Second American Dendrochronology Conference

University of Arizona

Laboratory of Tree-Ring Research

AmeriDendro 2013

Midweek Excursions

May 15, 2013

1:00 PM – 8:30 PM

Mt. Lemmon Highway (red line): One of America's best single-day natural history tours, the Mt. Lemmon Highway traverses 6500 feet (2000 m) of elevation with very little driving. Stops will be made to see multiple different forest ecosystem types. Dendrochronology projects will be visited, and wildland fire management will be featured.

Mt. Lemmon pine forest

Middle Bear

Aspen burn area

Catalina Highway: Mt. Lemmon, To the Top			time
1:00 PM	1:45 PM	drive to Molino campground	0:45
1:45 PM	2:35 PM	Sky Island gradients, Madrean woodland, yes bathrooms	0:50
2:35 PM	2:50 PM	drive to Middle Bear	0:15
2:50 PM	3:45 PM	erosion, ponderosa fire ecology, photo, yes bathrooms	0:55
3:45 PM	4:00 PM	drive to Palisades Visitor Center	0:15
4:00 PM	4:45 PM	Palisades Visitor Center, no bathrooms	0:45
4:45 PM	5:05 PM	drive to top	0:20
5:05 PM	6:00 PM	Douglas-fir/aspen, Aspen Fire, salvage, no bathrooms	0:55
6:00 PM	6:30 PM	drive to Windy Pt.	0:30
6:30 PM	7:30 PM	dinner, sunset 7:15, photo, yes bathrooms	1:00
7:30 PM	8:30 PM	drive to DoubleTree	1:00

DROUGHT AND FLAME: THE FIRE HISTORY OF A SKY ISLAND

GUIDES: Drs. Tom Swetnam and Paul Sheppard

Significant stories of the past are faithfully recorded in trees. Dendrochronology — the study of tree rings — reveals intriguing ecological patterns. Explore how these patterns relate to the larger global issues facing us today and gain a better understanding of the history of fire and the role that fire plays in forest ecosystems.

CATALINA MOUNTAINS SKY ISLAND: VEGETATION NOTES

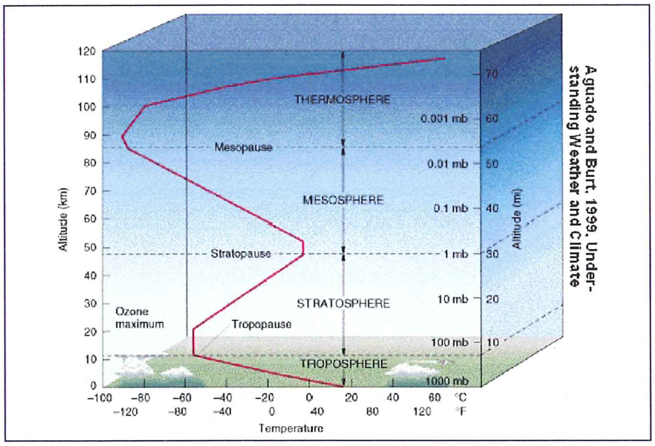


FIGURE 6: Changes in elevation do two important things to local climate. One: temperature decreases with increased elevation, at least within the lowest part of the atmosphere (called the troposphere). The temperature change is called the "lapse rate," which is ~10° C for every 1,000 m of elevation change (~5° F / 1,000 ft).

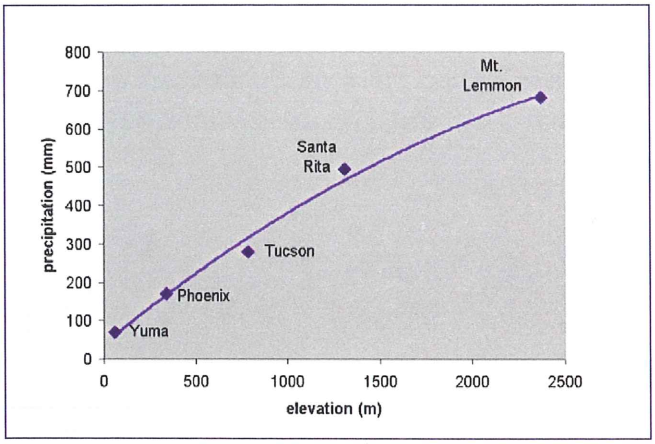


FIGURE 7: Two: precipitation increases with increased elevation. This is partly due to the temperature change of above because cool air can't hold as much moisture in a vapor state as warm air. Thus, as elevation increases, cloud formation and precipitation are more likely.

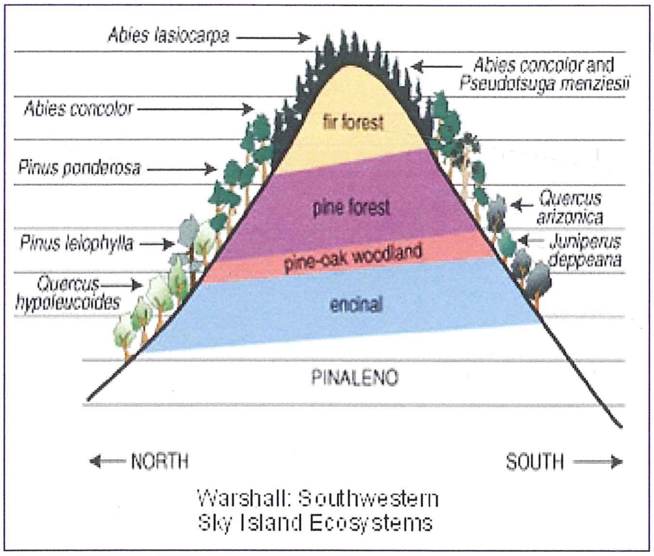
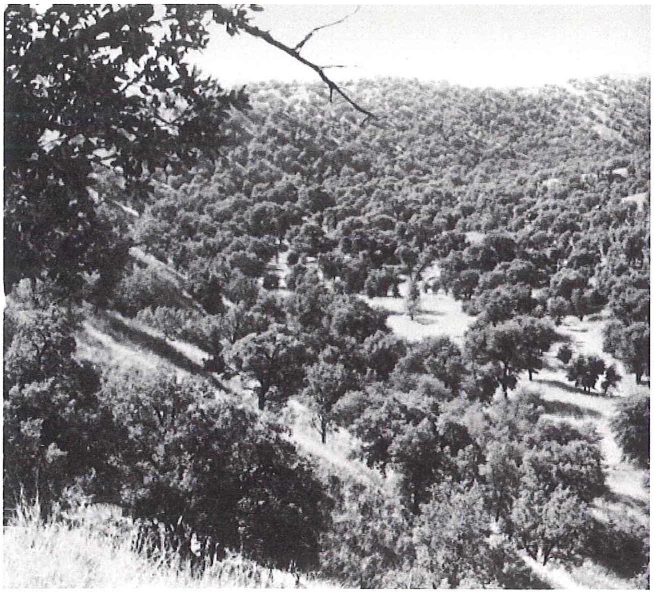


FIGURE 8: These two climatic changes with elevation lead to sharp vegetation changes with elevation. As we climb the Catalina Mountains, we will go from ~2,600 ft (850 m) elevation of Tucson to ~9,000 ft (2950 m) of Mt. Lemmon. As we do so we will experience the elevational temperature change of ~20°C (36° F) as well as the diurnal temperature change. We will see the vegetation change accordingly, which will be roughly the same as that of the Pinaleños (Mt. Graham). Note the difference between south- and north-facing slopes. Why is that?

FIGURE 9: Babad Do'ag (3,000 ft elevation): We're still within the Sonoran Desert, more specifically the Arizona Upland Subdivision, which is perhaps the most diverse desert in the world. We see columnar cacti (saguaros), smaller cacti (cholla, prickly pear), ocotillo, and the all-important legume trees of the Sonoran Desert (palo verde, mesquite, ironwood, etc.). Note the various shapes and sizes of the plants.



Brown, 1982, Desert Plants v.4

FIGURE 10: Molino Basin (4,000 ft): The desert is gone, but it's still warm and dry. Now we're in the Madrean Woodland, named for forests of the Mexican Sierra Madre. We see live oaks (they don't lose their leaves in winter) plus juniper and perhaps piñon pine. Note: between here and Bear Canyon we'll pass by riparian (streamside) corridor forests that include Arizona cypress and Arizona sycamore.

Brown, 1982, Desert Plants v.4

FIGURE 11: Bear Canyon Picnic Area (5,000 ft): We've reached the famous ponderosa pine forest, dominated by one North America's premier forest trees. It has needles of three and a prickly cone (try rolling a cone in your hands). Also found here is the alligator-bark juniper (aptly named) plus some additional Arizona specialties such as Arizona walnut. North America's ponderosa pine forests have changed a lot in the past, something that can be reconstructed using dendrochronology (tree-ring science). We'll see fire regime and tree stocking changes here, as well as an erosion study.

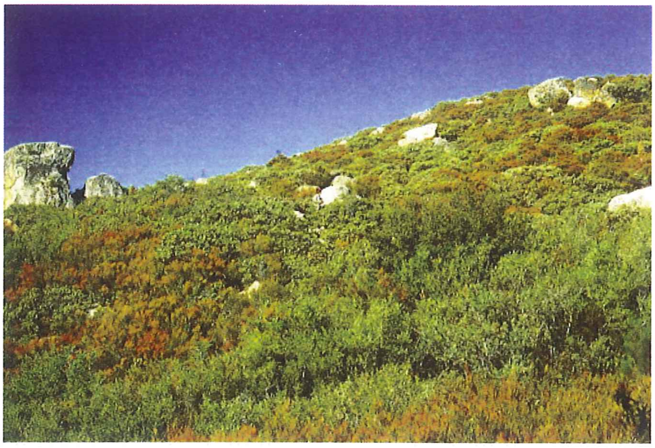

ASDM, 2000, Natural History Sonoran Desert

FIGURE 12: Geology Vista (6,000 ft): A curious vegetation type called chaparral is visible here. Usually found at lower elevation, chaparral is dominated by shrubby hardwood plants, including the well-known manzanita. This vegetation type seems made to burn, as many of the plants here contain flammable secondary compounds making them burn hot when a fire starts. Californians know the dangers of building houses in chaparral, but they do it anyway.


Brown, 1982, Desert Plants v.4

FIGURE 13: Palisades Ranger Station (8,000 ft): Ponderosa pine is still here, but so are other conifer species. We're now in the Mixed-Conifer Forest which includes Douglas-fir and southwestern white pine. Douglas-fir is another venerable forest tree of North America (botanically speaking, it's not a true fir). Find their interesting cones with the odd 3-pronged bracts. Notice the white pine growth form. They have branches all the way to the ground, in sharp contrast to the other tree species which self-prune their lower branches. Do the white pines look old or young? What might their effect on fire behavior be with those branches down to the ground?

Brown, 1982, Desert Plants v.4

FIGURE 14: Summerhaven, Mt. Lemmon (9,000 ft): The top—cold even now. We're in the Rocky Mountain Subalpine Forest, complete with Douglas-fir of below but also white and corkbark firs (these are true firs; can you find any fir cones on the ground?) and even the public favorite, quaking aspen. Other Sky Island mountains have Englemann spruce, but for some reason spruce is not found on the Catalina Mountains.
If the Catalina Mountains were any higher in elevation, we could move up into a true alpine forest of scrawny but hardy pines, including bristlecone pine which is found on Arizona's highest mountain chain, the San Francisco Peaks near Flagstaff.

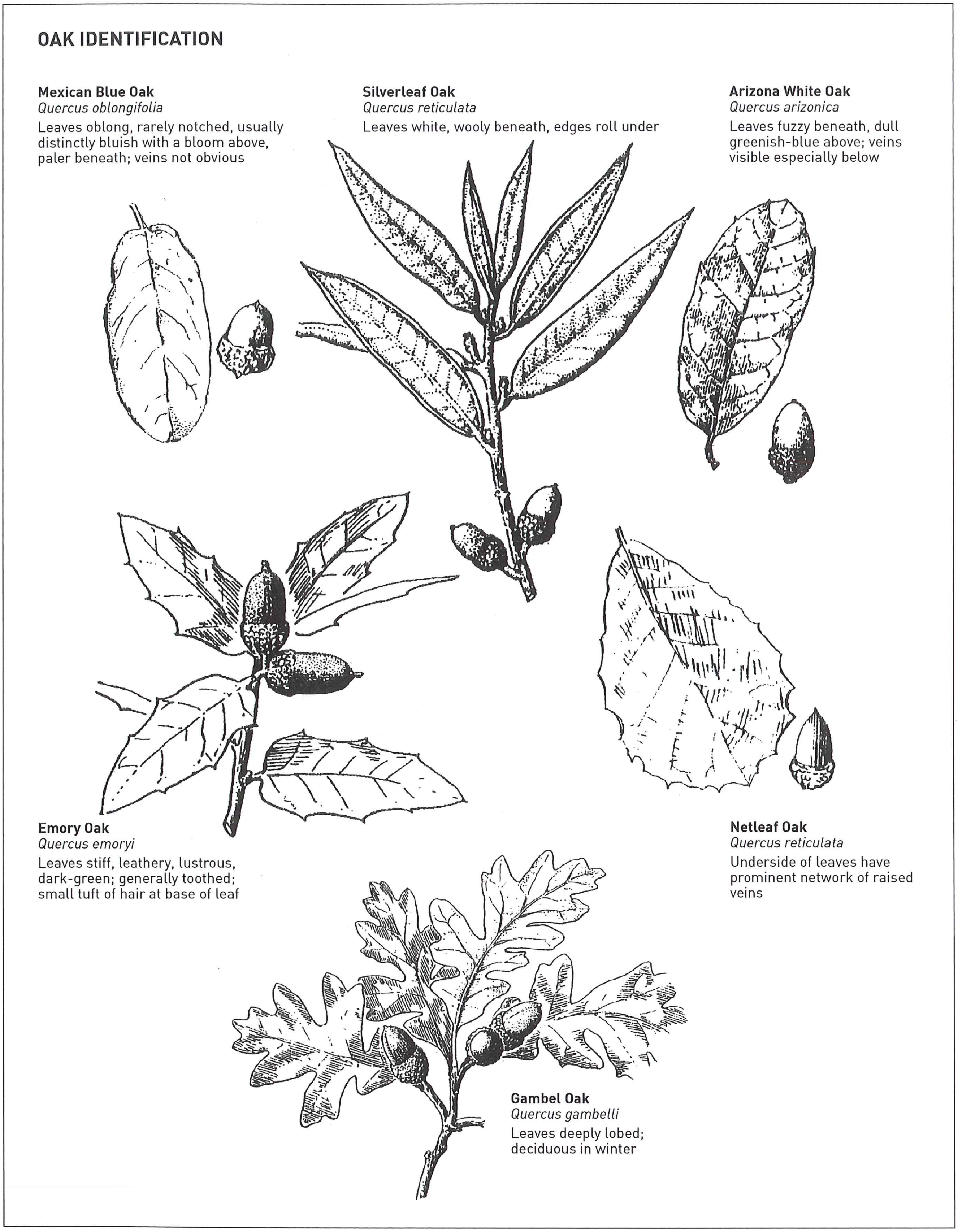


FIGURE 28: Most drawings are from *Shrubs and Trees of the Southwest Uplands* and are reproduced with permission of Jeanne R. Janish.

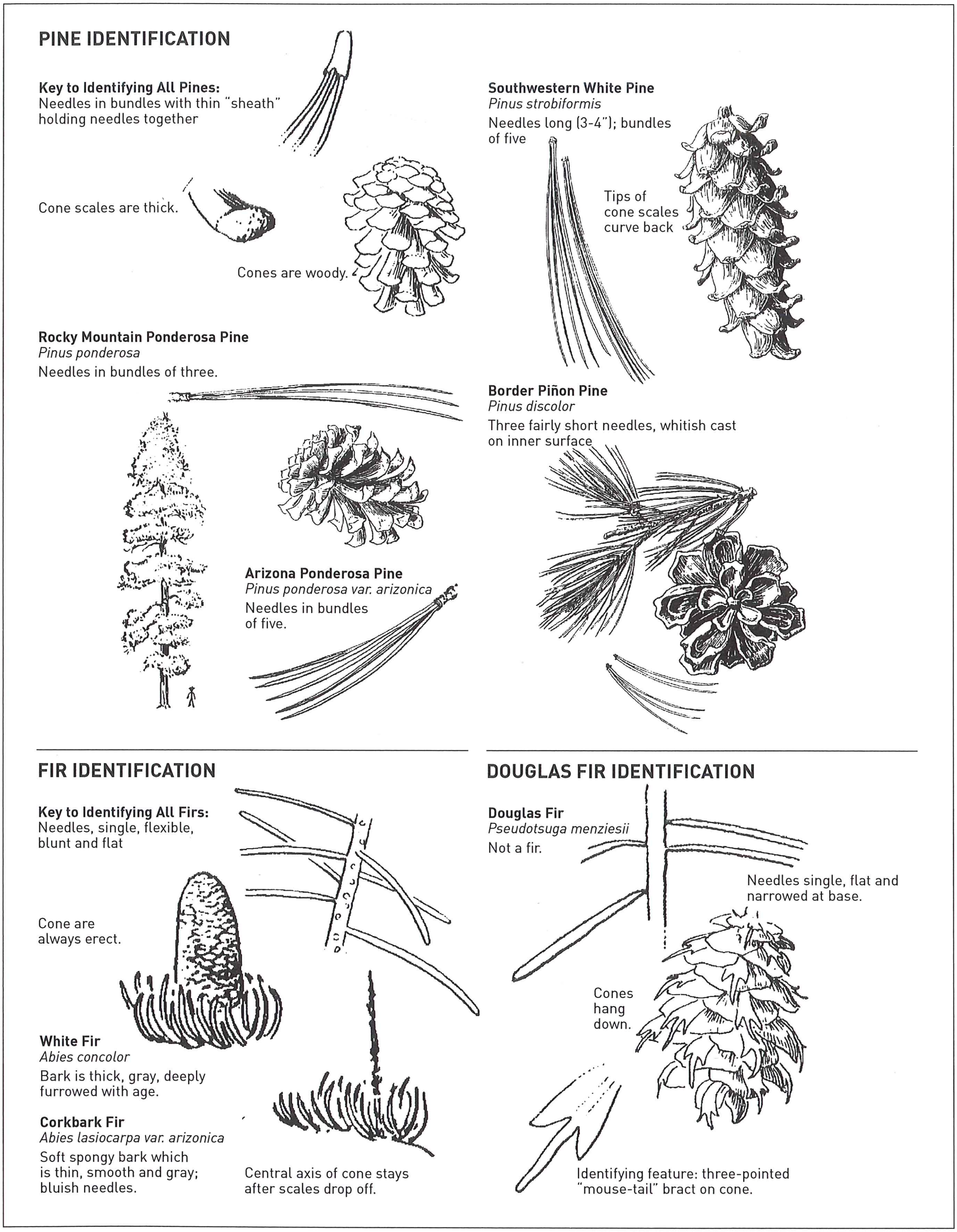


FIGURE 29: Most drawings are from *Shrubs and Trees of the Southwest Uplands* and are reproduced with permission of Jeanne R. Janish.

Middle Bear Canyon Erosion Investigation, Catalina Mountains, Tucson Arizona.

Carried out by LTRR students spring semester, 2000.

Middle Bear Canyon, located at an elevation of around 1820 meters in the Santa Catalina Mountains near Tucson, Arizona, is a popular picnicking and camping destination. Tusconans wishing to escape the heat of the desert can reach Middle Bear Canyon in less than an hour and enjoy the shade provided by tall ponderosa pines. However, recreational use in the area may be contributing to increased erosion on adjacent slopes, a problem also encountered at nearby Rose Canyon Lake (Danzer 1996).

Hypothesis: Bank and slope erosion occurred following expanded recreational use of the campgound area due to foot traffic and other human activity.

Alternative hypothesis: Bank and slope erosion is occurring continually in this area and the campground use is not an important factor.

METHODS

Because no direct measurements of slope erosion have been made for the Middle Bear Canyon area, we used dendrogeomorphological methods to estimate approximate dates of large erosional events as well as to infer the amount of erosion that has occurred in the area since the establishment of the sampled trees (LaMarche 1968). At least 2 cores were taken from approximately 30 trees, many of which were leaning and about half of which were rooted directly on the slopes affected by erosion. Modified skeleton plots (Schroder 1976) were created in order to show where suppression or release, numerous resin ducts, and other tree reactions occurred during the life history of the tree. The skeleton plots were compiled and dates of reaction that -were common among many trees were noted.

Normally, tree roots are underground. Under conditions of rapid or persistent soil erosion, roots can become exposed. The trunks and root diameters were measured, as well as the distance from the top of the root to the present soil surface. Measurements were also taken of the distance between the trees and the streambed, as well as the height of the tree location above the present stream channel. Measurements and observations of each tree were recorded on separate cards. The site was then mapped to approximate scale. Large exposed roots were cored from the top, while dead exposed roots were cut with a saw.

Several fire scarred stumps were sampled in the vicinity as well in order to determine fire frequency and history for the site.

Observations

Stumps beyond the stream had been cut with an ax and were quite weathered. Exposed roots were noted on both young and old trees.

Preliminary results

Changes in growth were noted around 1890, the 1920s, the 1940s, and ca. 1960. A tree by the creek had a wound late in the 1914 ring possibly the result of summer flooding. Many of the older trees had a wound in 1879 (a fire date).

The group of twisted trees near profile “E” probably began growth on the high bank which was undercut and slumped in the 1850s - resulting in the twisted forms as the trees re-oriented to vertical. These trees began growing in the 1830s or 40s (age estimated when correcting for coring height). Tree size and tree age were not well related as these trees proved similar in age to much larger individuals above and below that had not been affected by the bank slump.

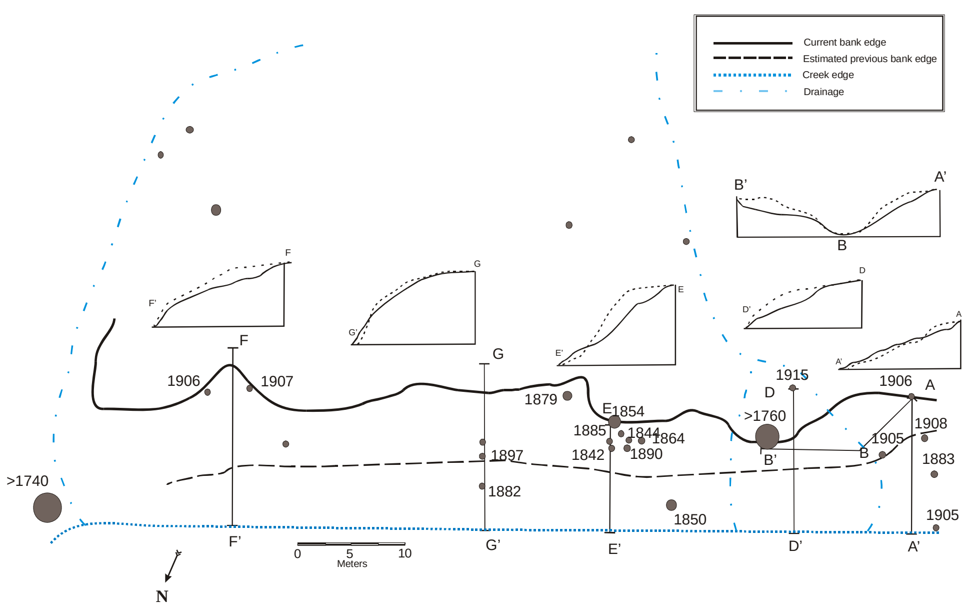
The large tree with the massive expose roots provided evidence of erosion prior to 1850. A large root was wounded on its upper surface by fire in 1819. By 1851 enough erosion had occurred to expose the bottom and it was scarred by a fire in 1851 on its lower surface.

The creek channel has not been cutting the bank as older trees grow at the foot of the toe slope. Some soil has been deposited along the base of the toe slope burying the tree bases.

One of the ax cut trees was felled in the 1880s.

So, we concluded that the erosion process is episodic and a persistent feature of the area. While the current human use probably has some effect, erosion in this area did not begin recently. The erosion is due to overland flow and washing of the slope material. Additionally, the area has been used for a long time, perhaps for centuries, as the location is pleasant and water is seasonally available.

Middle Bear Canyon erosion study



Map of MBC site with pith dates of trees, bank features, and section profiles.

Profile “E” with twisted trees on fallen bank section.

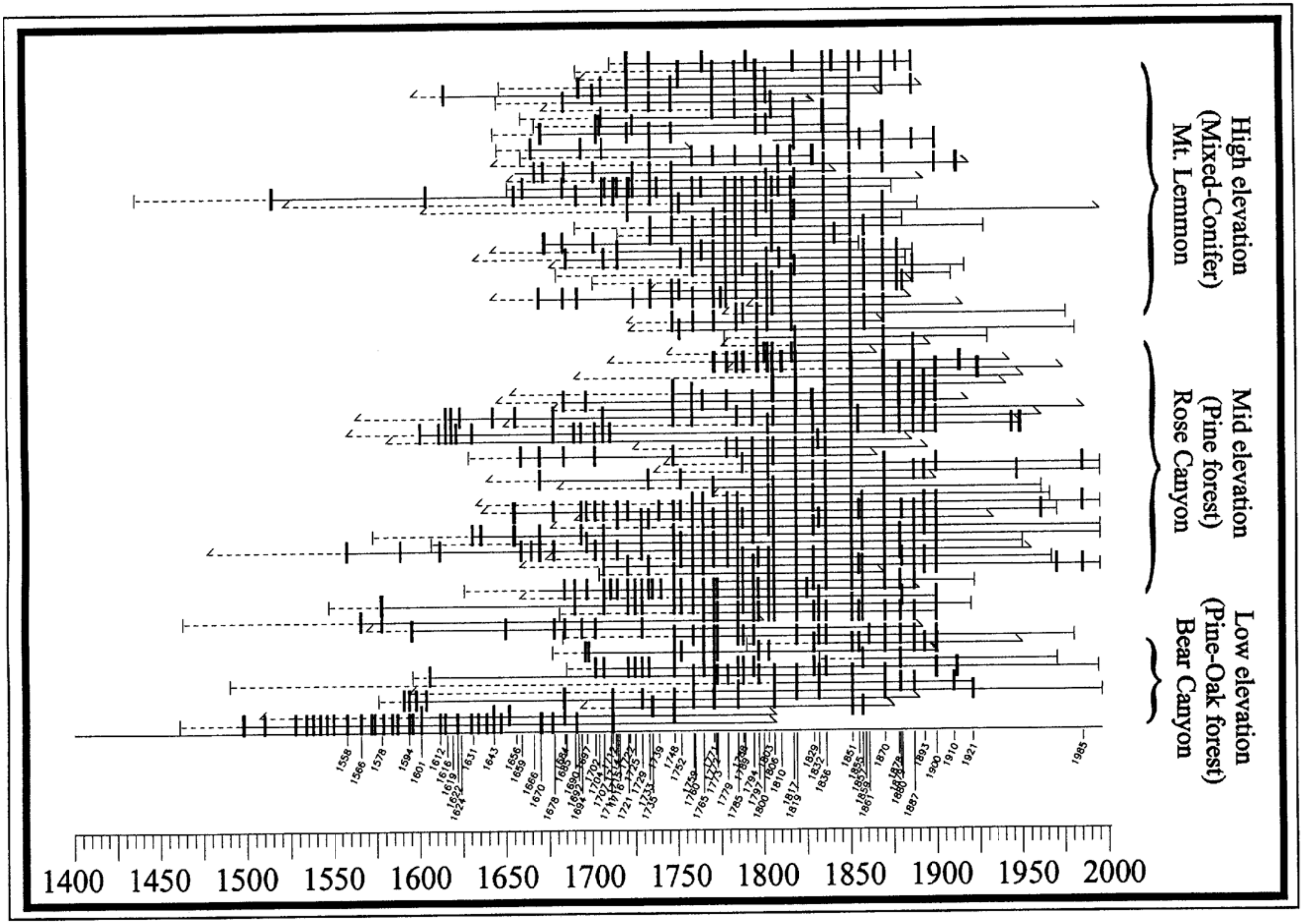


Figure 3. Fire history chart for the Catalina Mountains. Horizontal lines represent individual tree records while vertical bars represent fire events recorded by that tree. Vertical alignment of the bars indicates the spatial extent of fires. Note the change of fire frequency and spatial extent that occurred about 1800. Also, note the sharp decline of fire after 1900 as grazing followed by fire suppression impacts the fire regime.

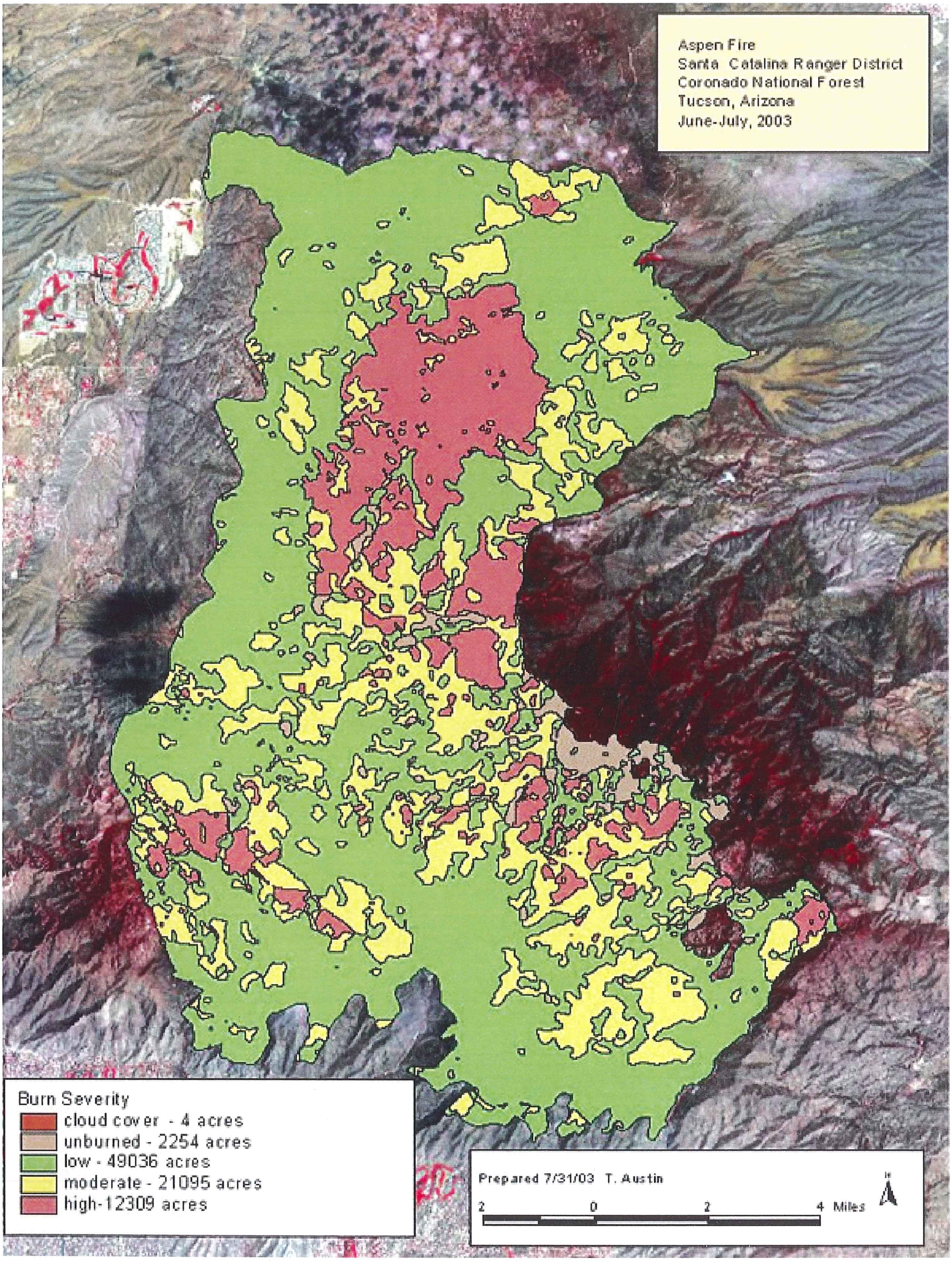


FIGURE 18: Aspen Fire Burn Severity

LETTERS TO THE EDITOR

No intentional fires

Thursday, 28 May 1998

COMMENT 12A

THE ARIZONA DAILY STAR

I came to Tucson to escape Southern California's smog. How disappointing to read that the U.S. Forest Service will be conducting controlled burns and subjecting the citizens of Tucson to increased smog this summer (``Intentionally set fires may bring back haze" - May 22).

I don't believe that a few government employees should arbitrarily be able to make an entire city suffer. How did the forest manage all by itself before the U.S. Forest Service came along?

LETTERS TO THE EDITOR

The forests must burn

Monday, 1 June 1998

COMMENT 10A

THE ARIZONA DAILY STAR

The letter (``No intentional fires" – May 28) was laughable. He complained about smoke from forest fires while wondering how the forests were managed before the U.S. Forest Service.

The short answer to that query is that they burned - and frequently. Given that the Star regularly publishes articles about the University of Arizona Laboratory of Tree-Ring Research, informed Tucsonans know that tree-ring data tell a consistent story of frequent, low-intensity ground fires that burned in the past throughout Southwestern coniferous forests.

However, such fires have been rare since the late 1800s, probably because of the advent of grazing and the improved effectiveness of fire suppression since the mid-1900s. As a result, many Southwestern forests have been diagnosed as ``unhealthy" because their current form (numbers and types of trees, fuel loading) and function (frequency and intensity of processes like fire) are not what they were in the past.

The Forest Service uses prescribed burning as one of many management tools for rectifying this situation. Unfortunately, where there's fire, there's smoke. Indeed, poor air quality resulting from prescribed burning is one of the most vexing issues associated with that management tool. Perhaps it's intractable: The forests will (must) burn, but we don't like smoke. There is no easy answer to this dilemma.

BRIEF HISTORIES

Paul Sheppard

How Mt. Lemmon Came By Its Name

John Gill Lemmon was born in 1832 in Michigan. Lemmon was POW during the Civil War and was a rare survivor of the infamous Andersonville Prison Camp in Georgia. Weighing just 90 pounds, he moved to California to recuperate. In California he become active in botany, discovering many new plant species (*e.g., Aeslepias lemmonii* and *Oreocarya lemonnii*).

Sara Allen Plummer was born in 1836 in Maine. At the age of 33 Plummer contracted pneumonia and almost died. She too moved to California to recuperate and became active in botany, also discovering new plant species (*e.g., Allium plummeraie* and *Baccharis plummeraie*).

John and Sara met in 1874 and quickly discovered their obvious mutual interests. They explored Santa Barbara together for plants and he named a new taxonomic genus after her, *Plummera*. They married on Thanksgiving Day, 1880.

John Gill Lemmon, 1866

Sara Allen Lemmon

In spring of 1881 the Lemmons came to southern Arizona to honeymoon on an exploration of the Santa Catalina Mountains. They tried to reach the upper elevations from the south side (Tucson), but it was too rugged for them. They then contracted a guide named E. O. Stratton to help them make the trip on the north side (Oracle). Upon reaching the very top, Sratton named the peak Mt. Lemmon in honor of Sara Plummer Lemmon making the trek. It was rare for mountain tops to be named after women, and the name was officially recorded in 1904 by Pima County.

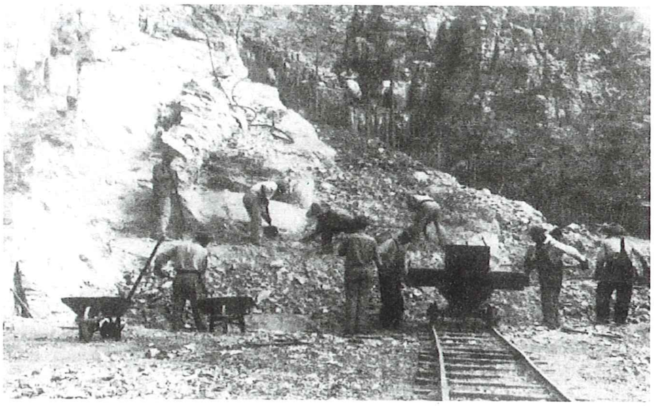
Ultimately, the Lemmons made large collections of plants throughout southern Arizona, discovering about 3% of the flora of the entire state of Arizona. On one trip they were stopped by a band of Apaches who demanded to see their stuff. They were allowed to proceed after showing off their specimens and plant presses. They later gave a public talk entitled, "Perils and Pleasures of Botanizing in Arizona."

John Lemmon died in Oakland in 1908. Sara Lemmon died in 1923, after a full life of accomplishment and achievement.

After thousands of years of people climbing slowly up and down the Catalina Mountains, often taking days for each excursion, a major road was put in on the south side during the 1900s. In the early 1900s, various ballot measures were put forth to Tucson for funding the road, but most were rejected as too expensive.

Frank Hitchcock

In the 1930s, a Good Roads Committee was formed to provide leadership in the mountain road issue. A key player in this committee was Frank Hitchcock, editor of the Tucson Citizen. Hitchcock had served in the Taft administration as Postmaster General, and following that stint he was forever known as General Hitchcock. Among other innovations to road building, Hitchcock felt that employing prisoners to build the highway would be an effective way to hold down costs. Construction began in 1933, though the General never did get to see much of the road, dying 1935.




Construction of Mt. Lemmon Highway

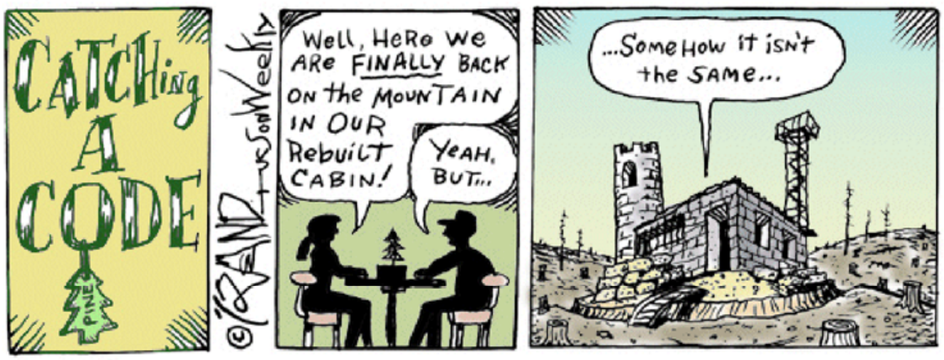
Prisoners at the Prison Camp were there for various infractions, ranging from tax evasion to murder. During World War II, conscientious objectors and Japanese-Americans were also held at the Catalina Prison Camp and forced to work on the road. Crews worked in the higher elevations during summer months and the lower elevations during the winter. By 1939, a camp for the prisoners was built at the site known as Prison Camp, which is now a campground area. Playing fields were installed at the camp to raise morale, which had plummeted especially low when the men were asked to carve up solid rock with only pick axes. By 1940, ten miles of the road had been completed.

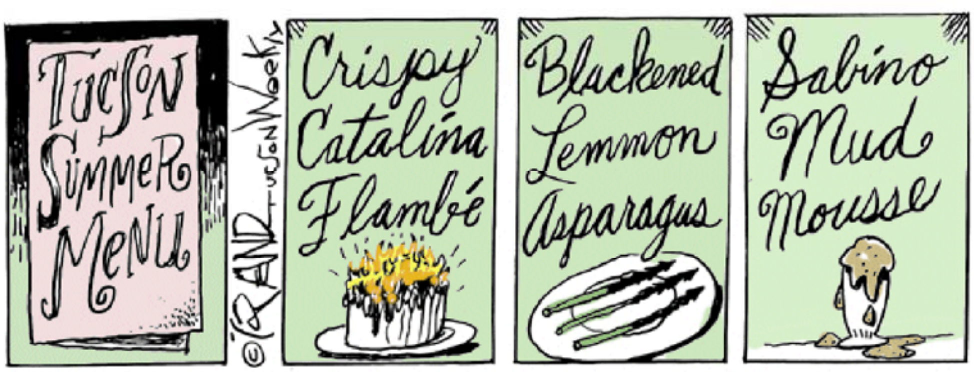
World War II slowed progress on the road as the country focused on its war effort, but by 1945, 17.5 miles were completed. By 1946, the original plan for 23 miles had been completed and a dedication ceremony was held. After that, work continued to connect a paved road to the top as well as the many spurs that now connect to various recreational spots; these spur roads amounted to 16 more miles of road.

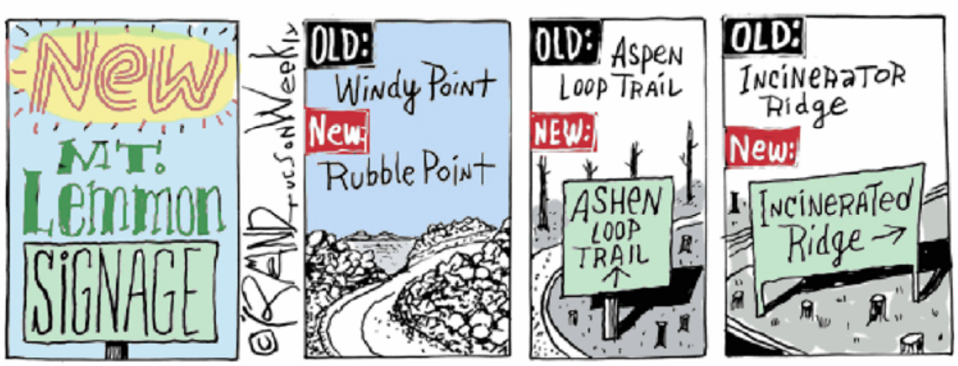
Construction ended in 1951, after 18 years of effort. Because of employing prison labor, the project wound up costing just $4,000 per mile. On the plus side, it was rationalized that most of the prisoners were unusually successfully rehabilitated and provided with job skills, so this partnership was considered to be win-win for everyone.

In the 1990s, the road was rebuilt almost completely, at considerably greater cost.


Nothing to YOU Maybe...
©'12 RAND – Tucson Weekly
Whew–Thank Goodness Nothing's burnt.


Catching A Code
©'12 RAND – Tucson Weekly
Well, Here we are FINALLY back on the mountain in our Rebuilt cabin!
Yeah, but...
...Somehow it isn't the same...


Tucson Summer Menu
©'12 RAND – Tucson Weekly
Crispy Catalina Flambé
Blackened Lemmon Asparagus
Sabino Mud Mousse


New Mt. Lemmon Signage
©'12 RAND – Tucson Weekly
OLD: Windy Point
New: Rubble Point
OLD: Aspen Loop Trail
NEW: ASHEN LOOP TRAIL ↑
OLD: Incinerator Ridge
New: Incinerated Ridge →


The Same But Different
©'12 RAND – Tucson Weekly
HEALTHY FOREST
HEALTHY HENHOUSE

Sunset over Tucson, from Windy Point

--from halfway up to Mt. Lemmon, sunset over Tucson, looking over Thimble Peak and distant Baboquivari Peak.
(iPhone4 w/ snapseed app)

Comments and faves

texturejunky pro (4 months ago)
oh how i love the southwest. this is truly beautiful!

texturejunky added this photo to her favorites. (4 months ago)

elisabethTX (4 months ago)
Gorgeous..love all the layers in this one, and esp. the light skimming the flowers in the foreground.

allophile (4 months ago)
thanks! I was driving down the mtn and decided to pull off at the last minute; glad I did; beautiful evening...

elisabethTX, Cthulhu6, and Ag-NO3 added this photo to their favorites.

Ag-NO3 pro (3 months ago)
Excellent shot! Raking light and warm with a fairytale landscape! Well done!

allophile (3 months ago)

By allophile
No real name given + Add Contact

This photo was taken on October 15, 2012 using an Apple iPhone 4.

65 views 4 favorites 6 comments

This photo belongs to

allophile's photostream (158)

This photo also appears in

- landscapes (set)
- Arizona (set)
- iPhone-Photography (group)
- Life In LoFi: iPhoneography (group)
- Amazing iPhoneography (group)
- Snapseed Photo Share (group)
- Arizona Passages (group)
- Arizona Wonders (up to 3 in a... (group)

Tags

Arizona • desert • sunset • landscape • mountains • Tucson • Santa Catalina Mountains • Catalina Highway • iphoneography • Arizona Passages

Additional info

Settings: 1/943 ƒ/2.8 ISO 80 3.9 mm

License

Privacy

This photo is visible to everyone