menziesii</u>	Pyramidal growth habit to 250 feet in forests and 60 feet when planted on home grounds. Small dense soft needles, dark green to blue color. Will grow in any soil except heavy undrained clay or swamp conditions. Grows in sun or shade. Withstands extreme wind. In dry summer climate will grow dense and irregular.

TREES NATIVE TO THE PENINSULA AREA (Con't)

<u>Name</u>	<u>Growth Characteristics</u>
Holly Oak <u>Quercus ilex</u>	Moderate growth to 40-60 feet; wide spreading dense foliage; tolerates wind and salt air; grows well in many types of soil; a good tree for small growing spaces; acts as an excellent screen.
Red Alder <u>Alnus rubra</u>	Excellent for brackish or swampy areas where other trees will not grow; extremely fast growth to 45-50 feet; green 2-4 inch leaves, hairy under sides; dense foliage which can be attacked by tent caterpillar or aphids when under dry conditions; roots are aggressive so do not plant near walks or sewer lines.

## NATIVE PLANTS SUITABLE FOR HOME GARDENS IN CARMEL AREA

This is not a complete list of available native plants. These are the most commonly available commercially and the most adaptable to home gardens.

Although native plants are considered to be low maintenance, this refers to well established plants. New plantings require regular waterings.

Mature, naturalized plants require no care; however, most native plants will benefit from regular waterings, pruning and shaping, fertilizings and spraying during their first several years of growth.

Most native plants are drought tolerant. When established, they will survive conditions that would kill more demanding plants. Deep, infrequent waterings (once a month) would go a long way towards improving the overall quality of their appearance.

Autumn is a good time to plant California Poppy seeds. If the rains are late, keep them watered. Good, healthy plants will reseed themselves when they finish flowering.

NATIVE PLANTS SUITABLE FOR HOME GARDENS IN CARMEL AREA

Name of Plant	Qualities	Uses
Manzanita "Howard McMinn" <u>Arctostaphylos densiflora</u>	Dense mound, 3-4 feet high and 7 feet wide; tiny white pink flowers; smooth reddish black bark.	Ground or bank cover; informal low hedge.
Monterey Manzanita <u>Arctostaphylos Hookeri</u>	Low, dense growth; bright green foliage; slow growing.	Ground or bank cover
Bearberry Manzanita "Point Reyes" <u>Arctostaphylos uva-ursi</u>	Prostrate, spreading creeper; glossy dark-green leaves, bright red berries in autumn winter.	Ground or bank cover trailing over walls
Brewer's Salt Bush "Breweri" <u>Atriplex lentiformis</u>	5-7 feet high, 6-8 feet wide; drought, wind, salt and fire resistant; gray, silvery foliage.	Informal or clipped hedges; windbreak in difficult conditions.
Dwarf Coyote Bush <u>Baccharis pilularis</u>	Prostrate, dense growth to 6 feet; tiny, bright-green leaves; tolerates drought and poor soil; very adaptable.	Ground and bank cover.
Bush Anemone <u>Carpenteria californica</u>	Multi-stemmed shrub; slow growing, 3-6 feet high; neat formal look; white anemone-like flowers; May-August; sun or shade.	Specimen or display shrub; containers
<u>Ceanothus</u> "Point Reyes" <u>Ceanothus gloriosus</u>	Low dense, spreading growth dark green leaves; lavender blue flowers; March to May	Ground or bank cover
Carmel Creeper "horizontalis" <u>Ceanothus griseus</u>	Low, creeping (older plants will mound to 3 feet) large glossy dark green leaves; light blue flowers.	Ground or bank cover
"Yankee Point" <u>Ceanothus g.h.</u>	2-3 feet high; flowers brighter blue than Carmel creeper; slower growing	Ground or bank cover

\* Common names in quotes indicates hybridized nursery plants.

NATIVE PLANTS (Cont.)

<u>Name of Plant</u>	<u>Qualities</u>	<u>Uses</u>
<u>Ceanothus impressus</u>	Fast growing to 4-10 feet; small, dark green crinkly leaves covered with dense clusters of bright blue flowers; Feb. - April.	Informal hedge; screen display shrub.
"Julia Phelps" <u>Ceanothus impressus</u>	More compact than impressus with deeper blue flowers.	Informal hedge or screen; display shrub.
"Joyce Coulter" <u>Ceanothus</u>	Very fast growth, 3 feet high to 12 feet wide; deep blue flowers.	Bank of ground cover.
"Ray Hartman" <u>Ceanothus</u>	Big shrub 10-15 feet tall, 12-15 feet wide; large dark green leaves; bright blue flowers; March - May.	Small tree; informal hedge or screen.
"Sierra Blue" <u>Ceanothus</u>	Tall shrub 6-12 feet high; dense medium sized leaves; deep blue flowers.	Clipped or informal hedge or screen.
Buckwheat - Santa Cruz Island <u>Eriogonum arborescens</u>	3-4 feet high to 4-5 feet wide; gray-green leaves; long stalked flat clusters of pink flowers; May-Sept. drought and wind resistant.	Dry bank cover; rocky areas, rock gardens
Saffron Buckwheat <u>Eriogonum crocatum</u>	Low, compact, small, white wooly leaves; yellow flowers in flat clusters; April-Aug.	Same as above.
California Buckwheat <u>Eriogonum fasciculatum</u>	1-3 feet high to 4 feet wide. Narrow, hairy leaves; whitish flowers in clusters; May - Oct.	Same as above.
St. Catherine's Lace <u>Eriogonum giganteum</u>	Same as arborescens except more rangy and larger.	Same as above.
Red Buckwheat <u>Eriogonum rubescens</u>	Low, compact; gray-green leaves; round clusters of rose-red flowers.	Same as above.
Native Sword Fern <u>polystichum</u>	Leathery shiny dark green fronds, 2-4 feet long; withstands neglect.	For shady beds, under trees, woodland gardens, along house walls.

NATIVE PLANTS (Cont.)

<u>Name of Plant</u>	<u>Qualities</u>	<u>Uses</u>
Giant Chain Fern <u>Woodwardia radicans</u>	4-6 feet tall; bright green fronds; eventually withstands neglect.	Near pool or stream, shaded walls, under trees, woodland gardens.
Wild Strawberry <u>Fragaria chiloensis</u>	Evergreen ground cover; low, compact lush mats of dark green, glossy leaves; white flowers; tiny fruit.	Ground cover; part shade or sun.
Coast Silktassel "James Roof" <u>Garrya elliptica</u>	4-8 feet tall; long oval dark green leaves; clusters of unusual flower tassels; Dec. - Feb.; slow growing without water.	Sun or part shade; informal hedge; display shrub.
Toyon <u>Heteromeles arbutifolia</u>	Dense shrub or small tree 6-10 feet tall; thick, leathery glossy dark green leaves; bright red berries; Nov. - Jan.	Screen; bank planting erosion control; berries attract birds.
Oregon Grape <u>Mahonia aquifolium</u>	6 feet tall (compact form smaller); shiny glossy green leaves, purple-bronze in winter; yellow flowers, blue berries; sun or shade; very adaptable.	Foundation plantings; low screens; containers; resistant to Oak root fungus.
Pacific Myrtle <u>Myrica californica</u>	Tall shrub; clean, dense, glossy deep green foliage.	Tall screen; informal or clipped hedge.
Hollyleaf Cherry <u>Prunus ilicifolia</u>	Shrub or small tree; deep green leaves; white flowers; red fruit.	Small tree to 30 feet. tall screen; clipped hedge.
Catalina Cherry <u>Prunus lyonii</u>	Shrub or tall tree; long, bright green leaves; large black fruit; drought tolerant; very adaptable.	Tall screen; informal or clipped hedge.
Coffeeberry <u>Rhamnus californica</u>	Broad spreading shrub; long shining dark green leaves; red and black berries; sun or shade.	Ground cover; under trees; display shrub.
Pink Flowering Currant "Glutinosum" <u>Ribes sanguinem</u>	Deciduous shrub; 4-12 feet tall; large maple-like leaves; deep pink flowers in small drooping clusters; small blue-black berries. Mar. - June.	Display shrub; informal screen; background woodland garden.

NATIVE PLANTS (Cont.)

<u>Name of Plant</u>	<u>Qualities</u>	<u>Uses</u>
Lemonade Berry <u>Rhus integrifolia</u>	3-10 feet high to 3-10 feet wide; oval leathery dark green leaves; white pinkish flowers; Feb. - June; small red berries; can be shaped according to wind and use.	Bank and ground cover. screen; background, woodland garden.
Evergreen Currant <u>Ribes viburnifolium</u>	Low spreading; 3 feet tall to 12 feet wide; low arching wine-red stems; round leathery, dark green leaves pink flowers, red berries.	Ground cover for sun or shade; good for under oaks.
California Fuchsia <u>Zauschneria californica</u>	Perennials; pretty red flowers; gray foliage; drought resistant; flowers attract humming birds.	Informal gardens; banks; hillsides.

Footnote: See Appendix  
The Look of the Monterey Peninsula Landscape, by California American Water Co. and Others. 1979





ESCHSCHOLZIA CALIFORNICA

# A Drought-Tolerant Plant List for the Monterey Peninsula

Plants which are adapted to the dry summers and short rainy winters of the Monterey Peninsula are called "Mediterranean Zone" plants. These include plants native to California, as well as those found in Mediterranean climates around the world. Such plants do not need much water in the summer because they are naturally suited to long dry periods. Keep these low-water use plants separate from thirsty plants — some will suffer from too much water.

## Efficient Landscape Maintenance

Soil preparation is important in reducing water, fertilizer, and pesticide requirements. Good soil means less matting, compaction, erosion, and leaching of valuable soil minerals, and better aeration. Converting vegetable and grass clippings and leaves into compost to be incorporated into the soil as a natural fertilizer will also help soil stay in good condition and aid water-retention. Use of mulch — lawn clippings, wood chips, sawdust, leaves, or pine needles on the ground — decreases water evaporation, soil compaction, and weeds. Newspapers, straw, and even old carpeting have been used for this purpose.

In many areas of the Monterey Peninsula, with relatively cool summers, gardens require much less water than many people realize. During the 1976 - 1977 drought, many landscapes survived water rationing with little or no plant loss. Drought-tolerant plants survive with little or no water other than available rainfall; however, they need water to become established. Plant in the fall and early winter, and, usually, after a year or two, no watering will be needed. (Plants cultivated from seed establish themselves more quickly, but may need special protection during their first months of growth; nursery plants in cans may need watering for an additional year or two.) A short distance in from the coast, particularly in Carmel Valley, watering requirements increase; however, even these areas require less water for a drought-tolerant garden.

Give plants only as much water as they need, and only when they show signs of needing it. Irrigate during the cool of the day to cut evaporation losses. Different soils require different applications of water. For deep-rooted plants such as shrubs and trees, water slowly, deeply, and infrequently. Shallow-rooted plants, such as lawns, should be watered more frequently and less deeply, as should heavy clay soils which do not absorb water quickly and need "soak-in" time.

Keep sprinkler heads clean to prevent uneven watering, and place them where they spray the greenery, not the pavement. Avoid fine mists, which lose water to wind and evaporation. Use pistol-grip nozzles with shut-offs on all hoses to avoid waste, and always turn off the faucet when finished to prevent leakage. Keep your garden weed-free, as weeds compete with other plants for nutrients and water. When watering on a regular basis is required, investigate the use of low water-using irrigation systems such as trickle, drip, soaker hoses, or biwall tubing. Eliminate or cut back on lawn-areas — less lawn means less watering and less mowing.

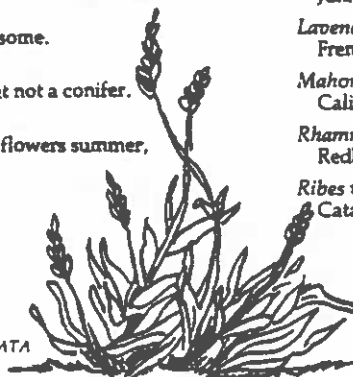


ECHIUM FASTUOSUM

# Selected Drought

Botanical Name Common Name	Zone Exposure	Notes	Botanical Name Common Name	Zone Exposure
<b>Trees (mature height over 12 ft.)</b>				
<i>Aesculus californica</i> ** California Buckeye	F,G,H Sun, shade	Deciduous, wide-spreading; aromatic white spikes in late spring.	<i>Leptospermum laeovigatum</i> 'Compactum' Australian Tea	All Sun
<i>Arbutus menziesii</i> ** Madrone	G,H Sun	Striking, smooth, sheds red bark. White flowers, red berries.	<i>Nerium oleander</i> Oleander	G,H Sun
<i>Arbutus unedo</i> Strawberry Tree	B,C,D,F,G,H Sun, shade	Single or multi-stem, handsome foliage, slightly edible red fruits.	<i>Pittosporum crassifolium</i> Pittosporum	A,C,D Sun
<i>Cupressus macrocarpa</i> ** Monterey Cypress	A,C Sun, shade	Useful as barrier, deer, weed control.	<i>Prunus ilicifolia</i> * Holly-leaf Cherry	D,G,H Sun
<i>Olea europaea</i> Olive	D,F,G,H Sun	Single or multi-trunked small tree. Silvery-gray leaves.	<i>Rhamnus californica</i> ** Coffeeberry	B,C,D,E,F Sun, shade
<i>Pinus coulteri</i> * Coulter Pine	G,H Sun	Graceful specimen tree; long gray-green needles.	<i>Rhus integrifolia</i> * Lemonade Berry	B,C,D,F Sun, shade
<i>Pinus muricata</i> ** Bishop Pine	B,C,D,E Sun	Gray-green needles, takes poor soil. Tolerant of wind and salt air.	<i>Rhus ovata</i> * Sugar Bush	B,D,G,H Sun
<i>Pinus radiata</i> ** Monterey Pine	B,C,D Sun	Vigorous, fast-growing, for large space.	<i>Ribes sanguineum glutinosum</i> ** Pink Flowering Currant	C,D,E,F Sun, shade
<i>Pinus thunbergii</i> Japanese Black Pine	B,C,D,F,G Sun	Picturesque small pine for small yards.	<i>Romneya coulteri</i> * Matilija Poppy	B,D,F,G,H Sun
<i>Quercus agrifolia</i> ** Coast Live Oak	B,C,D,F,G,H Sun, shade	Abundant, adaptable native tree. Faster growing than most oaks.	<b>Small Shrubs (1-4 ft.) and Shrubby C</b>	
<i>Quercus ilex</i> Holly Oak	C,D,F,G Sun	Straighter than coast live oak, for small gardens.	<i>Arctostaphylos densiflora</i> * Vine Hill Manzanita	B,C,D,F,G Sun
<i>Quercus lobata</i> ** Valley Oak	G,H Sun	Deciduous, majestic tree.	<i>Arctostaphylos hookeri</i> ** Monterey Carpet Manzanita	B,C,D,E,F Sun, shade
<b>Tall Shrubs (to 6 ft. and over)</b>			<i>Arctostaphylos edmundsii</i> * Little Sur Manzanita	A,B,C Sun
<i>Arbutus unedo</i> 'compacta' Strawberry Tree	B,C,D,F,G,H Sun, shade	Extremely handsome; slightly edible fruits.	<i>Arctostaphylos pumila</i> ** Sandmat Manzanita	B Sun
<i>Arctostaphylos tomentosa</i> ** Shaggy Bark Manzanita	B,D,E Sun	Gray-green leaves, multiple trunks.	<i>Baccharis pilularis</i> 'Twin Peaks'** Dwarf Coyote Bush	All Sun
<i>Atriplex lentiformis breweri</i> * Salt Bush	A,B,C,D,F,G,H Sun	Gray foliage, screen or hedge, fire retardant.	<i>Ceanothus griseus horizontalis</i> ** Carmel Creeper	A,C,D,E,F Sun, shade
<i>Callistemon citrinus</i> Lemon Bottlebrush	B,C,D,E,F,G,H Sun	Flowers have showy red stamens.	<i>Ceanothus 'Joyce Coulter'</i> * Joyce Coulter Ceanothus	A,B,C,D,F Sun
<i>Ceanothus 'Ray Hartman'</i> * Felt Leaf Ceanothus	C,D,E,F Sun, shade	Fluffy blue flowers in spring; tall.	<i>Cistus spp.</i> Rockrose	B,C,D,F,G, Sun, shade
<i>Ceanothus 'Julia Phelps'</i> ** Ceanothus	B,C,D,E,F,G,H Sun	Small leaves; compact; showy flowers.	<i>Cistus villosus prostratus</i> Safeleaf Rockrose	B,C,D,F,G Sun, shade
<i>Cercis occidentalis</i> * Western Redbud	G,H Sun	Showy pink flowers in spring.	<i>Diplacus spp. (aka Mimulus)</i> ** Bush Monkeyflower	B,C,D,E,F, Sun, shade
<i>Cotoneaster (large-growing)</i> Red Clusterberry	B,C,D,F,G,H Sun, shade	Graceful, arching; leaves variable by species.	<i>Euryops hybrid</i> Yellow Bush Daisy	B,C,D,F Sun
<i>Dendromecon harfordii</i> * Island Bush Poppy	B,C,D,F,G,H Sun	Gray leaves, poppy-like flowers. Needs drainage.	<i>Gaultheria shallon</i> ** Salal	C,D,E Shade
<i>Erigonum gigantea</i> * Giant Buckwheat	A,B,C,D,F,G Sun	Gray oval leaves, flat clusters of white flowers.	<i>Grevillea rosmarinifolia</i> Rosemary grevillea	B,C,D,E,F, Sun, shade
<i>Feijoa sellowiana</i> Pineapple Guava	B,C,D,F Sun	Gray-green foliage, red & white flowers, edible fruit.	<i>Juniperus spp.</i> Juniper	B,C,D,F,G, Sun
<i>Fremontodendron spp.</i> * Flannel Bush	B,D,F,G,H Sun	Showy yellow-orange flowers. Water only to establish.	<i>Lavendula dentata</i> French lavender	B,C,D,F,G, Sun
<i>Garrya elliptica</i> ** Coast Silktassel	B,C,D,E,F Sun, shade	Dark green foliage, handsome.	<i>Mahonia pinnata</i> ** California Grape Holly	B,C,D,F,G, Sun, shade
<i>Hakea suaveolens</i> Sweet Hakea	A,B,C,D,E,F Sun	Somewhat like a pine, but not a conifer.	<i>Rhamnus crocea</i> ** Redberry	D,G,H Sun, s
<i>Heteromeles arbutifolia</i> ** Toyon	B,C,D,E,F,G,H Sun, shade	Stiff green foliage, white flowers summer, red berries winter.	<i>Ribes viburnifolium</i> * Catalina Currant	A,B,C,D,F, Shade

LAVENDULA DENTATA



# -Tolerant Plants

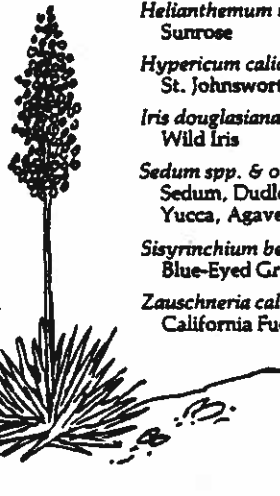
## Notes

- Small gray-green leaves, bushy.
- Showy pink or white blossoms. Poisonous.
- Gray leaves. Prune back occasionally, but don't hedge. Withstands ocean winds.
- Small leaves, bushy, edible fruit.
- Leafy, sprawling, nice under oaks.
- Leafy, spreads, dark green foliage.
- Large rounded shrub, dark green leaves.
- Upright deciduous, pink flowers in spring, then dark berries.
- Large perennial over 6' tall.
- Huge white flowers, can be invasive.

## Groundcovers

- Small bright green leaves, profuse pink flowers late winter.
- Low; small green leaves, beautiful groundcover.
- 1' high, spreading. Pink flowers Dec. - Jan.
- Gray-green, billowy, excellent groundcover in sandy soil where native.
- Good groundcover, for fire hazard areas.
- Wide-spreading groundcover, blue flowers; may die back in hot sun.
- Similar to above, smaller leaves; may be more heat- & deer-resistant.
- Shrub 2-5 ft. high, white or pink flowers, bank cover & for fire areas.
- To 2 ft. high, spreads, white flowers. Good groundcover under pines or oaks.
- Spindly shrub with showy flowers from pale orange to red.
- Bright yellow flowers, grayish foliage. Deer-resistant.
- Tall groundcover, showy green leaves.
- Conifer-like foliage. Tiny red flowers.
- Variable by species.
- Finely cut gray foliage, purple flowers most of year.
- Holly-like leaves, yellow flowers, blue berries.
- Tiny leaves, red berries.
- Sprawling high groundcover. Aromatic.

YUCCA WHIPPLEI



## Botanical Name Common Name

## Zone Exposure

## Notes

- Ribes speciosum* \*\*  
Fuchsia Flowering
- Rosmarinus officinalis*  
Creeping Rosemary
- Salvia clevelandii* \*  
Cleveland Sage
- Salvia leucantha*  
Mexican Sage
- Santolina chamaecyparissus*  
Lavender Cotton
- Simmondsia californica*  
Jojoba
- Sollya fusiformis*  
Australian Bluebell

- B, C, D, F, G, H  
Sun, shade
- All  
Sun
- B, C, D, F, G, H  
Sun
- B, C, D, F, G, H  
Sun
- All  
Sun
- G, H  
Sun
- B, C, D  
Sun, shade
- Tiny red flowers, summer deciduous, thorny.
- Aromatic, deer-resistant groundcover, tiny blue flowers.
- Purple flowers, gray foliage. Needs good drainage.
- Spikes of purple & white flowers.
- Finely cut gray foliage, yellow flowers.
- Stiff green leaves. Very drought-tolerant.
- Sprawling green foliage, tiny blue flowers. Needs good drainage.

## Herbaceous Perennial Groundcovers & Flowers

- Achillea* spp.  
Yarrow
- Arctotheca calendula*  
Capeweed
- Arctotis*  
African Daisy
- Brodiaea* spp. \*\*  
Brodiaea, Wild Hyacinth
- Centaurea cineraria*  
Dusty Miller
- Clarkia* spp. \*\*  
Farewell to Spring
- Convolvulus mauritanicus*  
Ground Morning Glory
- Delosperma alba*  
White Trailing Ice Plant
- Drosanthemum floribundum*  
Magic Carpet Ice Plant
- Dryopteris arguta* \*\*  
Wood Fern
- Eschscholzia californica* \*\*  
California Poppy
- Erigeron glaucus* \*\*  
Seaside Daisy
- Festuca ovina glauca*  
Blue Fescue
- Gazania* spp.  
Gazania
- Helianthemum nummularium*  
Sunrose
- Hypericum calycinum*  
St. Johnswort
- Iris douglasiana* and hybrids \*\*  
Wild Iris
- Sedum* spp. & other succulents  
Sedum, Dudleya, Yucca, Agave
- Sisyrinchium bellum* \*\*  
Blue-Eyed Grass
- Zauschneria californica* \*\*  
California Fuchsia

- B, C, D, F, G, H  
Sun
- A, B, C, D, F, G  
Sun, shade
- A, B, C, D, F  
Sun
- B, D, F, G, H  
Sun, shade
- B, C, D, F, G, H  
Sun
- B, D, F, G, H  
Sun
- B, C, D, F, G, H  
Sun
- All  
Sun, Shade
- A, B, C, D, F  
Sun
- C, D, F, G  
Shade
- All  
Sun
- A, C, D  
Sun, shade
- All  
Sun
- All  
Sun
- B, C, D, F, G, H  
Shade
- B, C, D, F, G  
Sun, shade
- B, C, D, E, F  
Shade
- All  
Sun, Shade
- All  
Sun
- C, D, F, G, H  
Sun
- Fern-like foliage. Flowers flat clusters, white, yellow, or magenta.
- Fast-spreading groundcover, yellow daisy blossoms. Helps choke weeds.
- Orange or red flowers; some forms fast-spreading, excellent sand cover.
- Small purple, whitish, or yellow flowers on stalks in spring.
- Whitish gray leafy foliage, yellow or purplish flowers.
- Showy lavender flowers in early summer.
- Low-growing mound, soft green foliage. Flowers sky-blue to lavender. Reliable.
- Tiny, miniature green ice plant, small white flowers. Won't overrun landscape.
- Brilliant pink carpet, gray-green foliage.
- Best fern under oaks.
- Flowers gold to orange, foliage gray-green. California state flower.
- Lavender flowers with yellow centers.
- Perennial, ornamental grass, gray foliage, planted from containers.
- Variable or yellowish daisy-like flowers. Clumping or groundcover types.
- Low gray-green foliage, flowers variable colors.
- Leafy groundcover, showy yellow flowers. Occasional water. Invasive.
- Showy purple flowers. Good under oaks.
- Many varieties and colors.
- Tiny iris-like flowers on grass-like stems. Propagate by divisions.
- Beautiful red flowers late summer, fall. Prune to ground after blooming.

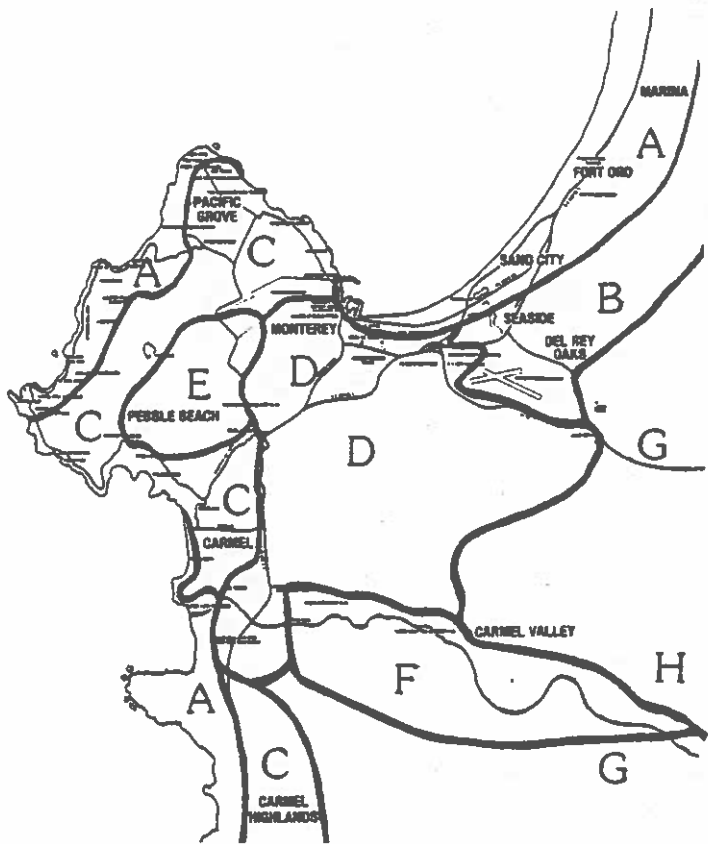
\* California Native  
\*\* Monterey Peninsula Native

# Plant Zones

The Monterey Peninsula area is extremely complex in geography and climate. A plant that does well in one location may survive only with difficulty, or not at all, a short distance away. Many species which are drought tolerant in the cool foggy coastal belt are not on a hot dry hillside. Conversely, inland species may succumb to strong salty ocean winds.

The Monterey Peninsula can be roughly divided into the following plant zones based on wind, soil, sun or fog, temperature, and exposure:

- A—Windy, sandy dunes and other areas with strong ocean influence.
- B—Dry sandy soil away from most direct ocean influence.
- C—Foggy, damp coastal Monterey cypress and pine belt, protected from strongest northwest winds.
- D—Monterey pine forest, less fog, soil variable.
- E—Pine, huckleberry-manzanita community, poorly drained rocky or clay soil or decomposed granite.
- F—Carmel Valley bottomland, mostly lower valley, deep fertile alluvial soil.
- G—Carmel Valley—upper valley and north-facing slopes, oak woodland, soil variable. Also Monterey-Salinas Highway.
- H—Carmel Valley—upper valley and south-facing hillsides, mostly brush or soft chaparral, thin poor rocky soil.



# The Look of the Monterey Peninsula Landscape

We live in an area of recurring droughts and a limited water supply. The California Department of Water Resources estimates that the volume of water used in outside irrigation can be cut by 50% or more via improved site planning, the use of drought-tolerant plants, and efficient landscape maintenance and irrigation practices. Use of this plant list and the techniques described here should assist home landscapers, nurseries, governmental agencies, and landscape professionals in retaining the uniqueness of the Monterey Peninsula landscape and to save water as well.



ESCHSCHOLZIA CALIFORNICA

## A Community Project

### -Participants-

California American Water Company  
 California Department of Water Resources  
 California Native Plant Society, Monterey Bay Chapter  
 Bruce Cowan  
 Bill Cusack  
 Monterey Peninsula Landscape Gardeners Association  
 Monterey Peninsula Water Management District  
 Randy Morgan

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