

3. Current state of Rocklin's urban and natural tree forest

3.1. Changes in overall canopy levels within the City from 1952 to 2003

Introduction

Most of the major benefits that trees provide to urban areas are directly related to the amount of tree canopy cover present. These benefits include energy conservation associated with shading, evaporative cooling, and reduction of the urban heat island effect; improving air quality by intercepting particulate and gaseous air pollutants; reducing flooding and erosion and improving water quality by moderating stormwater runoff; and providing habitat for birds and other wildlife species (see also Section 1).

Tree canopy cover levels can increase over time through the growth of existing trees and the addition of new trees. Canopy cover can also decrease as the result of tree death or removal. Although tree canopy can be reduced quickly, increasing canopy cover is typically a slow process that can take many years. Hence, long-term planning is needed if tree canopy cover is to be maintained or increased over time.

Overview

Findings

- Canopy cover in the currently-developed portion of Rocklin has increased from an average of 11.3% in 1952 to 18.5% in 2003.
- Gains in canopy cover over the past 50 years are due to both canopy growth of conserved native oaks and planting of trees in new developments.
- Conserved oak canopy accounts for a high percentage of the total tree cover in many parts of Rocklin.
- Tree canopy cover in residential areas is typically much greater than canopy cover in other types of developments.
- The overall distribution of oak woodlands within Rocklin's current boundaries has not changed substantially since at least the 1930's.

Management issues and recommendations

- Existing policies to conserve native trees in new developments should be continued.
- Existing policies to encourage or require tree planting in new developments should continue.
- Ways to increase tree cover in commercial/industrial sites should be explored.

Current status

Regulations related to canopy development and retention

The City of Rocklin has a number of ordinances and regulations that pertain to tree planting or tree care within the City, including the following:

- Street Tree Ordinance, originally adopted in 1979, and modified slightly in 1993

- Oak Tree Ordinance and Guidelines, updated in 1997
- Design Review Objective and Criteria adopted in 2000
- The current City of Rocklin General Plan, primarily the Circulation and Open Space, Conservation and Recreation Elements
- Southeast Rocklin Circulation Element, which applies to the portion of the City located southeast of I-80.
- Northwest Rocklin General Development Plan and Northwest Rocklin Design Guidelines, adopted in 2002, which apply to Northwest Rocklin.

The last two documents listed, which cover specific portions of the city, are typical of recent general development plans and design guidelines adopted for other areas of the City. These two documents are currently proposed to be incorporated into the City General Plan scheduled to be adopted in 2006. Many of the regulatory instruments listed above contain language that promotes retention or development of tree canopy in developed areas.

Tree planting requirements

The Street Tree Ordinance calls for a program to plant and maintain trees on publicly owned property in the City of Rocklin. Circulation Policy 7 of the Rocklin General Plan requires landscaping and a tree planting along major new streets and highways, and along existing streets as appropriate. In addition, general development plans and design guidelines adopted for specific areas of the City also call for planting along arterial roads. The Northwest Rocklin Design Guidelines require landscape medians in major arterial streets and address the planting of trees in landscape corridors along streets.

The Northwest Rocklin General Development Plan indicates that at least one shade tree should be planted per single family lot in new developments. (Exhibit B. Section D, Air quality, item 3). This same plan also makes reference to tree planting in new parks, emphasizing the use of native species. The General Plan Land Use Element (Land Use Policies 22 and 31) specifies the use of appropriate buffers, which may include trees in landscaping, greenbelts, or open space areas, between commercial and industrial land uses and incompatible adjacent land uses.

Requirements for planting in parking lots appear in several regulatory documents. The Design Review Resolution (section 6) sets several requirements for landscaping in parking lots. The Northwest Rocklin General Development Plan and Northwest Rocklin Design Guidelines include several standards related to the use of trees and other landscaping in parking lots (Northwest Rocklin GDP, Section N Landscaping, item 1, Northwest Rocklin Design Guidelines, Section 6 Landscaping, Item G).

Protection of existing trees

The City of Rocklin's Oak Tree Ordinance is designed to conserve existing stands of native oaks and natural topographic features during new residential development. When new residential development will result in the loss of native oaks, the ordinance requires that tree loss be mitigated. On-site planting of nursery stock of native oak species is the preferred mitigation alternative. Mitigation requirements can also be met through off-site planting and, in some situations, dedication of land for an oak tree preserve. A monetary payment into the Oak Tree Preservation Fund is also a mitigation option.

Although new business or commercial developments are not required to mitigate for removing oak trees, the ordinance encourages staff to work with developers to minimize

impacts to existing trees. Incentives (delays in fee payments) are provided if new commercial developments can be designed to conserve native oaks. The Design Review Resolution (section 6) also requires that existing trees be incorporated into parking lot design where possible.

The Oak Tree Ordinance includes provisions to help protect oaks conserved during the development process after construction is completed. The ordinance forbids removal of a healthy oak from a commercial development when the oak tree was protected during development. However, homeowners may remove protected healthy oaks that were conserved during development. Homeowners are required to mitigate for these tree removals either with new tree planting or a payment into the Oak Tree Preservation Fund.

The Open Space, Conservation and Recreation Element of the Rocklin General Plan contains several policies that encourage the protection of existing oak woodlands and other native trees. The General Plan specifies that conservation easements, buffers, setbacks, or other measures are to be used to protect natural resource areas, scenic areas, hilltops, open space areas and parks from encroachment or destruction by incompatible development. Buffers (50 feet minimum from top of bank) required around both perennial and intermittent streams provide protection for existing riparian woodland habitat along these watercourses. Adequate setbacks are also required from other open space and natural resource areas to provide protection for existing trees and woodland habitat. This element (Policy 4) also encourages the protection of native oaks and other significant vegetation.

The Southeast Rocklin Circulation Element also contains policies that provide for the protection of oaks and riparian trees along roadways in southeast Rocklin. These include aligning and designing roads to minimize impacts to oaks and riparian habitat and measures to protect retained trees in road construction areas. Oak trees with a diameter of six inches or more that are removed as a result of road construction are also replaced in kind at a ratio 2:1 (replaced:removed) or greater. Replacement plantings are conducted in areas adjacent to the roadway.

Assessment of canopy cover

General methods

Current and historical aerial photography of Rocklin was used to track changes in tree canopy cover that have occurred over the past 51 years. Phytosphere Research measured canopy cover on 23 matched sample plots on recent (2003) and historical (1952) aerial photographs. Samples were located in areas that were mostly or entirely developed by 1998 and for which 1952 aerial photo coverage was also available (Figure 3.1-1). The total sample area was 5.26 square miles. This represents about 40% of the developed area of the City and about 27% of the total City area. Further details of the survey methods used are presented in the Appendix (Section 7.1.1).

To look at canopy cover changes prior to 1952, Phytosphere examined some older aerial photographs (1938), as well as historical photos taken in the Rocklin area in the late 1800's from the Online Archive of California (<http://findaid.oac.cdlib.org>).

Native tree cover in the Rocklin area

In Rocklin, as in much of California, the state of the native vegetation that existed prior to settlement is clouded by the lack of records from early explorers and settlers. However,

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based on our knowledge of oak woodland ecology, existing vegetation, historical information, and some early photographs of the area, it is possible to draw some conclusions about past conditions and possible future potential of Rocklin's native oak woodlands.

Photographs of the Rocklin area from the late 1800's show oak woodlands and blue oak-foothill pine woodlands that were already being extensively cut and cleared for both fuel and agriculture (Figures 3.1-1 to 3.1-3). In response to a poll conducted by the California State Board of Forestry in 1886, the respondent from Placer County indicated that half to two-thirds of the foothill woodlands had been cut, with some oak and "nut pine" (foothill pine, *Pinus sabiniana*) left standing (e.g., Figure 3.1-1 background).

After clearing, some native oak stands regenerated, primarily from pre-existing understory seedlings and sprouts from cut stumps (Swiecki and Bernhardt 1998). This regrowth and residual trees that were left after clearing gave rise to the native woodlands that exist in Rocklin today. In other areas, regeneration was either actively or unintentionally inhibited. As a result, some areas that originally supported oak woodland or savanna were left devoid of trees, or with only a few outlying stragglers. It is likely that most if not all of the land within the current City limits once supported native oak stands. More open savanna-like stands dominated by blue oak and foothill pine would likely have been present on the poorer soils, especially on the west side of the City, while denser woodlands including interior live oak, valley oak, and other species would have occurred along the creeks and drainages.

The earliest aerial photos of the area, taken in 1937 and 1938, show a distribution of oak woodland cover in the western part of the City that is virtually identical to that seen in 1952 aerial photos. Only the areas in the southwestern part of the City, which were more actively farmed in that time period, show some changes in tree cover associated with agricultural clearing between 1937 and 1952.



Figure 3.1-1. This photo of the engine house in Rocklin, taken in the late 1860's, shows foothill pine and oaks in the background and a large stack of oak cordwood used to fuel

locomotives. Oaks, especially blue oaks, were the most common source of fuel in the area throughout the 19th century. (Photo credit: “Engine House and Turntable. Rocklin, 22 miles from Sacramento.” Photographer’s number: 241, Central Pacific Railroad, California. Scenes in the Valley of the Sacramento. Alfred A. Hart Stereograph Collection Relating to the Central Pacific Railroad, ca. 1866-1869, The Bancroft Library, University of California, Berkeley., accessed from the Online Archive of California, <http://ark.cdlib.org/ark:/13030/tf4v19p0zf/>)



Figure 3.1-2. Views of J.P. Whitney’s Ranch in what is now north Rocklin show evidence of past clearing for agriculture (top) and other purposes. Young trees that regenerated after clearing are visible in both photos. (Photo credits: top – “Spring Valley Ranch.

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Vineyard and Buildings.” Unit ID: 9; bottom – “Spring Valley Ranch. Park in Clover Valley.” Unit ID: 13. From: Spring Valley Ranch of J.P. Whitney by Runnels & Stateler, San Francisco, The Bancroft Library. University of California, Berkeley., accessed from the Online Archive of California, <http://findaid.oac.cdlib.org/images/ark:/13030/tf4489p11c>)



Figure 3.1-3. Upper photo taken in 1889 with J. P. Whitney’s mansion “The Oaks” at center shows evidence of extensive woodland clearing and some regeneration (e.g., young trees on slope to right of house). Similar view photographed in February 2004 shows similar canopy cover on the outlying hills, including some of the trees visible in 1889. Park Drive is the street across the lower portion of the photo. (Top photo credit. “The Oaks. Residence of J. Parker Whitney, Rocklin, Placer Co., Cal.” Unit ID: 1; Spring Valley Ranch of J.P. Whitney by Runnels & Stateler, San Francisco, The Bancroft Library. University of California, Berkeley., accessed from the Online Archive of California, <http://findaid.oac.cdlib.org/images/ark:/13030/tf4489p11c>)

Canopy cover change 1952-2003

Figure 3.1-4 shows the distribution of plots sampled for assessment of canopy cover in 1952 and 2003 aerial photos. The samples are distributed throughout the developed portion of the City. Sample plots include areas that have been developed for many years, as well as some areas that have been built within the past 5 years. A few parcels with ongoing construction and some as-yet undeveloped parcels were also present within the sampled area.

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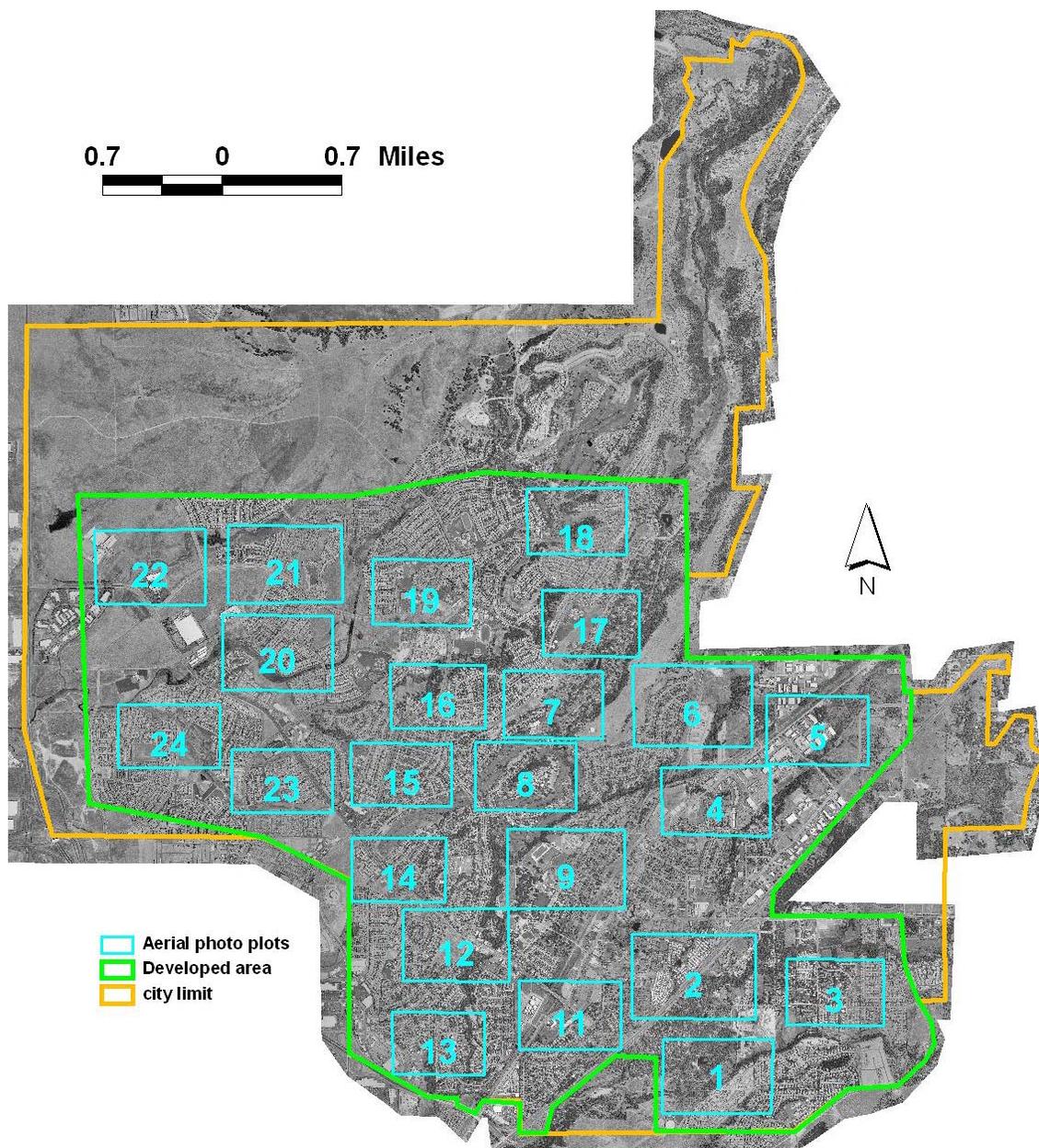


Figure 3.1-4. Locations and numbers of plots (numbered boxes) sampled in the survey of canopy cover. Samples were limited to the developed portion of the City shown by the green line. Plot size and shape varies because areas were matched to 1952 aerial photos that were not ortho-corrected. Plot number 10 (not shown) was not used because it overlapped with adjoining plots. Date of photograph: August 2003.

Figure 3.1-5 shows the percent of each sample plot that was developed in 1952 and in 2003. Sixteen of the 23 plots were rated as undeveloped in 1952, indicating that they lacked structures or evidence of intensive agriculture. Other than some residential and commercial/industrial development near the core area of Rocklin, the major developed land uses in 1952 were agricultural. Both orchards and field crops were present, mainly in areas

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east of current I-80 (Figure 3.1-11). Overall, only 12% of the sample area showed any sort of development in 1952.

In contrast, most of the sample plots were nearly or completely developed in 2003. About 77% of the total sample area was developed in 2003. Residential land uses predominate in most of the plots. Exceptions include plots 8 and 9, which are dominated by park land and a golf course, and plots 4, 5, and 22, which are dominated by commercial/industrial uses. In 2003, the total sample plot area was 52% residential housing (single and multifamily), 9% commercial / industrial, and 16% other developed uses (including parks, schools, golf courses, but not undeveloped open space).

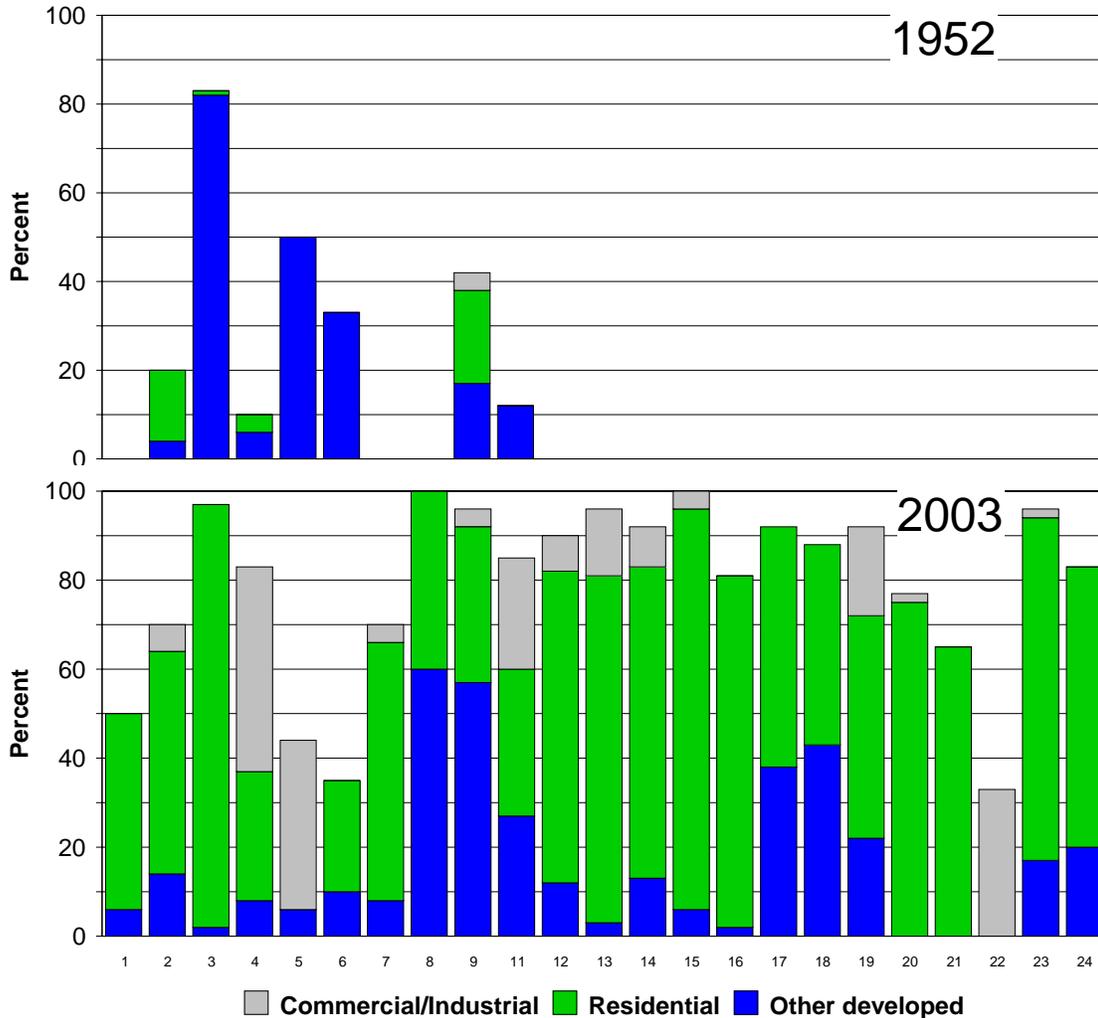


Figure 3.1-5. Developed land uses of sample plots in 1952 and 2003. Other developed land uses include orchards and agricultural fields (mainly 1952), parks, golf courses, school sites, and highways and railroads and their associated rights-of-way.

Overall tree canopy cover in the surveyed plots is shown in Figures 3.1-6 and 3.1-7. Canopy cover was greater overall in 2003 (18.5%) than in 1952 (11.3%). Furthermore, 19 of 23 plots showed increases in canopy cover over the 51 year interval, and four plots showed slight decreases in canopy cover over this period (Figures 3.1-6 and 3.1-7). Canopy cover

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increases were due to both increased numbers of trees and increased canopy spread of existing trees, mainly native oaks. Canopy cover levels in 2003 ranged from about 1% to 35% within the 24 sampled plots.

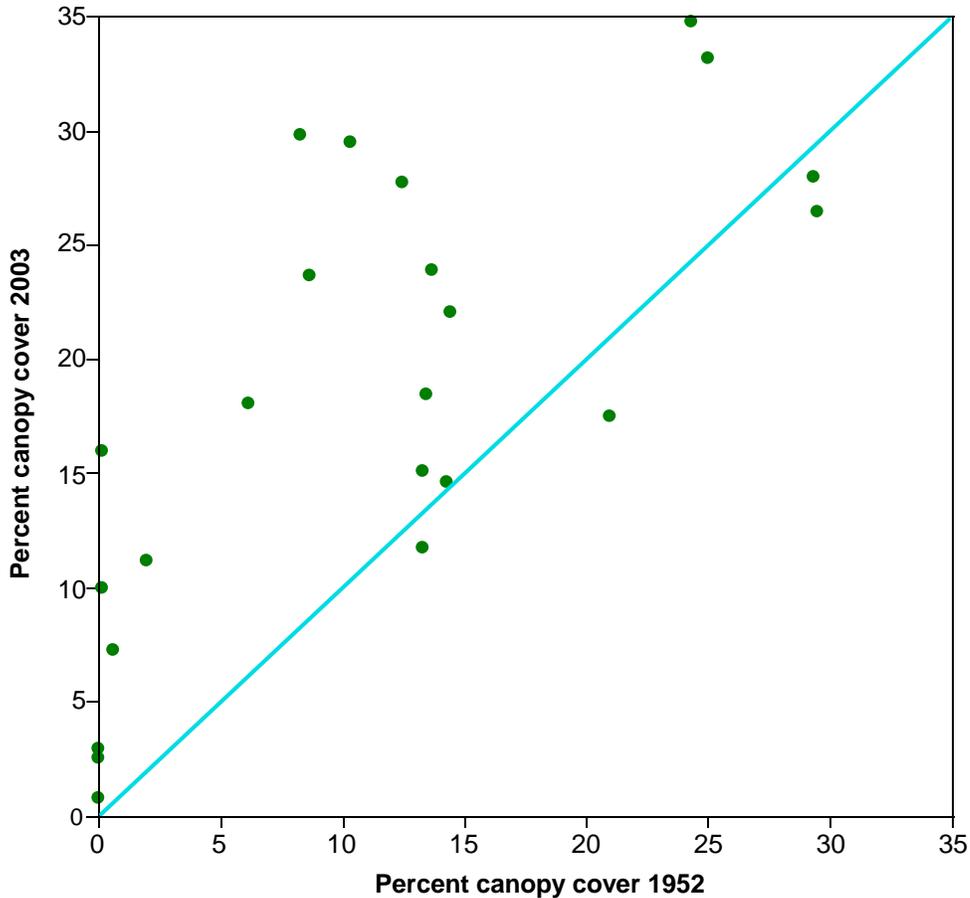


Figure 3.1-6. Percent tree canopy cover for the 23 sample plots in 1952 and 2003, as determined from aerial photographs. Tree canopy cover levels in the two years are correlated; about 53% of the variation in 2003 canopy cover is related to canopy cover in 1952. The diagonal line represents equal levels of canopy in 1952 and 2003. Points above the line represent plots in which canopy cover increased over the time interval. Points below the line are plots that lost canopy over the interval.

Trees in conserved oak and riparian woodlands contribute substantially to the overall levels of canopy cover in Rocklin (e.g., Figures 3.1-8, 3.1-9). Plots that had high levels of tree canopy cover in 1952, mainly due to the presence of oak woodlands, also had high levels in 2003 (Figures 3.1-6, 3.1-7). For example, the five plots with more than 15% canopy cover in 1952 (average canopy cover 26%) had an average canopy cover of 28% in 2003. This is well above the overall average canopy cover (18.5%) for all plots. In comparison, the seven plots that had 2% or less canopy cover in 1952 averaged only 7% canopy cover in 2003.

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In general, areas with high levels of tree canopy in 1952 experienced some tree loss during subsequent development. It can take a number of years before trees planted after development grow large enough to offset such canopy loss (e.g., Figure 3.1-11). Therefore, most of these areas showed only modest gains or slight losses in canopy cover between 1952 and 2003. In contrast, plots with lower levels of canopy cover in 1952 (less than 15% cover) showed the largest relative gains in canopy cover over the past 50 years. Many of these plots are in parts of the City that have been built out for a longer period of time, so canopy from planted trees has had more time to develop (e.g., Figure 3.1-10).

Among the various land uses within the surveyed plots, park and open space areas with conserved native woodlands and other undeveloped wooded parcels generally had the highest levels of canopy cover in the 2003 sample. Developed areas normally support lower levels of tree cover because pavement and structures occupy a relatively high percentage of the total land area. Within developed areas, older residential neighborhoods generally had the highest levels of canopy cover. Canopy cover was minimal in newly-constructed residential areas that had no pre-existing tree cover, such as those in the northwestern portion of the surveyed areas. Canopy cover was also generally low in industrial and commercial areas, including older commercial centers. Most commercial parking lots (e.g., Figure 3.1-8) have only minimal levels of canopy cover due to sparse plantings and slow tree growth (see also Section 3.6).

McPherson and Simpson (2003) have reported on tree canopy cover levels for 21 California cities. However, it is difficult to make meaningful comparisons between cities with respect to total canopy cover. Most of the observed differences in canopy cover within and between cities can be attributed to factors such as land use, development density, native woodland/forest cover, and the number of years elapsed since development. These factors should be taken into account when comparing canopy in different cities. Furthermore, the data of McPherson and Simpson (2003) are based on surveys that extended to the City limits and therefore included extensive tracts of undeveloped land for some cities. Phytosphere's analysis was restricted to the area bounded by the green line in Figure 3.1-4, which excludes extensive tracts of undeveloped land. Although these canopy cover data are not directly comparable to those reported by McPherson and Simpson (2003), it appears that Rocklin's overall canopy cover is near the middle of the range seen in comparable California cities.

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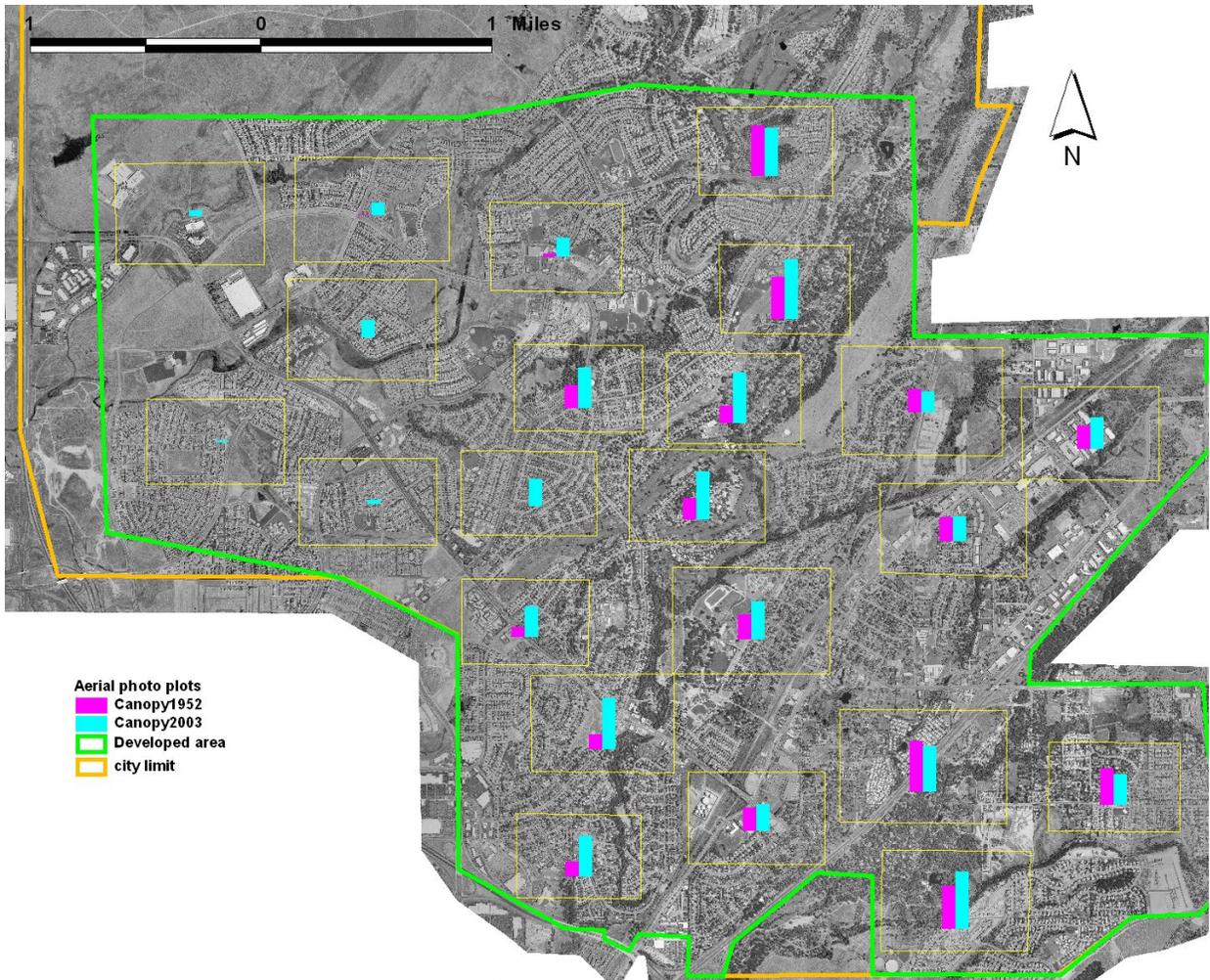


Figure 3.1-7. Relative levels of canopy cover in 1952 and 2003 within surveyed sample plots. The tallest bar shown (blue bar in plot 17, see figure 3.1-4 for plot numbers) represents 35% canopy cover.

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Figure 3.1-8. Plot 11 area in 1952 (top) and 2003 (bottom). Overall canopy cover increased slightly from 1952 to 2003. Recent (2003) photo shows low canopy cover in industrial (upper left corner) and commercial (upper middle) areas. Residential neighborhoods (lower right) with conserved oaks have higher levels of canopy cover.