

CHAPTER II
THE NATURAL ENVIRONMENT

Although several workers have contributed to our botanical knowledge of the Sierra Madre Occidental of northwestern Mexico the region remains underexplored. No flora covers the area. Brand (1937), Gentry (1942), LeSueur (1945), White (1948), and Maysilles (1959) provided floristic information on portions of the region. Bennett & Zingg (1935), Pennington (1963, 1980), Gentry (1963), and Bye (1979, 1981), have supplied ethnobotanical information on the Tarahumara, Warihio, and lowland Pima Bajo peoples bordering on the Mountain Pima.

The Nabogame valley ranges in altitude from 1600 m in the south at the confluence of the Nabogame Arroyo with the Rio Yepachi to 2100 m at the summit of the mountain to the northeast of the town. The east side of the valley is formed of a highly siliceous rhyolite, while the west side is of a purplish-red shale. There are also numerous granitic outcroppings in the vicinity, often forming steep precipices. The entire area is cut by numerous small canyons and arroyos. There are no deep barrancas in the immediate vicinity of Nabogame, such as those found south of Yepachi in the drainage basin of the Rio Mayo.

Precipitation in the Sierra Madre Occidental is

experienced the worst drought in the memory of the local people. The drought adversely affected many of the local plant populations, and uncommon mesophytes may be underrepresented in this survey. Indirect effects of the drought (i.e. increased grazing pressure) were as devastating as the direct effects.

Although the predominant natural vegetation of Nabogame is pine/oak forest (Rzedowski 1986), this has been greatly modified by human utilization. The valley can be subdivided into various vegetation zones according to use, soil, slope, aspect, and availability of water. The inhabitants of the town impact on the landscape in several ways: livestock grazing, plowing of fields for agricultural use, and direct utilization of wild plants for food, fiber, medicine, construction materials, and firewood. Grazing intensity varies seasonally due to the local habit of allowing the livestock into cultivated portions of town during the winter but keeping them in the forest during the summer planting season from May to November. This results in a great abundance of herbaceous vegetation inside the town during the summer rainy season. This luxuriant growth is nearly completely consumed by the livestock by spring. Direct human utilization of plant resources has severely depleted several useful species, according to many of the local people. Economic species they describe as having been

bimodal, with two rainy seasons and two dry seasons (Figure 2) (Wallen 1955). Average annual precipitation in Yecora, Sonora, 40 km west of Nabogame, is reported at 1071 mm per annum (Hastings 1964). Most of the rain occurs in the form of thunder showers which approach from the southeast in late summer (Hastings 1964). Nabogame is in a strong rain shadow even with respect to Yepachi 18 km to the southeast. The name "Nabogame", i.e. "place of the prickly-pears", reflects the abundance of xerophytic vegetation at this site. In Yepachi, moist pine forest covers a much larger portion of the surface area than in Nabogame. Nabogame is nevertheless moister than Maycoba and other communities farther west and is by no means a desert.

The seasonality of rainfall has a significant impact on vegetation and streamflow. Fallow fields depleted of vegetation by grazing during the spring dry season become covered with a thick stand of herbs two meters or more tall by the end of August. Creeks in the town dry out completely during the May-June dry season, then become raging torrents during July and August thunder showers. The desiccation of the annual dry season combined with the scouring effect of the summer floodwaters prevents the formation of swamps and marshes in the valley.

During the latter half of my fieldwork period, beginning in August 1987, the Mountain Pima area

more abundant in the past include *Dasylicion wheeleri*, *Molina* sp., *Yucca madrensis*, and *Priosteadium townsendii*.

The following habitats are present in Nabogame, characterized by their dominant species:

1. Cultivated fields: *Amaranthus hybridus*, *A. rigidus*, *Cosmos parviflorus*, *Bidens aurea*, *Ipomoea* spp.
2. Fallow fields, ungrazed in summer: *Cosmos parviflorus*, *Bidens aurea*, etc.
3. Cleared but unplowed fields: *Hymenocallis pimana*, *Cosmos parviflorus*, *Bidens aurea*, *Opuntia* spp. Within the perimeter fence protecting the agricultural sections of town from grazing livestock, there are areas too steep or rocky for planting. These are therefore left permanently as pasture, grazed in the winter but not the summer. Most of the annual species found in the fallowed fields may also be found here, in addition to perennial species such as *H. pimana* which cannot withstand the effects of the plow.
4. Permanently grazed pasture: various grasses and forbs. In the forest beyond the perimeter fence there are several permanent pastures devoid of trees and subject to year-round grazing pressure. Some of these represent fields formerly cultivated but now abandoned due to erosion, while others are covered with poor,

rocky soil.

5. Oak forest: Quercus chihuahuensis, Q. vaminea, Q. hypoleuca, Arbutus xalapensis. This constitutes the most widespread vegetation zone, covering large sections of hillside.
6. Moist pine forest: Pinus engelmannii, P. chihuahuana, Quercus chihuahuensis, Q. vaminea. Moist pine forest generally occurs in more protected, sheltered areas than oak woodland, although the two do intergrade considerably.
7. Dry pine forest: Pinus lumholtzii, Quercus chihuahuensis, Juniperus deppeana, Arbutus xalapensis. The soil in certain areas is poorer and more porous than in others, resulting in slightly more xerophytic vegetation. The trees in this area are shorter than in the moist pine forest, the herbaceous vegetation more scanty, and the general aspect more open.
8. Cypress forest: Cupressus arizonica, Pinus spp., Quercus spp., Prunus gentryi, Arbutus xalapensis, Fraxinus spp. Along the intermittent creeks where the water table is rather shallow, there occurs a very moist community dominated primarily by tall trees. Many of these areas were steep-walled canyons, with such shrubs as Berberis pimana, Molodiscus dumosus, Rhus trilobata, and Forestiera neomexicana. Some

arizonica.

14. Steep cliffs and near-cliffs: Dasylirion wheeleri, Agave shrevei ssp. matapensis, Opuntia spp., Esenhardtia orthocarpa. These open rock-faces are largely immune to grazing pressure.
15. Sun-lit creekbanks: Baccharis salicifolia, Polygonum spp.

I collected specimens of 612 plant species in Nabogame between October 1986 and November 1988 (Appendix I). This included 23 seedless vascular plants (3.8% of total), 8 conifers (1.3%), 447 dicotyledons (73.0%) and 134 monocotyledons (21.9%). There were 98 botanical families represented, the largest being the Asteraceae (120 species, 19.6% of total), Poaceae (64, 10.5%), Fabaceae (50, 8.2%), Cyperaceae (20, 3.3%), Lamiaceae (19, 3.1%), Scrophulariaceae (18, 2.9%), Euphorbiaceae (14, 2.3%), Orchidaceae (14, 2.3%), Convolvulaceae (12, 2.0%), Adiantaceae (11, 1.8%), and Solanaceae (10, 1.6%).

The region included in the floristic survey covers the drainage basin of the creek running through the center of Nabogame, plus the neighboring drainage basin locally referred to as "La Mesa." This basin to the east of the main drainage basin was included since one house socially and politically considered part of Nabogame lies to the

utilizable plants such as Prionosciadium townsendii, Dahlia spp., and Hedeoma patens are also found in these regions.

9. Maple forest: Acer grandidentatum, Cupressus arizonica. Along the banks of the Rio Yepachi, there are two small stands dominated by these two tree species. Though of a small extent, these groves are important floristically since many mesic, sun-intolerant herbs are present only in these groves.
10. Manzanita thickets: Arctostaphylos punaensis, Quercus chihuahuensis, Juniperus erythrocarpa. This community dominated by shrubs and small trees is found in areas of extremely poor, porous soil. This type grades into the dry pine forest.
11. Aquatic: Ranunculus subrigida, Potamogeton spp. The only truly aquatic habitat in the area is the Rio Yepachi. In its waters are found a few submerged and emergent species.
12. Sunlit springs: Eryngium longifolium, Lobelia cardinalis. Most of the sunlit springs are very heavily grazed, but approximately 1 km north of the town there is a permanent spring on a slope too steep for even the goats. This spring was flowing even during the drought of 1988.
13. Shaded springs: Quercus spp., Prunus gentryi, Cupressus

east of the divide, and because the vegetation there more closely reflects the natural vegetation of the area. The eastern drainage has been subjected to less intensive agricultural exploitation and no commercial logging. The creeks of both drainage basins are tributaries of the Rio Yepachi, which in turn drains into the Rio Papigochic and the Rio Yaqui. The portion of the river between the mouths of the two creeks was also included in the survey. Estimated total area of the survey was 20-25 square kilometers.

The number of species collected compares favorably with those of other local floras from northwestern Mexico and the southwestern United States (Bowers 1981, 1982). White (1948) listed 1200 species from the Rio Bavispa, an area close to Nabogame but approximately 200 times as large. Welsh & Moore (1968) reported 224 taxa from an area in Utah slightly larger than Nabogame. Hazen (1978) listed 220 taxa from 51.8 square kilometers in northern Arizona. Reeves (1976) listed 687 species from Chiricahua National Monument, Arizona, an area of approximately 43 square kilometers. Fletcher (1972), Little & Campbell (1943), Langenheim (1955), Rondeau (1991), Halse (1973) all recorded fewer than 600 species from areas 15-40 times as large as my study area. Toolin et al. (1979), however, listed 624 spp. from 9 square kilometers in Sycamore

Canyon, Arizona. Montane environments often tend to have higher species richness than desert habitats (Felger 1980). Given these comparisons to other studies, I feel confident that the list represents the vast majority of the plant species present in Nabogame during the study period. I cannot, however, estimate the number of species missed because of the drought.

Nabogame is the type locale for seven recently described plant and fungal taxa. These are *Prunus gentryi* forma *flavipulpa* (Laferrière 1989a), *Hymenocallis pimana* (Laferrière 1990b), *Berberis pimana* (Laferrière & Marroquin 1990), *Laennecia pimana* (Nesom & Laferrière 1990), *Pectis pimana* (Laferrière & Keil 1991), *Albatrellus mexicanus* Lafer. & Gilbn. (Laferrière & Gilbertson 1990a), and *Polyporus tenuinarius* Lafer. & Gilbn. (Laferrière & Gilbertson 1990b). Five other taxa on this list (cited as *Quercus mcvaughii*, *Gnaphalium* sp., *Bromelia angustifolia*, *Asclepias madransis*, and *Arabis microcarpa*) represent new species soon to be described elsewhere (Spellenberg pers. comm.; Nesom, pers. comm.; Van Devender & Jenkins, pers. comm.; Stevens, pers. comm.; Al-Shehbaz, pers. comm.).

Ethnotaxonomy

Collection of ethnotaxonomic information was hampered

called "lali sha'i" ("small herb") or "kokmok sha'i" ("gray herb"). The tendency toward spontaneous descriptions was true even of economically useful plants, which occasionally shared names. For example, *Hymenocallis pimana* and several wild species of *Allium*, especially *A. rhizomatum*, were both referred to in Spanish as "cebollin" ("little onion"). I overheard a Pima woman differentiate *H. pimana* from the *Allium* by referring to it as "lo que florece blanco, muy grande asi" ("the one with white flowers this big"). Similarly, *Arctostaphylos pungens* and the garden herb *Chamaemelum recutita* are both called "manzanilla" ("little apple"), the former because of its fruit shape, the latter because of its odor. The same woman and I were discussing *A. pungens* when her son asked which manzanilla we were talking about. "Ese arbusto que le mostraste el año pasado" ("that shrub you showed him last year") was her reply. This contrasts with the usual ethnotaxonomic situation in which related species are distinguished by standardized adjectives (e.g. "white oak" or "sugar maple").

Several names applied to unrelated groups of species with similar appearances or uses. All banded snakes, regardless of color, even the brown and tan lyre snake (*Trimorphodon biscutatus*), are lumped together as "corallo" ("coral snake"). The Pima term for this folk taxon, "h=sktash ko'o", translates as "one-day snake", in

by the limited number of Pima speakers in Nabogame and the high level of disagreement among them. Logistical limitations and the obligations imposed by my optimization study in Nabogame prevented me from travelling extensively in the region to gather data from more informants. I did, however, collect some information from an elderly couple in Las Varitas, 6 km south of Nabogame and 14 km west of Yepachi.

The differences between informants were at times difficult to deal with. Repeating names given by one native consultant sometimes elicited hearty laughter from another. Several reasons for the discrepancies were apparent. The Mountain Pima are rapidly losing their traditional ethnobiological knowledge through disuse. Even many of the older people who speak Pima say they have not used the language in years. Traditional medicine is being replaced with health care provided by the Mexican government and with herbal medicine imported from lower elevations. Mountain Pima names for many plants are being replaced with mestizo and Tarahumara borrowings. My inquiries as to the Pima names for various plants often elicited only Pimatizations of Spanish names, e.g. "yerbaviiv" for "hierba de la vibora".

Many of the names I received represented spontaneous descriptions rather than fixed names. Many plants were

reference to the fact that a bite from a true coral snake can kill a person in one day. The Spanish name "contrayerba" (Pima "kontrayerv") refers to a variety of plants with similar medicinal properties, i.e. *Euphorbia cyathophora*, *Gomphrena nitida*, *Gulleminea densa*, and *Zinnia parviflora*. "Malamujer" (Pima "haramkulyi") referred to plants with adhesive propagules, such as *Triumfetta discolor*, *Priva mexicana*, and *Heterotheca subaxillaris*. All twining plants were called "redadera" (Pima "shitulyi"), except *Clematis drummondii* was "redadera del nopal" (Pima "kaava beporo"). *Mammillaria* spp. and *Echinocereus* spp. were included in the taxon "cholla" (Pima "tu'i shogi"), although *M. sonorenensis* was also called "pitaya".

Sometimes informants disagreed concerning inclusion of taxa. Lusers classed all orchids as "kiki" and all ferns as "carnahual" while splitters considered only *Blechnum gracilis* and *Cheilanthes cuneata*, respectively, as true representatives of these groups.

Fungi are extremely underclassified among the Pima, with only a few folk species recognized. This contrasts sharply with other indigenous peoples such as the Purepecha, who have a very elaborate folk taxonomy of fungi (Mapes et al. 1981). Fungi are named primarily according to habitat or substrate, being grouped into "hongo de la tierra" ("earth fungus"), "hongo de encino" ("oak fungus"),

"hongo de pino" ("pine fungus"), "hongo de fresno" ("ash fungus"), "hongo de sabino" ("cypress fungus"), etc. A fungus growing on the pine shingles of a house is called "hongo de la casa" ("house fungus"). *Cuscuta campestris*, a common angiosperm parasitic on herbaceous vegetation, is called "hongo de zacate" ("hay fungus") or "hongo de juve" ("*Cosmos parviflorus* fungus"). All mosses, lichens, and liverworts are lumped together as either "barba de encino" ("oak beard") or "barba de piedra" ("rock beard"). *Selaginella* is also included in this taxon except for *S. lepidophylla*, which is "flor de piedra" ("rock flower"). The epiphytic bromeliad *Tillandsia rubescens*, however, is called "flor de encino" ("oak flower") regardless of substrate.

The Mountain Pima do acknowledge the existence of unnamed taxa subordinate to the named folk species, and that specimens collected from different substrates represent identical species despite the different names. Occasionally, the native categories cut across the boundaries of scientific classification; for example, specimens of *Lentinus lewis* were named as "hongo de encino" when collected from oak (*Quercus* spp.), "hongo de madroño" when found on *Arbutus californica*. This conflict between named taxa and unnamed covert categories contrasts with the more usual hierarchical folk classification described by

others (Berlin et al. 1966, 1968). More often, however, fungi recognized as different species by mycologists are lumped together in heterogeneous folk species by the Mountain Pima.

Appendix II contains listings of the names of plants and fungi for which I have enough corroboration to consider trustworthy. Animal names are listed in Appendix III. These were obtained primarily by showing color pictures published by Udvardy (1977), Behler & King (1979), Whitaker (1980), and Boschung et al. (1983).